City of La Crosse
2040 Wastewater Strategic Plan | Treatment Facility

March 20, 2020

La Crosse Wastewater Treatment Facility
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ABBREVIATIONS

7-d	Seven-day
30-d	Thirty-day
AA	Annual Average
ac	acres
ACH	Air Changers per Hour
BOD	5-day Biochemical Oxygen Demand
BFP	Belt Filter Press
CID1	Class I, Division 1
CID2	Class 1, Division 2
CFR	Code of Federal Regulations
City	City of La Crosse
CWFP	Clean Water Fund Program
CMOM	Capacity, Management, Operation, and Maintenance
cy	cubic yards
cyh	cubic yards per hour
d	day
DOA	Department of Administration
DSD	Digested Sludge
DT	dry tons
EPA	United States Environmental Protection Agency
EQ	Exceptional Quality (biosolids)
Facility	Facility
F:M	food-to-microorganism ratio
ft	feet
GBT	Gravity Belt Thickener
gpcd	gallons per capita per day
gpd	gallons per day
gph	gallons per hour
gpm	gallons per minute
H2S	Hydrogen Sulfide
hp	horsepower
hr/d	hours per day
HVAC	Heating, Ventilation, and Air Conditioning
in	inches
in/hr	inches per hour
kcf	thousand cubic feet
Kg	kilogram
kWh	kilowatt hours
lbs	pounds
M	millions
MCC	Motor Control Center
MD	Maximum Day
mg	milligram
mg/L	milligrams per liter
mgal	million gallons

ABBREVIATIONS (CONTINUED)

mgd	million gallons per day
ML	mixed liquor
MM	Maximum Month
mo	month
MPN	most probable number
MRRPC	Mississippi River Regional Planning Commission
MW	Maximum Week
NFPA	National Fire Protection Agency
NR	Natural Resources
Permit	WPDES Permit
P	phosphorus
PP	particulate phosphorus
ppcd	pounds per capita per day
ppd	pounds per day
ppy	pounds per year
ng/L	nanograms per liter
Q	refers to flow
RAS	Return Activated Sludge
RWW	Raw Wastewater
scfm	Standard Cubic Feet per Minute
sf	square feet
SNRP	soluble non-reactive phosphorus
SP	soluble phosphorus
SRP	soluble reactive phosphorus
SRT	Solids Retention Time or sludge age
SSES	Sewer System Evaluation Survey
SSO	Sanitary Sewer Overflow
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TPAD	Temperature Phased Anaerobic Digestion
TS	Total Solids
TSS	Total Suspended Solids
TWAS	Thickened Waste Activated Sludge
USEPA	United States Environmental Protection Agency
VS	Volatile Solids
VSS	Volatile Suspended Solids
WAC	Wisconsin Administrative Code
WAS	Waste Activated Sludge
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollution Discharge Elimination System
WWTF	Wastewater Treatment Facility
yr	year

EXECUTIVE SUMMARY

PURPOSE

This Report documents Wastewater Treatment Strategic Planning. This Planning effort, which was initiated in 2015, produced a comprehensive Recommended Plan (Plan): a capital improvement program to provide the City a safe, reliable, cost-effective, and Permit-compliant wastewater treatment system for the nominal 20-year planning period. The Plan addresses concerns as categorized below, and provided in more detail in TM 1 Project Definition. The final year of the nominal 20-year planning period is Year 2040.

1. Capacity deficiency
2. Regulatory compliance
3. Resource Recovery
4. Environmental Stewardship
5. Public Safety
6. Aging Infrastructure

CAPACITY DEFICIENCY

As loadings to the Facility increased, the limiting unit process was identified as the solids system. Solids system components lack adequate capacity today and are anticipated to further lack capacity during the 20-year planning period. The Recommended Plan addresses capacity concerns for the City and regional communities.

REGULATORY COMPLIANCE

The Recommended Plan addresses compliance concerns. Recommendations aimed at maintaining compliance with present-day regulatory requirements are categorized as Aging Infrastructure recommendations. The Regulatory Compliance recommendations are aimed at impending regulations, namely a lower effluent phosphorus limit as defined by a water quality based effluent limit (WQBEL) and land application restrictions for phosphorus in biosolids.

RESOURCE RECOVERY

A wastewater facility receives nutrients such as nitrogen and phosphorus every day it is operable. These nutrients can be recovered and recycled to other end uses. For example, biosolids disposal options are affected by the level of biosolids treatment therefore impacting the available end users. Alternatives that improve resource recovery and the ability to recycle nutrients for another sector will be ranked higher. An alternative that enhances resource recovery improves the environment and can boost public perception.

Another area of resource recovery is creating beneficial uses for the various products from the WWTP. These include water reuse, biogas utilization, heat recovery, and biosolids end-use. Although some of these recovery products are currently partially captured, enhancements will align with the City's strategic goals.

ENVIRONMENTAL STEWARDSHIP

Protection of community assets such as the Mississippi River and reducing carbon footprint for the City is a priority concern. The Facility is well operated and maintained; however, some of the unit processes in the liquid and solids treatment trains lack adequate reliability, flexibility, redundancy, and control. These shortcomings degrade the potential performance of the Facility and jeopardize consistent, reliable compliance.

Minimizing energy use not only provides savings on cost, but it also minimizes the impact to the environment. Some alternatives may even produce new sources of energy that could be used at the facility and offset existing energy reliance. Public perception of the WWTP can be impacted by the facility's use of energy. Alternatives that positively contribute to reducing total net energy use will be more desirable.

PUBLIC SAFETY

Protection of City staff and the community are vital to the success of the current Facility. During the previous facility plan assessment, code related improvements for National Fire Protection Association (NFPA) and 10-States Standards were identified as important standards to uphold in any future improvements project. The Facility, most of which was designed and constructed before NFPA 820 was adopted, does not comply with this Standard.

AGING INFRASTRUCTURE

The Recommended Plan addresses safety, reliability, and performance concerns. The Facility was constructed in two major phases: Phase 1 in 1936, Phase 2 in 1972, since then several replacement projects have continued to advance the facility. Much of the core infrastructure and equipment is at least 47 years old. Structural infrastructure remaining from the Phase 1 facility is now 83 years old and may be nearing the end of its useful life. A significant fraction of the equipment installed in 1972 has been well maintained, but is also rapidly approaching the end of its reliable service life.

CURRENT FLOWS AND LOADINGS

Existing service area populations are provided in Table 1. The service area serves residential populations of La Crosse, Onalaska, T. Campbell, T. Shelby in Wisconsin and La Crescent, Minnesota. It also serves significant industrial users within the City of La Crosse. TM 2 – Existing Conditions provides additional detail about each unit process and the current flows and loadings.

Table 1 - Existing Flow and Loading Summary

	Average	Max. Month	Max. Week	Max. Day	Peak Hourly
Sewer Service Area Population = 90,955					
Flow (MGD)	10.1	12.5	13.2	17.9	32.3
BOD (lb/d)	26,000	30,800	35,200	64,300	
TSS (lb/d)	29,400	49,800	60,900	77,000	
TKN (lb/d)	2,912	3,450	3,942	7,202	
TP (lb/d)	549	687	793	1,540	

FUTURE FLOWS AND LOADINGS

Future residential contributions were projected using population estimates, while industrial contributions were projected from feedback received from the major industries. TM 3 – Future Conditions provides additional detail about the projection methodology, with TM 9 providing a final mass balance after incorporation of stakeholder projection revisions. Design wastewater flows and loadings are estimated by adding together the future municipal load and future industrial load and are presented in Table 2.

Table 2 - 2040 Design Flow and Loading Summary

	Average	Max. Month	Max. Week	Max. Day	Peak Hourly
Sewer Service Area Population = 99,911					
Flow (MGD)	13.0	15.8	17.7	28.8	42.5
BOD (lb/d)	31,300	39,700	45,000	91,000	
TSS (lb/d)	36,600	56,700	70,000	126,000	
TP (lb/d)	700	800	950	1,900	

ALTERNATIVES ANALYSIS

The Recommended Plan is a product of an evaluation of alternatives that address present-day and design-year issues and concerns, these items are summarized in TM 4 – System Needs. The alternatives that address these shortcomings have been grouped into the four key issue categories listed and defined in Table 3. Many of the alternatives, particularly those that address safety-, condition-, and/or performance-related issues, do not have a competing alternative or alternatives. Alternatives that do

not have a competing alternative remedy shortcomings in a straightforward and cost-effective manner consistent with the present-day Facility configuration, leveraging to the maximum extent possible previous infrastructure investments.

Table 3 - Key Issue Categories

Issue Categories	Definition
Reliability	Some of these alternatives remedy safety-, condition-, or age-related deficiencies associated with process equipment, equipment ancillary to processes, process-related infrastructure, and Facility-related infrastructure. Other alternatives enhance the performance, stability, reliability, and/or efficiency of a particular unit process.
Solids Capacity	These alternatives enhance the solids capacity of a particular unit process to adequately and efficiently accommodate projected Design Year flows and loadings.
Phosphorus Regulations	These alternatives enhance existing unit processes, replace existing unit processes, or add unit processes to comply with more stringent future regulations. For this Plan, these alternatives were aimed exclusively at phosphorus compliance. The Facility discharges to a stretch of the Mississippi River that is phosphorus impaired and the effluent has been assigned a maximum effluent phosphorus concentration of 0.1 mg/L TP.
Energy	These alternatives provide options to minimize the City's carbon footprint by boosting digester biogas, capturing this methane and processing the gas to generate renewable energy or fuel.

PROCESS ISSUES AND CONCERNS

Process issues and concerns are pervasive throughout the aging Facility. These are delineated in Chapters 3 and 4 and are summarized in Table 4. Figure 1 shows required solids handling unit process capacities relative to the current rated capacity. Bars that fall short of the horizontal 100% line lack adequate capacity. Proposed modifications were brainstormed as alternatives and selected for further evaluation in TM 5 – Alternative Screening and Retained Alternatives.

NON-PROCESS ISSUES AND CONCERNS

Non-process issues and concerns are pervasive throughout the aging Facility. These are delineated in Chapters 3 and 4. In general, non-process issues and concerns are related to aging Buildings, aging Site features and infrastructure, and changed or more restrictive safety Standards, building Codes, and workplace requirements.

ALTERNATIVE COMPARTMENTS

Alternatives were grouped in the Alternative Compartments listed below. Table 4 shows how the alternatives were assembled by each unit process and by key issues and concerns.

1. Preliminary Treatment
2. Primary Clarification
3. Activated Sludge
4. Effluent Phosphorus
5. Disinfection
6. Sludge Thickening

7. Digestion
8. Biosolids Reuse
9. Biogas Utilization
10. Site and Utilities

Table 4 - Summary of Existing Unit Process Issues and Concerns

Unit Process	Reliability	Capacity	Phosphorus Regulations	Energy
Preliminary Treatment				
Fine Screen	■	■		
Influent Pumping				
Grit Removal and Influent Flow Measurement	■			
Hauled Waste Receiving	■			
Primary Clarification				
Primary Settling		■		
Scum and Sludge Handling	■			■
Activated Sludge				
Activated Sludge Reactors	■		■	
Aeration Blowers and Diffusers				■
Secondary Settling	■			
Return Activated Sludge Handling	■			
Effluent Phosphorus				
Effluent Filtration			■	
Disinfection				
Ultraviolet Light System	■			
Sludge Thickening				
Pre-Digestion Sludge Thickening		■		■
Digestion				
Anaerobic Digestion Heating and Mixing	■	■		■
Biosolids Reuse				
Biosolids Storage	■	■		
Land Application Program	■		■	
Biogas Utilization				
Gas Safety Equipment	■			
Digester Boilers	■			■
Site and Utilities				
Building Heating System	■			■
Compliance with Code and Standards	■			
Effluent Water Reuse	■	■		
Electrical Infrastructure	■			
Flood Management	■			
Odor and Corrosion Control	■			

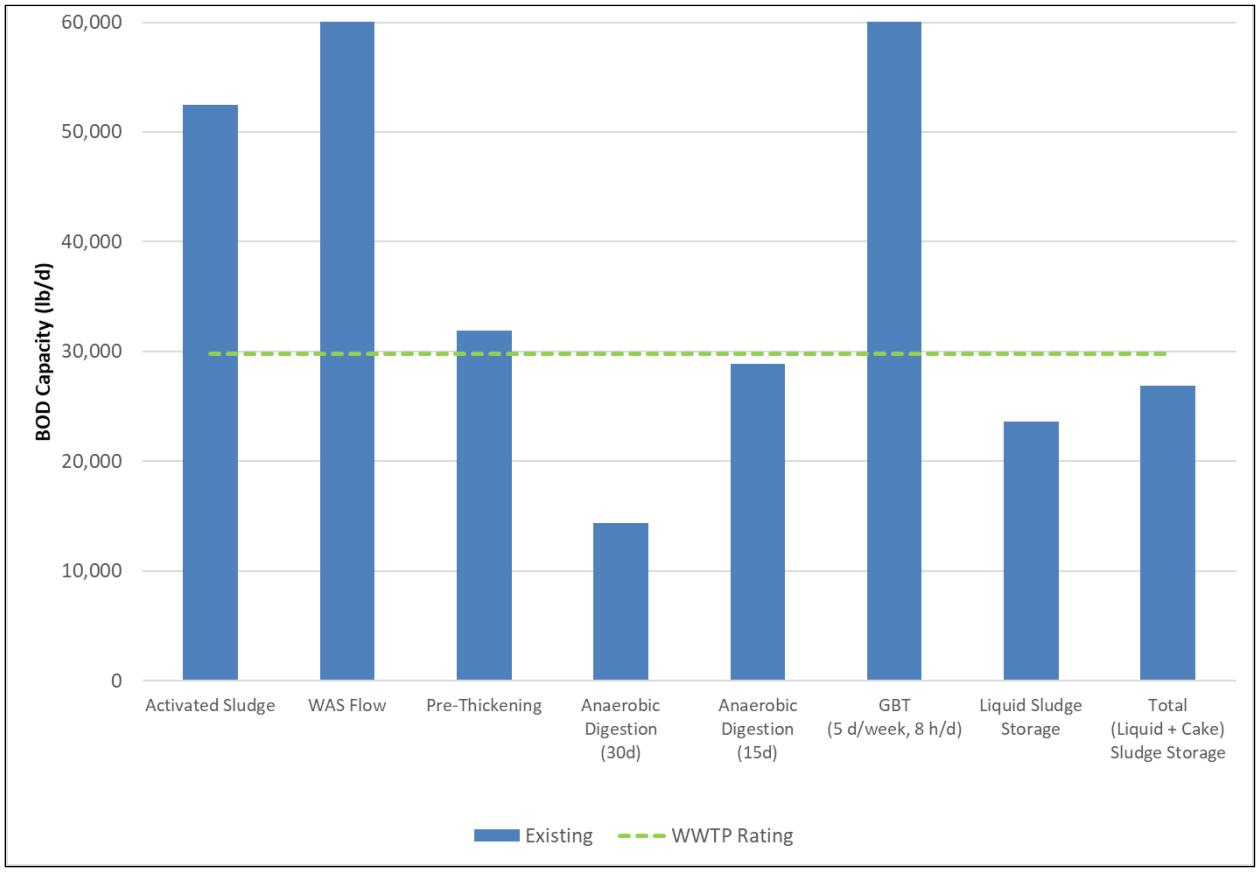


Figure 1-1 Existing Solids Handling Unit Process Capacities Relative to Required Capacities

COST ALLOCATION

Elected officials and the rate paying stakeholders deserve a clear and succinct explanation of the issues and concerns proposed capital improvements address.

OPINIONS OF COST

Detailed planning phase capital cost opinions are included in Appendix 6A. Annual cost opinions were developed when two competing alternatives have different annual operating costs. The annual costs are converted to a 20-year present worth cost. The 20-year present worth represents the current dollars required to construct the improvements and operate them for 20 years.

These planning phase costs were refined in TM 9 to develop a higher confidence level in the total project cost.

RESIDENTIAL USER COST PERSPECTIVE

In addition to considering capital, annual, and total present worth costs, the Plan was developed considering typical City of La Crosse residential rate increases. The City intends to finance the project using the Clean Water Fund (CWF) over a 20-year term (1.98% annual interest rate).

THE ANALYSIS OF ALTERNATIVES

The details of the Alternatives Analysis are beyond the scope of an Executive Summary. The rationale used to recommend or select specific alternatives are documented in TM 6 – Alternatives Analysis. Additional project scope refinement was developed in TM 9 based on detailed discussions with the project team.

RECOMMENDED PLAN

The Recommended Plan is the collection of individual recommendations for the various unit processes and Facility functions. Figure 2 shows how costs are distributed around the Facility and between the condition categories. A summary of the recommended plan project components is provided in TM 7 – Recommended Plan, with a total capital cost estimate of $55.5M; note however that this cost was updated in TM 9 with a total capital cost estimate of $62M. Typical City of La Crosse residential user rates will increase approximately $5 to $6/month if the Project is financed using a 20-year Wisconsin Clean Water Fund Program low-interest loan.

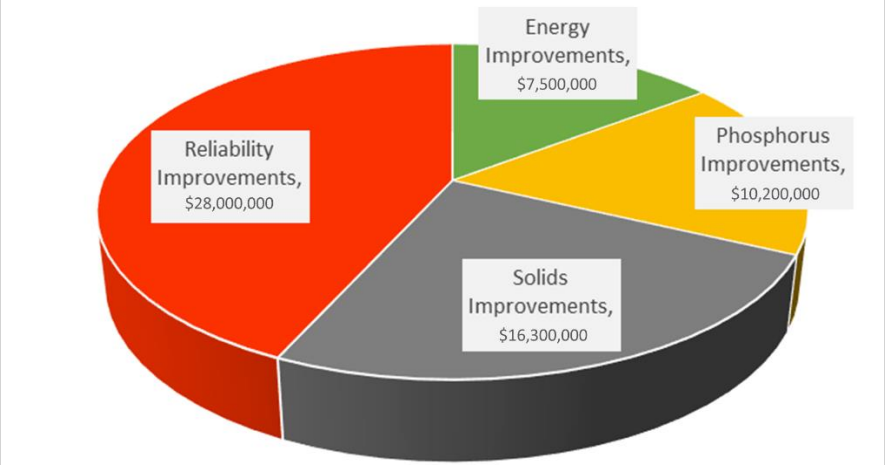


Figure 2 - Capital Cost Distribution by Condition Category

Figure 2 shows that the Recommended Plan is first and foremost a capital improvement plan to address safety, reliability, and performance concerns at an aging Facility. More than 40% of the total capital cost is attributed to reliability-, safety-, and performance-related improvements. Roughly 25% of the total capital cost addresses capacity concerns for the solids handling processes and 17% of the total capital cost is to implement a simple, reliable, and robust strategy to comply with an impending low-level effluent phosphorus limit. The City continues to explore all potential methods to minimize this cost; however, the included alternative provides a simple method to comply with the current stringent limit. The Recommended Plan also includes a biosolids drying process that will produce a Class A EQ biosolids end product, eliminating the challenges inherent with the existing Class B land application program and guarding against future challenges that could significantly increase the annual cost of the current program. Lastly, 15% of the Plan provides energy improvements that increase biogas quantities and combust treated biogas in a cogeneration reciprocating engine-generator to produce electricity.

The City intends to Bid the Work associated with the proposed Facility improvements in the first quarter of 2021. Construction is expected to require 24 months. A proposed implementation schedule is shown

in Figure 3. In conformance with the requirements of the Wisconsin Clean Water Fund Program, reviewable plans and specifications will be submitted to the WDNR by September 30, 2020.

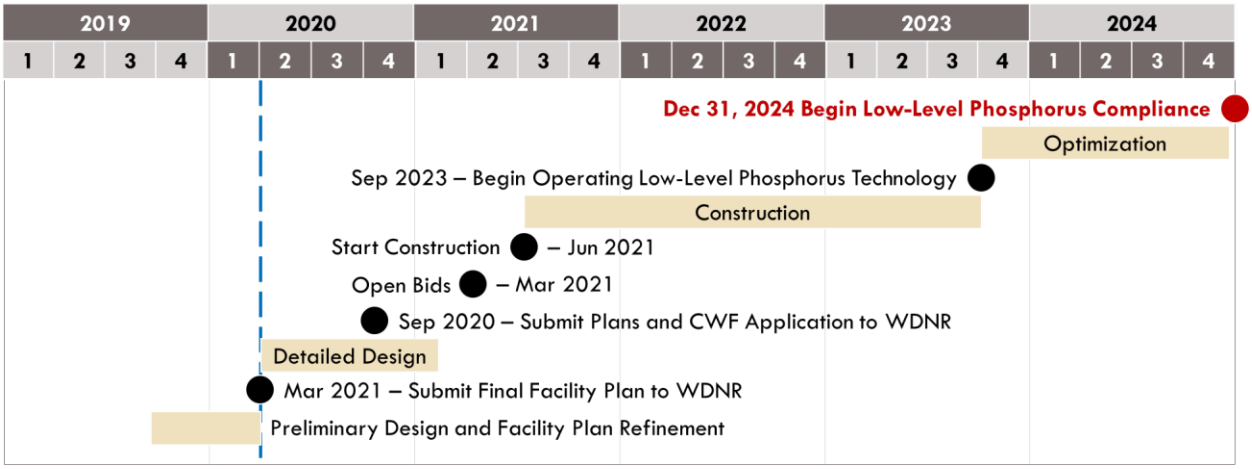


Figure 3 - Proposed Implementation Schedule for the Final Plan

Technical Memorandum 1
Project Definition
Strategic Plan: Wastewater Treatment
La Crosse Wastewater Treatment Facility
La Crosse, Wisconsin

Date: March 20, 2020

To: Bernard Lenz – Utilities Manager

Copy: Jared Greeno, WWTP Superintendent
Brian Hein – WWTP Assistant Superintendent
Greg Kozelek – City Engineer

From: Mike Gerbitz – Donohue & Associates

By: Bill Marten – Donohue & Associates
Eric Lynne – Donohue & Associates

Purpose

The purpose of Technical Memorandum 1 (TM 1) is to establish the project definition for the La Crosse Wastewater Facility (WWTP) Facilities Plan which will set the strategic direction of the facility's future. TM 1 documents major points of discussion that occurred at the Kickoff Workshop held on August 15, 2018. This TM also serves to establish the following planning foundations for the Facilities Plan:

- Project Drivers
- Planning goals and objectives
- Stakeholders and level of involvement
- Metrics for evaluating improvement alternatives

Project Drivers

Several Project Drivers were identified at the Kickoff Workshop. These drivers provide motivation and justification for the Facilities Plan. The Project Drivers are described below:

Capacity Deficiency	Ensuring adequate capacity for the City and regional communities
Regulatory Compliance	Planning for compliance with future regulations with an emphasis on phosphorus limits and biosolids management
Resource Recovery	Reusing and recycling valuable resources from the various waste streams and processes
Environmental Stewardship	Protecting community assets such as Mississippi River and reducing carbon footprint for City as a whole
Public Safety	Protecting the community and City staff
Aging Infrastructure	Renewing and maintaining facilities to provide reliable service and treatment performance

Project Phases

This planning project has eight phases of work.

Phase 1 Project Definition	Establish strategic direction, project objectives, metrics for evaluations, and decision-making criteria
Phase 2 Existing Conditions	Document current condition of facilities, flows, loadings, and performance
Phase 3 Future Conditions	Define future conditions required by the facility during the planning period. This will include a review of flows, loadings, and impacts from future regulations and trends inclusive of significant industrial loading scenarios.
Phase 4 System Needs	Summarize deficiencies to be addressed in the planning period and preliminary prioritize
Phase 5 Retained Alternatives	Identify and screen alternatives to address system needs
Phase 6 Evaluate Alternatives	Develop, evaluate, and compare alternatives that resolve system needs
Phase 7 Recommended Plan	Document rationale for technical solutions and timing for implementation as well as estimate user rate impacts
Phase 8 Facilities Plan	Prepare summary report for quick representation of Phases 1 through 7, conduct public meetings, and submit for regulatory approval.

Project Goals and Objectives

The Facilities Plan will provide evaluations focused on the WWTP, collection system, and watershed. Project alternatives will be developed for both the liquid treatment and solids treatment areas of the facility. These alternatives will be evaluated holistically with economic and non-economic criteria. The finalized Plan will recommend improvements to the facilities with recommended phases and an implementation schedule to meet the needs identified in the Existing and Future Conditions phase.

The alternatives evaluation portion TM 6 will be refined and submitted separately to satisfy the WDNR required Preliminary Compliance Alternatives Plan.

Mission Statement

Overall, the Facility Plan will be guided by the following mission statement:

> *The Facility Plan establishes a course of action that emphasizes optimum performance, sustainability, and resource recovery to direct the WWTP through regulation while ensuring continued protection of local resources and the environment.*

Project Stakeholders

Major project stake holders were identified at the Strategic Direction Workshop. Understanding the stakeholders will help guide project update and input stages and help to establish a decision-making process. The following list summarizes the project stakeholders:

- City Sewer Customers

- Major Commercial and Industrial Customers
  - City Brewery
  - Kwik Trip Dairy
  - Great Lakes Cheese
  - Trane Company
- Partner Municipalities
  - City of Onalaska
  - City of La Crescent, MN
  - Town of Campbell
  - Town of Shelby Sanitary District 1
  - Town of Shelby Sanitary District 2

Evaluation Criteria

The evaluation process will be driven by both economic and non-economic factors. During the Kickoff Workshop these drivers were discussed and refined. The alternative analysis will develop materials related to each of these factors for comparison and evaluation.

The economic analysis and non-economic analysis will be performed in parallel. Alternatives will be evaluated based on how well they balance both cost as well as non-economic criteria. User rate and 20-year life cycle costs will be used to quantify the economics, and a scoring matrix will be used to quantify the non-economic criteria.

Economic Evaluation

The economic evaluation will include both a life-cycle analysis as well as a simple user rate comparison.

Life-cycle Evaluation

A life-cycle economic evaluation will be developed for each alternative to understand the holistic cost. The following discount, inflation, and escalation rates were identified based on current economic data and will be used to develop life-cycle costs.

Parameter	Value
Discount Rate	3.625%[1]

1. WDNR Guidance in accordance with NR 110.09(1)(a)

Initial unit electricity costs will be based on 2017 electric bills. Natural gas unit costs will be based on 2017 natural gas bills. The unit energy costs are listed below.

Parameter	Value
Electricity	$0.083 per kWh
Natural Gas	$0.65 per Therm

Economic evaluations will summarize Capital Costs and Annual Costs. Based on the Capital and Annual Cost, the Net Present Value (NPV) of each alternatives will be captured to represent the life-cycle costs. The Facilities Plan will summarize life-cycle costs similar to the graphic shown in Figure 1. Year “0” costs represent the estimated capital costs for construction and Year “20” costs on the right-hand side represent the net present value at the end of the 20-year planning period (i.e. the present value of the

life cycle costs). The slope of the line is defined by the annual operation and maintenance (O&M) costs. Steeper slopes represent higher annual O&M costs.

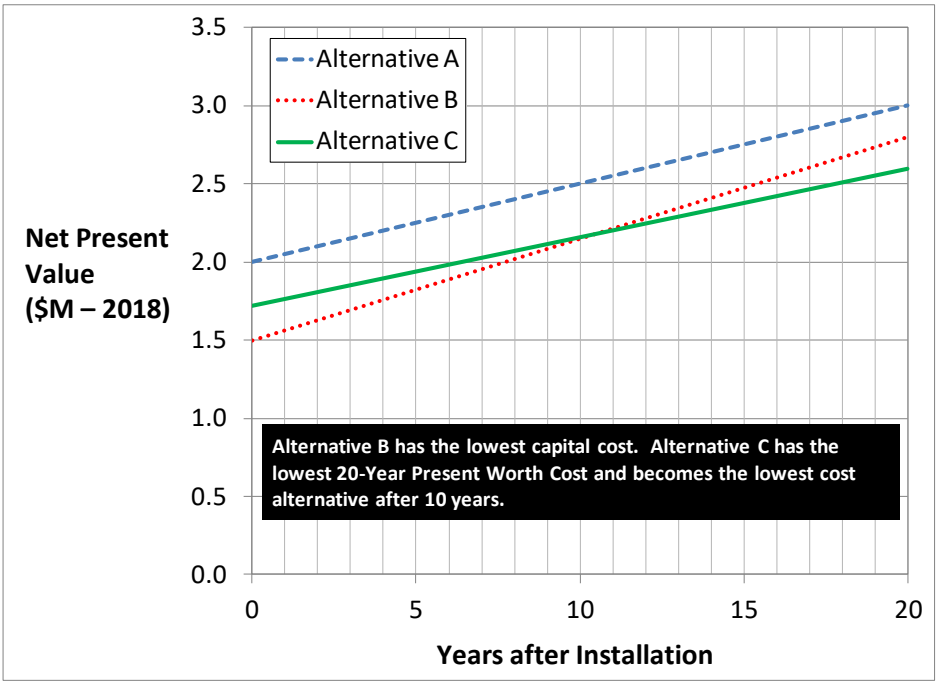


Figure 1 - Example Net Present Value Graphical Representation

User Rate Comparison

User rate implications will also be developed for competing alternatives. The public can better relate to user rate impacts compared to net present values. During times of decision-making and public acceptance, user rates will be used to give a simple perspective. The following method will be used to calculate the annual user rate increase associated with alternatives.

$$Annual\ User\ Rate\ Increase = X \times \frac{(A_{PI} + A_{OM})}{U}$$

where:

$X = \%\ Revenue\ from\ Residential\ Class$
$A_{PI} = Annual\ Principal\ and\ Interest\ Payment$
$A_{OM} = Annual\ O\&M\ Cost\ Increase$
$U = Number\ of\ Residential\ Users$

Non-Economic Factors

The Kickoff Workshop also identified non-economic factors that were grouped into five general categories. Non-economic factors help highlight characteristics of alternatives that are desirable but may not have an obvious financial impact. The following summarizes the five general categories that were agreed upon during the Workshop:

1. Operability, and Maintenance
2. Resiliency, Stability, Robustness
3. Quality of Life
4. Environment Stewardship and Sustainability
5. Longevity and Flexibility

These five categories provide broad areas where more specific criteria can further be defined as subsets to these categories. The following sections discuss the five categories and some potential subsets.

Operability, and Maintenance

Operability and Staffing

Upgrade alternatives can alter the staffing level requirements at the WWTP. Significant increases or changes in staffing levels requiring more "on-call" attention or 2nd or 3rd shift rotations would be less desirable. As a basis, an alternative that does not alter existing staffing levels or shift ratios would receive a higher score for this sub-category. Alternatives will receive lower scores if they impact the working conditions of the staff negatively by introducing increases in the requirements of staff or by increasing risk to the safety of staff.

Maintenance requirements

Upgrade alternatives can have differing levels of maintenance (both in complexity and frequency). When considering the number of systems and processes involved in the WWTP, it is important to consider the maintenance impacts for alternatives. Not all maintenance impacts are reflected in the cost evaluation.

Resiliency, Stability, Robustness

The WWTP's main responsibility is to treat wastewater under an array of conditions. Resiliency, stability and robustness of an alternative relates to its ability to recover and perform under the dynamic conditions experienced throughout the years. This alternative characteristic also relates to an alternative's ability to withstand unintended plant upsets or influxes in flows or loadings. A highly resilient, stable, and robust facility can continue to protect the environment during an unexpected natural disaster, safeguard capital investments, and continue serving the community without permit violations or system failures.

Quality of Life

The WWTP is located adjacent to a heavily used community park to the east, and recreational water bodies to the west and north. The facility's close proximity to community assets heightens the importance of mitigating safety risks, pollution, noise, and odors at the facility. Alternatives will be evaluated based on continuing the facility's success as it relates to maintaining and improving the community's environment and health. In addition, plant traffic is a concern as it could increase congestion in the area. Since the plant is located nearby recreation areas, an increase in traffic could lead to negative perception towards that process or alternative. As a basis, a higher "quality of life" score would be given to an alternative that limits the disturbance to the public who are in close proximity to the WWTP.

Stewardship and Sustainability

Energy Balance

Minimizing energy use not only provides savings on cost, but it also minimizes the impact to the environment. Some alternatives may even produce new sources of energy that could be used at the facility and offset existing energy reliance. Public perception of the WWTP can be impacted by the facility's use of energy. Alternatives that positively contribute to reducing total net energy use will be more desirable.

Resource Recovery

A wastewater facility receives nutrients such as nitrogen and phosphorus every day it is operable. These nutrients can be recovered and recycled to other end uses. For example, biosolids disposal options are affected by the level of biosolids treatment therefore impacting the available end users. Alternatives that improve resource recovery and the ability to recycle nutrients for another sector will be ranked higher. An alternative that enhances resource recovery improves the environment and can boost public perception.

Another area of resource recovery is creating beneficial uses for the various products from the WWTP. These include water reuse, biogas utilization, heat recovery, and biosolids end-use.

Longevity and Flexibility

Changing regulation landscapes and improving technology can affect the longevity or usefulness of a process. Each alternative will be evaluated on its ability to be reconfigured to a different process in the future. For example, a Bio-P configuration that could be easily updated to adapt to new permit limits would receive a higher score than a configuration that would be costly to alter. This type of flexibility is desirable, as it could reduce future upgrade costs. Creatively repurposing the facility's already constructed infrastructure minimizes the reliance on new construction materials minimizing impacts on natural resources. Alternatives that can meet current and future effluent, air emissions, and biosolids regulations will be given higher scores which will be compounded by ability to adapt to current and future processes.

Non-economic Scoring Matrix

In order to quantify the importance non-economic and economic factors, a scoring matrix will be used to compare project alternatives. A weighting factor was assigned to each evaluation metric. Weighting factors capture the relative importance of each criteria with respect to the stake holders involved. The following summarizes the main evaluation metrics and their respective weighting factors:

Evaluation Metric Category	Weighting Factor*
Operability, and Maintenance	25%
Resiliency, Stability, Robustness	15%
Quality of Life	15%
Environment Stewardship, Sustainability	20%
Longevity and Flexibility	25%

*It may be appropriate on a case-by-case basis to adjust weights for a group of competing alternatives.

The weighting factors will help to produce a score under each category for each alternative. Scores will be combined, normalized, and weighted to create a composite score for each alternative. Figure 2 shows a sample scoring matrix to compare alternatives. It may be appropriate to adjust the weighting

factors for groups of competing alternatives The scoring matrix for each alternative evaluation will be revised and refined in the subsequent Facilities Plan phases.

Project Definition Evaluation Metrics	Operability, & Maintenance	Resiliency, Stability, Robustness	Quality of Life	Environmental Stewardship, Sustainability	Longevity and Flexibility	**Totals**
Weight	25%	15%	15%	20%	25%	**100%**
Scores (1 to 5)						
Alternative 1	5	4	3	2	3	**-**
Alternative 2	3	3	5	4	5	**-**
Weighted Scores						
Alternative 1	1.3	0.6	0.5	0.4	0.8	**3.5**
Alternative 2	0.8	0.5	0.8	0.8	1.3	**4.0**

Figure 2 - Sample Scoring Matrix for Alternatives

Technical Memorandum 2
Existing Conditions
Strategic Plan: Wastewater Treatment
La Crosse Wastewater Treatment Facility
La Crosse, Wisconsin

Date: March 20, 2020

To: Bernard Lenz – Utilities Manager

Copy: Jared Greeno, WWTF Superintendent
Brian Hein – WWTF Assistant Superintendent
Greg Kozelek – City Engineer

From: Mike Gerbitz – Donohue & Associates

By: Bill Marten – Donohue & Associates
Eric Lynne – Donohue & Associates
Ben Stephens – Donohue & Associates

Purpose

This Technical Memorandum (TM 2) documents the following items for the existing Isle La Plume Wastewater Treatment Facility:

- Overview of Existing Wastewater Treatment Facility
- WPDES Permit
- Plant Loadings & Performance
- Facility Issues & Observations

Existing Wastewater Treatment Facility

The Sanitary Sewer Utility for the City of La Crosse operates the Isle La Plume Wastewater Treatment Facility (WWTF). This WWTF is a regional facility that receives wastewater from the City of La Crosse and surrounding areas in Minnesota and Wisconsin. Adjacent entities served by the Sanitary Sewer Utility include the City of Onalaska, WI, the City of La Crescent, MN, the Town of Campbell, WI, and two sanitary districts that include parts of the Town of Shelby, WI. Service to these entities is provided according to a contract negotiated with each one.

The Utility was formed in July 1991. In addition to the Isle La Plume WWTF, the Utility is responsible for 26 sanitary lift stations and 188 miles of sanitary sewers that make up the wastewater collection system for the City of La Crosse. The Sanitary Sewer Utility also operates and maintains 7 storm water lift station and 134 miles of storm sewers. A smaller treatment facility on Barron Island was taken out of service in March of 2009. Customers served by the Barron Island facility connected to the La Crescent/La Crosse forcemain.

The facility was originally constructed on Isle La Plume in 1936 and has been upgraded several times since then. Capacity of the WWTF was doubled and secondary treatment added in 1972. Significant

additions and upgrades made since 1972 include replacement of chlorine disinfection with ultraviolet disinfection; upgrading the secondary treatment system to perform biological phosphorous removal; enhance aeration efficiency; upgrade of biosolids dewatering and construction of biosolids storage facilities; and upgrades to the screening and grit removal systems.

Figure 1 presents a process flow diagram of the plant. The liquid treatment train consists of fine screening, grit removal, primary settling, activated sludge configured to achieve biological phosphorus removal, secondary settling, and ultraviolet disinfection. The solids handling treatment train consists of co-thickening of primary sludge and waste activated sludge (WAS)in gravity thickeners, and anaerobic digestion. The digested sludge, termed biosolids, are either thickened using gravity belt thickeners or dewatered using a belt filter press. Liquid and dewatered biosolids are stored onsite prior to being recycled on agricultural land. The other residual material produced at the plant, from raw wastewater screening and grit removal, is disposed of by landfilling.

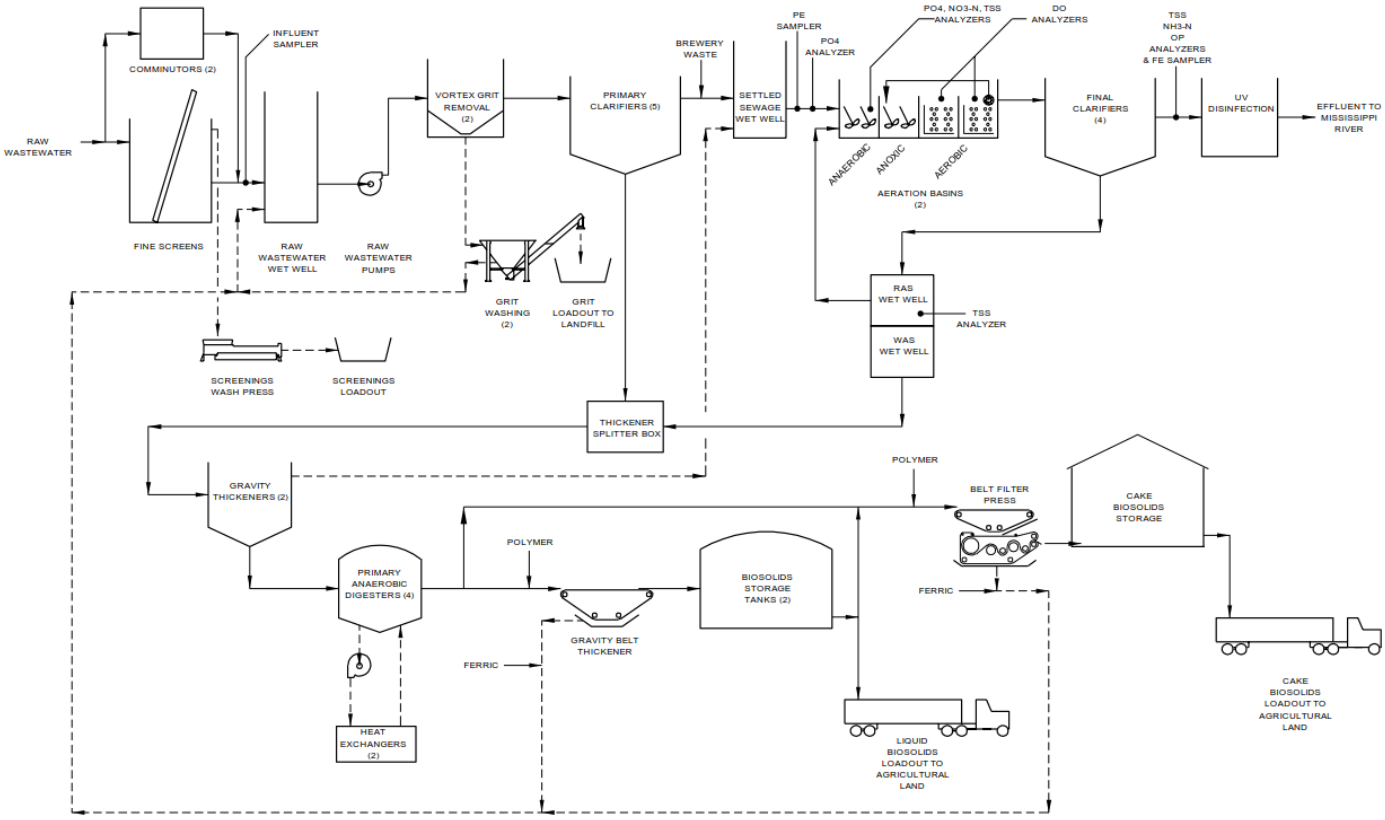


Figure 1 - Isle La Plume WWTF Flow Schematic

Although well maintained, a significant portion of the City's wastewater infrastructure is relatively old and likely nearing the end of its useful life. To avoid costly repairs or risk inadequate treatment performance, the City initiated this study to evaluate and develop a planned approach towards equipment replacement and to plan for major improvements in the future.

The following sections provide brief discussions of these unit processes.

Preliminary Treatment

Influent wastewater is screened with a ¼-inch mechanical fine screen, which has a washer and compactor to process the screenings. The processed screenings are discharged into a dumpster and disposed of in a landfill. Two comminutors provide redundancy for the one mechanical screen.

The screened wastewater is pumped by the plant's raw wastewater pumps to one of two vortex grit basins. The removed grit is pumped to a grit washer and discharged into a dumpster prior to landfill disposal. The grit basin in service is rotated daily.

Figure 2 - Grit Classifier

Primary Treatment

There are a total of five primary clarifiers. Two rectangular clarifiers, which are 112 feet long by 26 feet wide, were part of the original plant construction. The third clarifier is 90-feet in diameter and was added when the facility was expanded in the 1950's. The newest clarifiers were added in the 1970's and are both 90-feet in diameter. Elevations of the effluent weirs in the rectangular clarifiers are approximately 6-inches higher than the circular clarifiers, which is attributed to differences in the influent hydraulics to the rectangular clarifiers. Current operational practice is to use the two newer circular clarifiers, while the older clarifier system is kept offline and only used to equalize downstream forward flows during periodic maintenance.

Primary effluent flows to the Settled Sewage Wet Well where it merges with gravity thickener overflow. Online analyzers monitor the condition of the primary effluent phosphorus concentrations to assist with decisions on how to manage nutrient removal. The facility's hydraulic profile is relatively flat, which requires pumps to lift the forward flow to the secondary treatment system.

Primary sludge and scum is pumped to the gravity thickener splitter box using dedicated plunger pumps.

Secondary Treatment

The activated sludge process consists of two parallel BNR process trains of anaerobic, anoxic, and aerobic zones to achieve secondary treatment and biological nutrient removal in the form of year-round biological phosphorus removal (BPR) and seasonal ammonia nitrogen removal through nitrification during portions of the year.

The BNR system is configured for the A2O process where primary effluent first mixes with return activated sludge (RAS) in an unaerated zone, mixed with submersible mixers, where the nitrate in the RAS is quickly denitrified. With such denitrification complete the process goal is that there are sufficient volatile fatty acids (VFAs) remaining to allow the first step in enhanced biological phosphorus (P) removal (EBPR or Bio-P) to occur, that being phosphorus release while VFAs are taken up by the phosphorus accumulating organisms (PAOs). The PAOs, responsible for Bio-P, break internally stored polyphosphate molecules releasing orthophosphate into solution, and by doing so gain a small amount of energy just sufficient to take up and store the VFAs.

Following the anaerobic zone, the mixed liquor flows into another unaerated zone (also mixed by submersible mixers) – the anoxic zone. In this zone effluent from the aeration tanks is recycle pumped

back to the beginning of this zone to promote biological denitrification of the nitrified mixed liquor. The key to this step is recycling a large amount of the nitrified mixed liquor, such that the overall nitrate content of the mixed liquor exiting the aeration basins and flowing to the final clarifiers is minimized as much as possible. By minimizing the nitrate in the aeration effluent the nitrate content of the RAS is also minimized, thus reducing the amount of VFAs in the primary effluent that are lost to denitrification in the anaerobic zone – and hopefully helping to optimize the first step of Bio-P.

The mixed liquor exiting the anoxic zone enters the aeration basins/aerobic zones, where fine bubble membrane diffusers provide aerobic conditions during which the following key activities occur:

- The biomass stabilizes/treats the waste in the primary effluent, often measured by a greater than 90% reduction in primary effluent BOD concentration.
- Ammonia nitrogen is oxidized by special, aerobic bacteria termed nitrifiers, converted biologically to nitrate nitrogen (a portion of which is recycled to the anoxic zones as noted above, in an attempt to minimize nitrate in the RAS).
- Excess biological uptake of phosphorus by the PAOs occurs – these Bio-P organisms take up excess orthophosphate, beyond what is needed for normal cell growth and reproduction, and store the excess as polyphosphate molecules within their cell bodies. This excess P uptake represents a key to EBPR – growing a microbial population that contains excess P, beyond that needed for cell growth/reproduction. But the other key to EBPR comes in waste activated sludge (WAS) – the only way P removal actually occurs through Bio-P is by wasting these phosphorus rich microorganisms from the system.

The air for the aeration basins is supplied by high-speed, air-bearing, turbo blowers. To balance airflow to the tanks, a single electric modulating butterfly valve is throttled on one of three main supply lines, the remaining lines have manual control valves. The facility commonly operates with excess dissolved oxygen (DO) deliberately to help avoid excessive ON/OFF cycling of the blowers.

In total, 50% of the plant's total bioreactor tank volume (2.5 million gallons) is operated as unaerated selectors (split evenly between anaerobic and anoxic zones) and 50% (2.5 million gallons) comprises the downstream aeration basin bioreactor zones.

The City's wastewater characteristics are normally favorable for Bio-P, with sufficient VFAs to denitrify the RAS and still have enough left over in the anaerobic zones for the PAOs. However the City has found the need to add supplemental carbon (VFAs) at times on weekends or when industrial shutdowns occur, to stabilize the system's biological phosphorus removal performance. The facility uses an online Chem-Scan analyzer to monitor insitu phosphorus and nitrate values of the anaerobic selector zone. This data is used by staff to react to upset conditions for adding carbon source or ferric chloride for phosphorus control.

The aerobic zones are supplied oxygen with fine bubble diffused air membranes.

The aerated mixed liquor suspended solids (MLSS) flows to a distribution chamber with submerged gates that isolate flow to each clarifier. The MLSS enters one of four, 120-foot diameter, circular clarifiers, where the biomass settles to the bottom and the clarified effluent flows up and over a peripheral v-notch weir. Algae growth on the clarifier effluent weirs and launders is significant and requires frequent cleaning to prevent nuisance algae in the final effluent.

The settled sludge is withdrawn from the bottom of each tank using siphon draft tube mechanisms and flows to a common sludge well. Three RAS pumps pump the biomass back to the anaerobic zones. Historical RAS flows exhibit a range of 40% to 120% of forward flow, with an average rate of 75%. Staff routinely monitor the mixed liquor settle-ability as documented by the sludge volume index (SVI). Historical SVI data ranges from 65 mL/g to 160 mL/g, with an average value of 110 mL/g.

Figure 3 - Final Clarifier Mechanism

A portion of the RAS is diverted out of the system as waste activated sludge to maintain efficient biological treatment. WAS is pumped to the gravity thickeners 10-15 minutes every hour, with the amount wasted determined by the aerobic solids retention time (SRT) with a typical target range of 3-6 days, with higher mass carried through the winter to promote nitrification.

A process model of the existing wastewater treatment facility and solids handling process was developed in 2008 as part of the previous facilities planning effort. A schematic of the process model is presented in Figure 4. This calibrated process model was also used to develop and assess optimization concepts for the phosphorus removal requirements. The model will again be utilized to assess the treatment impacts associated with proposed changes in subsequent phases of this facilities plan.

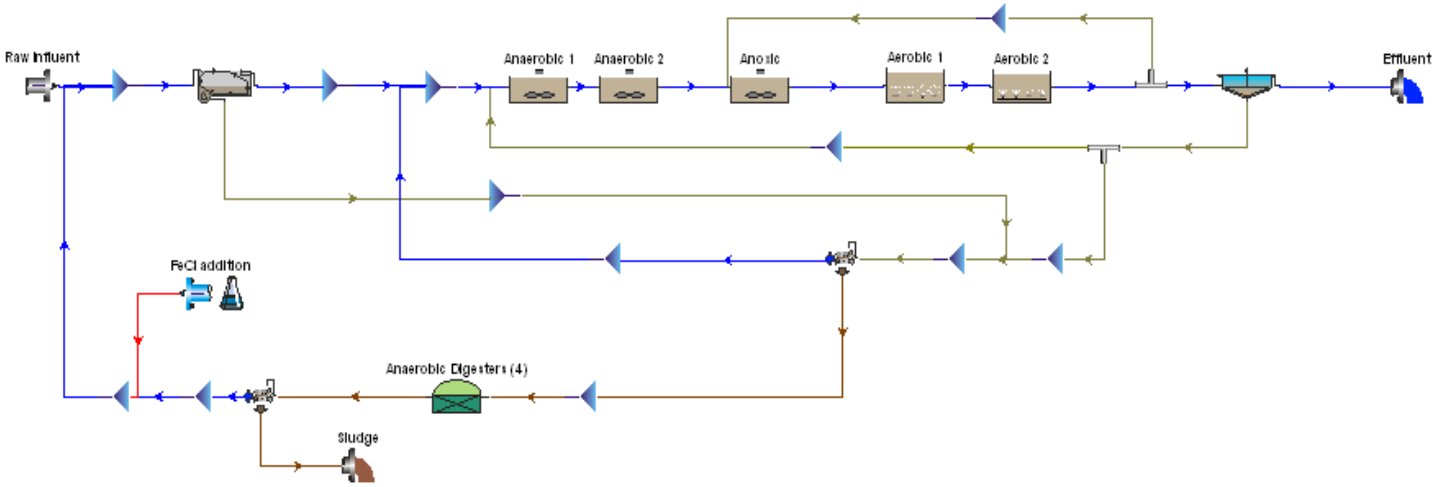


Figure 4 – Process Model for Isle La Plume WWTF

Disinfection

Ultraviolet (UV) light is used to disinfect the secondary effluent by inactivating cellular reproduction, which reduces the fecal coliform count in the treated wastewater prior to discharge. The three UV banks are sized for 42 mgd. The Ozonia UV system was installed in 2004 but was noted as difficult to obtain replacement parts. The City has proactively purchased an additional system, to use for spare parts, from the City of Waukesha WWTF (who had removed it and replaced it with a new system).

Raw Sludge Thickening

WAS and primary sludge are combined prior to thickening in two circular, 50-feet diameter gravity thickeners. The potential exists for the combined sludges to strip phosphate from the Bio-P WAS due to fermented, VFA-rich material in the primary sludge and the anaerobic conditions in the thickeners. Based on the tank volume and average underflow rates, the sludge inside the thickeners has an estimated detention time of 1-2 days.

The thickened sludge underflow from the gravity thickeners averages 2.8% total solids, and is fed to the anaerobic digesters for stabilization. Gravity thickener overflow merges with the primary effluent at the settled sewage effluent pump station wet well, from which it is sent to the BNR activated sludge system.

Sludge Stabilization

Thickened sludge is anaerobically digested in four mesophilic anaerobic digesters operated in parallel. Digesters 1 and 4 are 700,000 gal each (74.5-feet diameter and 18-feet sidewater depth), while Digesters 2 and 3 are 430,000 gal each (65-feet diameter and 15-feet sidewater depth). The digesters are fed proportionally based on their respective volumes.

Digesters 1, 2, and 3 have floating steel covers, while Digester 4 has a skirted gas holding cover to provide biogas storage. Gas is utilized for digester heating, by heating the incoming raw sludge and also heating recirculated digested sludge, to maintain digester temperatures in the mesophilic temperature range. Historical data confirms digester temperatures have been sustained at 95-98 degrees Fahrenheit, at the upper end of the mesophilic range. The two sludge heaters (combination boiler and heat exchanger) provide a total of 4-million British Thermal Units (BTU) of boiler and sludge heat exchanger capacity.

Biosolids Thickening and Dewatering

Digested sludge (biosolids) is thickened on a single 2-meter gravity belt thickener (GBT). This unit used to be operated intermittently, as-needed, at full capacity. However, to stabilize/equalize the sidestream loadings, that can be high in N and P recycled to the plant, operation of the GBT has been changed to continuous (24 hours per day, 7 days per week), and successfully managed during times when the plant is staffed and unattended – the latter via monitoring by a remote camera display. Thickened sludge is targeted at 5-8% solids to maximize storage yet retain feasibility for land application (based on land application equipment limitations). The thickened sludge is pumped to liquid storage tanks and filtrate flows back into the liquid treatment process upstream of the grit tanks. Ferric chloride is added to the GBT filtrate to help control recycle phosphorous, struvite, and odors.

Figure 5 - Gravity Belt Thickener

In lieu of thickening, the digested biosolids can also be dewatered to further improve sludge storage abilities or provide alternative opportunities for land application. Biosolids are dewatered on a single two meter belt filter press. Fresh digested sludge typically dewaters better than stored liquid biosolids, typically achieving 20-23% total solids compared to 15-18% total solids for the stored liquid material.

Similar to the GBT, ferric chloride is dosed to the BFP filtrate to control recycle phosphorus, struvite, and odors.

Separate emulsion polymer makedown systems feed the thickening and dewatering equipment. Limited free space exists for tote storage and handling for dewatering polymer. Current practice requires polymer tote storage and handling to be performed in the second story exterior doorway. With the doorway open, this limits use of the belt filter press to periods of warmer weather.

Biosolids Storage

Biosolids are stored primarily as liquid before engaging dewatering. The biosolids storage facilities consist of two 3-million gallon liquid storage tanks. Pumps in the lower level of the connecting building can be used to mix the tanks and additional pumps discharge biosolids to a truck loadout for land application.

Liquid storage provides approximately 150-180 days of storage depending on the applied loading to the treatment plant. Unpredictable weather patterns often cause delays in getting all the biosolids land applied in a timely manner, which results in a need for additional storage. To supplement biosolids storage, the dewatering facility is operated and biosolids are transferred by a dump truck to be stacked and stored in a covered cake storage shed. The cake storage building provides approximately 30 days of biosolids storage.

The limited storage available requires land application of biosolids in the spring and fall. If available, summer land application to alfalfa fields is used to help lessen the burden of fall land application. To expedite the hauling effort, the City has contracted with Synagro until 2020 to provide biosolids hauling and management of the nutrient application. The combined liquid and cake land application program requires over 1800 acres when applied at appropriate nutrient rates for nitrogen. Additional acres would be required for phosphorus based nutrient management. These acres are often small parcels (average size is 17 acres) due to the terrain along the Mississippi River. The resulting interaction with numerous parcels requires significant coordination and agreeance between landowners, tenant farmers, and the City's team. The current practice requires over 1100 truckloads in and out of the City for 2 to 3 weeks, twice a year. Annual costs for the land application program averaged $860,000 in recent years.

Site Considerations - Utilities

The WWTF obtains electricity from Xcel Energy through three power feeds and is invoiced separately for each. The three feeds serve the Main WWTF, the Blower Building, and the UV Building,. Power demand is split roughly 48% to the Main WWTF, 46% to the Blower Building, and 6% to the UV Building. The combined power consumption is 5,500,000 kWh per year, at a cost of over $450,000. The normalized power draw for the flow treated exhibits a rate of 1473 kWh/MGD, which is under the best practice benchmark established by Focus on Energy of 1760 kWh/MGD, but implies there may be efficiency improvements available when compared to the target top performance quartile for facilities under 1,350 kWh/MGD. The normalized power draw for the load treated exhibits a rate of 572 kWh/1000 lb BOD, which far exceeds the target of 900 kWh/1000 lb BOD.

Backup power is provided by four standby diesel generators serving critical systems throughout the facility. The two oldest units serve Plant 1 and Plant 2 and were installed in the 1972 upgrade. Parts availability and reliability is a concern. Additionally, the aeration blowers are not connected to standby power, which severely complicates effluent compliance when power is lost for an extended duration.

Natural Gas is available from Xcel Energy a parent company of the Northern States Power Company of Wisconsin.

Potable water is available from the City of La Crosse.

Data communication throughout the site is available through fiber optic network; however, radio is used to connect with the collection system lift stations. The City noted difficulty obtaining reliable radio signals due to the river valley and bluffs that block direct line of sight from the WWTF to the remote sites.

Site Considerations - Environmental Restrictions

Isle La Plume WWTF was constructed on an island within the Mississippi River. Being close to the discharge point at the Mississippi River is an advantage for the treatment facility, but it also increases potential exposure to flooding. The treatment facility is in the flood plain, but it is not in the flood way. The WWTF has survived several significant flooding events, which prompted the Engineering Department for the City of La Crosse to provide a review of the flood zone identification for the treatment facility property in 2009 as part of previous planning efforts. In the meanwhile, FEMA revised maps of this area on January 6, 2012 to better reflect the observed flood limits. This revised map is included in Appendix A. No critical WWTF areas are vulnerable to a 1% annual flood chance (100-year flood); however, some areas are vulnerable to a 0.2% annual flood chance (500-year flood). The rough contours of the map indicate portions of the primary clarifiers and gravity thickeners would be compromised. However, a site survey could be performed to prove that these tanks are installed at or above the flood level of 642.33 ft.

The Isle La Plume has been noted to be originally an old landfill prior to development as the WWTF. Although the debris has not been observed to create differential settlement, it has been suspected to contribute to elevated mercury levels during periods of high river stage (groundwater). The high groundwater leaks in through the building walls and cause the structural sump pumps to engage, which could be a reason that the effluent mercury is higher than the influent mercury at times. The City is continuing to investigate this issue as part of their Pollutant Minimization Plan (PMP) for mercury.

The WWTF is situated on the west edge of the City and odors are a continual concern to be attentive to the rate payers. Despite this concern, the facility does not currently mitigate odors with treatment. In recent years, the majority of odor complaints have been due to odorous activities taking place at City Brewery.

WPDES Permit

The WWTF is governed by National Pollution Discharge Elimination System (NPDES) Permit WI-0029581-09-0. The current version of this permit came into effect January 1, 2016 and expires December 31, 2020. A copy of the permit is included in Appendix C. Several items in the Permit that are particularly relevant to the facility planning effort are presented below.

Permitted Outfalls

The NPDES Permit regulates one continuous discharge to the Mississippi River and it outlines the requirements for land application of Class B biosolids as liquid or cake products. Discharges are described below.

Design Capacity

The NPDES Permit identifies the treatment facility is designed to treat an average annual flow of 20 MGD and a maximum month BOD of 29,793 lb/d.

Effluent Limits (Outfall 001)

Tables 1 and 2 below are an abbreviated list of the treatment plant effluent limits. The complete effluent limits and monitoring requirements are included in Appendix C. The City was issued a variance to avoid additional treatment for effluent mercury limits.

Table 1 - Effluent Limits

Parameter	Limit	Type
5-day Carbonaceous Biological Oxygen Demand ($CBOD_5$)	25 mg/L	Monthly Avg
	40 mg/L	Daily Avg
Total Suspended Solids (TSS)	30 mg/L	Monthly Avg
	45 mg/L	Weekly Avg
Total Phosphorus (TP)	1.0 mg/L	Monthly Avg (Interim)
	0.1 mg/L, (17 lbs/d)	6-Month Average
	0.3 mg/L	Monthly Avg
Fecal Coliform	400 #/100 mL	Geometric Mean
pH	6.0 / 9.0	Daily Min/Max

Table 2 – Ammonia Nitrogen Effluent Limits

Effluent pH (s.u.)	Daily Maximum NH_3-N Limit (mg/L)
pH ≤ 7.6	No Limit
7.6 < pH ≤ 7.7	29*
7.7 < pH ≤ 7.8	24*
7.8 < pH ≤ 7.9	20*
7.9 < pH ≤ 8.0	17

* Only apply November through April.

Historical Flows and Loadings

Analysis of historical flow and loads is based on the three year period between January 1, 2015 and December 31, 2017. This is summarized in Table 3. The table includes average day, maximum month, maximum week, and maximum day values for major influent loading parameters. Peak hourly influent flow recorded is included in the table.

Table 3 - Summary of 2015-2017 Influent Flows and Loadings

	Average	Max. Month	Max. Week	Max. Day	Peak Hourly
Flow (MGD)	10.07	11.94	13.15	17.9	32.3
BOD (lb/d)	25,975 (308 mg/L)	29,400	35,200	64,000	
TSS (lb/d)	29,529 (352 mg/L)	48,900	60,900	100,00	
TKN* (lb/d)	3,058 (34 mg/L)	5,000	n/a	n/a	
Ammonia* (lb/d)	1,714 (19 mg/L)	2,500	n/a	n/a	
TP (lb/d)	548 (6.6 mg/L)	675	800	1,500	

*Ammonia and Total Kjeldahl Nitrogen (TKN) data is based on limited data taken only once per month.

Figure 6 illustrates influent wastewater flow and rainfall during this period. Comparing wastewater flow rate with rainfall is useful for identifying the effects of inflow and infiltration (I&I) in the collection system.

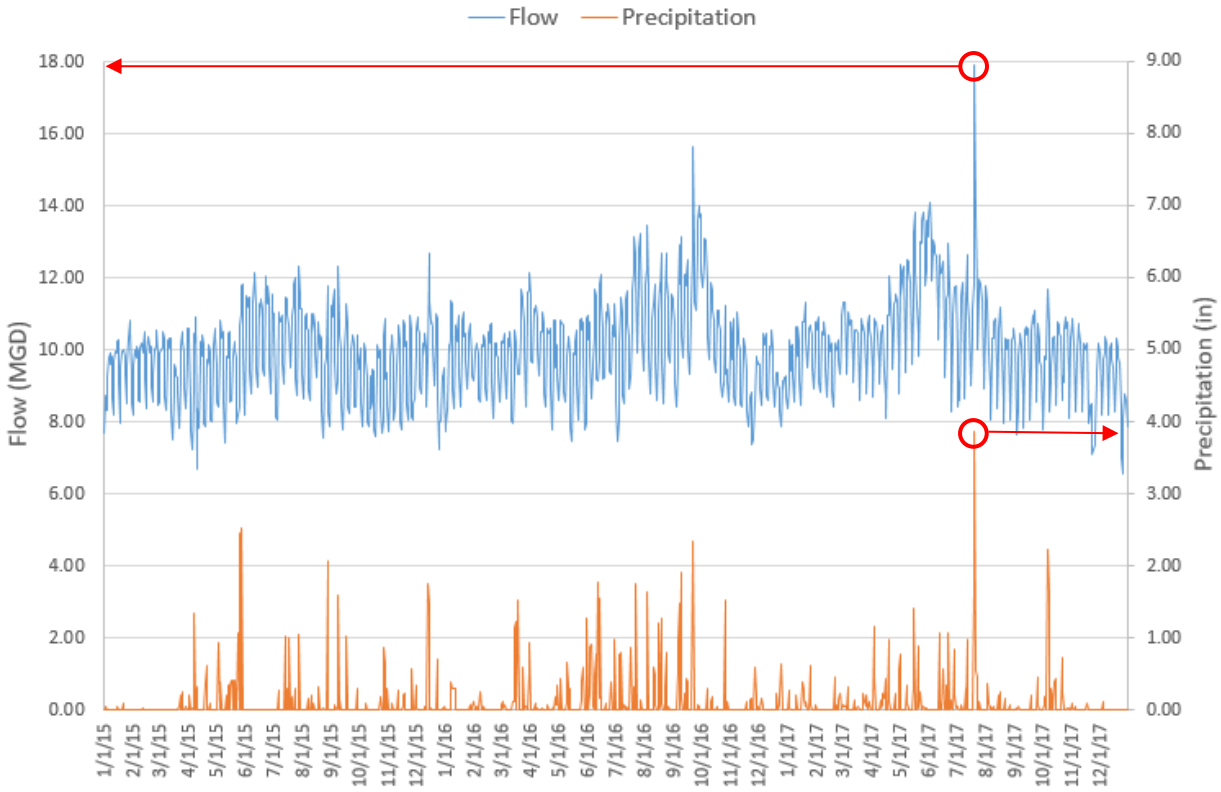


Figure 6 - Influent Flows and Rainfall

I&I is essentially clean water that enters the collection system as a result of precipitation or elevated ground water levels. For the case of La Crosse, high groundwater is directly influenced by river level. Inflow is considered to represent rainfall contribution from sources such as manhole covers, roof drains, foundation drains, or cross connections with storm sewers. Infiltration is groundwater that enters the collection system through defective pipes, pipe joints, and manholes.

Clean water entering the treatment facility increases operational costs through increased demands on equipment and reduced treatment efficiency. It also reduces the effective capacity of the facility. Infiltration is defined as being excessive when the weekly average flow exceeds 120 gallons per capita per day (gpcd) during periods with seasonally high groundwater. Inflow is excessive if wastewater flow during storm events exceeds 275 gpcd. The City is aware of areas in the collection system that are exposed to inflow from surcharged storm water infrastructure or high groundwater. Recent construction projects in recent years have addressed several of these major I&I issues; however, peak flow preparedness is still required.

The past few years of historical data in Figure 3 supports the fact that I&I directly correlates with high flows at the WWTF. Although this dataset includes a notable 4" rain, a larger storm of 16" was documented in 2007. This storm produced unprecedented flooding and created higher peak instantaneous flows at the WWTF than the July 2017 event. Table 4 summarizes the flows exhibited by these two high flow events. The WWTF was designed to accommodate peak flows of 44 mgd, and readily conveyed the recent peak flow of 42.5 MGD with no issues. Although the City has reduced I&I since the 2007 event, this peak flow is recommended to be retained for future capacity requirements as it is more conservative than the 2017 data. The Utility should continue efforts to reduce I&I as opportunities arise.

Table 4 - Peak Hourly Flow

	Average Daily Flow (MGD)	Max Peak Hourly Flow (MGD)
2007	8.8	42.5
2017	10.2	32.3

Recent Treatment Performance

The wastewater treatment facility has exhibited excellent performance, in both effluent quality (as discussed further below) and energy efficiency operation. The staff have optimized the current facilities to consistently provide stable biological treatment, which has yielded a perfect Compliance Maintenance Annual Report (CMAR) effluent score for several consecutive years.

The consistent, high-quality effluent is illustrated in Figure 7 through Figure 10 for cBOD, TSS, ammonia, and TP, respectively. In particular, Figure 9 demonstrates how the facility achieves full nitrification for the majority of the year, except for late winter when flows are typically coldest. The City has approached the maximum day ammonia limits, but the limit has not been exceeded. Improvements to the secondary treatment process may achieve a more consistent effluent ammonia concentration.

In agreement with the City's Optimization Evaluation Report (OER) developed in response towards potential compliance with future TP limits, Figure 10 confirms the fact that the facility has made positive strides towards optimization. It is worth noting that maximum monthly effluent TP values reached 0.81 mg/L TP in 2014, and that recent months now average 0.40 mg/L TP. However, compliance with the future 0.1 mg/L TP limit is not possible without filtration improvements.

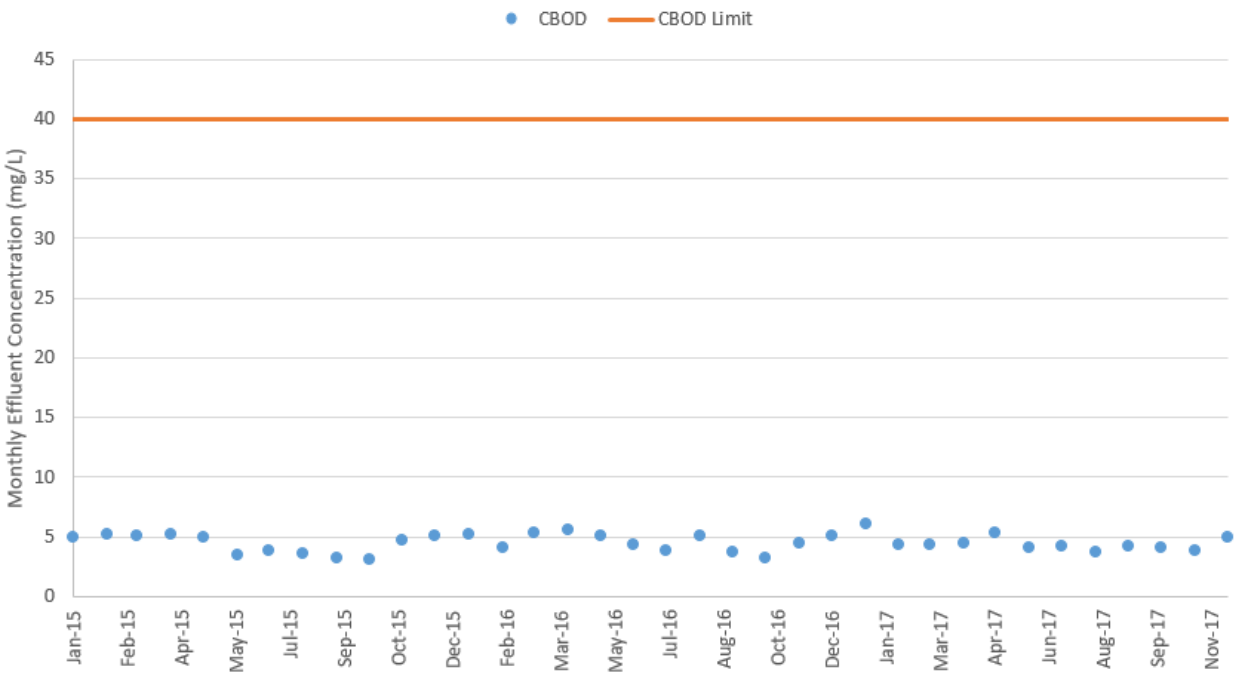


Figure 7 - Effluent $CBOD_5$ Concentration

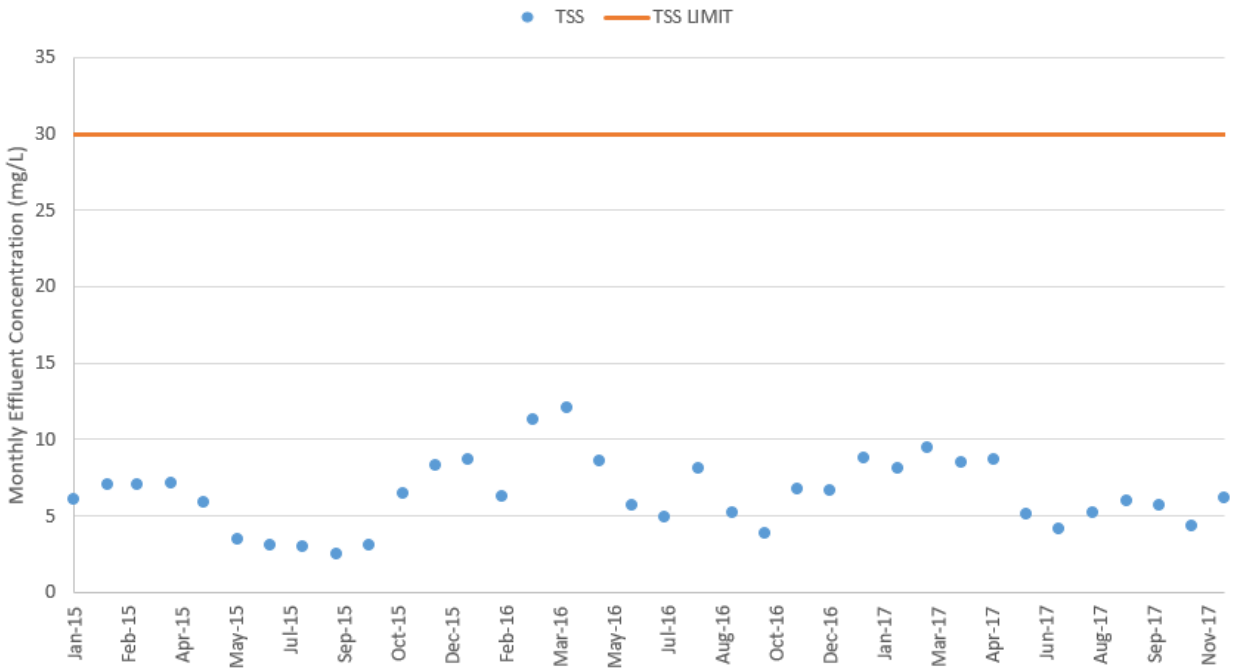


Figure 8 - Effluent TSS Concentration

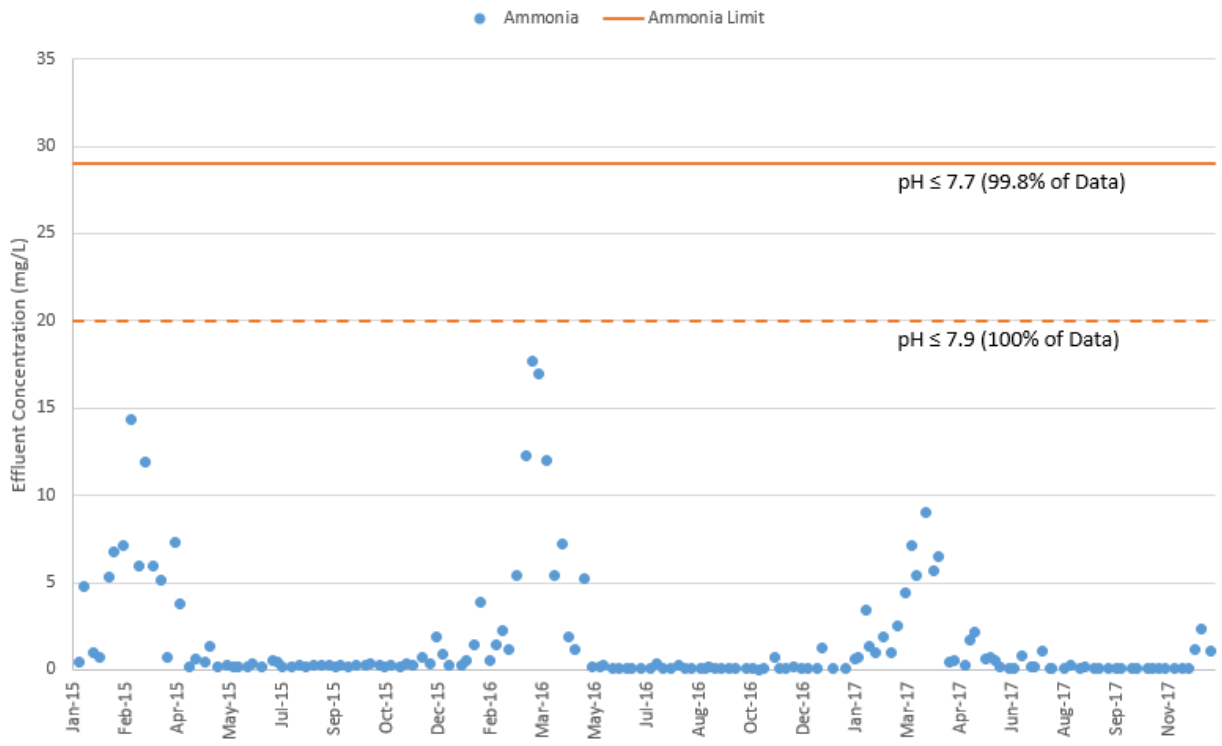


Figure 9 - Effluent Ammonia Concentration

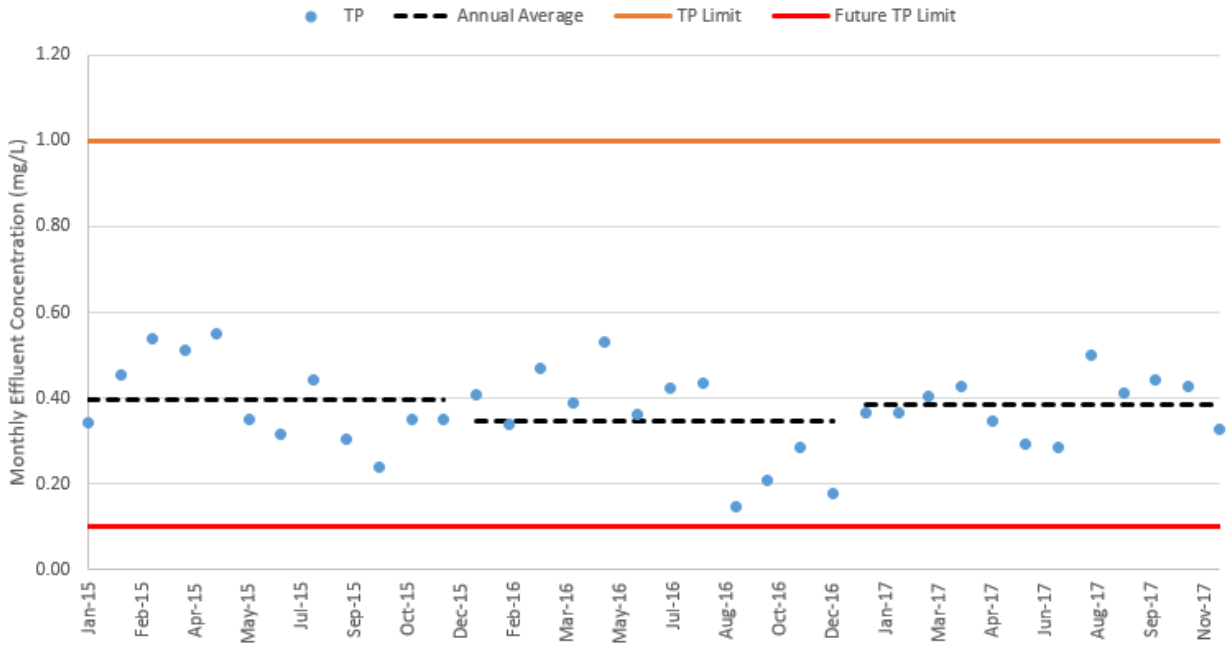


Figure 10 - Effluent TP Concentration

Sludge generated during the treatment of wastewater must also be stabilized prior to reuse as fertilizer in the City's land application program. The historical sludge production is summarized in Table 5 below.

Table 5 – Historical Average Sludge Production

WAS				PSD*				Total Sludge to Digestion			
Flow	Conc.	Conc.	Load	Flow	Conc.	Conc.	Load	Flow	Conc.	Conc.	Load
MGD	% TS	% VS	lb VS/d	gpd	% TS	% VS	lb VS/d	MGD	% TS	% VS	lb VS/d
0.356	0.43	79%	10,100	n/a	n/a	n/a	19,550	0.158	3.0	75%	29,650

* Primary sludge (PSD) data was unavailable during the data period

The combined sludge yield is within industry standard ranges for the pounds of waste received. The proportion of primary solids received appear disproportionately higher in pounds and dis-proportionately lower in volatile content than typical municipal sludge. Supplemental sampling of the primary sludge is recommended to confirm the validity of the sludge data. The significant portion of industrial wastes are likely influencing the primary sludge data.

Based on the sludge flows to digestion, the average digester hydraulic retention time (HRT) is 14 days. This is below the NR110 recommended 15 day minimum sustained condition. Based on the sludge loading applied, the average organic loading in the digesters is 98 lb/1,000 cubic feet (cf). This value exceeds the NR110 recommended 80 lb/1,000 cf, but within the industry standard maximum of 120 lb/1,000 cf. These loading criteria support the fact that WWTF capacity is limited based on the solids handling system. Combining these high loadings with limited mixing in the digesters, substantial short circuiting and reduced performance would be anticipated. However, sludge monitoring data suggests the digesters are actually performing quite well. This is suspected to be due to highly degradable particulate wastes received from industry.

The sludge applied to digestion enters at 75% volatile content, and exits at 62% volatile content. Based on the mass balance of material, this results in 50% volatile solids reduction (VSR); which is provides acceptable solids stabilization at current conditions. Biogas is metered at the points of utilization (each boiler and the waste gas flare), with an average biogas production rate of 156,500 cf/d. The specific biogas yield ranges from 14-20 cf/lb VSR, which is above average from the industry standard range of 12-16 cf/lb VSR.

Facility Issues & Observations

A meeting between Donohue engineers and City officials occurred on August 15, 2018 to discuss the existing conditions, operations and maintenance, and future concerns. The full meeting notes are detailed in Appendix D, while the key notes on the existing facility include the following:

- Site
  - The only odor complaints are typically due to City Brewery's facility.
- Administration Building
  - Has been repurposed many times since 1936.
  - HVAC is aging and inefficient.
- Preliminary Treatment
  - No equalization of hauled waste receiving or convenient ability to direct to anaerobic digestion.
  - No influent flowmeter (currently use primary effluent or final effluent).
  - Recent 4" rain resulted in a 32 MGD peak flow; however, higher flows were observed in 2007.
  - Grit deposits upstream of the comminutors and overwhelms the downstream systems every time the fine screen channel is taken offline.
  - Stringy debris passes through the existing ¼-inch step screen.

Figure 11 - Existing Septage Receiving

- Primary Settling
  - City uses their trucks to transfer approximately 4,000 gallons per week of brewery waste (retentate backwash, 350,000 mg/L COD) to supplement primary effluent BOD on weekends, holidays, and during facility shutdowns. The waste is stored at the plant in two 3,000 gallon polyethylene tanks.
- Aeration Basins
  - Medium voltage blowers were replaced in 2012 with 480V high speed turbo blowers. Typically operate with D.O.s in range of 3 mg/L - unable to operate at lower DOs due to aeration control system & blower constraints. Currently run 2 blowers to limit starts/stops.
  - Blowers are not on standby power
  - Single, line-size aeration valve cannot throttle system to maximize system efficiency. Valve closure below 19% open may create concern for mixing limited conditions.

Figure 12 - Airflow Control Valve

- Secondary Settling
    - Concern regarding algae control in effluent weirs/launders.
    - Potential mixed liquor flow distribution imbalance into the secondary clarifiers.
    - Concern for settling without flocculating energy dissipating inlet
- UV
    - Bulb/sleeve cleaning frequency has decreased since City Brewery switched from using Ferric Chloride for odor control (now use Hydrogen Peroxide).
- Solids Handling
    - The digesters have been rehabilitated one per year for the last several years with Digester 1 planned to be completed in the coming year.
    - Solids handling is a main concern of the facility as it limits capacity, noted by staff and confirmed by the 2016 re-rate study.
    - Evident digester capacity improvement is to increase sludge concentration into the digesters; however, mixing systems will be required as sludge viscosity changes. Other digester/sludge system capacity improvements need to be identified.
    - Currently no digester mixing (just recirculation and transfer). The group discussed the options for digester mixing. The City indicated that recent digester cover rehabilitations were performed without consideration for future adaptation to linear motion mixing due to the cost of cover modifications needed.
    - The two larger digesters have taller sidewall elevations than the older digesters.

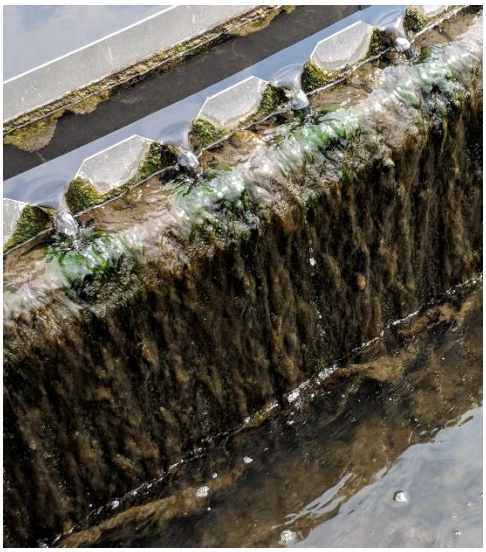


Figure 13 - Final Clarifier Algae

Figure 14 - Anaerobic Digester Complex

- Biogas
    - Substantial excess biogas is flared. Potential exists for cogeneration facilities to burn biogas to produce electricity. The City is OK with adding this extra equipment if done properly and with a maintenance contract to limit/minimize any added O&M burden to the existing (limited) staff.
    - A biogas line has been routed to the admin building for potential use in the house boilers
    - Biogas storage is currently limited, and the City's preference would be for a low-pressure slab on grade biogas storage membrane because this decouples the gas storage from digester maintenance.
- Sludge Storage
    - Capacity requires semi annual sludge hauling. Wet seasons increase reliance on already tight situations for storage.

- Capacity is limited to 30 days of storage at historical sludge production rates.
- City has contracted with Synagro to ensure liquid and cake hauling requirements for the next two years.
- BFP operation is not efficient with equipment separated from the cake storage location.
- Use of a solar (greenhouse) sludge dryer was noted to be a high-potential alternative to increase the capacity of the existing cake storage building, while improving land application and public acceptance.

Figure 15 - Cake Biosolids Handling

Appendix A Flood Hazard Area Identification

Appendix B Existing Unit Processes

Appendix C WPDES Permit

Appendix D 8/15/2018 Facilities Plan Meeting Notes

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15N. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey **at (301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by La Crosse County. The **aerial** photography was acquired in the spring of 2007 to create 1":200' scale digital orthophotos with 12-inch ground resolution and resampled to a 24-inch ground resolution.

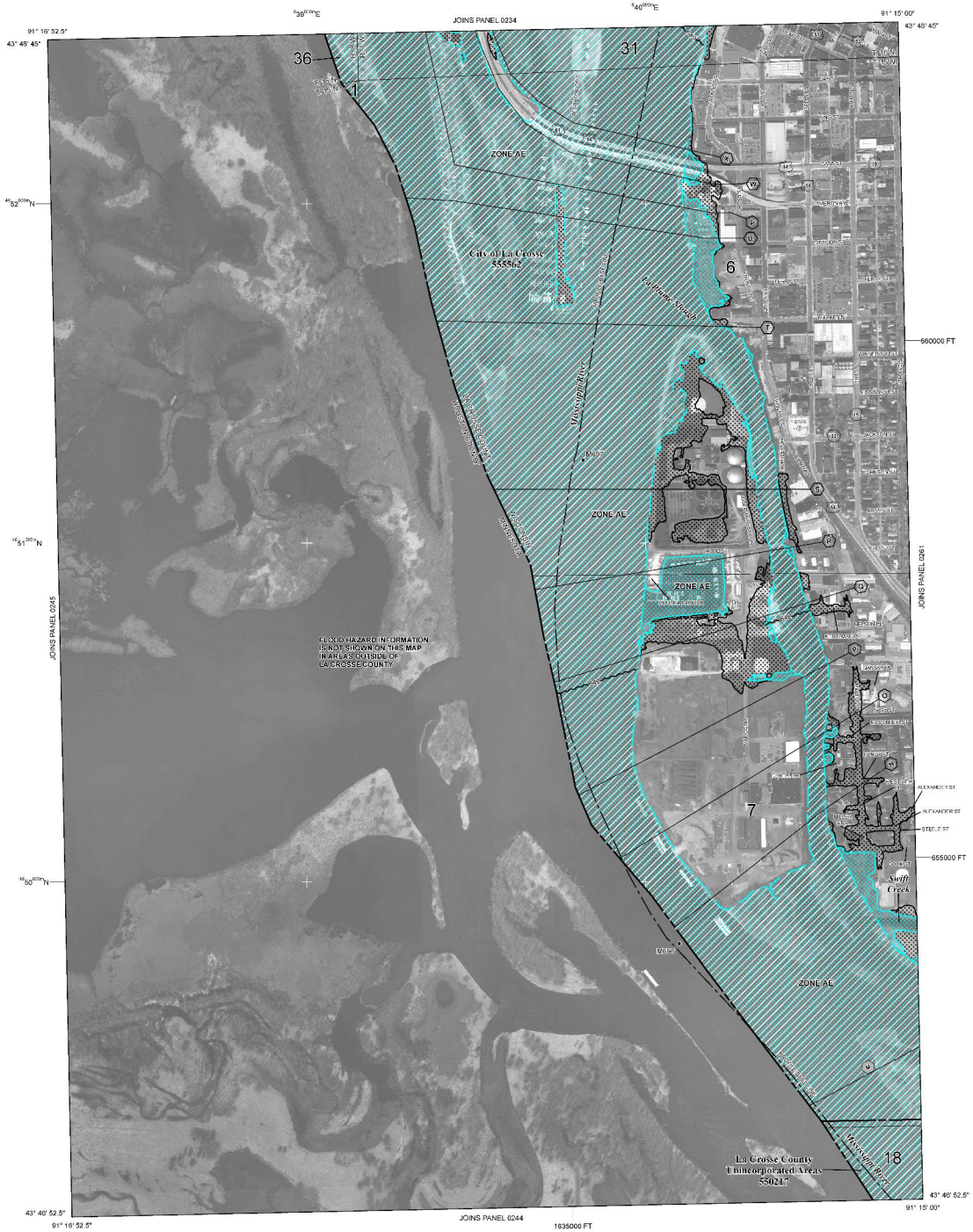
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- Culvert
- Bridge
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 3100000 FT — 5000-foot ticks: Wisconsin State Plane South Zone (FIPS Zone 4803), Lambert Conformal Conic projection
- 1000-meter Universal Transverse Mercator grid values, zone 15N
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
April 2, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

January 6, 2012 to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, to show revised Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0242D

FIRM

FLOOD INSURANCE RATE MAP

LA CROSSE COUNTY, WISCONSIN AND INCORPORATED AREAS

PANEL 242 OF 425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LA CROSSE, CITY OF	555262	0242	D
LA CROSSE COUNTY	550247	0242	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
55063C0242D

MAP REVISED
JANUARY 6, 2012

Federal Emergency Management Agency

Engineering Department

City of La Crosse
400 La Crosse Street
La Crosse, WI 54601-3396
(608)789-7505
Fax (608)789-7367

Parcel I.D. # 17-50256-010
905 Joseph Houska Drive
La Crosse, WI
54601

January 9, 2009

Dear City of La Crosse Property Owner,

This is in reference to a request that the City of La Crosse Engineering Department determine if the property described above is located within an identified Special Flood Hazard Area (SFHA), the area that would be inundated by a flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), as shown on the effective Flood Insurance Rate Map. Using the revised Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) supplied to the City of La Crosse by the Federal Emergency Management Agency (FEMA) effective April 2nd, 2008, I have determined that the property referenced above is located in one following flood zones:

- ✓ SPECIAL FLOOD HAZARD AREA (SFHA) Subject to Inundation by the 1% Annual Chance Flood. (The 1% annual chance flood (100 Year), also known as the base flood which include Zones A, AE, AH, AO, A99, V, and VE)
- ✓ OTHER FLOOD AREAS Zone X (Areas of 0.2% annual chance flood (500 Year); areas of 1% annual chance flood with depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- ✓ OTHER AREAS (Areas determined to be outside the 0.2% annual chance floodplain)

The Base Flood Elevation (BFE) is the water-surface elevation of the 1% annual chance flood.

BFE for property described above: 642.3 feet (NGVD 1929)

Additional Information: From FEMA and the City of La Crosse

When making determinations on requests, the City of La Crosse bases its determination on the flood hazard information available at the time of the determination. Requesters should be aware that flood conditions may change or new information may be generated that would supersede the City of La Crosse's determination.

Requesters also should be aware that removal of a property (parcel of land or structure) from the Special Flood Hazard Area means the property is not subject to inundation by the flood having a 1-percent of being equaled or exceeded in any given year (base flood). This does not mean the property is not subject to other flood hazards. The property could be inundated by a flood with a magnitude greater than the base flood or by localized flooding not shown on the effective FIRM.

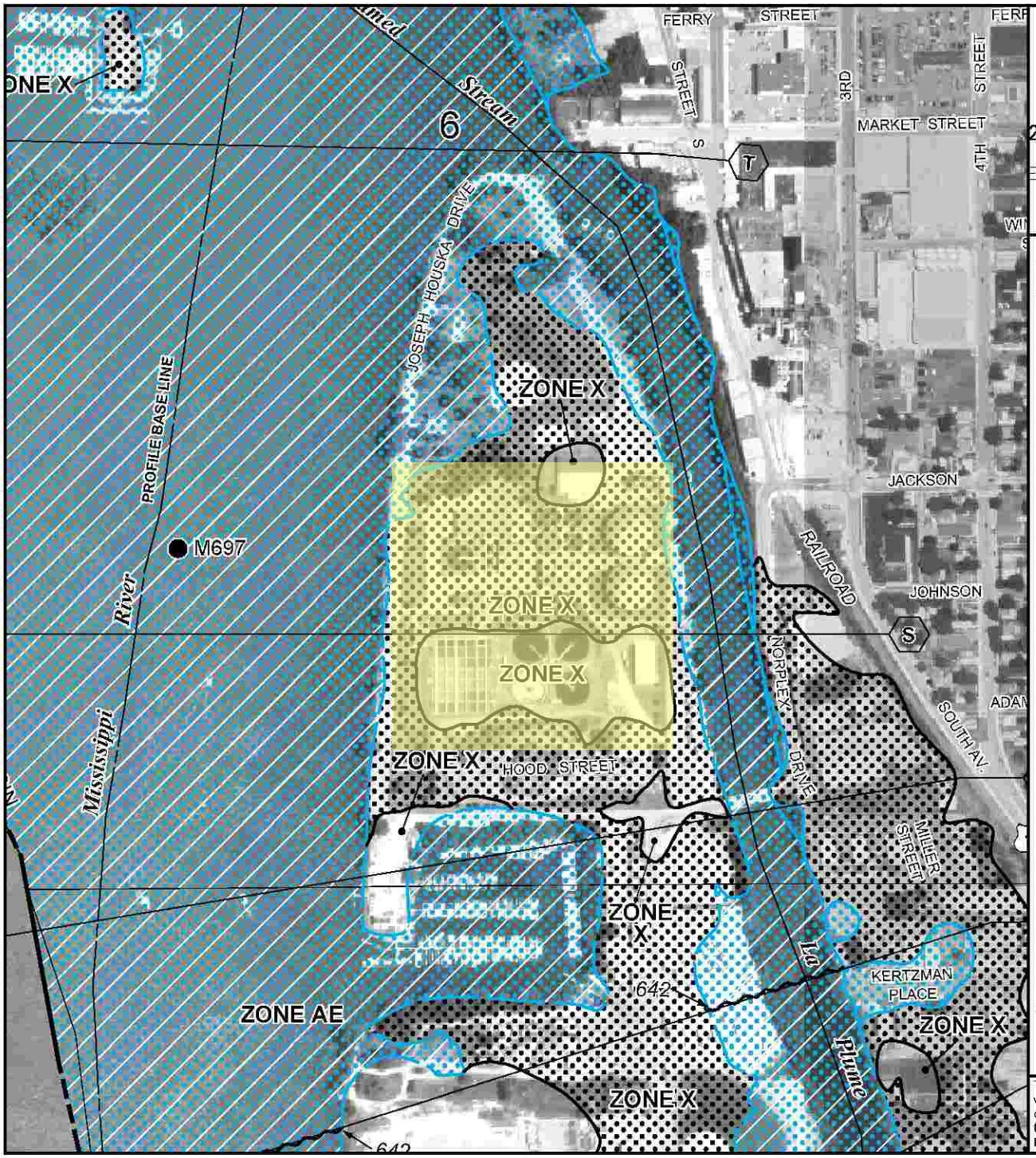
This letter is the determination made by the City of La Crosse Engineering Department. It *is not* a waiver of the condition that the property owners maintain flood insurance coverage for the property. *Only* the lender can waive the flood insurance purchase requirement because the lender imposed the requirement. *The property owner must request and receive a written waiver from the lender before canceling the policy.* The lender may determine, on its own as a business decision, that it wishes to continue the flood insurance requirement to protect its financial risk on the loan.

Even though structures are not located in the SFHA, as mentioned above, they could be flooded by a flooding event with a greater magnitude than the base flood. In fact, more than 25 percent of all claims paid by the NFIP are for policies for structures located outside the SFHA in Zones B, C, X (shaded), and X (unshaded). More than one fourth of all policies purchased under the NFIP protect structures located in these zones. The risk to structures located outside the SFHA is just not as great as the risk to structures located in SFHA's. Finally, approximately 90 percent of all federally declared disasters are caused by flooding, and homeowners insurance does not provide financial protection from this flooding. Therefore FEMA and the City of La Crosse encourage the widest possible coverage under the NFIP.

Issuance of this communication to you does not confer upon you any benefits or rights. If you are looking for a determination of your rights you must seek the advice of an attorney of your choosing. Please be advised that issuance of this communication does not create any duties or obligations for the City of La Crosse.

Douglas Kerns, CFM

City of La Crosse
Engineering Department



MAP SCALE 1" = 500'

250 0 500 1000 FEET

METE

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0242C

FIRM

FLOOD INSURANCE RATE MAP

LA CROSSE COUNTY, WISCONSIN

AND INCORPORATED AREAS

PANEL 242 OF 420

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LA CROSSE COUNTY	550217	0242	C
LA CROSSE, CITY OF	555562	0242	C

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
55063C0242C

EFFECTIVE DATE
APRIL 2, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Existing Unit Processes
Isle La Plume WWTP
City of La Crosse, WI

Design Flow and Load

Design Flow and Load						
	Average Design Flow (Dry Weather)	20	mgd			
	Average Design Flow (Wet Weather)	44	mgd			
Design Influent BOD Loading		29,793	lb/d			

Raw Wastewater Screening

Screen Type		Step Screen				
	Number of Screens	1				
	Opening Size	0.25	inch			
	Capacity	20.00	mgd	=	13,889	gpm
Screenings washer/compactor		1				
	Capacity	70	cu ft/hr			
Comminutors		2				
	Size	1.5	HP			

Year		
	Infrastructure	2002
	Screen	2002
	Washer/compactor	2002
	Comminutors	1970

Notes: Headworks building new in 2002. Screen installed in refurbished Comminutor Pit

Raw Wastewater Pumping

Pump Type		Vertical, non-clog, dry-pit centrifugal				
Number of Pumps		4				
Capacity per Pump		8,400	gpm			
Year						
	Infratstructure	1970				
	Pumps	1970				

Notes:

Pump Type		Vertical, non-clog, dry-pit centrifugal				
Number of Pumps		1				
Capacity per Pump		6,950	gpm			
Year						
	Infratstructure	1936				
	Pumps	1952				

Notes: Across the line starting

Total Raw Wastewater Pumping Capacity		40,550	gpm	=	58.4	mgd
Firm Raw Wastewater Pumping Capacity		32,150	gpm	=	46.3	mgd

Grit Removal

Number of Basins		2	
	Type	Vortex	
	Dimensions		
	Diameter	16.0	ft
	Depth	14.3	ft

Volume per Basin	2,792	gal
Total Volume	5,584	gal
Design Capacity	20.0	mgd
Year		
Infrastructure	2002	
Equipment	2002	

Notes: Pista type units, each tanks is made up of 2 different size circular tanks, 16X5.3 ft and 6.8X5 ft

Grit Pumping and Washers

Pump Type	Horizontal, Dry-Pit Recessed Impeller	
Total Number of Pumps	2	
Capacity per Pump	250	gpm
Year		
Infrastructure	2002	
Pump	2002	
Grit Washers	Coanda Tulip	
Number	2	
Capacity per washer	250	gpm
Total capacity	500	gpm
Year		
Infrastructure	2002	
Equipment	2002	

Primary Clarifiers

Total Number of Clarifiers	5	
Clarifier #1		
Length	112.1	ft
Width	25.5	ft
Sidewater Depth	10.0	ft
Surface Area	2,859	sq ft
Volume	28,586	cu ft
Rehab	2004	
Clarifier #2		
Length	112.1	ft
Width	27.0	ft
Sidewater Depth	10.0	ft
Surface Area	3,027	sq ft
Volume	30,267	cu ft
Rehab	2004	
Clarifier #3		
Diameter	90.0	ft
Sidewater Depth	10.0	ft
Surface Area	6,362	sq ft
Volume	63,617	cu ft
Rehab	2003	
Clarifier #4		
Diameter	90.0	ft
Sidewater Depth	12.0	ft
Surface Area	6,362	sq ft
Volume	76,341	cu ft
Rehab	2003	
Clarifier #5		
Diameter	90.0	ft
Sidewater Depth	12.0	ft
Surface Area	6,362	sq ft
Volume	76,341	cu ft

Rehab	2003		
Total Surface Area	24,970	sq ft	
Total Volume	275,151	cu ft	
SOR at Design Dry Weather Flow	801	gpd/sq ft	
SOR at Design Wet Weather Flow	1,762	gpd/sq ft	

Primary Sludge and Scum Pumping

Sludge Pump Type	Centrifugal	
Total Number of Pumps	3	
Firm Number of Pumps	2	
Capacity per Pump	550	gpm
Firm Capacity	1,100	gpm
Year		
Equipment	Plant 1 primary sludge pump (1) 2001 and Plant 2 pumps (2) 2008	

Plant 2 Primary Scum Pumping

Scum Pump Type	Rotary Lobe	
Total Number of Pumps	2	
Firm Number of Pumps	1	
Capacity per Pump	100	gpm
Firm Capacity	100	gpm
Year		
Equipment	2008	

Settled Sewage Effluent Pumps

Pump Type	Vertical, non-clog, dry-pit centrifugal	
Total Number of Pumps	4	
Firm Number of Pumps	3	
Capacity	8,400	gpm
Firm Capacity	25,200	gpm
Year		
Infrastructure	1970	
Equipment	1970	

Notes: 3 of the pumps have VFDs (When was P4 refurbished)

Activated Sludge (BNR) Tanks

Tank No.	L (ft)	W (ft)	D (ft)	Volume (cu	Volume	
1A	99.5	35	16	55,720	416,813	gal
1B	99.5	35	16	55,720	416,813	gal
2C	99.5	35	16	55,720	416,813	gal
2D	99.5	35	16	55,720	416,813	gal
3D	200	35	16	112,000	837,816	gal
4D	200	35	16	112,000	837,816	gal
5C	99.5	35	16	55,720	416,813	gal
5D	99.5	35	16	55,720	416,813	gal
6A	99.5	35	16	55,720	416,813	gal
6B	99.5	35	16	55,720	416,813	gal

A, B Zones are Anaerobic	Total Anaerobic	1,667,254	gal
C Zones are Anoxic	Total Anoxic	833,627	gal
D Zones are Aerobic	Total Aerobic	2,509,259	gal

Criteria - Volumetric Loading	40	lb BOD/kcf/d	(1)
Primary Effluent BOD Loading Capacity	26,790	lb/d	
Average Removal in Primary Clarifier	30	%	

Influent BOD Loading Capacity	38,272	lb/d	
Criteria - F:M	0.2 - 0.5	d^{-1}	
Average MLSS	2500	mg/L	(2)
BOD Capacity @ 0.5 F:M	52,231		
Aeration Type	Membrane Fine Bubble Diffusers		
Year			
Infrastructure	1970		
Equipment	2012		
Anerobic/Anoxic Zone Mixers			
Type	Submersible Propeller		
Number	6		
Capacity per mixer	7,000	gpm	
Year			
Equipment	1998		
Anerobic/Anoxic Zone Mixers			
Type	Submersible Propeller		
Number	2		
Capacity per mixer	7,000	gpm	
Year			
Equipment	1998		

Aeration Blowers

Blower Type	High Speed Turbo	
Number of Blowers	4	
Capacity per Blower	5100	scfm
Year	2012	
Total Aeration Capacity	20,400	
Firm Aeration Capacity	15,300	

Final Clarifiers

Type	Circular	
Total Number of Clarifiers	4	
Dimensions		
Diameter	120	ft
Sidewater Depth	12	ft
Surface Area per Basin	11309.73	sq ft
Volume	135716.8	cu ft
Total Surface Area	45238.93	sq ft
Total Volume	542867.2	cu ft
Average MLSS	2500	mg/L
Average RAS Rate	0.79	
Solids Loading at Design Dry Weather Flow	16.49973	lb/d/sq ft
Solids Loading at Design Wet Weather Flow	36.2994	lb/d/sq ft
Maximum MLSS Capacity at Design Dry Weather Flow	5090.994	mg/L
Year		
Infrastructure	1970	
Equipment	1970	

Notes: Complete Rehabilitiation in 2004 and 2005

RAS Pumping

Pump Type	Vertical Turbine (Mix Flow)
Total Number of Pumps	3
Firm Number of Pumps	2

Capacity per Pump		3,500	gpm			
Firm Capacity			gpm			
Year						
	Infrastructure	1970				
	Equipment	1970				

Notes: One pump runs constant and a second varies on VFD, 3rd is backup

WAS Pumping

Pump Type		Vertical Turbine (Mixed Flow)				
Total Number of Pumps		2				
Firm Number of Pumps		1				
Capacity per Pump		2,400	gpm			
Firm Capacity		2,400	gpm			
Year						
	Infrastructure	1970				
	Equipment	1970				

Notes: One pump operates on operator input time schedule and speed(VFD) other pump is backup

Disinfection

Type		Ultraviolet				
Number of Channels		3				
Capacity		14.0	mgd each			
Capacity at Peak Flows		42.0	mgd			
Year						
	Infrastructure	1990				
	Equipment	2005	#1,#2			
		2008	#3			

Gravity Thickeners

Type		Circular				
Number		2				
Dimensions						
	Diameter	50.0	ft			
	Sidewater Depth	10.0	ft			
	Surface Area	1,963	sq ft			
	Volume	19,635	cu ft =	146,869	gal	
	Cone Volume	3,272	cu ft =	24,475	gal	
	Tank Volume	22,907	cu ft =	171,344	gal	
Total Surface Area (2 tanks)		3,927	sq ft			
Total Volume (2 tanks)		45,814	cu ft =	342,688	gal	
Year						
	Infrastructure	1970				
	Equipment	1970				

Ferric Chloride Storage and Feed System

Storage Type		Fiberglass Storage Tank	
Number		1	
Capacity		10,000	gallons
Year, Equipment		1998	
FeCl Feed Pump Type		Chemcial Metering	
Number		3	
Capacity		1.3	gpm
Total Capacity		3.9	gpm
Year, Equipment		1998	

Thickened Sludge Transfer Pumping (to digesters)

Pump Type		Rotary Lobe	
Total Number of Pumps		2	
Firm Number of Pumps		2	
Capacity per Pump		160	gpm
Firm Capacity			gpm
Year			
	Infrastructure	1970	
	Equipment	2008	

Anaerobic Solids Digestion

No. of Digesters		4	
Digester No. 1			
	Diameter	74.5	ft
	Sidewater Depth	20	ft
	Cone Volume	108580	gal
	Volume	760753.4	gal
Digester No. 2			
	Diameter	65	ft
	Sidewater Depth	20	ft
	Cone Volume	55130	gal
	Volume	551581.9	gal
Digester No. 3			
	Diameter	65	ft
	Sidewater Depth	18	ft
	Cone Volume	55130	gal
	Volume	501936.8	gal
Digester No. 4			
	Diameter	74.5	ft
	Sidewater Depth	20	ft
	Cone Volume	108580	gal
	Volume	760753.4	gal
Total Digester Volume		2575025	gal
		344231.7	cu ft
Raw Sludge Loading Limit		171668.4	gpd
VS Loading Rate		27538.54	lb/d
Year			
	Infrastructure	1936	#2,#3
		1952	#1,#4
	Equipment	2015-2018	#2,#3, #1, #4

Digester Gas Equipment

Waste Gas Burner			
	Control	Electric actuated valve with PRV bypass	
	Capacity	Unknown	cf/hr
Year			
	Equipment	1997	

Notes: History shows to it handles up to 6000 cf/hr

Boiler/Heat Exchangers

Type	Tube in Tube
Number	1
Fuel Source	Biogas/Natural Gas

Boiler Capacity	2,125,000	BTU/hr	
Heat Exchanger Capacity	2,000,000	BTU/hr	
Digester Temperature	95-98	deg F	
Type	Hotwater Bath		
Number	1		
Fuel Source	Biogas/Natural Gas		
Boiler Capacity	2,000,000	BTU/hr	
Heat Exchanger Capacity	2,000,000	BTU/hr	
Digester Temperature	95-98	deg F	
Year			
Equipment	1988	Sludge Heater No. 1	
	1980	Sludge Heater No. 2	

Digester Recirculation Pumping

Pump Type	Centrifugal	
Total Number of Pumps	2	
Firm Number of Pumps	1	
Capacity per Pump	500	gpm
Firm Capacity	500	gpm
Year		
Infrastructure	1952	
Equipment	1952	

Feed Pump to Gravity Belt Thickener

Pump Type	Progressive Cavity	
Number of Pumps	1	
Capacity per Pump	500	gpm
Year		
Infrastructure	1998	
Equipment	1998	

Notes: Operates on VFD

Gravity Belt Thickening

Type	Gravity Belt Thickener	
Number	1	
Size	2	meter
Capacity	700	gpm
Max Solids Loading Rate	3700	lb/h
Year		
Infrastructure	1998	
Equipment	1998	

Biosolids Transfer Pumping (GBT to Storage)

Pump Type	Progresssive Cavity	
Number of Pumps	1	
Capacity per Pump	135	gpm
Year		
Infrastructure	1998	
Equipment	1998	

Notes: Speed varies (VFD) based on level in discharge hopper

Liquid Biosolids Storage

Type	Glass-Lined Steel Tanks	
Number	2	
Dimensions		

Diameter	151.0	ft	
Depth	23.8	ft	
Volume	426,207	c	3.2 MG
Total Volume	6,376,485	g	6.4 MG
Year			
Tanks	1999		

Biosolids Mixing Pumps

Pump Type	Centrifugal Chopper	
Total Number of Pumps	2	
Firm Number of Pumps	1	
Capacity per Pump	5,250	gpm
Firm Capacity	5,250	gpm
Year		
Equipment	1999	

Biosolids Tanker Loading Pumps

Pump Type	Centrifugal Chopper	
Total Number of Pumps	2	
Firm Number of Pumps	1	
Capacity per Pump	1,300	gpm
Firm Capacity	1,300	gpm
Year		
Equipment	1999	

Belt Filter Press Feed Pumps

Pump Type	Progressing Cavity	
Total Number of Pumps	1	
Capacity	300	gpm
Year		
Equipment	1999	

Liquid Polymer Storage and Feed System

Storage Type	Plastic Tank	
Number	4	
Capacity per Tank	1,000	gallons
Total Storage Capacity	4,000	gallons
Year, Equipment	1999	
BFP Liquid Polumer Feed Pumps	Dyna-Blend	
Number	3	
Capacity	0.1	gpm
Total Capacity	0.3	gpm
Year, Equipment	1999	
GBT Liquid Polumer Feed Pump1	Dyna-Blend	
Number	1	
Capacity	0.1	gpm
Year, Equipment	1999	

Belt Filter Press

Number	1	
Size	2	meter
Capacity	126	gpm
Solids Loading Capcity	2500	lb/h
Year		
Infrastructure	1999	

	Equipment	1999		
Notes:	126 gpm is at 2.7% solids			

Cake Biosolids Storage

Type		Concrete push walls with steel building cover.		
Number		1		
Dimensions				
	Length	125.0	ft	
	Width	60.0	ft	
	Push Wall Height	6	ft	
	Storage Volume	18,750	cu ft	2.5 ft depth
		45,000	cu ft	Full Depth
		1,667	cu yd	Full Depth
Year				
	Structure	1999		

Notes:

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
West Central Region Headquarters
1300 W. Clairemont Ave.
Eau Claire, WI 54701

Scott Walker, Governor
Cathy Stepp, Secretary
Dan Baumann, Regional Director
Telephone (715) 839-3700
FAX (715) 839-6076
TDD (715) 839-2786

RECEIVED
DEC 10 2015

Timothy Kabat
Mayor
La Crosse, City of
400 La Crosse Street, Mayor's Office
La Crosse, WI 54601

SUBJECT: WPDES Permit Reissuance No. WI-0029581-09-0
La Crosse, City of, 905 Joseph Houska Drive

Dear Permittee:

Your Wisconsin Pollutant Discharge Elimination System (WPDES) Permit is enclosed. The conditions of the enclosed permit reissuance were determined using the permit application, information from your WPDES permit file, other information available to the Department, comments received during the public notice period, and applicable Wisconsin Administrative Codes. All discharges from this facility and actions or reports relating thereto shall be in accordance with the terms and conditions of the enclosed permit.

This enclosed permit requires you to submit monitoring results to the Department on a periodic basis. Monitoring forms, which must be submitted electronically, are available on the Department's web page. Go to the DNR Switchboard page at http://dnr.wi.gov/topic/switchboard/ to log in and access your monitoring forms. For your convenience, there is a 'Summary of Reports Due' at the end of the enclosed permit that shows a synopsis of the required reports and monitoring forms.

The WPDES permit program has been approved by the Administrator of the U.S. Environmental Protection Agency pursuant to Section 402(b) of the Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. Section 1342 (b)). The terms and conditions of the enclosed permit are accordingly subject to enforcement under ss. 283.89 and 283.91, Stats., and Section 309 of the Federal Act (33 U.S.C. Section 1319).

The Department has the authority under chs. 160 and 283, Wis. Stats., to establish effluent limitations, monitoring requirements, and other permit conditions for discharges to groundwater and surface waters of the State. The Department also has the authority to issue, reissue, modify, terminate, or revoke and reissue WPDES permits under ch. 283, Wis. Stats.

The enclosed permit contains water quality-based effluent limitations that are necessary to ensure the water quality standards for the Mississippi River in the Lower La Crosse River Watershed of the Bad Axe – La Crosse Rivers Basin located in La Crosse County are met. You may apply for a variance from the water quality standard used to derive the limitations pursuant to s. 283.15, Stats., by submitting an application to the Director of the Bureau of Water Quality, P.O. Box 7921, Madison, Wisconsin 53707 within 60 days of the date the permit was issued (see "Date Permit Signed/Issued" after the signature on the front page of the enclosed permit). This statute also allows the permittee to apply for a variance to the water quality standard when applying for reissuance of the permit. Subchapter III of ch. NR 200, Wis. Adm. Code, specifies the procedures that must be followed and the information that must be included when submitting an application for a variance.

If your permit contains a stringent Water Quality Based Effluent Limit for Phosphorus, there is a Compliance Schedule requirement to complete a Phosphorus Operational Evaluation and Optimization Report. To streamline the Report preparation and review process the Department has prepared a Worksheet which should be used to develop the report. The worksheet can be found at : http://dnr.wi.gov/topic/surfacewater/phosphorus.html.
To challenge the reasonableness of or necessity for any term or condition of the enclosed permit, s. 283.63, Stats., and ch. NR 203, Wis. Adm. Code, require that you file a verified petition for review with the Secretary of the Department of Natural Resources within 60 days of the date the permit was issued (see "Date Permit Signed/Issued" after the signature on the front page of the enclosed permit). For permit-related decisions that are

not reviewable pursuant to s. 283.63, Stats., it may be possible for permittees or other persons to obtain an administrative review pursuant to s. 227.42, Stats., and s. NR 2.05(5), Wis. Adm. Code, or a judicial review pursuant to s. 227.52, Stats. If you choose to pursue one of these options, you should know that Wisconsin Statutes and Administrative Code establish time periods within which requests to review Department decisions must be filed.

Sincerely,

Michael Vollrath
Wastewater Field Supervisor

Dated: December 7, 2015

cc: Julia Stephenson , Legal Permit File - LAX
Cyndi Barr, WT/3
Jared Greeno, Plant Operator, 905 Joseph Houska Dr, La Crosse, WI 54601
U.S. Fish and Wildlife Service (Electronic Copy via Email)
EPA – Region V (Electronic Copy via Email)

STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES

NOTICE OF FINAL DETERMINATION TO REISSUE

A WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES) PERMIT No. WI-0029581-09-0

Permittee: La Crosse, City of, 905 Joseph Houska Dr, La Crosse, WI, 54601

Facility Where Discharge Occurs: La Crosse, City of, 905 Joseph Houska Drive

Receiving Water And Location: the Mississippi River in the Lower La Crosse River Watershed of the

Bad Axe – La Crosse Rivers Basin located in La Crosse County

Brief Facility Description: The City of La Crosse owns and operates an activated sludge type wastewater treatment facility on Isle La Plume with discharge to the Mississippi River. The annual average design flow of the facility is 20 million gallons per day (MGD), and the actual annual average flow in 2014 was 11.67 MGD. Treatment processes include, an influent fine screen, grit removal, primary clarification, aeration tanks with biological phosphorus removal, effluent clarification with UV disinfection. Sludge is processed using anaerobic digestion and mechanical sludge dewatering. Changes in operation since the last permit term includes a new high efficiency turbine blowers to aerate the BNR system. Future planned changes include optimizing the sludge anaerobic digesters to produce higher quality sludge, and addressing effluent phosphorus reduction. Proposed monitoring changes include an alternative mercury effluent limit with continuation of their mercury pollutant minimization program, new effluent total nitrogen series monitoring, new effluent copper limits with a compliance schedule to meet them, effluent hardness monitoring, and lower effluent phosphorus limits with a compliance schedule to meet them.

Permit Drafter's Name, Address and Phone: Angela Parkhurst, DNR, WCR Headquarters, 1300 W. Clairemont Ave. Eau Claire, WI, 54701, (715) 839-3836

Basin Engineer's Name, Address, and Phone: Julia Stephenson, 3550 Mormon Coulee Road, La Crosse, WI 54601, (608) 785-9981

Date Permit Signed/Issued: December 7, 2015
Date of Effectiveness: January 1, 2016
Date of Expiration: December 31, 2020

Following the public notice period the Department has made a final determination to reissue the WPDES permit for the above-named permittee for this existing discharge. The permit application information from the WPDES permit file, comments received on the proposed permit and applicable Wis. Adm. Codes were used as a basis for this final determination.

The Department has the authority to issue, modify, suspend, or revoke WPDES permits and to establish effluent limitations and permit conditions under ch. 283, Stats.

Following is a summary of significant comments and any significant changes which have been made in the terms and conditions set forth in the draft permit:

Comments Received from the Applicant, Individuals or Groups and Any Permit Changes as Applicable

The City of La Crosse submitted the following comments via email April 17, 2015. The DNR responses follow each comment.

1. The City requests that the effluent copper limits, along with the monitoring requirement for hardness, be eliminated from the proposed permit due to inaccurate data.

DNR Response: The data was shown to be inaccurate, and the newer correct data demonstrates the copper limits and corresponding hardness monitoring is not needed. The copper limits and hardness monitoring were removed from the permit.

2. The City requests that the language for the Operational Evaluation Report in the phosphorus compliance schedule be eliminated from the proposed permit along with the due date for implementation as the City is concerned that this language is vague with respect to how the City is to demonstrate compliance with the requirement.

DNR Response: An interim limit for phosphorus has been given as well as the compliance schedule. The expectation is that the interim limit will continue to be met and that is how the City will demonstrate compliance with the requirement. Therefore, no changes were made to the compliance schedule language.

3. Due to a Wisconsin Circuit Court decision July 11, 2014 regarding ammonia limits, the City requests the effluent ammonia limits be removed and monitoring reduced because of the lack of reasonable potential to exceed the limits by the facility.

DNR Response: A court decision on July 11, 2014 rendered s. NR 106.33(2) invalid. As a result of this decision, the seasonal 20 and 40 mg/L thresholds for including ammonia limits in municipal discharge permits are no longer applicable under current rules. As such, s. NR 106.33(1) enables the Department to determine the need to include new ammonia limits in municipal discharge permits based on the statistical comparisons in s. NR 106.05. The reasonable potential analysis was documented during a previous permit issuance process, and a daily maximum ammonia limit has been in effect since November 2004 for this facility. Daily maximum limitations are based on acute toxicity criteria, which are a function of the effluent pH and the receiving water classification. A review of daily pH values from the most recent three years shows that the upper 99th percentile is 8.0 s.u., with results as high as 8.4 s.u. reported. This corresponds to a daily maximum Ammonia Nitrogen limit of 20 mg/L. This value was exceeded on 10 occasions during the current permit term, the 1-day P99 of the effluent being 27 mg/L with a maximum reported value of 28.6 mg/L. To account for the range of effluent pH and ammonia results encountered at La Crosse the table in section 3.2.1.2 in the draft permit was substituted with the following table:

Effluent pH (s.u.)	NH_3-N Limit (mg/L)
$pH \leq 7.6$	No Limit
$7.6 < pH \leq 7.7$	29
$7.7 < pH \leq 7.8$	24
$7.8 < pH \leq 7.9$	20
$7.9 < pH \leq 8.0$	17
$8.0 < pH \leq 8.1$	14
$8.1 < pH \leq 8.2$	11
$8.2 < pH \leq 8.3$	9.4
$pH \geq 8.4$	7.8

Comments Received from EPA or Other Government Agencies and Any Permit Changes as Applicable

The EPA submitted preliminary permit review comments as part of the FY 2015 permits for review are listed below, followed by the DNR responses.

1. The type of collection system should be listed in the fact sheet as well as the percent combined versus separation of the system.

DNR Response: The service area is 100% separate sewer collection system. This was noted in the fact sheet.

2. The receiving water body impairments should be listed in the fact sheet.

DNR Response: The following information was added to the Fact Sheet in the General Information Section: The facility discharges to the Mississippi River sections of Pool 8 where it is listed as impaired for contaminated fish tissue from PCBs and Mercury, as well as water quality use restrictions from phosphorus. This was noted in the fact sheet.

3. The identification of the biosolids land application sites or where the list can be viewed should be listed in the fact sheet.

DNR Response: The following information was added to the Fact Sheet in the Sludge Requirements Section: "Land application of waste shall be done in accordance with permit conditions and applicable codes. All land application sites shall be approved prior to their use. To receive a list of approved sites, or to be notified of potential approvals, please contact the regional wastewater specialist."

4. It is recommended that the stormwater coverage be mentioned in the fact sheet.

DNR Response: The following information was added to the Fact Sheet: in the General Information section: The City of La Crosse is covered under the Municipal Separate Storm Sewer System (MS4) General Permit (No. WI-S050075-2) which took effect on May 1, 2014. The City was originally covered under the MS4 General Permit issued January 19, 2006. Information regarding the programs and activities required under the MS4 permits can be found at; http://dnr.wi.gov/topic/stormwater/municipal.

5. A sketch or detailed description of the location of the discharge should be included in the permit or the fact sheet.

DNR Response: The following information was added to the Fact Sheet for Outfall 001: Outfall location is at 43N 48'0" and 91W 15'34", 50 ft off the east bank of the main channel of the Mississippi River, approximately 0.625 miles downstream of the existing US Highway 14, 16, and 61 main channel bridge.

6. On February 1, 2014, Wisconsin Administrative Code Streamlining rules went into effect for POTWs pretreatment programs. The permit contains general language for pretreatment program modifications due to state of federal law changes but it is the expectation that more detailed language be included in

the draft permit to ensure that the WWTP incorporates streamlining rule updates into its Sewer Use Ordinance. Please include detailed language specific to the streamlining rule changes into the draft permit requirements for the pretreatment program.

DNR Response: The City of La Crosse has already submitted their pretreatment modification incorporating the Streamlining requirements so revising their WPDES permit to require that submittal is not needed.

As provided by s. 283.63, Stats., and ch. 203, Wis. Adm. Code, persons desiring further adjudicative review of this final determination may request a public adjudicatory hearing. A request shall be made by filing a verified petition for review with the Secretary of the Department of Natural Resources within 60 days of the date the permit was signed (see permit signature date above). Further information regarding the conduct and nature of public adjudicatory hearings may be found by reviewing ch. NR 203, Wis. Adm. Code, s. 283.63 Stats., and other applicable law, including s. 227.42, Stats.

Information on file for this permit action may be inspected and copied at either the above named permit drafter's address or the above named basin engineer's address, Monday through Friday (except holidays), between 9:00 a.m. and 3:30 p.m. Information on this permit action may also be obtained by calling the permit drafter at (715) 839-3836 or by writing to the Department. Reasonable costs (usually 20 cents per page) will be charged for copies of information in the file other than the public notice and fact sheet. Pursuant to the Americans with Disabilities Act, reasonable accommodation, including the provision of informational material in an alternative format, will be made to qualified individuals upon request.

WISCONSIN
DEPT. OF NATURAL RESOURCES

WPDES PERMIT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

City of La Crosse

is permitted, under the authority of Chapter 283, Wisconsin Statutes, to discharge from a facility located at
905 Joseph Houska Drive
to
the Mississippi River in the Lower La Crosse River Watershed of the Bad Axe – La Crosse Rivers Basin located in La Crosse County

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit, according to Chapter NR 200, Wis. Adm. Code, at least 180 days prior to the expiration date given below.

State of Wisconsin Department of Natural Resources
For the Secretary

By _____
Michael Vollrath
Wastewater Field Supervisor

December 7, 2015
Date Permit Signed/Issued

PERMIT TERM: EFFECTIVE DATE - January 01, 2016 **EXPIRATION DATE - December 31, 2020**

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1 Influent Requirements

1.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
701	Representative influent samples shall be collected prior to the grit removal and filtrate/centrate return.

1.2 Monitoring Requirements

The permittee shall comply with the following monitoring requirements.

1.2.1 Sampling Point 701 - INFLUENT PRIOR TO GRIT REMOVAL

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Continuous	Continuous	
BOD_5, Total		mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	Daily	24-Hr Flow Prop Comp	
Cadmium, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Chromium, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Copper, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Lead, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Nickel, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Zinc, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Cyanide, Total		µg/L	Monthly	Grab	
Mercury, Total Recoverable		ng/L	Monthly	24-Hr Flow Prop Comp	

1.2.1.1 Total Metals Analyses

Measurements of total metals and total recoverable metals shall be considered as equivalent.

1.2.1.2 Sample Analysis

Samples shall be analyzed using a method which provides adequate sensitivity so that results can be quantified, unless not possible using the most sensitive approved method.

1.2.1.3 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

2 In-Plant Requirements

2.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)
106	A representative in plant sample shall be collected for a Mercury field blank using standard sample handling procedures.

2.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

2.2.1 Sampling Point 106 - MERCURY FIELD BLANK

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Mercury, Total Recoverable		ng/L	Monthly	Blank	

2.2.1.1 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

3 Surface Water Requirements

3.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
001	Representative effluent samples shall be collected following secondary clarification and prior to discharge to the Mississippi River.

3.2 Monitoring Requirements and Effluent Limitations

The permittee shall comply with the following monitoring requirements and limitations.

3.2.1 Sampling Point (Outfall) 001 - PRIOR TO DISCHARGE

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Continuous	Continuous	
$CBOD_5$	Monthly Avg	25 mg/L	Daily	24-Hr Flow Prop Comp	
$CBOD_5$	Weekly Avg	40 mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	Daily	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Cadmium, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Chromium, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Lead, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Nickel, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Zinc, Total Recoverable		µg/L	Monthly	72-Hr Flow Prop Comp	
Cyanide, Total		µg/L	Monthly	Grab	
Nitrogen, Ammonia (NH_3-N) Total	Daily Max - Variable	mg/L	Weekly	24-Hr Flow Prop Comp	See ammonia subsection below.
Nitrogen, Ammonia Variable Limit		mg/L	Weekly	24-Hr Flow Prop Comp	See ammonia subsection below.

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Fecal Coliform	Geometric Mean	400 #/100 ml	2/Week	Grab	Limit and monitoring effective May-Sept annually.
Acute WET		TU_a	See Listed Qtr(s)	24-Hr Flow Prop Comp	Tests required annually, rotating quarters. See Acute subsection below.
Nitrogen, Total		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Nitrite + Nitrate Total		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	1.0 mg/L	5/Week	24-Hr Flow Prop Comp	Interim limit of 1.0 mg/L monthly average effective throughout the permit term. Final limits of 0.100 mg/L, 17 lbs 6-month avgs and 0.300 mg/L monthly avg effective next permit term. See phosphorus footnote below and compliance schedule.
Copper, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Mercury, Total Recoverable	Daily Max	4.8 ng/L	Monthly	Grab	See Mercury subsection below and compliance schedule.

3.2.1.1 Average Annual Design Flow

The average annual design flow of the permittee's wastewater treatment facility is 20 MGD.

3.2.1.2 Ammonia Nitrogen Effluent Limitations

Acute Ammonia limitations (daily maximums) are based on the effluent pH. Below is a table which states the applicable ammonia limit for various pH values from 6.0 to 9.0 standard units (s.u.) and should be used to determine the daily maximum ammonia limit to be reported on the DMRs. When measuring pH, rounding to the nearest 0.1 is required. For example, if the pH reading is 7.14 it should be rounded to 7.1. If the pH reading was 7.15, it should be rounded to 7.2. These limits apply year-round unless noted below.

Effluent pH (s.u.)	NH_3-N Limit (mg/L)
$pH \leq 7.6$	No Limit
$7.6 < pH \leq 7.7$	29*
$7.7 < pH \leq 7.8$	24*
$7.8 < pH \leq 7.9$	20*
$7.9 < pH \leq 8.0$	17

$8.0 < pH \leq 8.1$	14
$8.1 < pH \leq 8.2$	11
$8.2 < pH \leq 8.3$	9.4
$pH \geq 8.4$	7.8

* During the months of May through October if the pH is less than or equal to 7.6 there is no daily maximum limit for NH3-N. Limits shown in the table above with an asterisk * would only apply from November through April.

3.2.1.3 Total Metals Analyses

Measurements of total metals and total recoverable metals shall be considered as equivalent.

3.2.1.4 Sample Analysis

Samples shall be analyzed using a method which provides adequate sensitivity so that results can be quantified at a level of quantitation below the calculated/potential effluent limit, unless not possible using the most sensitive approved method.

3.2.1.5 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

3.2.1.6 Phosphorus Water Quality Based Effluent Limitation(s)

The final water quality based effluent limits for phosphorus are 0.100 mg/L, 17 lbs/day 6-month average and 0.300 mg/L monthly average will take effect per the Compliance Schedule unless:

(A) As part of the application for the next reissuance, or prior to filing the application, the permittee submits either: 1.) a watershed adaptive management plan and a completed Watershed Adaptive Management Request Form 3200-139; or 2.) an application for water quality trading; or 3.) an application for a variance; or 4.) new information or additional data that supports a recalculation of the numeric limitation; and

(B) The Department modifies, revokes and reissues, or reissues the permit to incorporate a revised limitation before the expiration of the compliance schedule*.

Note: The permittee may also submit an application for a variance within 60 days of this permit reissuance, as noted in the permit cover letter, in accordance with s. 283.15, Stats.

If Adaptive Management or Water Quality Trading is approved as part of the permit application for the next reissuance or as part of an application for a modification or revocation and reissuance, the plan and specifications submittal, construction, and final effective dates for compliance with the total phosphorus WQBEL may change in the reissued or modified permit. In addition, the numeric value of the water quality based effluent limit may change based on new information (e.g. a TMDL) or additional data. If a variance is approved for the next reissuance, interim limits and conditions will be imposed in the reissued permit in accordance with s. 283.15, Stats., and applicable regulations. A permittee may apply for a variance to the phosphorus WQBEL at the next reissuance even if the permittee did not apply for a phosphorus variance as part of this permit reissuance.

Additional Requirements: If a water quality based effluent limit has taken effect in a permit, any increase in the limit is subject to s. NR 102.05(1) and ch. NR 207, Wis. Adm. Code. When a six-month average effluent limit is specified for Total Phosphorus the applicable averaging periods are May through October and November through April.

*Note: The Department will prioritize reissuances and revocations, modifications, and reissuances of permits to allow permittees the opportunity to implement adaptive management or nutrient trading in a timely and effective manner.

3.2.1.7 Alternative Approaches to Phosphorus WQBEL Compliance

Rather than upgrading its wastewater treatment facility to comply with WQBELs for total phosphorus, the permittee may use Water Quality Trading or the Watershed Adaptive Management Option, to achieve compliance under ch. NR 217, Wis. Adm. Code, provided that the permit is modified, revoked and reissued, or reissued to incorporate any such alternative approach. The permittee may also implement an upgrade to its wastewater treatment facility in combination with Water Quality Trading or the Watershed Adaptive Management Option to achieve compliance, provided that the permit is modified, revoked and reissued, or reissued to incorporate any such alternative approach. If the Final Compliance Alternatives Plan concludes that a variance will be pursued, the Plan shall provide information regarding the basis for the variance.

3.2.1.8 Submittal of Permit Application for Next Reissuance and Adaptive Management or Pollutant Trading Plan or Variance Application

The permittee shall submit the permit application for the next reissuance at least 6 months prior to expiration of this permit. If the permittee intends to pursue adaptive management to achieve compliance with the phosphorus water quality based effluent limitation, the permittee shall submit with the application for the next reissuance: a completed Watershed Adaptive Management Request Form 3200-139, the completed Adaptive Management Plan and final plans for any system upgrades necessary to meet interim limits pursuant to s. NR 217.18, Wis. Adm. Code. If the permittee intends to pursue pollutant trading to achieve compliance, the permittee shall submit an application for water quality trading with the application for the next reissuance. If system upgrades will be used in combination with pollutant trading to achieve compliance with the final water quality-based limit, the reissued permit will specify a schedule for the necessary upgrades. If the permittee intends to seek a variance, the permittee shall submit an application for a variance with the application for the next reissuance.

3.2.1.9 Whole Effluent Toxicity (WET) Testing

Primary Control Water: Mississippi River, upstream of discharge

Instream Waste Concentration (IWC): 1.8%

Dilution series: At least five effluent concentrations and dual controls must be included in each test.

- **Acute:** 100, 50, 25, 12.5, 6.25% and any additional selected by the permittee.

WET Testing Frequency:

Acute tests shall be conducted [choose one: once every other year, once each year, twice each year, quarterly, or bimonthly] in rotating quarters in order to collect seasonal information about the discharge. Tests are required during the following quarters.

- **Acute Tests:**

  July – Sept 2016

  Oct – Dec 2017

  Jan – March 2018

  April – June 2019

  July – Sept 2020

Acute WET testing shall continue after the permit expiration date (until the permit is reissued) in accordance with the WET requirements specified for the fourth calendar year of this permit. For example, the next test would be required in Oct-Dec 2021.

Reporting: The permittee shall report test results on the Discharge Monitoring Report form, and also complete the "Whole Effluent Toxicity Test Report Form" (Section 6, "*State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition*"), for each test. The original, complete, signed version of the Whole Effluent Toxicity Test Report Form shall be sent to the Biomonitoring Coordinator, Bureau of Water Quality, 101 S. Webster St., P.O. Box 7921, Madison, WI 53707-7921, within 45 days of test completion. The Discharge Monitoring Report (DMR) form shall be submitted electronically by the required deadline.

Determination of Positive Results: An acute toxicity test shall be considered positive if the Toxic Unit - Acute (TU_a) is greater than 1.0 for either species. The TU_a shall be calculated as follows: If $LC_{50} \geq 100$, then $TU_a = 1.0$. If LC_{50} is < 100, then $TU_a = 100 \div LC_{50}$. A chronic toxicity test shall be considered positive if the Relative Toxic Unit - Chronic (rTU_c) is greater than 1.0 for either species. The rTU_c shall be calculated as follows: If $IC_{25} \geq$ IWC, then $rTU_c = 1.0$. If $IC_{25} <$ IWC, then $rTU_c = IWC \div IC_{25}$.

Additional Testing Requirements: Within 90 days of a test which showed positive results, the permittee shall submit the results of at least 2 retests to the Biomonitoring Coordinator on "Whole Effluent Toxicity Test Report Forms". The 90 day reporting period shall begin the day after the test which showed a positive result. The retests shall be completed using the same species and test methods specified for the original test (see the Standard Requirements section herein).

4 Land Application Requirements

4.1 Sampling Point(s)

The discharge(s) shall be limited to land application of the waste type(s) designated for the listed sampling point(s) on Department approved land spreading sites or by hauling to another facility.

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
002	Representative cake sludge samples shall be collected prior to land application. Sludge must be mixed prior to sampling and monitored bimonthly for lists 1, 2, 3, and 4, and once in 2016 for PCBs.
003	Representative liquid sludge samples shall be collected from the sludge storage discharge. Sludge must be mixed prior to sampling, and monitored bimonthly for lists 1, 2, 3, and 4, and once in 2016 for PCBs.

4.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

4.2.1 Sampling Point (Outfall) 002 - CAKE SLUDGE and 003- LIQUID SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	1/ 2 Months	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	1/ 2 Months	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	1/ 2 Months	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	1/ 2 Months	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	1/ 2 Months	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	1/ 2 Months	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	1/ 2 Months	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	1/ 2 Months	Composite	
Lead Dry Wt	High Quality	300 mg/kg	1/ 2 Months	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	1/ 2 Months	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	1/ 2 Months	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	1/ 2 Months	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	1/ 2 Months	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	1/ 2 Months	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	1/ 2 Months	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	1/ 2 Months	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	1/ 2 Months	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	1/ 2 Months	Composite	
Nitrogen, Total Kjeldahl		Percent	1/ 2 Months	Composite	
Nitrogen, Ammonium (NH_4-N) Total		Percent	1/ 2 Months	Composite	
Phosphorus, Total		Percent	1/ 2 Months	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Phosphorus, Water Extractable		% of Tot P	1/ 2 Months	Composite	
Potassium, Total Recoverable		Percent	1/ 2 Months	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2016.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2016.

Other Sludge Requirements	
Sludge Requirements	**Sample Frequency**
List 3 Requirements – Pathogen Control: The requirements in List 3 shall be met prior to land application of sludge.	**BiMonthly**
List 4 Requirements – Vector Attraction Reduction: The vector attraction reduction shall be satisfied prior to, or at the time of land application as specified in List 4.	**BiMonthly**

4.2.1.1 List 2 Analysis

If the monitoring frequency for List 2 parameters is more frequent than "Annual" then the sludge may be analyzed for the List 2 parameters just prior to each land application season rather than at the more frequent interval specified.

4.2.1.2 Changes in Feed Sludge Characteristics

If a change in feed sludge characteristics, treatment process, or operational procedures occurs which may result in a significant shift in sludge characteristics, the permittee shall reanalyze the sludge for List 1, 2, 3 and 4 parameters each time such change occurs.

4.2.1.3 Multiple Sludge Sample Points (Outfalls)

If there are multiple sludge sample points (outfalls), but the sludges are not subject to different sludge treatment processes, then a separate List 2 analysis shall be conducted for each sludge type which is land applied, just prior to land application, and the application rate shall be calculated for each sludge type. In this case, List 1, 3, and 4 and PCBs need only be analyzed on a single sludge type, at the specified frequency. If there are multiple sludge sample points (outfalls), due to multiple treatment processes, List 1, 2, 3 and 4 and PCBs shall be analyzed for each sludge type at the specified frequency.

4.2.1.4 Sludge Which Exceeds the High Quality Limit

Cumulative pollutant loading records shall be kept for all bulk land application of sludge which does not meet the high quality limit for any parameter. This requirement applies for the entire calendar year in which any exceedance of Table 3 of s. NR 204.07(5)(c), is experienced. Such loading records shall be kept for all List 1 parameters for each site land applied in that calendar year. The formula to be used for calculating cumulative loading is as follows:

[(Pollutant concentration (mg/kg) x dry tons applied/ac) ÷ 500] + previous loading (lbs/acre) = cumulative lbs pollutant per acre

When a site reaches 90% of the allowable cumulative loading for any metal established in Table 2 of s. NR 204.07(5)(b), the Department shall be so notified through letter or in the comment section of the annual land application report (3400-55).

4.2.1.5 Sludge Analysis for PCBs

The permittee shall analyze the sludge for Total PCBs one time during **2016**. The results shall be reported as "PCB Total Dry Wt". Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with Table EM in s. NR 219.04, Wis. Adm. Code and the conditions specified in Standard Requirements of this permit. PCB results shall be submitted by January 31, following the specified year of analysis.

4.2.1.6 Lists 1, 2, 3, and 4

List 1 TOTAL SOLIDS AND METALS See the Monitoring Requirements and Limitations table above for monitoring frequency and limitations for the List 1 parameters
Solids, Total (percent)
Arsenic, mg/kg (dry weight)
Cadmium, mg/kg (dry weight)
Copper, mg/kg (dry weight)
Lead, mg/kg (dry weight)
Mercury, mg/kg (dry weight)
Molybdenum, mg/kg (dry weight)
Nickel, mg/kg (dry weight)
Selenium, mg/kg (dry weight)
Zinc, mg/kg (dry weight)

List 2 NUTRIENTS See the Monitoring Requirements and Limitations table above for monitoring frequency for the List 2 parameters
Solids, Total (percent)
Nitrogen Total Kjeldahl (percent)
Nitrogen Ammonium (NH4-N) Total (percent)
Phosphorus Total as P (percent)
Phosphorus, Water Extractable (as percent of Total P)
Potassium Total Recoverable (percent)

List 3
PATHOGEN CONTROL FOR CLASS B SLUDGE

The permittee shall implement pathogen control as listed in List 3. The Department shall be notified of the pathogen control utilized and shall be notified when the permittee decides to utilize alternative pathogen control.

The following requirements shall be met prior to land application of sludge.

Parameter	Unit	Limit
Fecal Coliform*	MPN/gTS or CFU/gTS	2,000,000
OR, ONE OF THE FOLLOWING PROCESS OPTIONS		
Aerobic Digestion	Air Drying	
Anaerobic Digestion	Composting	
Alkaline Stabilization	PSRP Equivalent Process	

* The Fecal Coliform limit shall be reported as the geometric mean of 7 discrete samples on a dry weight basis.

List 4
VECTOR ATTRACTION REDUCTION

The permittee shall implement any one of the vector attraction reduction options specified in List 4. The Department shall be notified of the option utilized and shall be notified when the permittee decides to utilize an alternative option.

One of the following shall be satisfied prior to, or at the time of land application as specified in List 4.

Option	Limit	Where/When it Shall be Met
Volatile Solids Reduction	≥38%	Across the process
Specific Oxygen Uptake Rate	≤1.5 mg O_2/hr/g TS	On aerobic stabilized sludge
Anaerobic bench-scale test	<17 % VS reduction	On anaerobic digested sludge
Aerobic bench-scale test	<15 % VS reduction	On aerobic digested sludge
Aerobic Process	>14 days, Temp >40°C and Avg. Temp > 45°C	On composted sludge
pH adjustment	>12 S.U. (for 2 hours) and >11.5 (for an additional 22 hours)	During the process
Drying without primary solids	>75 % TS	When applied or bagged
Drying with primary solids	>90 % TS	When applied or bagged
Equivalent Process	Approved by the Department	Varies with process
Injection	-	When applied
Incorporation	-	Within 6 hours of application

4.2.1.7 Daily Land Application Log

Daily Land Application Log		
Discharge Monitoring Requirements and Limitations The permittee shall maintain a daily land application log for biosolids land applied each day when land application occurs. The following minimum records must be kept, in addition to all analytical results for the biosolids land applied. The log book records shall form the basis for the annual land application report requirements.		
Parameters	**Units**	**Sample Frequency**
DNR Site Number(s)	Number	Daily as used
Outfall number applied	Number	Daily as used
Acres applied	Acres	Daily as used
Amount applied	As appropriate * /day	Daily as used
Application rate per acre	unit */acre	Daily as used
Nitrogen applied per acre	lb/acre	Daily as used
Method of Application	Injection, Incorporation, or surface applied	Daily as used

*gallons, cubic yards, dry US Tons or dry Metric Tons

4.2.2 Sampling Point (Outfall) 003 - LIQUID SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	1/ 2 Months	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	1/ 2 Months	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	1/ 2 Months	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	1/ 2 Months	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	1/ 2 Months	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	1/ 2 Months	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	1/ 2 Months	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	1/ 2 Months	Composite	
Lead Dry Wt	High Quality	300 mg/kg	1/ 2 Months	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	1/ 2 Months	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	1/ 2 Months	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	1/ 2 Months	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	1/ 2 Months	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	1/ 2 Months	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	1/ 2 Months	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	1/ 2 Months	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	1/ 2 Months	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	1/ 2 Months	Composite	
Nitrogen, Total Kjeldahl		Percent	1/ 2 Months	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nitrogen, Ammonium (NH_4-N) Total		Percent	1/ 2 Months	Composite	
Phosphorus, Total		Percent	1/ 2 Months	Composite	
Phosphorus, Water Extractable		% of Tot P	1/ 2 Months	Composite	
Potassium, Total Recoverable		Percent	1/ 2 Months	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	

Other Sludge Requirements	
Sludge Requirements	**Sample Frequency**
List 3 Requirements – Pathogen Control: The requirements in List 3 shall be met prior to land application of sludge.	**Annual**
List 4 Requirements – Vector Attraction Reduction: The vector attraction reduction shall be satisfied prior to, or at the time of land application as specified in List 4.	**Annual**

4.2.2.1 List 2 Analysis

If the monitoring frequency for List 2 parameters is more frequent than "Annual" then the sludge may be analyzed for the List 2 parameters just prior to each land application season rather than at the more frequent interval specified.

4.2.2.2 Changes in Feed Sludge Characteristics

If a change in feed sludge characteristics, treatment process, or operational procedures occurs which may result in a significant shift in sludge characteristics, the permittee shall reanalyze the sludge for List 1, 2, 3 and 4 parameters each time such change occurs.

4.2.2.3 Multiple Sludge Sample Points (Outfalls)

If there are multiple sludge sample points (outfalls), but the sludges are not subject to different sludge treatment processes, then a separate List 2 analysis shall be conducted for each sludge type which is land applied, just prior to land application, and the application rate shall be calculated for each sludge type. In this case, List 1, 3, and 4 and PCBs need only be analyzed on a single sludge type, at the specified frequency. If there are multiple sludge sample points (outfalls), due to multiple treatment processes, List 1, 2, 3 and 4 and PCBs shall be analyzed for each sludge type at the specified frequency.

4.2.2.4 Sludge Which Exceeds the High Quality Limit

Cumulative pollutant loading records shall be kept for all bulk land application of sludge which does not meet the high quality limit for any parameter. This requirement applies for the entire calendar year in which any exceedance of Table 3 of s. NR 204.07(5)(c), is experienced. Such loading records shall be kept for all List 1 parameters for each site land applied in that calendar year. The formula to be used for calculating cumulative loading is as follows:

[(Pollutant concentration (mg/kg) x dry tons applied/ac) ÷ 500] + previous loading (lbs/acre) = cumulative lbs pollutant per acre

When a site reaches 90% of the allowable cumulative loading for any metal established in Table 2 of s. NR 204.07(5)(b), the Department shall be so notified through letter or in the comment section of the annual land application report (3400-55).

4.2.2.5 Sludge Analysis for PCBs

The permittee shall analyze the sludge for Total PCBs one time during **2016**. The results shall be reported as "PCB Total Dry Wt". Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with Table EM in s. NR 219.04, Wis. Adm. Code and the conditions specified in Standard Requirements of this permit. PCB results shall be submitted by January 31, following the specified year of analysis.

4.2.2.6 Lists 1, 2, 3, and 4

List 1 TOTAL SOLIDS AND METALS See the Monitoring Requirements and Limitations table above for monitoring frequency and limitations for the List 1 parameters
Solids, Total (percent)
Arsenic, mg/kg (dry weight)
Cadmium, mg/kg (dry weight)
Copper, mg/kg (dry weight)
Lead, mg/kg (dry weight)
Mercury, mg/kg (dry weight)
Molybdenum, mg/kg (dry weight)
Nickel, mg/kg (dry weight)
Selenium, mg/kg (dry weight)
Zinc, mg/kg (dry weight)

List 2 NUTRIENTS See the Monitoring Requirements and Limitations table above for monitoring frequency for the List 2 parameters
Solids, Total (percent)
Nitrogen Total Kjeldahl (percent)
Nitrogen Ammonium (NH4-N) Total (percent)
Phosphorus Total as P (percent)
Phosphorus, Water Extractable (as percent of Total P)
Potassium Total Recoverable (percent)

List 3
PATHOGEN CONTROL FOR CLASS B SLUDGE

The permittee shall implement pathogen control as listed in List 3. The Department shall be notified of the pathogen control utilized and shall be notified when the permittee decides to utilize alternative pathogen control.

The following requirements shall be met prior to land application of sludge.

Parameter	Unit	Limit
Fecal Coliform*	MPN/gTS or CFU/gTS	2,000,000
OR, ONE OF THE FOLLOWING PROCESS OPTIONS		
Aerobic Digestion	Air Drying	
Anaerobic Digestion	Composting	
Alkaline Stabilization	PSRP Equivalent Process	

* The Fecal Coliform limit shall be reported as the geometric mean of 7 discrete samples on a dry weight basis.

List 4
VECTOR ATTRACTION REDUCTION

The permittee shall implement any one of the vector attraction reduction options specified in List 4. The Department shall be notified of the option utilized and shall be notified when the permittee decides to utilize an alternative option.

One of the following shall be satisfied prior to, or at the time of land application as specified in List 4.

Option	Limit	Where/When it Shall be Met
Volatile Solids Reduction	≥38%	Across the process
Specific Oxygen Uptake Rate	≤1.5 mg O_2/hr/g TS	On aerobic stabilized sludge
Anaerobic bench-scale test	<17 % VS reduction	On anaerobic digested sludge
Aerobic bench-scale test	<15 % VS reduction	On aerobic digested sludge
Aerobic Process	>14 days, Temp >40°C and Avg. Temp > 45°C	On composted sludge
pH adjustment	>12 S.U. (for 2 hours) and >11.5 (for an additional 22 hours)	During the process
Drying without primary solids	>75 % TS	When applied or bagged
Drying with primary solids	>90 % TS	When applied or bagged
Equivalent Process	Approved by the Department	Varies with process
Injection	-	When applied
Incorporation	-	Within 6 hours of application

4.2.2.7 Daily Land Application Log

Daily Land Application Log		
Discharge Monitoring Requirements and Limitations		
The permittee shall maintain a daily land application log for biosolids land applied each day when land application occurs. The following minimum records must be kept, in addition to all analytical results for the biosolids land applied. The log book records shall form the basis for the annual land application report requirements.		
Parameters	**Units**	**Sample Frequency**
DNR Site Number(s)	Number	Daily as used
Outfall number applied	Number	Daily as used
Acres applied	Acres	Daily as used
Amount applied	As appropriate * /day	Daily as used
Application rate per acre	unit */acre	Daily as used
Nitrogen applied per acre	lb/acre	Daily as used
Method of Application	Injection, Incorporation, or surface applied	Daily as used

*gallons, cubic yards, dry US Tons or dry Metric Tons

5 Schedules

5.1 Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus

The permittee shall comply with the WQBELs for Phosphorus as specified. No later than 30 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills the notification requirement.

Required Action	Due Date
Operational Evaluation Report: The permittee shall prepare and submit to the Department for approval an operational evaluation report. The report shall include an evaluation of collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that will optimize reductions in phosphorus discharges from the treatment plant during the period prior to complying with final phosphorus WQBELs and, where possible, enable compliance with final phosphorus WQBELs by 01/01/2019. The report shall provide a plan and schedule for implementation of the measures, improvements, and modifications as soon as possible, but not later than 01/01/2019 and state whether the measures, improvements, and modifications will enable compliance with final phosphorus WQBELs. Regardless of whether they are expected to result in compliance, the permittee shall implement the measures, improvements, and modifications in accordance with the plan and schedule specified in the operational evaluation report. If the operational evaluation report concludes that the facility can achieve final phosphorus WQBELs using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the permittee shall comply with the final phosphorus WQBEL by 01/01/2019 and is not required to comply with the milestones identified below for years 3 through 9 of this compliance schedule ('Preliminary Compliance Alternatives Plan', 'Final Compliance Alternatives Plan', 'Final Plans and Specifications', 'Treatment Plant Upgrade to Meet WQBELs', 'Complete Construction', 'Achieve Compliance'). STUDY OF FEASIBLE ALTERNATIVES - If the Operational Evaluation Report concludes that the permittee cannot achieve final phosphorus WQBELs with source reduction measures, operational improvements and other minor facility modifications, the permittee shall initiate a study of feasible alternatives for meeting final phosphorus WQBELs and comply with the remaining required actions of this schedule of compliance. If the Department disagrees with the conclusion of the report, and determines that the permittee can achieve final phosphorus WQBELs using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the Department may reopen and modify the permit to include an implementation schedule for achieving the final phosphorus WQBELs sooner than 01/01/2025.	01/01/2017
Compliance Alternatives, Source Reduction, Improvements and Modifications Status: The permittee shall submit a 'Compliance Alternatives, Source Reduction, Operational Improvements and Minor Facility Modification' status report to the Department. The report shall provide an update on the permittee's: (1) progress implementing source reduction measures, operational improvements, and minor facility modifications to optimize reductions in phosphorus discharges and, to the extent that such measures, improvements, and modifications will not enable compliance with the WQBELs, (2) status evaluating feasible alternatives for meeting phosphorus WQBELs.	01/01/2018
Preliminary Compliance Alternatives Plan: The permittee shall submit a preliminary compliance alternatives plan to the Department. If the plan concludes upgrading of the permittee's wastewater treatment facility is necessary to achieve final phosphorus WQBELs, the submittal shall include a preliminary engineering design report.	01/01/2019

If the plan concludes Adaptive Management will be used, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 without the Adaptive Management Plan. If water quality trading will be undertaken, the plan must state that trading will be pursued.	
Final Compliance Alternatives Plan: The permittee shall submit a final compliance alternatives plan to the Department. If the plan concludes upgrading of the permittee's wastewater treatment is necessary to meet final phosphorus WQBELs, the submittal shall include a final engineering design report addressing the treatment plant upgrades, and a facility plan if required pursuant to ch. NR 110, Wis. Adm. Code. If the plan concludes Adaptive Management will be implemented, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 and an engineering report addressing any treatment system upgrades necessary to meet interim limits pursuant to s. NR 217.18, Wis. Adm. Code. If the plan concludes water quality trading will be used, the submittal shall identify potential trading partners. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	01/01/2020
Progress Report on Plans & Specifications: Submit progress report regarding the progress of preparing final plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	01/01/2021
Final Plans and Specifications: Unless the permit has been modified, revoked and reissued, or reissued to include Adaptive Management or Water Quality Trading measures or to include a revised schedule based on factors in s. NR 217.17, Wis. Adm. Code, the permittee shall submit final construction plans to the Department for approval pursuant to s. 281.41, Stats., specifying treatment plant upgrades that must be constructed to achieve compliance with final phosphorus WQBELs, and a schedule for completing construction of the upgrades by the complete construction date specified below. (Note: Permit modification, revocation and reissuance, and reissuance are subject to s. 283.53(2), Stats.) Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	01/01/2022
Treatment Plant Upgrade to Meet WQBELs: The permittee shall initiate construction of the upgrades. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	04/01/2022
Construction Upgrade Progress Report #1: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	04/01/2023
Construction Upgrade Progress Report #2: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	04/01/2024
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2024

Achieve Compliance: The permittee shall achieve compliance with final phosphorus WQBELs. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	01/01/2025

5.2 Mercury Pollutant Minimization Program

The permittee shall implement or continue to implement a pollutant minimization program as defined in s. NR 106.145(7), Wis. Adm. Code.

Required Action	Due Date
Submit Annual Status Reports: The permittee shall submit to the Department an annual status report on the progress of the PMP as required by s. NR 106.145(7), Wis. Adm. Code. Submittal of the first annual status report is required by the Date Due. Note: If the permittee wishes to apply for an alternative mercury effluent limitation, that application is due with the application for permit reissuance by 6 months prior to permit expiration. The permittee should submit or reference the PMP plan as updated by the Annual Status Report or more recent developments as part of that application.	04/01/2016
Submit Annual Status Report: Submit second annual status report.	04/01/2017
Submit Annual Status Report: Submit third annual status report.	04/01/2018
Submit Annual Status Report: Submit fourth annual status report.	04/01/2019
Submit Annual Status Report #5: Submit fifth annual status report.	04/01/2020

5.3 Sludge Management Plan Update

This compliance schedule requires the permittee to achieve compliance by the specified date

Required Action	Due Date
Sludge Management Plan Submittal: : The permittee shall submit to the Department an updated sludge management plan which shall include plans to provide additional sludge storage capacity.	03/31/2016

6 Standard Requirements

NR 205, Wisconsin Administrative Code: The conditions in ss. NR 205.07(1) and NR 205.07(2), Wis. Adm. Code, are included by reference in this permit. The permittee shall comply with all of these requirements. Some of these requirements are outlined in the Standard Requirements section of this permit. Requirements not specifically outlined in the Standard Requirement section of this permit can be found in ss. NR 205.07(1) and NR 205.07(2).

6.1 Reporting and Monitoring Requirements

6.1.1 Monitoring Results

Monitoring results obtained during the previous month shall be summarized and reported on a Department Wastewater Discharge Monitoring Report. The report may require reporting of any or all of the information specified below under 'Recording of Results'. This report is to be returned to the Department no later than the date indicated on the form. A copy of the Wastewater Discharge Monitoring Report Form or an electronic file of the report shall be retained by the permittee.

Monitoring results shall be reported on an electronic discharge monitoring report (eDMR). The eDMR shall be certified electronically by a principal executive officer, a ranking elected official or other duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

If the permittee monitors any pollutant more frequently than required by this permit, the results of such monitoring shall be included on the Wastewater Discharge Monitoring Report.

The permittee shall comply with all limits for each parameter regardless of monitoring frequency. For example, monthly, weekly, and/or daily limits shall be met even with monthly monitoring. The permittee may monitor more frequently than required for any parameter.

6.1.2 Sampling and Testing Procedures

Sampling and laboratory testing procedures shall be performed in accordance with Chapters NR 218 and NR 219, Wis. Adm. Code and shall be performed by a laboratory certified or registered in accordance with the requirements of ch. NR 149, Wis. Adm. Code. Groundwater sample collection and analysis shall be performed in accordance with ch. NR 140, Wis. Adm. Code. The analytical methodologies used shall enable the laboratory to quantitate all substances for which monitoring is required at levels below the effluent limitation. If the required level cannot be met by any of the methods available in NR 219, Wis. Adm. Code, then the method with the lowest limit of detection shall be selected. Additional test procedures may be specified in this permit.

6.1.3 Pretreatment Sampling Requirements

Sampling for pretreatment parameters (cadmium, chromium, copper, lead, nickel, zinc, and mercury) shall be done during a day each month when industrial discharges are occurring at normal to maximum levels. The sampling of the influent and effluent for these parameters shall be coordinated. All 24 hour composite samples shall be flow proportional.

6.1.4 Recording of Results

The permittee shall maintain records which provide the following information for each effluent measurement or sample taken:

- the date, exact place, method and time of sampling or measurements;
- the individual who performed the sampling or measurements;
- the date the analysis was performed;
- the individual who performed the analysis;
- the analytical techniques or methods used; and
- the results of the analysis.

6.1.5 Reporting of Monitoring Results

The permittee shall use the following conventions when reporting effluent monitoring results:

- Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 0.1 mg/L, report the pollutant concentration as < 0.1 mg/L.

- Pollutant concentrations equal to or greater than the limit of detection, but less than the limit of quantitation, shall be reported and the limit of quantitation shall be specified.

- For purposes of calculating NR 101 fees, the 2 mg/l lower reporting limits for BOD_5 and Total Suspended Solids shall be considered to be limits of quantitation

- For the purposes of reporting a calculated result, average or a mass discharge value, the permittee may substitute a 0 (zero) for any pollutant concentration that is less than the limit of detection. However, if the effluent limitation is less than the limit of detection, the department may substitute a value other than zero for results less than the limit of detection, after considering the number of monitoring results that are greater than the limit of detection and if warranted when applying appropriate statistical techniques.

6.1.6 Compliance Maintenance Annual Reports

Compliance Maintenance Annual Reports (CMAR) shall be completed using information obtained over each calendar year regarding the wastewater conveyance and treatment system. The CMAR shall be submitted by the permittee in accordance with ch. NR 208, Wis. Adm. Code, by June 30, each year on an electronic report form provided by the Department.

In the case of a publicly owned treatment works, a resolution shall be passed by the governing body and submitted as part of the CMAR, verifying its review of the report and providing responses as required. Private owners of wastewater treatment works are not required to pass a resolution; but they must provide an Owner Statement and responses as required, as part of the CMAR submittal.

A separate CMAR certification document, that is not part of the electronic report form, shall be mailed to the Department at the time of electronic submittal of the CMAR. The CMAR certification shall be signed and submitted by an authorized representative of the permittee. The certification shall be submitted by mail. The certification shall verify the electronic report is complete, accurate and contains information from the owner's treatment works.

6.1.7 Records Retention

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application. All pertinent sludge information, including permit application information and other documents specified in this permit or s. NR 204.06(9), Wis. Adm. Code shall be retained for a minimum of 5 years.

6.1.8 Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or correct information to the Department.

6.2 System Operating Requirements

6.2.1 Noncompliance Reporting

Sanitary sewer overflows and sewage treatment facility overflows shall be reported according to the 'Sanitary Sewer Overflows and Sewage Treatment Facility Overflows' section of this permit.

The permittee shall report the following types of noncompliance by a telephone call to the Department's regional office within 24 hours after becoming aware of the noncompliance:

- any noncompliance which may endanger health or the environment;
- any violation of an effluent limitation resulting from a bypass;
- any violation of an effluent limitation resulting from an upset; and
- any violation of a maximum discharge limitation for any of the pollutants listed by the Department in the permit, either for effluent or sludge.

A written report describing the noncompliance shall also be submitted to the Department's regional office within 5 days after the permittee becomes aware of the noncompliance. On a case-by-case basis, the Department may waive the requirement for submittal of a written report within 5 days and instruct the permittee to submit the written report with the next regularly scheduled monitoring report. In either case, the written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

A scheduled bypass approved by the Department under the 'Scheduled Bypass' section of this permit shall not be subject to the reporting required under this section.

NOTE: Section 292.11(2)(a), Wisconsin Statutes, requires any person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance to notify the Department of Natural Resources **immediately** of any discharge not authorized by the permit. **The discharge of a hazardous substance that is not authorized by this permit or that violates this permit may be a hazardous substance spill. To report a hazardous substance spill, call DNR's 24-hour HOTLINE at 1-800-943-0003.**

6.2.2 Flow Meters

Flow meters shall be calibrated annually, as per s. NR 218.06, Wis. Adm. Code.

6.2.3 Raw Grit and Screenings

All raw grit and screenings shall be disposed of at a properly licensed solid waste facility or picked up by a licensed waste hauler. If the facility or hauler are located in Wisconsin, then they shall be licensed under chs. NR 500-536, Wis. Adm. Code.

6.2.4 Sludge Management

All sludge management activities shall be conducted in compliance with ch. NR 204 "Domestic Sewage Sludge Management", Wis. Adm. Code.

6.2.5 Prohibited Wastes

Under no circumstances may the introduction of wastes prohibited by s. NR 211.10, Wis. Adm. Code, be allowed into the waste treatment system. Prohibited wastes include those:

- which create a fire or explosion hazard in the treatment work;
- which will cause corrosive structural damage to the treatment work;
- solid or viscous substances in amounts which cause obstructions to the flow in sewers or interference with the proper operation of the treatment work;
- wastewaters at a flow rate or pollutant loading which are excessive over relatively short time periods so as to cause a loss of treatment efficiency; and
- changes in discharge volume or composition from contributing industries which overload the treatment works or cause a loss of treatment efficiency.

6.2.6 Bypass

This condition applies only to bypassing at a sewage treatment facility that is not a scheduled bypass, approved blending as a specific condition of this permit, a sewage treatment facility overflow or a controlled diversion as provided in the sections titled 'Scheduled Bypass', 'Blending' (if approved), 'SSO's and Sewage Treatment Facility Overflows' and 'Controlled Diversions' of this permit. Any other bypass at the sewage treatment facility is prohibited and the Department may take enforcement action against a permittee for such occurrences under s. 283.89, Wis. Stats. The Department may approve a bypass if the permittee demonstrates all the following conditions apply:

- The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities or adequate back-up equipment, retention of untreated wastes, reduction of inflow and infiltration, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance. When evaluating feasibility of alternatives, the department may consider factors such as technical achievability, costs and affordability of implementation and risks to public health, the environment and, where the permittee is a municipality, the welfare of the community served; and
- The bypass was reported in accordance with the Noncompliance Reporting section of this permit.

6.2.7 Scheduled Bypass

Whenever the permittee anticipates the need to bypass for purposes of efficient operations and maintenance and the permittee may not meet the conditions for controlled diversions in the 'Controlled Diversions' section of this permit, the permittee shall obtain prior written approval from the Department for the scheduled bypass. A permittee's written request for Department approval of a scheduled bypass shall demonstrate that the conditions for bypassing specified in the above section titled 'Bypass' are met and include the proposed date and reason for the bypass, estimated volume and duration of the bypass, alternatives to bypassing and measures to mitigate environmental harm caused by the bypass. The department may require the permittee to provide public notification for a scheduled bypass if it is determined there is significant public interest in the proposed action and may recommend mitigation measures to minimize the impact of such bypass.

6.2.8 Controlled Diversions

Controlled diversions are allowed only when necessary for essential maintenance to assure efficient operation. Sewage treatment facilities that have multiple treatment units to treat variable or seasonal loading conditions may shut down redundant treatment units when necessary for efficient operation. The following requirements shall be met during controlled diversions:

- Effluent from the sewage treatment facility shall meet the effluent limitations established in the permit. Wastewater that is diverted around a treatment unit or treatment process during a controlled diversion

shall be recombined with wastewater that is not diverted prior to the effluent sampling location and prior to effluent discharge;

- A controlled diversion does not include blending as defined in s. NR 210.03(2e), Wis. Adm. Code, and as may only be approved under s. NR 210.12. A controlled diversion may not occur during periods of excessive flow or other abnormal wastewater characteristics;
- A controlled diversion may not result in a wastewater treatment facility overflow; and
- All instances of controlled diversions shall be documented in sewage treatment facility records and such records shall be available to the department on request.

6.2.9 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. The wastewater treatment facility shall be under the direct supervision of a state certified operator as required in s. NR 108.06(2), Wis. Adm. Code. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114, Wis. Adm. Code, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

6.3 Sewage Collection Systems

6.3.1 Sanitary Sewage Overflows and Sewage Treatment Facility Overflows

6.3.1.1 Overflows Prohibited

Any overflow or discharge of wastewater from the sewage collection system or at the sewage treatment facility, other than from permitted outfalls, is prohibited. The permittee shall provide information on whether any of the following conditions existed when an overflow occurred:

- The sanitary sewer overflow or sewage treatment facility overflow was unavoidable to prevent loss of life, personal injury or severe property damage;
- There were no feasible alternatives to the sanitary sewer overflow or sewage treatment facility overflow such as the use of auxiliary treatment facilities or adequate back-up equipment, retention of untreated wastes, reduction of inflow and infiltration, or preventative maintenance activities;
- The sanitary sewer overflow or the sewage treatment facility overflow was caused by unusual or severe weather related conditions such as large or successive precipitation events, snowmelt, saturated soil conditions, or severe weather occurring in the area served by the sewage collection system or sewage treatment facility; and
- The sanitary sewer overflow or the sewage treatment facility overflow was unintentional, temporary, and caused by an accident or other factors beyond the reasonable control of the permittee.

6.3.1.2 Permittee Response to Overflows

Whenever a sanitary sewer overflow or sewage treatment facility overflow occurs, the permittee shall take all feasible steps to control or limit the volume of untreated or partially treated wastewater discharged, and terminate the discharge as soon as practicable. Remedial actions, including those in NR 210.21 (3), Wis. Adm. Code, shall be implemented consistent with an emergency response plan developed under the CMOM program.

6.3.1.3 Permittee Reporting

Permittees shall report all sanitary sewer overflows and sewage treatment overflows as follows:

- The permittee shall notify the department by telephone, fax or email as soon as practicable, but no later than 24 hours from the time the permittee becomes aware of the overflow;

- The permittee shall, no later than five days from the time the permittee becomes aware of the overflow, provide to the department the information identified in this paragraph using department form number 3400-184. If an overflow lasts for more than five days, an initial report shall be submitted within 5 days as required in this paragraph and an updated report submitted following cessation of the overflow. At a minimum, the following information shall be included in the report:

  ◦The date and location of the overflow;
  ◦The surface water to which the discharge occurred, if any;
  ◦The duration of the overflow and an estimate of the volume of the overflow;
  ◦A description of the sewer system or treatment facility component from which the discharge occurred such as manhole, lift station, constructed overflow pipe, or crack or other opening in a pipe;
  ◦The estimated date and time when the overflow began and stopped or will be stopped;
  ◦The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information;
  ◦Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
  ◦A description of the actual or potential for human exposure and contact with the wastewater from the overflow;
  ◦Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps;
  ◦To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the sanitary sewer overflow and that were within the same area of the sewage collection system as the sanitary sewer overflow; and
  ◦The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event. This includes any information available including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow.

  NOTE: A copy of form 3400-184 for reporting sanitary sewer overflows and sewage treatment facility overflows may be obtained from the department or accessed on the department's web site at http://dnr.wi.gov/topic/wastewater/SSOreport.html. As indicated on the form, additional information may be submitted to supplement the information required by the form.

- The permittee shall identify each specific location and each day on which a sanitary sewer overflow or sewage treatment facility overflow occurs as a discrete sanitary sewer overflow or sewage treatment facility overflow occurrence. An occurrence may be more than one day if the circumstances causing the sanitary sewer overflow or sewage treatment facility overflow results in a discharge duration of greater than 24 hours. If there is a stop and restart of the overflow at the same location within 24 hours and the overflow is caused by the same circumstance, it may be reported as one occurrence. Sanitary sewer overflow occurrences at a specific location that are separated by more than 24 hours shall be reported as separate occurrences; and
- A permittee that is required to submit wastewater discharge monitoring reports under NR 205.07 (1) (r) shall also report all sanitary sewer overflows and sewage treatment facility overflows on that report.

6.3.1.4 Public Notification

The permittee shall notify the public of any sanitary sewer and sewage treatment facility overflows consistent with its emergency response plan required under the CMOM (Capacity, Management, Operation and Maintenance) section of this permit and s. NR 210.23 (4) (f), Wis. Adm. Code. Such public notification shall occur promptly following any overflow event using the most effective and efficient communications available in the community. At minimum, a

daily newspaper of general circulation in the county(s) and municipality whose waters may be affected by the overflow shall be notified by written or electronic communication.

6.3.2 Capacity, Management, Operation and Maintenance (CMOM) Program

- The permittee shall by August 1, 2016 submit to the Department verification that a CMOM program for the sewage collection system has been developed which is consistent with the requirements of NR 210.23, Wis. Adm. Code.
- The permittee shall develop and maintain written documentation of the CMOM program components, and shall verify each year with the submittal of the Compliance Maintenance Annual Report required under the 'Compliance Maintenance Annual Reports' section of this permit that the CMOM program documentation is current and meets the requirements in NR 210.23, Wis. Adm. Code.
- The permittee shall implement a CMOM program consistent with the permittee's program documentation and with the requirements of NR 210.23, Wis. Adm. Code.
- The permittee shall annually conduct a self-audit of activities to ensure the CMOM program is being implemented as necessary to meet the requirements contained in the CMOM program documentation.
- The permittee shall make available CMOM program documentation, a record of implementation activities and the results of the self-audit to the Department on request.

6.3.3 Sewer Cleaning Debris and Materials

All debris and material removed from cleaning sanitary sewers shall be managed to prevent nuisances, run-off, ground infiltration or prohibited discharges.

- Debris and solid waste shall be dewatered, dried and then disposed of at a licensed solid waste facility.
- Liquid waste from the cleaning and dewatering operations shall be collected and disposed of at a permitted wastewater treatment facility.
- Combination waste including liquid waste along with debris and solid waste may be disposed of at a licensed solid waste facility or wastewater treatment facility willing to accept the waste.

6.4 Surface Water Requirements

6.4.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit

For pollutants with water quality-based effluent limits below the Limit of Quantitation (LOQ) in this permit, the LOQ calculated by the permittee and reported on the Discharge Monitoring Reports (DMRs) is incorporated by reference into this permit. The LOQ shall be reported on the DMRs, shall be the lowest quantifiable level practicable, and shall be no greater than the minimum level (ML) specified in or approved under 40 CFR Part 136 for the pollutant at the time this permit was issued, unless this permit specifies a higher LOQ.

6.4.2 Appropriate Formulas for Effluent Calculations

The permittee shall use the following formulas for calculating effluent results to determine compliance with average concentration limits and mass limits and total load limits:

Weekly/Monthly/Six-Month/Annual Average Concentration = the sum of all daily results for that week/month/six-month/year, divided by the number of results during that time period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Weekly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the week.

Monthly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the month.

Six-Month Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the six-month period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Annual Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the entire year.

Total Monthly Discharge: = monthly average concentration (mg/L) x total flow for the month (MG/month) x 8.34.

Total Annual Discharge: = sum of total monthly discharges for the calendar year.

12-Month Rolling Sum of Total Monthly Discharge: = the sum of the most recent 12 consecutive months of Total Monthly Discharges.

6.4.3 Effluent Temperature Requirements

Weekly Average Temperature – The permittee shall use the following formula for calculating effluent results to determine compliance with the weekly average temperature limit (as applicable): Weekly Average Temperature = the sum of all daily maximum results for that week divided by the number of daily maximum results during that time period.

Cold Shock Standard – Water temperatures of the discharge shall be controlled in a manner as to protect fish and aquatic life uses from the deleterious effects of cold shock. 'Cold Shock' means exposure of aquatic organisms to a rapid decrease in temperature and a sustained exposure to low temperature that induces abnormal behavior or physiological performance and may lead to death.

Rate of Temperature Change Standard – Temperature of a water of the state or discharge to a water of the state may not be artificially raised or lowered at such a rate that it causes detrimental health or reproductive effects to fish or aquatic life of the water of the state.

6.4.4 Visible Foam or Floating Solids

There shall be no discharge of floating solids or visible foam in other than trace amounts.

6.4.5 Surface Water Uses and Criteria

In accordance with NR 102.04, Wis. Adm. Code, surface water uses and criteria are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all surface waters including the mixing zone meet the following conditions at all times and under all flow and water level conditions:

a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state.

d) Substances in concentrations or in combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

6.4.6 Percent Removal

During any 30 consecutive days, the average effluent concentrations of BOD_5 and of total suspended solids shall not exceed 15% of the average influent concentrations, respectively. This requirement does not apply to removal of total

suspended solids if the permittee operates a lagoon system and has received a variance for suspended solids granted under NR 210.07(2), Wis. Adm. Code.

6.4.7 Fecal Coliforms

The limit for fecal coliforms shall be expressed as a monthly geometric mean.

6.4.8 Seasonal Disinfection

Disinfection shall be provided from May 1 through September 30 of each year. Monitoring requirements and the limitation for fecal coliforms apply only during the period in which disinfection is required. Whenever chlorine is used for disinfection or other uses, the limitations and monitoring requirements for residual chlorine shall apply. A dechlorination process shall be in operation whenever chlorine is used.

6.4.9 Whole Effluent Toxicity (WET) Monitoring Requirements

In order to determine the potential impact of the discharge on aquatic organisms, static-renewal toxicity tests shall be performed on the effluent in accordance with the procedures specified in the *"State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition" (PUB-WT-797*, November 2004) as required by NR 219.04, Table A, Wis. Adm. Code). All of the WET tests required in this permit, including any required retests, shall be conducted on the *Ceriodaphnia dubia* and fathead minnow species. Receiving water samples shall not be collected from any point in contact with the permittee's mixing zone and every attempt shall be made to avoid contact with any other discharge's mixing zone.

6.4.10 Whole Effluent Toxicity (WET) Identification and Reduction

This standard requirement applies only to acute or chronic WET monitoring that is not accompanied by a WET limit. Within 60 days of a retest which showed positive results, the permittee shall submit a written report to the Biomonitoring Coordinator, Bureau of Water Quality, 101 S. Webster St., PO Box 7921, Madison, WI 53707-7921, which details the following:

- A description of actions the permittee has taken or will take to remove toxicity and to prevent the recurrence of toxicity;

- A description of toxicity reduction evaluation (TRE) investigations that have been or will be done to identify potential sources of toxicity, including some or all of the following actions:

  (a) Evaluate the performance of the treatment system to identify deficiencies contributing to effluent toxicity (e.g., operational problems, chemical additives, incomplete treatment)
  (b) Identify the compound(s) causing toxicity
  (c) Trace the compound(s) causing toxicity to their sources (e.g., industrial, commercial, domestic)
  (d) Evaluate, select, and implement methods or technologies to control effluent toxicity (e.g., in-plant or pretreatment controls, source reduction or removal)

- Where corrective actions including a TRE have not been completed, an expeditious schedule under which corrective actions will be implemented;

- If no actions have been taken, the reason for not taking action.

The permittee may also request approval from the Department to postpone additional retests in order to investigate the source(s) of toxicity. Postponed retests must be completed after toxicity is believed to have been removed.

6.5 Pretreatment Program Requirements

The permittee is required to operate an industrial pretreatment program as described in the program initially approved by the Department of Natural Resources including any subsequent program modifications approved by the Department, and including commitments to program implementation activities provided in the permittee's annual pretreatment program report, and that complies with the requirements set forth in 40 CFR Part 403 and ch. NR 211, Wis. Adm. Code. To ensure that the program is operated in accordance with these requirements, the following general conditions and requirements are hereby established:

6.5.1 Inventories

The permittee shall implement methods to maintain a current inventory of the general character and volume of wastewater that industrial users discharge to the treatment works and shall provide an updated industrial user listing annually and report any changes in the listing to the Department by March 31 of each year as part of the annual pretreatment program report required herein.

6.5.2 Regulation of Industrial Users

6.5.2.1 Limitations for Industrial Users:

The permittee shall develop, maintain, enforce and revise as necessary local limits to implement the general and specific prohibitions of the state and federal General Pretreatment Regulations.

6.5.2.2 Control Documents for Industrial Users (IUs)

The permittee shall control the discharge from each significant industrial user through individual discharge permits as required by s. NR 211.235, Wis. Adm. Code and in accordance with the approved pretreatment program procedures and the permittee's sewer use ordinance. The discharge permits shall be modified in a timely manner during the stated term of the discharge permits according to the sewer use ordinance as conditions warrant. The discharge permits shall include at a minimum the elements found in s. NR 211.235(1), Wis. Adm. Code and references to the approved pretreatment program procedures and the sewer use ordinance.

6.5.2.3 Review of Industrial User Reports, Inspections and Compliance Monitoring

The permittee shall require the submission of, receive, and review self-monitoring reports and other notices from industrial users in accordance with the approved pretreatment program procedures. The permittee shall randomly sample and analyze industrial user discharges and conduct surveillance activities to determine independent of information supplied by the industrial users, whether the industrial users are in compliance with pretreatment standards and requirements. The inspections and monitoring shall also be conducted to maintain accurate knowledge of local industrial processes, including changes in the discharge, pretreatment equipment operation, spill prevention control plans, slug control plans, and implementation of solvent management plans.

The permittee shall inspect and sample the discharge from each significant industrial user as specified in the permittee's approved pretreatment program or as specified in NR 211.235(3). The permittee shall evaluate whether industrial users identified as significant need a slug control plan according to the requirements of NR 211.235(4). If a slug control plan is needed, the plan shall contain at a minimum the elements specified in s. NR 211.235(4)(b), Wis. Adm. Code.

6.5.2.4 Enforcement and Industrial User Compliance Evaluation & Violation Reports

The permittee shall enforce the industrial pretreatment requirements including the industrial user discharge limitations of the permittee's sewer use ordinance. The permittee shall investigate instances of noncompliance by collecting and analyzing samples and collecting other information with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions. Investigation and response to instances of noncompliance shall be in accordance with the permittee's sewer use ordinance and approved Enforcement Response Plan.

The permittee shall make a semiannual report on forms provided or approved by the Department. The semiannual report shall include an analysis of industrial user significant noncompliance (i.e. the Industrial User Compliance Evaluation, also known as the SNC Analysis) as outlined in s.NR 211.23(1)(j), Wis. Adm. Code, and a summary of

the permittee's response to all industrial noncompliance (i.e. the Industrial User Violation Report). The Industrial User Compliance Evaluation Report shall include monitoring results received from industrial users pursuant to s. NR 211.15(1)-(5), Wis. Adm. Code. The Industrial User Violation Report shall include copies of all notices of noncompliance, notices of violation and other enforcement correspondence sent by the permittee to industrial users, together with the industrial user's response. The Industrial User Compliance Evaluation and Violation Reports for the period January through June shall be provided to the Department by September 30 of each year and for the period July through December shall be provided to the Department by March 31 of the succeeding year, unless alternate submittal dates are approved.

6.5.2.5 Publication of Violations

The permittee shall publish a list of industrial users that have significantly violated the municipal sewer use ordinance during the calendar year, in the largest daily newspaper in the area by March 31 of the following year pursuant to s. NR 211.23(1)(j), Wis. Adm. Code. A copy of the newspaper publication shall be provided as part of the annual pretreatment report specified herein.

6.5.2.6 Multijurisdictional Agreements

The permittee shall establish agreements with all contributing jurisdictions as necessary to ensure compliance with pretreatment standards and requirements by all industrial users discharging to the permittee's wastewater treatment system. Any such agreement shall identify who will be responsible for maintaining the industrial user inventory, issuance of industrial user control mechanisms, inspections and sampling, pretreatment program implementation, and enforcement.

6.5.3 Annual Pretreatment Program Report

The permittee shall evaluate the pretreatment program, and submit the Pretreatment Program Report to the Department on forms provided or approved by the Department by March 31 annually, unless an alternate submittal date is approved. The report shall include a brief summary of the work performed during the preceding calendar year, including the numbers of discharge permits issued and in effect, pollution prevention activities, number of inspections and monitoring surveys conducted, budget and personnel assigned to the program, a general discussion of program progress in meeting the objectives of the permittee's pretreatment program together with summary comments and recommendations.

6.5.4 Pretreatment Program Modifications

- Future Modifications: The permittee shall within one year of any revisions to federal or state General Pretreatment Regulations submit an application to the Department in duplicate to modify and update its approved pretreatment program to incorporate such regulatory changes as applicable to the permittee. Additionally, the Department or the permittee may request an application for program modification at any time where necessary to improve program effectiveness based on program experience to date.

- Modifications Subject to Department Approval: The permittee shall submit all proposed pretreatment program modifications to the Department for determination of significance and opportunity for comment in accordance with the requirements and conditions of s. NR 211.27, Wis. Adm. Code. Any substantial proposed program modification shall be subject to Department public noticing and formal approval prior to implementation. A substantial program modification includes, but is not limited to, changes in enabling legal authority to administer and enforce pretreatment conditions and requirements; significant changes in program administrative or operational procedures; significant reductions in monitoring frequencies; significant reductions in program resources including personnel commitments, equipment, and funding levels; changes (including any relaxation) in the local limitations for substances enforced and applied to users of the sewerage treatment works; changes in treatment works sludge disposal or management practices which impact the pretreatment program; or program modifications which increase pollutant loadings to the treatment works. The Department shall use the procedures outlined in s. NR

211.30, Wis. Adm. Code for review and approval/denial of proposed pretreatment program modifications. The permittee shall comply with local public participation requirements when implementing the pretreatment program.

6.5.5 Program Resources

The permittee shall have sufficient resources and qualified personnel to carry out the pretreatment program responsibilities as listed in ss. NR 211.22 and NR 211.23, Wis. Adm. Code.

6.6 Land Application Requirements

6.6.1 Sludge Management Program Standards And Requirements Based Upon Federally Promulgated Regulations

In the event that new federal sludge standards or regulations are promulgated, the permittee shall comply with the new sludge requirements by the dates established in the regulations, if required by federal law, even if the permit has not yet been modified to incorporate the new federal regulations.

6.6.2 General Sludge Management Information

The General Sludge Management Form 3400-48 shall be completed and submitted prior to any significant sludge management changes.

6.6.3 Sludge Samples

All sludge samples shall be collected at a point and in a manner which will yield sample results which are representative of the sludge being tested, and collected at the time which is appropriate for the specific test.

6.6.4 Land Application Characteristic Report

Each report shall consist of a Characteristic Form 3400-49 and Lab Report. The Characteristic Report Form 3400-49 shall be submitted electronically by January 31 following each year of analysis.

Following submittal of the electronic Characteristic Report Form 3400-49, this form shall be certified electronically via the 'eReport Certify' page by a principal executive officer, ranking elected official or duly authorized representative. The 'eReport Certify' page certifies that the electronic report is true, accurate and complete. The Lab Report must be sent directly to the facility's DNR sludge representative or basin engineer unless approval for not submitting the lab reports has been given.

The permittee shall use the following convention when reporting sludge monitoring results: Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 1.0 mg/kg, report the pollutant concentration as < 1.0 mg/kg .

All results shall be reported on a dry weight basis.

6.6.5 Calculation of Water Extractable Phosphorus

When sludge analysis for Water Extractable Phosphorus is required by this permit, the permittee shall use the following formula to calculate and report Water Extractable Phosphorus:
Water Extractable Phosphorus (% of Total P) =
[Water Extractable Phosphorus (mg/kg, dry wt) ÷ Total Phosphorus (mg/kg, dry wt)] x 100

6.6.6 Monitoring and Calculating PCB Concentrations in Sludge

When sludge analysis for "PCB, Total Dry Wt" is required by this permit, the PCB concentration in the sludge shall be determined as follows.

Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with the following provisions and Table EM in s. NR 219.04, Wis. Adm. Code.

- EPA Method 1668 may be used to test for all PCB congeners. If this method is employed, all PCB congeners shall be delineated. Non-detects shall be treated as zero. The values that are between the limit of detection and the limit of quantitation shall be used when calculating the total value of all congeners. All results shall be added together and the total PCB concentration by dry weight reported. **Note**: It is recognized that a number of the congeners will co-elute with others, so there will not be 209 results to sum.
- EPA Method 8082A shall be used for PCB-Aroclor analysis and may be used for congener specific analysis as well. If congener specific analysis is performed using Method 8082A, the list of congeners tested shall include at least congener numbers 5, 18, 31, 44, 52, 66, 87, 101, 110, 138, 141, 151, 153, 170, 180, 183, 187, and 206 plus any other additional congeners which might be reasonably expected to occur in the particular sample. For either type of analysis, the sample shall be extracted using the Soxhlet extraction (EPA Method 3540C) (or the Soxhlet Dean-Stark modification) or the pressurized fluid extraction (EPA Method 3545A). If Aroclor analysis is performed using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.11 mg/kg as possible. Reporting protocol, consistent with s. NR 106.07(6)(e), should be as follows: If all Aroclors are less than the LOD, then the Total PCB Dry Wt result should be reported as less than the highest LOD. If a single Aroclor is detected then that is what should be reported for the Total PCB result. If multiple Aroclors are detected, they should be summed and reported as Total PCBs. If congener specific analysis is done using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.003 mg/kg as possible for each congener. If the aforementioned limits of detection cannot be achieved after using the appropriate clean up techniques, a reporting limit that is achievable for the Aroclors or each congener for the sample shall be determined. This reporting limit shall be reported and qualified indicating the presence of an interference. The lab conducting the analysis shall perform as many of the following methods as necessary to remove interference:

3620C – Florisil	3611B - Alumina
3640A - Gel Permeation	3660B - Sulfur Clean Up (using copper shot instead of powder)
3630C - Silica Gel	3665A - Sulfuric Acid Clean Up

6.6.7 Annual Land Application Report

Land Application Report Form 3400-55 shall be submitted electronically by January 31, each year whether or not non-exceptional quality sludge is land applied. Non-exceptional quality sludge is defined in s. NR 204.07(4), Wis. Adm. Code. Following submittal of the electronic Annual Land Application Report Form 3400-55, this form shall be certified electronically via the 'eReport Certify' page by a principal executive officer, ranking elected official or duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

6.6.8 Other Methods of Disposal or Distribution Report

The permittee shall submit electronically the Other Methods of Disposal or Distribution Report Form 3400-52 by January 31, each year whether or not sludge is hauled, landfilled, incinerated, or exceptional quality sludge is distributed or land applied. Following submittal of the electronic Report Form 3400-52, this form shall be certified electronically via the 'eReport Certify' page by a principal executive officer, ranking elected official or duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

6.6.9 Approval to Land Apply

Bulk non-exceptional quality sludge as defined in s. NR 204.07(4), Wis. Adm. Code, may not be applied to land without a written approval letter or Form 3400-122 from the Department unless the Permittee has obtained permission from the Department to self approve sites in accordance with s. NR 204.06 (6), Wis. Adm. Code. Analysis of sludge characteristics is required prior to land application. Application on frozen or snow covered ground is restricted to the extent specified in s. NR 204.07(3) (l), Wis. Adm. Code.

6.6.10 Soil Analysis Requirements

Each site requested for approval for land application must have the soil tested prior to use. Each approved site used for land application must subsequently be soil tested such that there is at least one valid soil test in the four years prior to land application. All soil sampling and submittal of information to the testing laboratory shall be done in accordance with UW Extension Bulletin A-2100. The testing shall be done by the UW Soils Lab in Madison or Marshfield, WI or at a lab approved by UW. The test results including the crop recommendations shall be submitted to the DNR contact listed for this permit, as they are available. Application rates shall be determined based on the crop nitrogen recommendations and with consideration for other sources of nitrogen applied to the site.

6.6.11 Land Application Site Evaluation

For non-exceptional quality sludge, as defined in s. NR 204.07(4), Wis. Adm. Code, a Land Application Site Request Form 3400-053 shall be submitted to the Department for the proposed land application site. The Department will evaluate the proposed site for acceptability and will either approve or deny use of the proposed site. The permittee may obtain permission to approve their own sites in accordance with s. NR 204.06(6), Wis. Adm. Code.

6.6.12 Class B Sludge: Fecal Coliform Limitation

Compliance with the fecal coliform limitation for Class B sludge shall be demonstrated by calculating the geometric mean of at least 7 separate samples. (Note that a Total Solids analysis must be done on each sample). The geometric mean shall be less than 2,000,000 MPN or CFU/g TS. Calculation of the geometric mean can be done using one of the following 2 methods.

Method 1:

Geometric Mean = $(X_1 \times X_2 \times X_3 \ldots \times X_n)^{1/n}$

Where X = Coliform Density value of the sludge sample, and where n = number of samples (at least 7)

Method 2:

Geometric Mean = $\text{antilog}[(X_1 + X_2 + X_3 \ldots + X_n) \div n]$

Where X = $\log_{10}$ of Coliform Density value of the sludge sample, and where n = number of samples (at least 7)

Example for Method 2

Sample Number	Coliform Density of Sludge Sample	$\log_{10}$
1	6.0×10^5	5.78
2	4.2×10^6	6.62
3	1.6×10^6	6.20
4	9.0×10^5	5.95
5	4.0×10^5	5.60
6	1.0×10^6	6.00
7	5.1×10^5	5.71

The geometric mean for the seven samples is determined by averaging the $\log_{10}$ values of the coliform density and taking the antilog of that value.

$(5.78 + 6.62 + 6.20 + 5.95 + 5.60 + 6.00 + 5.71) \div 7 = 5.98$

The antilog of $5.98 = 9.5 \times 10^5$

6.6.13 Vector Control: Volatile Solids Reduction

The mass of volatile solids in the sludge shall be reduced by a minimum of 38% between the time the sludge enters the digestion process and the time it either exits the digester or a storage facility. For calculation of volatile solids reduction, the permittee shall use the Van Kleeck equation or one of the other methods described in "Determination of Volatile Solids Reduction in Digestion" by J.B. Farrell, which is Appendix C of EPA's *Control of Pathogens in Municipal Wastewater Sludge* (EPA/625/R-92/013). The Van Kleeck equation is:

$$VSR\% = \frac{VS_{IN} - VS_{OUT}}{VS_{IN} - (VS_{OUT} \times VS_{IN})} \times 100$$

Where: VS_{IN} = Volatile Solids in Feed Sludge (g VS/g TS)

VS_{OUT} = Volatile Solids in Final Sludge (g VS/g TS)

VSR% = Volatile Solids Reduction, (Percent)

6.6.14 Class B Sludge - Vector Control: Injection

No significant amount of the sewage sludge shall be present on the land surface within one hour after the sludge is injected.

7 Summary of Reports Due

FOR INFORMATIONAL PURPOSES ONLY

Description	Date	Page
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Operational Evaluation Report	January 1, 2017	18
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Compliance Alternatives, Source Reduction, Improvements and Modifications Status	January 1, 2018	18
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Preliminary Compliance Alternatives Plan	January 1, 2019	18
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Final Compliance Alternatives Plan	January 1, 2020	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Progress Report on Plans & Specifications	January 1, 2021	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Final Plans and Specifications	January 1, 2022	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Treatment Plant Upgrade to Meet WQBELs	April 1, 2022	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Construction Upgrade Progress Report #1	April 1, 2023	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Construction Upgrade Progress Report #2	April 1, 2024	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Complete Construction	December 31, 2024	20
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Achieve Compliance	January 1, 2025	20
Mercury Pollutant Minimization Program -Submit Annual Status Reports	April 1, 2016	20
Mercury Pollutant Minimization Program -Submit Annual Status Report	April 1, 2017	20
Mercury Pollutant Minimization Program -Submit Annual Status Report	April 1, 2018	20
Mercury Pollutant Minimization Program -Submit Annual Status Report	April 1, 2019	20
Mercury Pollutant Minimization Program -Submit Annual Status Report #5	April 1, 2020	20
Sludge Management Plan Update -Sludge Management Plan Submittal	March 31, 2016	20
Compliance Maintenance Annual Reports (CMAR)	by June 30, each year	22
Industrial User Compliance Evaluation and Violation Reports	Semiannual	31
Pretreatment Program Report	Annually	31
General Sludge Management Form 3400-48	prior to any significant sludge management changes	32

Characteristic Form 3400-49 and Lab Report	by January 31 following each year of analysis	32
Land Application Report Form 3400-55	by January 31, each year whether or not non-exceptional quality sludge is land applied	33
Report Form 3400-52	by January 31, each year whether or not sludge is hauled, landfilled, incinerated, or exceptional quality sludge is distributed or land applied	33
Wastewater Discharge Monitoring Report	no later than the date indicated on the form	21

Report forms shall be submitted electronically in accordance with the reporting requirements herein. Any facility plans or plans and specifications for municipal, industrial, industrial pretreatment and non industrial wastewater systems shall be submitted to the Bureau of Water Quality, P.O. Box 7921, Madison, WI 53707-7921. All other submittals required by this permit shall be submitted to:
West Central Region - LaCrosse, 3550 Mormon Coulee Road, La Crosse, WI 54601

These Notes document a Meeting that occurred on August 15, 2018. Please contact Eric Lynne (elynne@donohue-associates.com or 920-803-7375) with any comments or questions concerning these Notes.

Attendees

- Bernie Lenz, Utilities Manager, City
- Jared Greeno, Superintendent, City
- Brian Hein, Assistant Superintendent, City
- Greg Kozelek, Engineer, City
- Bill Marten, Donohue
- Jeremy Cramer, Donohue
- Mike Gerbitz, Donohue
- Jeff Wills, Donohue
- Joe Berktold, Donohue
- Eric Lynne, Donohue

Agenda

The Agenda that was distributed to the Attendees is attached to these Notes.

Notes

Note No.	Action By	Note
Administrative Matters		
1	Contact Information	The people listed below will receive all email correspondence at the email addresses provided below. Email Addresses for Key Project Team Members • Bernie Lenz | lenzb@cityoflacrosse.org • Jared Greeno | greenoja@cityoflacrosse.org • Bill Marten | wmarten@donohue-associates.com • Eric Lynne | elynne@donohue-associates.com • Mike Gerbitz | mgerbitz@donohue-associates.com Phone Numbers for Key Project Team Members • Bernie Lenz | (608) 789-7588 • Jared Greeno | 608-789-7322 • Bill Marten | 262-993-1581 • Eric Lynne | 920-803-7375 • Mike Gerbitz | 920-889-4000

2	Information	All Key Project Team Members listed above will get all email correspondence, draft deliverables, and final deliverables. All Project emails should follow the subject line format shown below. La Crosse – WWFP – X where WWFP = wastewater facilities plan, and X = subject of particular email. For example, La Crosse – WWFP – Digester Heating Data.
3	Donohue	TM 3 will establish 20-year flows and loadings. This will require a service area population projection. Attendees recommended contacting the City Planning Department. Donohue will contact Jason Gilman. Bernie noted three distinct areas that are planned for expansion and of the regional connections, La Crescent is requesting more capacity, the rest are stable.
General Operation and Maintenance Information		
4	Information	The WWTP is staffed 1st shift weekdays, typically with 4 operators, 5 mechanics, 2 lab techs, 1 pretreatment coordinator, 1 electrician and 2 managers. It was noted the plant electrician maintains instrumentation & control (I&C) equipment and is in the process of learning I&C programming. It was also noted that an additional 8 work crew members handle City sewer maintenance. Due to the construction activity in and near La Crosse, the City has struggled to fill open positions.
5	Information	Lab analyses are currently performed at the WWTP, with specialty analyses by Davy Labs.
6		The facility SCADA system (PLCs, Software, and Fiber Optic) was recently upgraded and the Staff have a lot of confidence in monitoring systems remotely via cell phones. The majority of callouts are related to vacuum prime lift stations or plugs on the screenings washpress. • The City will consider the need for an improved operator station. A remotely visible camera to observe the 24/7 GBT operations enables users to start/stop/adjust the system from home.

Existing Conditions		
7	Information	The information in this section attempts to briefly summarize the discussion related to present-day conditions, concerns, and preferred Facility improvements. These matters will be better defined and considered as alternatives and cost opinions are developed. See the attached presentation material for additional information and documentation. These Notes reflect input from the City.
8	Information	Site • Security | adequate • Piping | adequate, relined some critical lines • Odors | Complaints typically due to City Brewery's facility • Parking | adequate • Stormwater | adequate
9	Information	Administration Building • Lab | adequate • Data Monitoring and Historian | adequate • Operations Center | adequate (door for desk) • Locker Rooms | adequate • Storage | adequate • Finishes and Features | Administration building from 1930's retains much of the original character. • HVAC | aging and inefficient • Training Room | adequate, staff use the break room
10	Information	Industrial Users • Industry meetings will be scheduled in the next couple weeks to discuss upcoming WWTP improvements/goals and obtain industry plans for growth/treatment goals. • Communication to the industries shall flow through Jared. • City Brewery, has pretreatment EQ tank and UASB digester. Facility had cogeneration, but was removed. Locally owned facility, makes a diverse portfolio of alcohol products. Growth of the brewery and observed loadings indicate the UASB is at/over capacity. o This plan must develop the cost for handling City Brewery's entire flow to contrast with their costs for treatment. Davy/Stover Engineering are

		developing estimated costs for improvements to the UASB system. • Great Lakes Cheese, expanded in 2014 mostly makes cheese slices for Walmart and McDonalds. City was cleaning sewers regularly due to the high loading. Facility is adding pretreatment DAF to captures solids. • Kwik Trip, handles dairy product receipt and distribution to convenience stores. Adding bread and bun facility in 2018. • Trane, manufacturers HVAC equipment. • La Crosse Distilling Co., planned to open in 2018. City is concerned for loading/growth issues experienced in Baraboo. The current plan is for the industry to hold wastes and haul them offsite to a farm. Concerns with this concept may require an ability to accept this waste in the future.
11	Information	Preliminary Treatment • 5MG of hauled in (septage/holding) wastes are dumped at the head of the plant. Grease loads are limited to weekday mornings to ensure operators are available to deal with debris or washpress alarms. Haulers have a gatepass now and a camera monitors activity (not recorded). A facility to receive these wastes and screen/pump the material to RWW or digestion is desired. This facility could also accept any local pretreatment facility waste sources. • No trucked leachate is received, but some does enter via the Onalaska collection system. • Some coal ash is received from Dairyland Power. • No influent flowmeter, no good place for it. Currently primary effluent or final effluent flow is used. • Peak flow was noted at 33 mgd during a 6-inch rain event in 2017, which was handled fine. • Grit deposits upstream of the comminutors and overwhelms the downstream systems every time the fine screen channel is taken offline. • Old comminutors should be replaced with a fine screen. City expressed interest towards a finer screening system as debris does make it through the existing ¼-inch step screen.
12	Information	Grit Process

		• Rotate operation of each grit basin every other day
13	Information	Primary Settling • City uses their trucks to transfer approximately 4,000 gallons per week of brewery waste (retentate backwash, 350,000 mg/L COD) to supplement primary effluent BOD on weekends, holidays, and during facility shutdowns. The waste is stored at the plant in 2 approximately 3,000 gallon poly tanks. • This trucking effort is tolerable, but consideration could be given to installing a pipeline to improve this process as well as to handle increased transfers should the City decide to add this high COD brewery waste to the plant digesters as well as for a supplemental COD source for the Bio-P process.
14	Information	Aeration Basins • Operate two trains of three basins with anaerobic and anoxic selectors for biological phosphorus removal. • Blowers were replaced in 2012. Typically operate with D.O.s in range of 3 mg/L - unable to operate at lower DOs due to aeration control system & blower constraints. Currently run 2 blowers to limit starts/stops. • Aeration valves cannot throttle lower than 19% open without concern for mixing limited conditions.
15	Information	Secondary Settling • Concern regarding algae control in effluent weirs/launders. • Potential mixed liquor flow distribution imbalance into the secondary clarifiers. • No issues with RAS or WAS pumping. Sludge is wasted 10-15 minutes every hour. Plant staff control wasting based on SRT – target in range of 4.5-5 days recently.
16	Information	UV • Wedeco system was installed in 2005. A third channel was added in 2008. • Parts availability is not a concern, City bought Waukesha's old system for parts.

		• Bulb/sleeve cleaning frequency has decreased since City Brewery switched from using Ferric Chloride for odor control (now use Hydrogen Peroxide).
17	Information	Solids Handling • Solids handling is a main concern of the facility as it limits capacity, identified by the re-rate study. • Evident capacity improvement is to increase sludge concentration into the digesters. Other digester/sludge system capacity improvements need to be identified. • Digested Sludge (DSD) is thickened via Gravity Belt Thickener (GBT). DSD thickening was converted to 24/7 operation and it has helped stabilize/dampen the facility sidestream loadings. • Struvite is not a major concern. Some precipitation is observed as granules in the digesters/sludge, but not a problem with buildup in the piping. PVC filtrate lines are cleaned every 3-months. Ferric Chloride is dosed to the sidestream to control phosphorus. Sludge tubes in the heat exchanger have been replaced due to scaling. • Currently no digester mixing (just recirculation and transfer). The group discussed the options for digester mixing. The City was not in favor of linear motion mixing due to the cost of cover modifications needed, in particular on the existing digester covers. o Draft Tubes were noted to have good mixing modulation and redundancy, but require a crane for maintenance. The City noted crane rental is easy and cost effective from a local company. o Pump/Nozzle mixing was noted to have good tolerance to varying liquid levels and skirted gas holder floating covers, but require a building for housing the pumps.
18	Information	Biogas • The existing sludge boilers utilize digester gas for heating the sludge and the digester complex. Substantial excess biogas is flared. • Potential exists for cogeneration facilities to burn biogas to produce electricity. The City is OK with adding this extra equipment if done properly and with a maintenance contract to limit/minimize any added O&M burden to the existing (limited) staff.

		• A biogas line was routed to the admin building for potential use in the house boilers • Biogas storage is currently limited, and the City's preference would be for a low-pressure slab on grade biogas storage membrane. This decouples the gas storage from digester maintenance.
19	Information	Cake Storage • BFP operation produces 15-18% TS cake solids when generated from sludge storage, but typically 20-23% when generated directly from the secondary digester. • BFP operation is not efficient with equipment separated from the cake storage location. • Use of a solar (greenhouse) sludge dryer was noted to be a high-potential alternative to increase the capacity of the existing cake storage building, while improving land application and public acceptance.
20	Information	Biosolids Land Application • Typically 6 MG of liquid sludge is applied to farm fields spring and fall by a 5-year contract with Synagro. Can haul 350,000 gal per day, but this still requires several weeks to empty storage; which is very vulnerable to adverse weather. Hauling extends 20 miles towards the Bangor area. Synagro handles the land application paperwork and field approvals. • Cake biosolids are only produced after the liquid sludge storage tanks are full or to land apply to summer crops (i.e., alfalfa). • Most farmers prefer liquid as it has less odor (incorporated upon application) and less time is spent at each field to cause complaints. • Local governments (Town of Washington, Trempealeau County) have attempted to ban spreading municipal sludge but have not been successful. • Concern for phosphorus based nutrient management plans limiting land application and increasing required acreage. • Concern if continued or expanded liquid storage is the most sustainable path forward. • Additional approved acres in Minnesota have improved the land application concept. Potential for biosolids

		storage at a remote site. This should be discussed with MPCA. • Concern for debris in biosolids. Had an incident where landowner observed debris and risked degraded public relations and future land application acres. Consider a sludge screen. • Contact Synagro for feedback on marketability impact of potential biosolids changes (cake sludge, dried sludge, Class A sludge, struvite granules, Lystek, land/ag control methods)
21	Information	Miscellaneous • Public Relations, the City hosts more than 70 tours to the public each year. The City will consider the need for improved facilities (display, etc.) to explain the facility.
22	Information	Future Regulations • Total Nitrogen limits are anticipated to be the next regulation beyond phosphorus. The group discussed the fact that non-point sources would be a target for reductions. Additionally, noted potential coverage available by converting the existing system to the UCT process and that simultaneous nitrification and denitrification provides a high level of cost effective nitrogen removal. Nitrogen limits lower than this technology would require major legislative action and long term compliance schedules.
23	Information	Safety • Donohue will review NFPA 820 recommendations from 2010 and update them to reflect proposed process changes. • The City had an arc flash study performed recently. City to provide a copy to Donohue.
24	City	City to provide instantaneous peak flow data during recent high flow event.
25	Information	Funding • City plans to use Clean Water Fund SRF funding for the next major improvement project related to phosphorus and any other near term improvements. The subsidized

		interest will be limited slightly due to the university/ industrial contribution. • Guaranteed savings project funding opportunities from Johnson Controls Inc. will likely fund energy savings projects (i.e., cogeneration). • The latest rate change was in 2015. Trilogy performed the most recent rate study. • The City is reviewing impact fees for new connections. • The City's replacement and O&M funds are healthy. The City felt as though revenue/expenses are neutral currently and any project would require a rate increase. Tina Erickson is the contact person for finances, but discussions would flow through Jared. • Phosphorus specific improvements should be tracked/quantified separately to manage a rate increase specific to this regulation change.
26	City	A list of previously recommended improvements from past studies performed by Donohue was provided at the meeting. The City will review this list and provide feedback towards items already implemented or no longer applicable.
27	Information	Examples of alternatives evaluation criteria were provided to describe the ability to select best-overall alternatives using both economic and non-economic factors. The City was in favor of this for complicated alternatives. The evaluation criteria should be discussed with the City Sustainability Coordinator as it progresses.
28	Information	Schedule was discussed. The City plans to submit Notice Of Intent to Apply for Clean Water Fund funding/principal forgiveness by October 31, 2018. The evaluation of alternatives will need to be substantially complete by this time to apply a relatively accurate cost opinion and project description. The final plan will be provided by end of 2018, with City review incorporated before presenting to the January Committee of the Whole and February Council approval meetings. Committee meetings occur the Tuesday before the Council meetings which are on the 2nd Thursday of the month.
End		

Technical Memorandum 3
Future Conditions
Strategic Plan: Wastewater Treatment
La Crosse Wastewater Treatment Facility
La Crosse, Wisconsin

Date: March 20, 2020

To: Bernard Lenz – Utilities Manager

Copy: Jared Greeno, WWTF Superintendent
Brian Hein – WWTF Assistant Superintendent
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From: Mike Gerbitz – Donohue & Associates

By: Bill Marten – Donohue & Associates
Eric Lynne – Donohue & Associates
Ben Stephens – Donohue & Associates

Purpose

Technical Memorandum No. 3 (TM 3) presents the development of projected flows and loadings for the planning period of 2020 through 2040 for the for the City of La Crosse, Wisconsin, Isle La Plume Wastewater Treatment Facility (WWTF). This memorandum summarizes projected influent flow and loading information based on several parameters, inclusive of recent discussions with significant industrial users and municipal partners. Following the flow and loading development, a summary of future regulatory conditions is provided to identify system needs with respect to current treatment abilities.

Background

The Wastewater Utility for the City of La Crosse operates a regional wastewater treatment facility serving an extended sewer service area in the vicinity of La Crosse. The sewer service area includes the adjacent entities of the City of Onalaska, the Town of Campbell, Sanitary Districts 1 and 2 in the Town of Shelby, and the City of La Crescent, Minnesota. Service to entities outside of the City of La Crosse is provided based on negotiated contracts.

As developed in TM2, a summary of flows and loadings from the sewer service area (SSA) collection system is re-presented in Table 1. These values are significant because they will be used as the basis from which to project future values in this TM.

Table 1 - Summary of 2015-2017 Combined Influent Flows and Loadings

	Average	Max. Month	Max. Week	Max. Day	Peak Hourly
Flow (MGD)	10.07	11.94	13.15	17.9	32.3
BOD (lb/d)	25,975 (308 mg/L)	29,400	35,200	64,000	
TSS (lb/d)	29,529 (352 mg/L)	48,900	60,900	100,00	
TKN* (lb/d)	3,058 (34 mg/L)	5,000	n/a	n/a	
Ammonia* (lb/d)	1,714 (19 mg/L)	2,500	n/a	n/a	
TP (lb/d)	548 (6.6 mg/L)	675	800	1,500	

*Ammonia and Total Kjeldahl Nitrogen (TKN) data is based on limited data taken only once per month.

The combined influent wastewater received at the facility is a combination of two primary wastewater categories.

1) **Municipal Wastewater:** This portion is comprised of wastewater generated by residential, commercial, public, and light industrial users located within the sewer service area (SSA) of the Isle La Plume WWTF. The following entities contribute towards this municipal waste component:
    a. City of La Crosse
    b. City of Onalaska
    c. City of La Crescent
    d. Town of Campbell
    e. Town of Shelby
    f. Hauled In Wastewater

2) **Industrial Wastewater:** Industrial users discharging loadings that have potential to impact process treatment are considered significant enough to be significant industrial users (SIUs). Often times, SIUs are defined as any industrial user that contributes flows and/or loads to the treatment facility that requires treatment capacity above normal municipal waste generation rates. The main SIUs are as follows:
    a. City Brewery
    b. Kwik Trip Dairy and Bakery
    c. Great Lakes Cheese
    d. Trane

The following subsections detail each of these categories and develop future projections based on best available records and information from the representative sources.

Design Flows and Loadings

The design flows and loadings, as described in the following subsections, is intended to estimate Year 2040 conditions and have been developed by adding projected flow and loading increases to the historical dataset presented in Table 1.

Historical Flows and Loads

Future projections can be derived from historical trends for influent flow and loading, and extrapolated higher for future growth. These types of projections are typically best suited for stagnant or predictable growth scenarios. Several factors invalidate this type of projection for the City of La Crosse, as it over-projects the required capacity. The La Crosse SSA exhibits the following features that must be considered for future conditions:

- Identifying no-growth SSA regions
- Credit growth for added SSA communities
- Consideration for newly sewered homes identified in the SSA
- Short planning horizon for SIUs
- Pretreatment system changes at SIUs
- Peak flows fluctuate based on river level and storm intensity
- Minimization of clearwater decreases per capita flows

A more appropriate method divides the historical data into precise increments and develops projections for each category (municipal and industrial) and merges the projections to obtain a total future flow and load.

Municipal Wastewater – Design Flows and Loadings

Future Sewer Service Area Population

Growth of the Sewer Service Area (SSA) for the Isle La Plume WWTF has been developed based on the City of La Crosse SSA Plan and additions that would be contributed by the adjacent entities served by the WWTF. The fraction of raw wastewater flow contributed by residential, commercial, public and light industrial sources are projected based on per capita growth rates of the SSA.

Past, current and future projected sewer service populations the Isle La Plume WWTF are presented in Table 2 and Figure 1. Service population estimates are based off of the *La Crosse Sewer Service Area Water Quality Management Plan 2013 - 2035*, Department of Administration (DOA) sources, but have been modified to reflect the projections developed during Municipal Partner meetings.

Steady growth is projected in Onalaska and Shelby. Onalaska may be limited in area; however, plans for future densification indicate potential for long range planning population to reach 25,000. A 5% increase to Onalaska's population was added to the contingency to reflect this trend. Major step-wise increases in flow from Shelby are expected as cost effective connections to the City of La Crosse conveyance system are identified.

La Crescent populations from the DOA exhibit declining populations; however, these were dampened with increased population associated with specific growth areas presented in a meeting with City officials.

Contingency populations were assigned to represent added flow from existing homes in unsewered portions of the Towns of Hamilton and Medary. Only 25% of the Town of Hamilton population was included to represent the actual portion covered by the existing sewer service area plan. The Town of Medary is 100% covered by the sewer service area; however, no municipal partnership contract is in place to service these homes. Near term capacity use of

contingency population expansion includes the capacity to add the equivalent of 600 homes by 2025 in Shelby.

Table 2 - 2040 Estimated SSA Population

	2010 Census	2015 Estimate	2020 Projection	2025 Projection	2030 Projection	2035 Projection	2040 Projection
T Campbell	4,314	4,385	4,395	4,405	4,400	4,350	4,315
T Onalaska	5,623	5,810	5,990	6,150	6,305	6,390	6,485
T Shelby	4,715	4,760	4,945	5,075	5,190	5,260	5,340
C La Crosse	51,320	52,200	52,550	52,750	52,700	52,300	51,850
C Onalaska	17,736	18,740	19,860	20,950	21,950	22,770	23,570
La Crescent	5,139	5,060	5,022	4,972	4,911	4,845	4,776
Contingency	-	-	3,202	3,318	3,426	3,497	3,575
Total Municipal Population	88,847	90,955	95,964	97,619	98,882	99,413	99,911

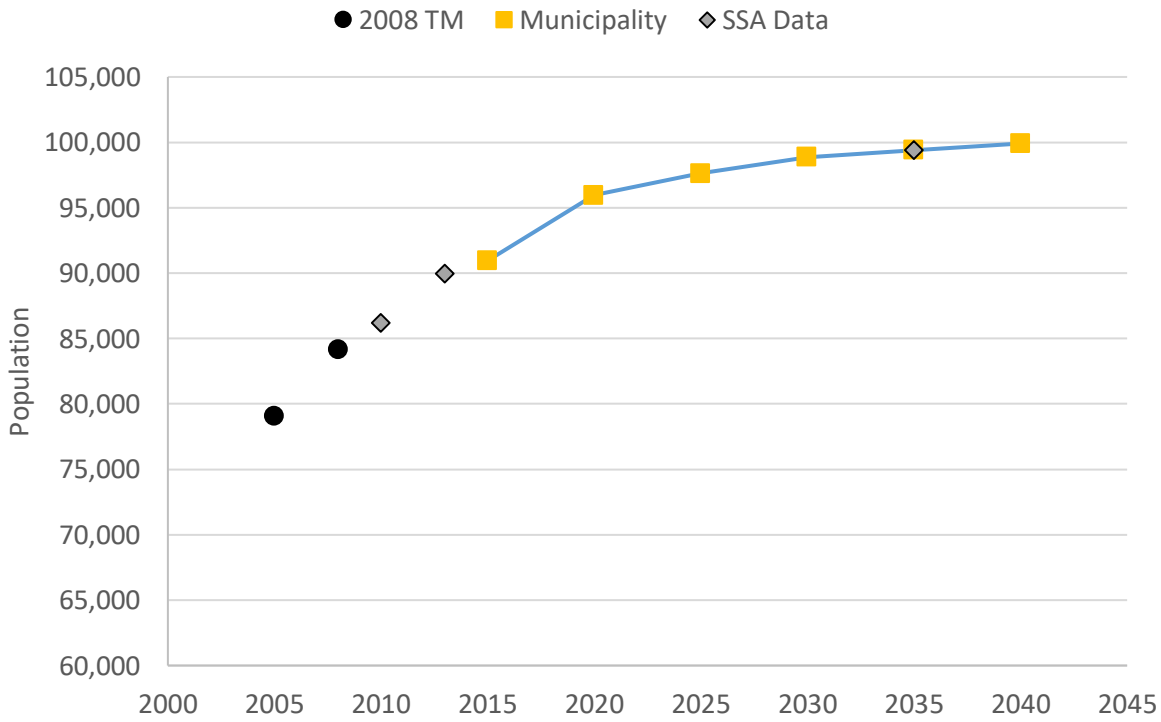

Figure 1 - 2040 Estimated SSA Population

Future Municipal Flows and Loads

Future residential flows were estimated using historical per capita production rates after excluding significant industrial users. The calculated per capita residential flow and loading rates

are summarized below. These values fall within industry standard municipal waste production ranges.

Flow	88	gpcd
CBOD5	0.169	ppcd
TSS	0.23	ppcd
TKN	0.025	ppcd
TP	0.004	ppcd

These values are coupled with SSA population growth estimates to generate municipal flow and load estimates in Table 3.

Table 3 – Summary of Municipal Flows and Loadings

Year	Population	Flow (MGD)	BOD (ppd)	TSS (ppd)	TKN (ppd)	TP (ppd)
2015	90,955	8.03	15,371	21,304	2,242	402
2030	98,882	8.73	16,711	23,161	2,437	437
2040	99,911	8.82	16,885	23,402	2,462	441

Hauled In Wastewater

Municipal wastes typically enter through the collection system, however, for areas not served by sewers, septage haulers extract the wastes and deliver it by tanker truck. These wastes are monitored individually, but are accounted for as part of the total raw wastewater sample and flow records.

Selective waste loads from grease traps are also accepted when staff is present. Hauled waste is not metered, but is billed to the hauler based on volume. 2017 totals are summarized in Table 4 below. Due to inconveniences in land application of these hauled wastes more haulers are requesting receipt at the WWTF. 2018 totals in progress indicate hauler loads are projected to surpass 2017 totals by 15%. The future growth of hauler loads is not anticipated to continue a 15% increase annually, but is an ever present feature that should be accommodated.

Table 4 - Summary of 2017 Waste Accepted from Haulers

Source	Number of Loads	Total Gallons
Holding & Septic Tanks	980	2,899,070
Grease Traps	276	547,245
Others	615	1,676,120

Future Industrial Wastewater Flows and Loadings

Although La Crosse has been contacted by industries that would like to build production facilities in the SSA, additional capacity for an undefined industry would add significant capital cost to this project, which the existing rate payers would have to bear. Therefore, the City has elected providing no additional capacity for future undefined industries. However, in an effort to support existing rate

payers and community growth, meetings were held to discuss the facilities planning project and identify industrial projections.

Current industrial flows and loadings are summarized in Table 5 below.

Table 5 – Existing Industrial Flows and Loadings

Industry	Flow (MGD)	BOD (ppd)	TSS (ppd)	TP (ppd)	Comments
Aramark	0.19	346.4	67.9	5.7	Growth since 2008
Brennan Marine	0.00	0.3	0.4	0.2	No significant change
Chart	0.07	81.3	35.7	1.9	Growth since 2008
City Brewing	1.33	5129	4574	85	Growth in line with projections from 2008. Annual average loadings do not reflect significant peaking factors. Brewery improvements are ongoing to control peaks.
Crown	0.06	61.2	17.9	0.4	No significant change
Great Lakes Cheese	0.15	2,019.1	534.1	21.6	Significant growth since 2008
Kwik Trip	0.15	2488.9	875.6	30.2	Significant growth since 2008
Metallics	0.01	0.0		0.0	No significant change
S&S Cycle	0.00	2.2	4.5	0.0	No significant change
Trane Co	0.01	24.3	2.4	0.1	Decreased discharge since 2008
Wis-Pak	0.07	454.1	3.0	1.0	Growth since 2008

Industrial flow and loading projections were requested from a number of major local industries to assess the future industrial load. Responses from four of the industries: City Brewery, Great Lakes Cheese, Kwik Trip, and Trane were documented and are summarized with Table 5. Industries that did not have an updated projection, the existing conditions were carried forward for the projected condition. Although updated projections from all industries was not obtained, the industries projections obtained represent over 86 percent of the industrial contribution.

The industrial load projections generated through this method are reported in Table 6. No industries are expected to have a major increase in TKN loadings over the planning period.

Table 6 – Projected 2040 Industrial Flows and Loadings

Industry	Flow (MGD)	BOD (ppd)	TSS (ppd)	TP (ppd)	Comments
Aramark	0.19	346.4	67.9	5.7	
Brennan Marine	0.00	0.3	0.4	0.2	
Chart	0.07	81.3	35.7	1.9	
City Brewing	2.10	5,538.5*	9,230.8	104.0	Values shown are average day. City Brewery provided revised projections of 12,000 lb/d COD and TSS at maximum month, resultant reductions are anticipated with a plan to optimize pretreatment equalization tank and enhance the anaerobic reactor.
Crown	0.06	61.2	17.9	0.4	
Great Lakes Cheese	0.15	202	53.4	2.2	Provided projections, new pretreatment DAF system planned to be operational 2019
Kwik Trip	0.33	4,788.0	410.0	25.0	Provided projections. No plans for pretreatment. Kitchens data growing but undefined loading.
Metallics	0.01	0.0		0.0	
S&S Cycle	0.00	2.2	4.5	0.0	
Trane Co	0.01	24.3	2.4	0.1	Continued reductions to TP discharge.
Wis-Pak	0.07	454.1	3.0	1.0	

*COD:BOD ratio of 1.67 used to obtain BOD loadings

The projected industrial flow and load changes are summarized below in Table 7. Note that City Brewery and Great Lakes Cheese BOD loadings decrease with improved pretreatment methods.

Table 7 – Summary of Industrial Flows and Loadings

Year	Flow (MGD)	BOD (ppd)	TSS (ppd)	TP (ppd)
Current	2.04	10,607	8,225	146
2040	2.99	11,498	9,826	140

Contracted Entities Analysis

The City has several contracts with industries within the City of La Crosse and a few regional municipality partners to provide wastewater conveyance and treatment.

Figure 2 provides a summary of each contract and depicts their current and future utilization rate with respect to maximum month flow and loading. The grey shaded bar represents the contracted value and the red shaded bar illustrates the actual (2017) contributions. Future (2040) sewer contributions are represented by a red dashed line. For projections that exceed the grey contracted amounts, the City will need to discuss contractual modifications to avoid violations and/or surcharges.

It is important to note, that the various contracts do not have similar language for management of the entities' flows, loads, and peaking factors. To compare the contracted data, historical raw wastewater loading assumptions were used to normalize the dataset. It is highly recommended that the City develop a standard contract to use upon reissuance of these contracts to provide a basis for common understanding the expected flows and loadings for average and peak conditions.

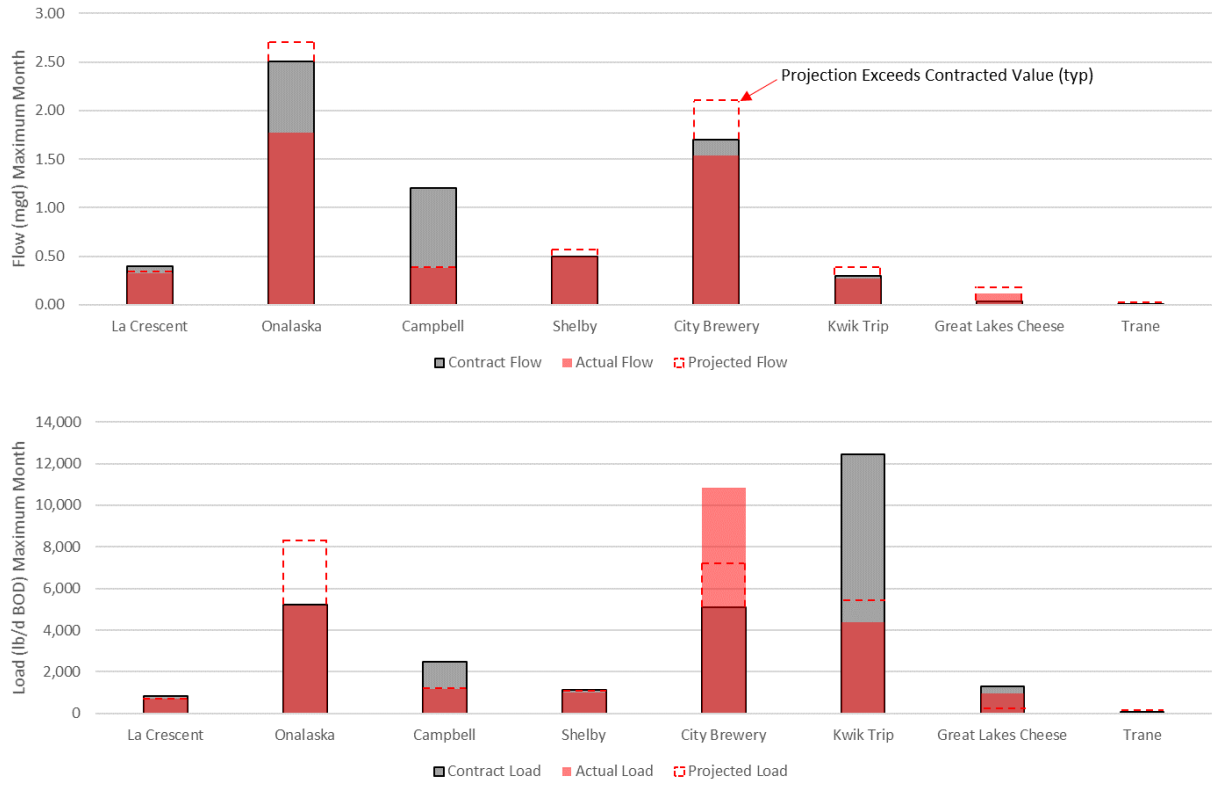

Figure 2 - City of La Crosse Contracts – Individual Basis

To avoid surcharge situations, it is not uncommon for wastewater facilities to have contracts that exceed the actual expected flows and loads, so long as the treatment performance is not impacted. Caution should be used when allocating contracts, as the cumulative contracted flow can reach or exceed the total treatment facility abilities.

Figure 3 assembles these individual contracts, and other non-contracted treatment needs of the facility to better comprehend the cumulative effect of these contracts. Note, that the City of La Crosse is not a contracted entity. Future stakeholder projections (not current contracts) were used to establish this summary. Projected values (shaded areas) exhibits adequate WWTF capacity exists with respect to flow, but show a possible over-capacity scenario for loading. System needs for capacity improvements will be discussed further in TM4.

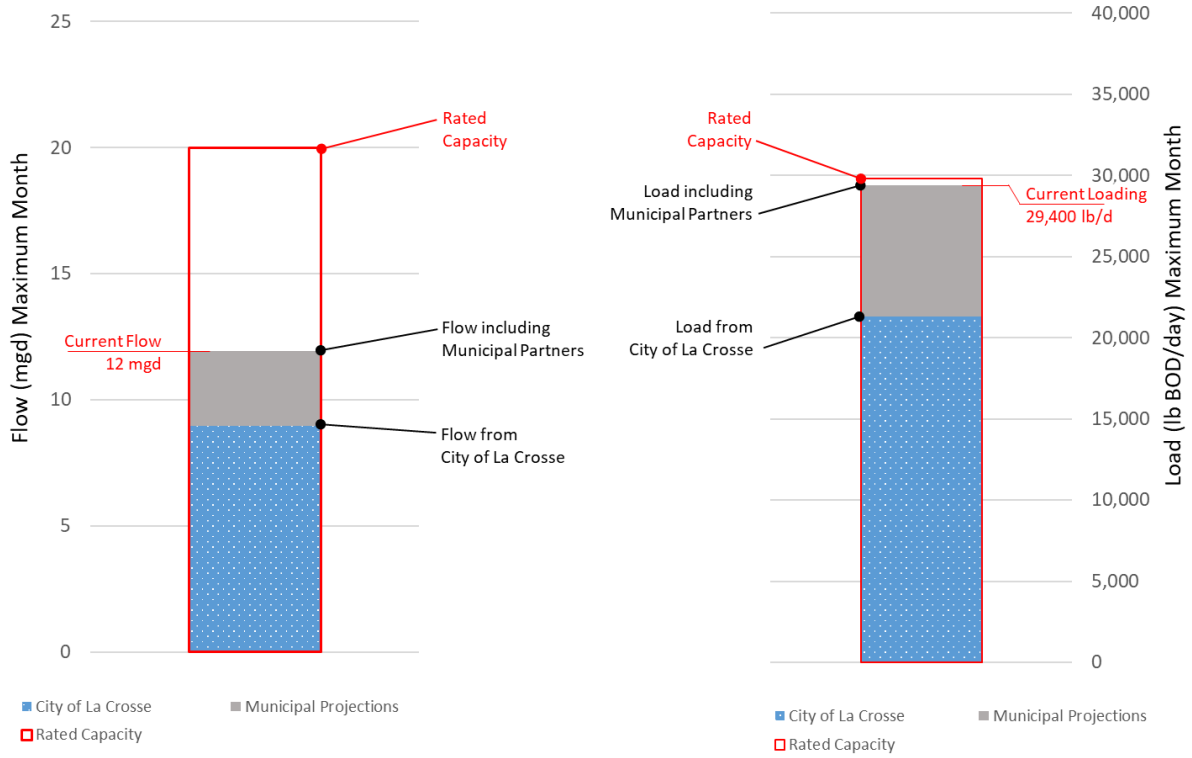

Figure 3a – WWTP Loadings – Cumulative Basis, Current

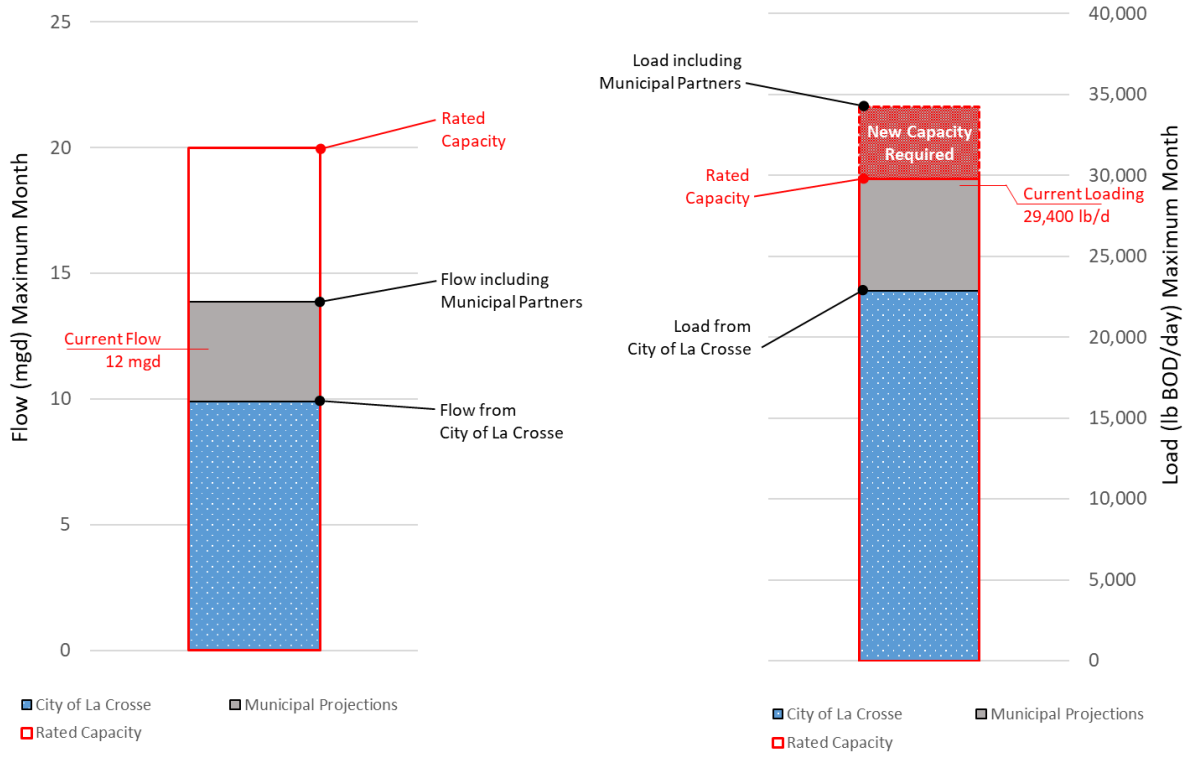

Figure 4b – WWTP Loadings – Cumulative Basis, YR 2040

Infiltration and Inflow Analysis

The Wastewater Utility has addressed removal of inflow and infiltration sources from the sanitary sewer as projects and budgets have allowed. Clear water entering the sanitary sewer system is normal in any collection system, particularly in systems that have been in service for over 60 years. The wastewater utility has done a good job of removing clean water sources and should continue to as projects and budgets allow.

Peak flows for the WWTP are more heavily biased towards inflow related clearwater, which results in a quick rise and fall peaking factor. The highest event documented in 2017 was 32.3 mgd; which exceeds the EPA criteria of 275 gpcd, which adequately identifies the system as inflow deficient. The average dry weather flow of 9.9 mgd, reveals the infiltration criteria suggests that there is no initial concern with infiltration.

The peak hourly factor (excluding industrial data) is 4.0, which is applied to the municipal portion of the flow projections. Applied to the 2040 municipal flows, the respective peak flow is 35.5 mgd. After projecting the municipal peaking factor, the industrial projection (2.99 mgd) is added as baseline flow, for a total of 38.5 mgd. The existing WWTF peak capacity is capable of 44 mgd, with recent observations at over 42.5 mgd without causing basement backups. To retain the ability to treat previously observed storms, a minimum of 42.5 mgd peak hour capacity is recommended. Upgrades beyond this capacity requires significant investment in new tankage and equipment. The City should continue to invest in disconnecting the existing sewer drains from stormwater facilities.

Design Wastewater Flows and Loadings

Design wastewater flows and loadings are estimated by adding together the future municipal load and future industrial load. To reduce the occurrence of being given negative CMAR scores, a 10% buffer capacity has been added to the average flows and loadings, included in Table 8.

Table 8 - 2040 Design Flow and Loading Summary

	Average	Max. Month	Max. Week	Max. Day	Peak Hourly
Flow (MGD)	12.99	15.80	17.70	28.80	42.5
BOD (lb/d)	31,300	39,700	45,000	91,000	
TSS (lb/d)	36,600	56,700	70,000	126,000	
TP (lb/d)	700	800	950	1,900	

A cursory overview of these projections notes that the TSS and TP loads are estimated to increase dramatically by 2020 due to industrial load and then fall into a slower steady growth to 2030, while flow is expected to increase slowly but steadily and BOD may actually drop slightly due to industrial pretreatment systems starting up at Great Lakes Cheese.

Future Regulatory Concerns

While the facility has remained in compliance with current discharge limits, the existing permit includes notable changes that may require changes to the WWTF. The most significant of these changes is the effluent total phosphorus (TP) restriction, decreasing the limit from the current 1.0 mg/L TP to 0.1 mg /L TP. The existing facility has implemented substantial operational adjustments to optimize for

phosphorus; however, the effluent quality has yet to attain compliance. Therefore, additional treatment systems, such as filtration, must be constructed and operational prior to December 31, 2024.

The WWTF's current discharge permit includes a compliance schedule to reduce total phosphorus (TP) discharges for both protection of local water quality and the downstream Mississippi River. Effluent phosphorus is limited to 0.1 mg/L TP as a seasonal 6-month average. Based on the facility design flow of 20 mgd, a phosphorous loading of 17 lbs/d (also as a seasonal 6-month average) serves to limit the maximum loading applied to the river. A maximum month limit of 0.3 mg/L TP is allowable to account for variability in effluent quality.

Phosphorus regulatory compliance strategies were reviewed in 2016 by the project team as part of the phosphorus optimization and feasibility studies. Consensus towards traditional WWTF filtration compliance was selected. Thus, for the purposes of developing alternatives and end-in-mind changes to the facility, effluent phosphorus compliance is retained as a deficiency that impacts several unit processes.

To understand the relative importance of other regulatory parameters potentially changing in the planning period, the project team conducted an interview with the WWTF's legal advisor, Stafford Rosenbaum LLP. Highlights from the discussion are summarized below. Unit processes are identified herein have also been identified in each of the subsequent unit process discussion sections as regulatory deficiencies.

<u>Effluent Discharge Regulatory Issues</u>

Nitrogen:

The current ammonia limit reflects acute toxicity and is related to pH. This limit has not posed a problem for compliance and can be addressed with minor operational adjustments. However, the WDNR has indicated potential for weekly or monthly ammonia limits may be necessary during the next permit reissuance. Depending on the extent of these limits, seasonal ammonia excursions may not be permissible.

The current permit also includes monitoring requirements for total nitrogen (TN). These limits are in response to the EPA's 2008 Gulf of Mexico Hypoxia Action Plan. In the WDNR's Nutrient Reduction Strategy, a goal of 45% TN reductions was established, primarily focused on non-point source reductions. The most recent progress report indicates that reductions to TN are anticipated by way of reducing runoff to comply with the local phosphorus criteria. As observed for phosphorus, new limits typically are developed after monitoring data is obtained. However, the focus on point source dischargers is anticipated to be lessened for nitrogen. Since the DNR does not have a mechanism in place to control non-point sources, total nitrogen regulations may still be applied to point sources, but with greater non-traditional compliance methods as was offered for phosphorus compliance. For example, the first few years will could contain optimization steps, interim limits, and eventual development of a statewide variance program to that re-focuses efforts on non-point sources. Compliance with a final limit is not expected sooner than YR 2028.

To account for future regulations imposed by the state or the watershed, facilities planning should consider alternatives to achieve effluent total nitrogen in the 8 mg/L and/or 3 mg/L range.

Mercury:

The current permit includes a mercury variance that enables discharge of a limit higher than the criteria. Historical monitoring data showed exceedances of the 1.3 ng/L mercury daily maximum, and a 4.0 ng/L variance was authorized. The variance heavily supports the continuation of an exceeded value, so long as management practices are continued and show progress towards compliance. Improved understanding of high effluent mercury values will be a key component in the next variance renewal. Threat of discontinuing the variance has not been discussed and is not anticipated in the planning period.

Microconstituents:

Microconstituents include pharmaceuticals, personal care products (PCPs), endocrine disrupting compounds (EDCs), perfluoroalkyl and polyfluoroalkyl substances (PFAS) and other compounds not specifically regulated in wastewater. These constituents represent a multitude of compounds, of which some may pose a threat to aquatic life at elevated concentrations. The scientific research behind these effects are still being developed, therefore no regulations on the discharge of these compounds have been established.

Although source reduction of these compounds may help reduce the influent loading, many of the compounds are still found in urine. Current and ongoing studies have documented the fate of these compounds through a WWTP to be highly variable and compound specific. A key observation has been that longer solids retention time (SRT) activated sludge systems appear to do a better job of treating most of the studied pollutants.

Final regulation on these compounds is uncertain, but discharge limits may be promulgated if adverse impacts are directly linked to aquatic life.

E.coli:

Current disinfection requirements for the recreational designated use standard of the Mississippi River require compliance with a fecal coliform limit. The DNR is developing E.coli requirements to better reflect the desired health standard.

Although future E.coli limits are not drafted, the new limits are being proposed as though no change is required to effluent disinfection technologies or capacity. However, initial testing by some facilities has indicated there are varying correlations between fecal coliform and E.coli. It is recommended the City develop their own split sample testing analysis to better substantiate a disinfection limit change.

<u>Biosolids Disposal Regulatory Issues</u>

Land Application Phosphorus Restrictions:

Historically, the land application of municipal biosolids has always been well managed, and applied at agronomic crop uptake rates for nitrogen. The Wisconsin Administrative Code (WAC) section NR 151 (which established more stringent runoff management practices) requires nutrient management plans for specific farming practices. As of 2017, La Crosse County had 47% of cropland participating in Nutrient Management Plans.

If applicable to acres where the City land applies biosolids, these regulations would significantly increase the costs for land application of biosolids. The change would require consideration for agronomic rates of phosphorus and require two to three times the area for land application of the

same quantity of biosolids. Additionally, the farmers are not always satisfied accepting biosolids at a reduced concentration because the crop may still require additional nitrogen fertilizer. Future planning efforts should consider alternatives to resolve this issue.

Class A Biosolids:

The current practice of mesophilic anaerobic digestion produces a Class B biosolid. The City consistently achieves the required 38 percent volatile solids reduction for surface land application, but to ensure minimal odor impact to the neighborhood, the City injects the biosolids upon land application. Farmers have historically accepted the Class B biosolids as a nutrient supplement.

Isolated problems with Class B biosolids throughout the nation have prompted a discussion to promulgate Class A biosolids to all WWTPs. However, this movement has not gained momentum because Class B land application is deemed safe by both State and Federal regulators and most local public. The City has observed some local governments attempt to ban biosolids land application in certain townships.

While Class A biosolids are not required at this time, it should be noted that a Class A product may be required in the future due to regulatory changes, public acceptance issues, or the defined need to increase the flexibility of the City's biosolids disposal/reuse program, such as developing an alternative end use product.

Technical Memorandum 4
System Needs
Strategic Plan: Wastewater Treatment
La Crosse Wastewater Treatment Facility
La Crosse, Wisconsin

Date: March 20, 2020

To: Bernie Lenz – Utilities Manager

Copy: Jared Greeno, WWTF Superintendent
Brian Hein – WWTF Assistant Superintendent
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Purpose

Technical Memorandum No. 4 (TM 4) documents the System Needs of the Isle La Plume Wastewater Treatment Facility (WWTF) based on a combination of historical performance, Wisconsin Administrative Code guidelines, typical wastewater treatment industry design criteria and previous WWTF studies. The system needs will serve as the foundation on which decisions are made for future improvements at the WPCF.

This TM reviews each unit process with regard to condition, capacity, and regulatory requirements.

Condition

Several major components (tanks and buildings) date back to 1936, 1952, and 1972. The majority of the mechanical systems within each structure are from the 1972 era; however, a higher proportion of the City's budget is now being directed at equipment replacement as these systems reach their end of life. It is undeniable that these facilities have provided great value to the rate payers and that future improvements will be developed in an effort to continue maximizing these investments. Items identified herein as a condition deficiency are showing signs of age and will need to be budgeted for repair or replacement during the planning period.

In addition to each system's remaining useful life, the condition section also considers each unit process for treatment performance and energy efficiency. The majority of the performance discussion herein will be focused on functionality. Energy efficiency is intended to be an integral part of all components and potential improvements, but such that it does not impart undue complexity or limit the capacity or function of the WWTF treatment objectives.

Capacity

The WWTF must maintain adequate capacity to serve the rate payers, with particular importance towards capacity to accept population growth and industrial growth.

A detailed Unit Process Capacity Summary was developed as part of the WWTP ReRate Study, depicted in Figure 1. The graphic defines units with insufficient capacity being below the green line. Each segment assesses the performance of each unit process based on historical data and identifies maximum code related capacity and expected performance with no modifications. Capacity issues are summarized and described for each unit process throughout the sections below.

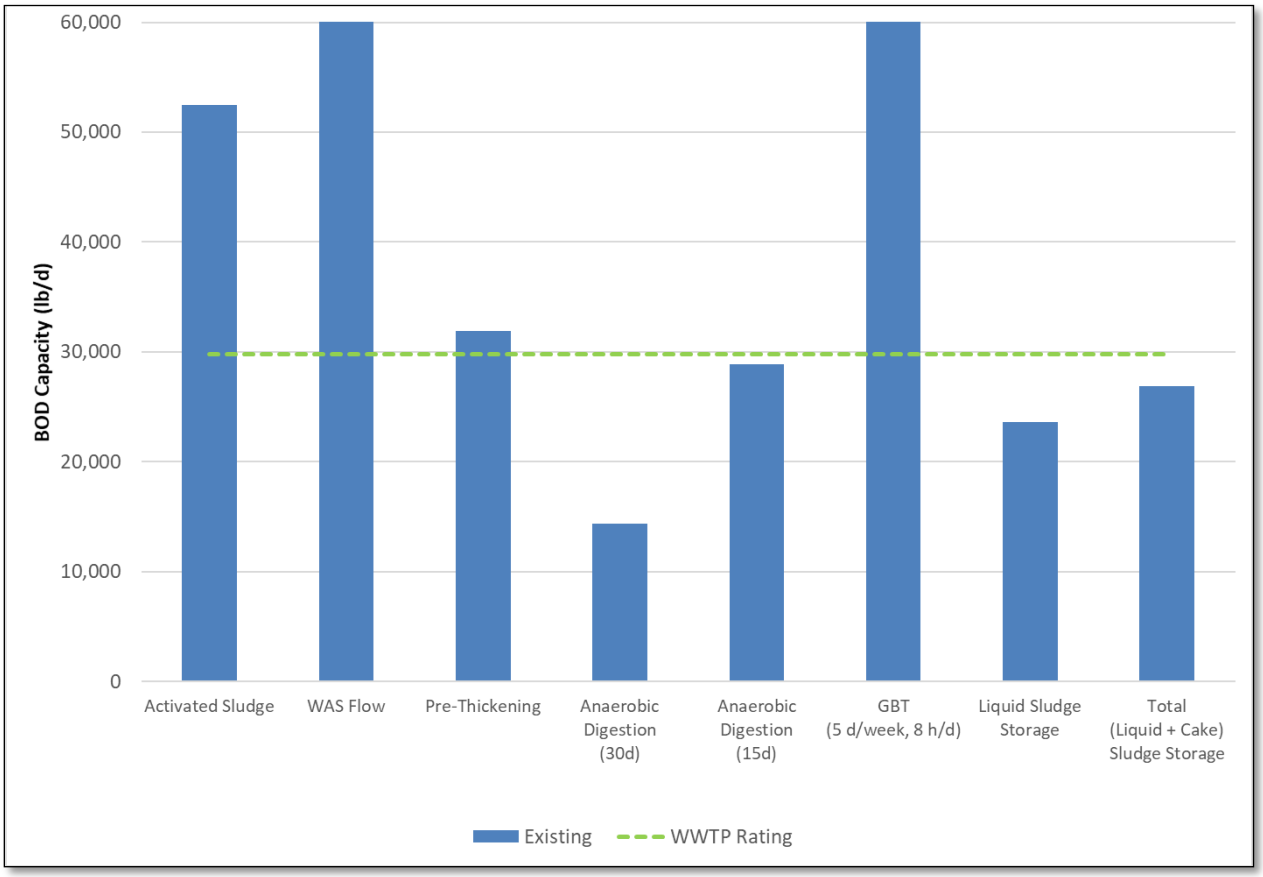


Figure 1 – Solids Handling Unit Process Capacity Summary

Regulatory Concerns

Future regulatory concerns were identified and discussed in TM3. The parameters identified as near-term system needs include effluent phosphorus and effluent E.coli. These items are either already on a compliance schedule, or anticipated on future permit renewals.

Longer term system needs include parameters that have not yet developed into regulatory requirements, but signals in the industry point towards potential (yet undefined extent or timing) for permit changes. These parameters include effluent total nitrogen, Class A biosolids, and phosphorus based land application of biosolids.

Unit Processes

Preliminary Treatment:

Influent Screening

The design basis for influent screening system is based around influent flow, and are not expected to have any capacity concerns within the next 20 years. However, there facility has multiple operational shortcomings, including the lack of an influent flowmeter and grit depositing upstream of the comminutor system. To address these concerns, a flowmeter should be installed and the comminutor overhauled or completely replaced as the system has been in place since 1970.

The screens themselves, while not in bad condition, should be considered for rehaul or replacement with a finer screen, as the existing ¼-inch screen allows significant amounts of debris to pass through.

Raw Wastewater Pumping

The raw wastewater (RWW) pumping system is currently not a major cause for concern for plant staff, and was capable of handling 32 MGD of flow during a 4 inch rain event in 2017 with higher flows observed in 2007. With a firm pumping capacity of 46 mgd spread across five installed pumps, the plant is well equipped for RWW flows. However, this equipment has aged significantly since installation in 1970, and should be considered for replacement or rehabilitation within the next 20 years.

Grit Removal

Grit is removed via two basins and disposed of using grit classifiers. The design capacity of 20 mgd will service the plant for the forecasted period

Preliminary Treatment Summary of System Needs:

Condition:

- Single 6mm step screen does not capture all debris.
- Comminutors old and debilitated.
- Age of some equipment.

Capacity:

- None

Regulatory:

- None

Primary Treatment:

Primary Clarification

Primary treatment is typically operated with two circular clarifiers from the 1970's with a diameter of 90 ft and side water depth of 12 ft. These clarifiers can meet 12.7 MGD average daily flows at the surface overflow rate (SOR) limit of 1000 gpd/ft^2 set by the Wisconsin Administrative Code (NR 110). These clarifiers are adequate for current average flows and projected 2040 flows of 11.1 MGD.

Current operations limit clarifiers in service and restricts rated capacity for handling peak flows. For example, in 2017 the peak hourly rate was 32.3 MGD. Using only Primary Clarifier No. 4 and 5, results in a SOR of 2,539 gpd/ft^2, while the maximum recommended rate is 1,500 gpd/ft^2. During this peak event, the capacity exceedance causes reduced primary clarifier removal rates for BOD, which must be absorbed by the secondary treatment system.

The additional three clarifiers that are not used in typical operation, can be used to equalize flows in maintenance periods. If operations expand to include even a limited number of these clarifiers during peak hourly flows, the primary treatment system will meet code guidelines at projected flows. If all existing primary clarifiers are integrated, the plant will meet code in 2040 at with 1,429 gpd/ft^2 at 35.6 MGD but will continue to fail to meet the rated peak plant capacity of 44 MGD.

Primary Treatment Summary of System Needs:

Condition:

- Unknown primary sludge database
- Age of some equipment.

Capacity:

- Peak hourly flow requirements are not met by the current operational strategy. Consider methods to maximize this capacity for peak events.

Regulatory:

- None

Secondary Treatment:

Activated Sludge Secondary Treatment

The activated sludge process has five unit processes that are critical to the system: the aeration tanks, the aeration blowers, the final clarifiers, the WAS pumps, and the RAS pumps. Many of these processes were assessed as part of a facility re-rate in 2016. This review found that the activated sludge system was fully capable of handling current loads; however, it is currently incapable of meeting the expected future phosphorus regulatory limits.

The aeration tanks, are capable of handling an average daily loading of 36,500 lb BOD/d in the primary effluent. This is adequate for handling the 2040 projection of primary effluent BOD loadings. This holds true for the blowers as well, which are capable of handling an average daily loading of 39,300 lb BOD/d. The aeration system also has sufficient capacity, but suffers from a lack of operational options due to aeration control and blower constraints.

The four final clarifiers have more than adequate capacity for the projected MLSS goals, and have some margins for change in MLSS capacity based on operational changes for regulatory impacts. The primary problems facing the final clarifiers include the lack of flocculating energy dissipating inlets, imbalanced flow distribution, and algae control.

The WAS pumping flow is expected to increase in direct relation to increase in BOD loads. Since primary effluent BOD is not expected to increase significantly, capacity is not a concern since the pumps typically operate at only 21% of their total capacity. While these pumps were not noted for poor condition, they were installed in 1970 and should be considered for replacement to ensure reliability.

Secondary Treatment Summary of System Needs:

Condition:

- Total phosphorus removal efficiency inadequate.
- Consider airflow control efficiency improvements if reconfiguring the basins
- Clarifier flow imbalance and lack of modern upgrades.
- Clarifier algae control
- Age of some equipment.

Capacity:

- RAS pumping is limited, but adequate for historical needs

Regulatory:

- Potential total nitrogen reductions.

Tertiary Treatment:

Filtration

Secondary effluent filtration facilities are not available, but are required to comply with future regulatory phosphorus requirements.

Tertiary Treatment Summary of System Needs:

Condition:

- Not applicable

Capacity:

- Mass balance for phosphorus needs and inclusive of any trading partners.

Regulatory:

- Total phosphorus compliance with 0.1 mg/L TP by 2024

Disinfection:

Ultraviolet Light Disinfection

The UV disinfection system is made up of three channels and has a peak hour capacity if 42 MGD, which is above peak flows observed or projected at the WWTP. In addition, plant staff feel comfortable with the replacement part acquisition process given that City owns extra equipment models not currently in service. This will likely run out at some point in the next 20 years, at which point spare part availability will have to be reassessed.

Disinfection Summary of System Needs:

Condition:

- None

Capacity:

- None

Regulatory:

- Considerations towards future E.coli compliance. Perform supplemental sampling/analysis.

Raw Sludge Thickening:

Gravity Thickeners

Raw primary sludge and WAS are co-thickened in two circular, 50-foot diameter gravity thickeners before being fed to the anaerobic digestion process. Thickener overflow is recycled to the settled sewage pump wetwell to the activated sludge system. Due to nearly year round nitrifying operation, the thickeners have been able to exceed expectations of the 2010 study and pass yearly flows of 11 MGD. In addition, despite the equipment and infrastructure being installed in 1970, plant staff have not had outstanding issues with the condition of the process.

However, projections show a potential increase in loading from the current 36,000 lb/d by 15,000 lb/d. This is due to increased TSS in the system, the majority of which will settle out in the primaries and raise the SOR making it somewhat more manageable. The issues caused by this could begin to appear relatively quickly depending on industry pretreatment and will persist to 2040 if not resolved.

The other major issue of the gravity thickeners is that they produce too much sludge for downstream processes to operate as they should. This issue could be resolved by producing thicker sludge instead of reworking downstream processes.

Raw Sludge Thickening Summary of System Needs:

Condition:

- Age of some equipment.
- Improve thickened sludge concentration to increase digestion capacity.

Capacity:

- Projected increase to TSS loadings not expected to exceed capacity, but may limit performance.

Regulatory:

- None.
- If revisions occur, consider provisions to increase WWTF TP removal.

Sludge Stabilization:

Anaerobic Digestion

After processing through the gravity thickeners, the sludge is fed into the four anaerobic digesters for stabilization. These digesters are operated in parallel and have varying specifications, with digesters 1 and 4 being smaller than 2 and 3 (430,000 gal versus 700,000 gal) and digesters 1 through 3 having floating steel covers and Digester 4 having a skirted gas holding cover. Gas generated in the digesters is fed to boilers to provide energy heat to facilities and the sludge heat exchanger.

The condition of the digesters is adequate after a series of rehabs these last few years. The major concern is the lack of digester mixing beyond the limited amount provided by recirculation through the sludge heating system.

Capacity is a major concern for the digesters due to hydraulic loading. They are currently under capacity, and this problem will only become more troubling as TSS increases.

Sludge Stabilization Summary of System Needs:

Condition:

- Digestion is adequate for current loadings
- Digesters should have mechanical mixing systems if thicker sludge is generated
- Review digester gas utilization options

Capacity:

- Hydraulic loading limited.

Regulatory:

- Consideration for long-term Class A biosolids as regulatory or for alternative disposal options.

Biosolids Thickening and Dewatering:

Gravity Belt Thickeners

The gravity belt thickening (GBT) process is currently one of two potential destinations for digested sludge. The single 2-meter GBT installed in 1998, and does not have any outstanding maintenance issues. The thickeners are oversized for the flow leaving the digester, being sized for 700 gpm and 3,700 lbs/hr receiving slightly more than 100 gpm and 1,600 lbs/hr. For current use, the thickeners are well positioned to serve for many more years.

Biosolids Dewatering - Belt Filter Press

The dewatering process is composed of single 2-meter belt filter press (BFP) which is fed from either the digester or the liquid sludge storage facility. The process reaches 20-23% or 15-18% total solids for digester or thickened sludge respectively. The process has seen increased use since the 2010 study to decrease the stress on the sludge thickening train. The BFP capacity of 120 gpm and 2,500 lbs/hr is not as large as the GBT, but is still capable of handling loads from the digester.

Biosolids Thickening and Dewatering Summary of System Needs:

Condition:

- Avoid dewatering of liquid storage tanks (reduced performance)
- Dewatering operation is restricted due to shuttle truck capacity

Capacity:

- None

Regulatory:

- None

Biosolids Storage and Reuse:

Liquid Biosolids Storage

Digested sludge that is thickened in the GBT is stored for land application or further dewatering in the biosolids storage facility. This facility consists of two 3-million gallon liquid storage tanks, with pumps in the lower level of the connecting building to accomplish mixing and truck loading. The tanks and pumps have no outstanding condition issues requiring resolution.

These facilities are sized at 150-180 days of storage capacity, typically operating under the 180-days capacity recommended by the Wisconsin Administrative Code. This could be driven down as far as 100 days in the near future as local industries expect to increase TSS loads. These issues have led to a tight storage situation with semi annual hauling.

Cake Biosolids Storage

The cake biosolids storage facility provides 30 days of sludge storage at 20% total solids. While the structure was being used as a garage in 2010, increased BOD has placed demands that the liquid biosolids storage process is not capable of handling. Despite opening up the cake storage facility, capacity persists as an issue.

In addition to the ongoing capacity issues with sludge storage, the location of this facility is an issue as well. The storage building is located 400 ft from the dewatering building, increasing traffic through the area.

Biosolids Storage and Reuse Summary of System Needs:

Condition:

- Cake storage located far from dewatering facility.
- Dewatered cake from liquid storage remains very wet

Capacity:

- Increase liquid and/or cake storage to provide ability to skip one season of land application (330-365 days storage)
- Consider adding capacity to dispose biosolids without weather limitations

Regulatory:

- Increased acres required for land application due to phosphorus

Site:

Utilities

The electrical needs of the WWTF are met by Xcel Energy through three power feeds serving the main WWTF, blower building, and the UV building. The plant consumes energy at a rate of 1473 kWh/MGD which represents a normalized rate per the amount of wastewater treated. In comparison to the best practice benchmark established by Focus on Energy, 1760 kWh/MGD, the City is well run, yet realizes there is always room for improvement. The normalized power draw for the load treated is 572 kWh/1000lb BOD, much lower than the target of 900 kWh/1000 lb BOD. Power redundancy is provided via four backup generators, one at each main service and another serving preliminary treatment. The two main generators are nearing the end of their useful life and should be budgeted for replacement. A new generator for operation of the process blowers should be considered.

Data communications are provided through a fiber optic network, with the exception of collection system lift stations which use radio. This is a noted issue for the City, as radio signals in the area are unreliable due to terrain.

Currently the plant uses effluent water throughout the plant. Consider methods to increase the non-potable (W3) water reuse system upon tertiary treatment installation.

Natural gas is also provided from Xcel Energy. With an expanded W3 system, building heat could be provided by a heat pump or from digester gas to reduce dependence on fossil fuels like natural gas.

NFPA 820

A number of environmental rating concerns noted in past evaluations need to be addressed by the City for the continued health and safety of plant staff. Structures with major concerns include the administration building, the primary effluent pump building, the anaerobic digester complex, the dewatering building, and the liquid biosolids storage complex. The major causes for concern are inadequate separation of rated spaces from electrical and non-explosion proof equipment, improper handling of digester and natural gasses, and insufficient or absent continuous ventilation.

The full notes of an extensive 2008 site visit are included in Appendix A, which gives a comprehensive overview of plant structural, process, electrical, HVAC and plumbing shortfalls. Many of these have yet to be resolved.

Environmental Restrictions

The WWTF is constructed on an old landfill on an island within the Mississippi river, with development east and west of the river. All of these factors play into concern of the plant. Flooding from the river is a known threat, but the plant does not sit in the flood way according to studies by FEMA. In addition, no critical areas are vulnerable to a 100 year flood; however some are vulnerable to a 500 year flood. A full site survey could identify these risks with increased certainty.

The Isle La Plume has been noted to be originally an old landfill prior to development as the WWTF. Although the debris has not been observed to create differential settlement, it has been suspected to contribute to elevated mercury levels during periods of high river stage (groundwater). The high

groundwater leaks in through the building walls and cause the structural sump pumps to engage, which could be a reason that the effluent mercury is higher than the influent mercury at times. Tertiary systems for low-level TP may assist with mercury removal.

The WWTF is situated on the west edge of the City and odors are a continual concern to be attentive to the rate payers. Despite this concern, the facility does not currently mitigate odors with treatment. In recent years, the majority of odor complaints have been due to odorous activities taking place at City Brewery.

Site Summary of System Needs:

Condition:

- Decrease reliance on City's water supply, consider expanding the non-potable (W3) system.
- Multiple rating issues caused by inadequate ventilation or area segregation.
- Age of some equipment.
- Monitor flooding concerns for all new structures.

Capacity:

- N/A.

Regulatory:

- Monitor mercury and address areas as needed to continue variance. Size TP tertiary filter system to optimize mercury removal.

Site Visit Notes
September 25, 2008
La Crosse, WI

Administration Building / Screens/Grit Wash/Offices/Lab/GBT– Grade Level

Structural –

- The room which houses the generator, adjacent to the administrative spaces, is separated from the rest of the building by wood frame walls. This construction should be reviewed. Installations of stationary combustion engines require a 1-hour fire wall separation between differing occupancies.
- The control joint in the masonry above the north end of the lintel over the east access door to the Screen/Grit Wash stand by generator room has opened up approximately ¼ inch. This is probably due to differential settlement of that portion of the building addition with respect to the deeper portion of the addition. This joint should be re-caulked inside and out and monitored to determine if additional movement takes place.
- The roofing and insulation over the original Plant #1 needs to be removed and replaced. A ballasted loose laid EPDM membrane is recommended.
- There is some cracking in the masonry parapet along the north face of the building, just above the east end of the east garage door. This deterioration should be repaired.
- Along the south wall just north of clarifiers #1 & #2, there is some deterioration of the brick joints near the top of the wall. This area should be tuck pointed to minimize future damage to the wall.
- If changes are made to this facility with respect to electrical classification issues, it may be necessary to update the means of egress from the building. This would possible include changes to the means of egress to the intermediate and lower levels.

Process –

- Preliminary treatment equipment in the Administration building is newer and clean. Equipment consists of comminutors, screens, screenings washer/compactor, and grit washers.
- Some corrosion problems were noted, but did not appear to be significant.
- The idea of changing the valve of the grit washer from 4-inch diameter to 6-inch diameter was discussed as a possible way of reducing clogging problems.

Electrical –

- The new headworks/screen building addition should be a class I, division 1, Group D hazardous classified location per the Nation Fire Protection Association standard 820 (NFPA 820). Currently the process equipment, electrical equipment, lighting, conduit system, etc is not suitable for a class I, division 1, group D hazardous classified location.

- NFPA 820 requires the headworks/screen addition to be "physically separate" from unclassified areas like the administration area of the building. This means that there should be no means for gas to migrate from the headworks/screen addition to the rest of the building. The headwork/screen addition does have separate exterior access but there is not a gas tight partition between the headworks/screen addition and the remainder of the building. The electrical conduit system does not have explosion proof seal offs that provide a gas tight seal and prevent gas from migrating to the administration building. Gas from the headworks/screen addition could migrate to the remainder of the building through the conduit system and fill the unclassified area with methane. As a result the remainder of the building would be rated the same as the headworks/screen room which is a class I, division 1, group D hazardous classified location.

- The generator room attached to the headworks/screen addition is not "physically separate" from the headworks/screen addition. The generator room does have separate exterior access but there is not a gas tight partition between the generator room and the headworks/screen room. The electrical conduit system does not have explosion proof seal offs that provide a gas tight seal and prevent gas from migrating into the generator room. As a result the generator room would be rated the same as the headworks/screen room which is a class I, division 1, group D hazardous classified location.
- Electrical motor control centers and variable frequency drives are located at grade in the room directly above the dry well where the raw wastewater pumps are located. The exposed copper inside the electrical equipment in this area is black with corrosion due to hydrogen sulfide.

Plumbing – No comments.

HVAC –

- A natural gas fired unit heater is installed within the Screen/Grit Room space. This space should be considered a hazardous classified space and should not have a gas fired appliance installed within it.
- Ventilation rates should be confirmed in the Screen Room space to ensure that the 10 States Standard required ventilation rate of 12 AC/Hr continuous or 30 AC/Hr intermittent are provided.
- Staff indicated that he new make-up air units (vertical Titan units) are problematic, wearing through belts to frequently and corroded sensors causing nuisance trips.
- The Electrical Room is cooled by split system air conditioning units with no outside air capability. This was done because of corrosion of the electrical gear from the previously installed outside air ventilation systems.
- The Electrical Room and the rest of the grade level administrative spaces are physically connected to the drywell area of the pump station. Because of this, all these interconnected spaces require 6 AC/Hr of continuous outside air ventilation

to be considered Unclassified spaces. Lesser ventilation rates would require the spaces to be considered a Class 1, Division 2 hazardous environment. It appears that the existing ventilation systems are less than code required ventilation rates for an Unclassified rating.

- The room which houses the generator, adjacent to the administrative spaces, appears to be under ventilated resulting in elevated temperatures when the generator runs.
- The Thickener Room interior air was very foul, indicating inadequate ventilation. Ventilation rates should be reviewed to confirm that 10 State Standards recommended minimum ventilation rate of 12 AC/Hr continuous or 30 AC/Hr intermittent is provided. Existing ventilating systems had minimal ductwork installed allowing for poor distribution of airflow which is probably a contributing factor to the elevated odor levels.
- Staining of the ceiling tiles was noticed in the Break Room. Inspection indicated that this was probably created by uninsulated branch take-offs from the main supply duct causing condensation and dripping.
- Staff indicated that the rooftop heating and cooling units serving the Lab and Break Room areas function adequately.

Administration Building – Intermediate Level

Structural –

- The spiral stair cases to the intermediate and lower levels do not meet current code with respect to egress. As long as significant changes are not made to the spaces or the occupancy of the spaces is not changed, code compliant stairs are not required.

Process –

- Five vertical centrifugal pumps lift the raw wastewater. Three of the five are driven by VFDs. The #4 pump is not operational because of problems with check valve slamming. Pumps #4 and #5 are not driven by VFDs, but #5 does not have the same plugging problems as the #4 pump. New motor and a VFD for the #4 pump is expected to be installed in the next 2-3 years. There is one spot left for installation of a VFD.
- The old 'detroiter' room is mostly empty and used for some storage. This space could be used for other process purposes if needed.
- Inclusion of the lab area in the plan was discussed on the tour. The owner does not have process concerns regarding the lab, but it is thought that it including it in the plan is not a bad idea.

Electrical –

- See lower level. The intermediate level is connected to the lower level and should be the same rating as the lower level.

Plumbing – No comments.

HVAC – See Lower Level.

Administration Building/Screens/RWW Pumps– Lower Level

Structural – See intermediate level.

Process –

- A digester gas pipe routed though the lower level is constructed of HDPE materials. International fuel gas code requires metallic piping systems for indoor gas piping.
- The digester gas pipe is routed in such a way that low points are created making potential traps for condensate. No means of draining the lines were found.

Electrical –

- The lower level contains raw wastewater pumps. Per NFPA 820 the lower level should be a class I, division 2, Group D hazardous classified unless the lower level and connected spaces are ventilated continuously with 100% outside air at 6 air changes per hour (AC/hr). Any spaces connected to the lower level and not "physically separate" (no means for gas migration between spaces) from the lower level should also be a class I, division 2, Group D hazardous classified location. The electrical and process equipment in the lower level does not appear to be suitable for a class 1, division 2, group D hazardous classified location.
- Since the lower level is "physically connected" to the rest of the administration building, the entire administration building should be a class 1, division 2, group D hazardous classified location. The electrical and process equipment in the administration building does not appear to be suitable for a class 1, division 2, group D hazardous classified location.
- The lighting in the lower level is older fixtures and in some areas there is not enough adequate light.

Plumbing – No comments.

HVAC –

- There appears to be inadequate ventilation of the lower level. 10 States Standards requires 6 AC/Hr continuous or 30 AC/Hr intermittent ventilation for below grade drywell spaces. NFPA 820 requires a continuous ventilation of 6 AC/Hr for the space to be considered Unclassified, otherwise the space should be considered a Class 1, Division 2 hazardous environment. It did not appear that any of the electrical components installed within the space are suitable for a Class 1, Division 2 hazardous environment.

Administration Building – Pista Grit/Wastewater Wet Well

Structural – No comments.

Process –

- Two vortex type Pista Grit systems were upgraded and refurbished about six years ago. Design capacity of the grit system is 20 MGD and the chambers are alternated daily.
- The discharge pipe that carries grit to the washer plug tends to plug. Operators try to prevent the plugging by monitoring the fill rate of the grit wash tank.
- SCADA is used to record functions of the process and the grit wash tank is inspected two or three times daily.
- Recycle process water is returned to the head of the plant at manholes outside of the headworks generator room. These flows come from the gravity belt thickener (GBT), belt filter press (BFP) or centrifuges (which aren't currently used).

Electrical –

- Per NFPA 820 the pista grit area should be rated a class 1, division 2, group D, hazardous classified location in the area 18 inches above the channels extending out 10'0" from the edge of the channels. Outside of this area is unclassified.
- The conduit systems in this classified area do not contain explosion proof seal-offs. The electrical equipment on the pista grit area and adjacent to the pista grit area within the classified area is not rated for a class 1,division 2, group D, hazardous classified location.
- The exposed cooper ground conductors in this area are black with corrosion due to hydrogen sulfide.
- Some of the conduit in the area adjacent to the pista grit area near the padmount transformer is rusted and corroded.

Plumbing – No comments.

HVAC – No comments.

Primary Clarifiers

Structural – No comments.

Process –

- There are five primary clarifiers. Two rectangular and one circular are older and there are two newer circular clarifiers. Operators monitor water temperature in the unused clarifiers to catch ice and freezing problems.
- Operators have found that problems with grease build-up and hydrogen sulfide formation are reduced when only two clarifiers are in operation, as opposed to three or five in operation. This new approach has been used for the past year.
- The clarifiers are cycled in and out of operation.

- Water is kept in the unused clarifiers to protect against floating caused by high ground water.

Electrical – No comments.

Plumbing – No comments.

HVAC – No comments.

Primary Effluent Pump Building/Blowers/Generator/Motors- Grade Level

Structural –

- The roofing and insulation on this building (Plant #2) needs to be removed and replaced. A ballasted loose laid EPDM membrane is recommended.
- The slab on grade floor is cracked in the vicinity of the blowers. The blowers sit directly on the floor, and are not supported by isolated equipment pads. This area should be monitored to determine if additional cracking occurs or settlement of the blowers occurs. If either happens, it may be necessary to provide isolated pads or vibration isolators.

Process –

- Three of the primary effluent pumps are driven by VFDs and plans to put the #4 pump on a VFD were discussed.

Electrical –

- Sludge pumps in upper level with sludge well below pumps. Sludge well is rated a class 1, division 1, group D, hazardous classified location. Hatch connects sludge well to upper level so building would also be rated a class 1, division 1, group D, hazardous classified location per NFPA 820. Electrical and process equipment in building not suitable for a class 1, division 1, group D, hazardous classified location.

Plumbing – No comments.

HVAC –

- The sludge pumps are vertical type penetrating the floor into a sludge well below. There are access hatches to the sludge wells within the space. The sludge wells are considered a Class 1, Division 1 hazardous environment and because of the interconnection provided by the access hatches, the entire structure should carry the same hazardous rating.
- The Generator Room and Blower Room seemed to have inadequate ventilation to provide cooling of the spaces.
- Because of the below grade sludge pumps and the lack of physical separation, the entire structure requires a continuous ventilation rate of 6 AC/Hr to be considered Unclassified, otherwise the space should be considered a Class 1, Division 2 hazardous environment. It did not appear that any of the electrical components installed within the space are suitable for a Class 1, Division 2 hazardous environment.

Primary Effluent Pump Building Intermediate Level

Structural – No comments.

Process – No comments.

Electrical – No comments.

Plumbing – No comments.

HVAC – See Lower Level.

Primary Effluent Pump Building Effluent Pumps Lower Level

Structural – No comments.

Process –

- The thickened sludge pumps and piping were being replaced at the time of the facility tour.

Electrical –

- Sludge pumps in lower level. Per NFPA 820 the lower level should be rated a class 1, division 2, group D, hazardous classified location unless the lower level and connected spaces are ventilated continuously with 100% outside air at 6 air changes per hour (AC/hr). Any spaces connected to the lower level and not "physically separate" (no means for gas migration between spaces) from the lower level should also be a class I, division 2, Group D hazardous classified location.

Plumbing – No comments.

HVAC –

- Because of the below grade sludge pumps the entire structure requires a continuous ventilation rate of 6 AC/Hr to be considered Unclassified, otherwise the space should be considered a Class 1, Division 2 hazardous environment. No continuous ventilation systems were noticed. It did not appear that any of the electrical components installed within the space are suitable for a Class 1, Division 2 hazardous environment.

Site Visit Notes
September 25, 2008
La Crosse, WI

Aerations Tanks

Structural –

- The walls and or walkways have experienced some deterioration at the north and south ends of the walkways where they sit on the tank walls. This deterioration is most likely the result of differential movement between the walkway and tank wall. This movement is most like caused by expansion and contraction of the walkways. The north end of the west walkway is the most severely deteriorated. At this location, there is a 4 ft square by 3 inch deep spall on the inside face.
- The old steel pipe air header needs to be repainted.

Process –

- Sludge wasting for the activated sludge process is based on NH_3-N.
- Two blowers are needed to maintain the target DO of 1.5 mg/L at the head end of the aerated zone. DO at the effluent end of the aeration zone is operated around 6-7 mg/L.
- The Norton stone fine bubble diffusers tend to plug more if the air flow from the blowers is throttled.
- Redmon Engineering visited the site the previous week to conduct off-gas studies of the aeration basins.

Electrical – No comments.

Plumbing – No comments.

HVAC – No comments.

Secondary Clarifiers

Structural – No comments.

Process –

- Effluent from the clarifiers flows through an open tank in the old chlorine contact tank. Growth of algae was observed in this tank.
- Algae growth was observed on the weirs and launders of the final clarifiers.

Electrical – No comments.

Plumbing – No comments.

HVAC – No comments.

Effluent Disinfection UV Building

Structural – No comments.

Process –

- The UV disinfection system was supplied by Wedeco and replaced a Fisher-Porter system from the early '90s.

Electrical – No comments.

Plumbing – No comments.

HVAC –

- There is no continuous ventilation for the UV Room. High moisture levels were noticed, but plant staff indicated there have been no issues within the space. General Corrosion was evident but would not be considered significant.
- A continuous ventilation system was installed for the air space between the channels and the cover system. This ventilation system reduces the moisture released to the room above. Staff has indicated that the fan exhausting this system has significant icing issues during cold weather. Consideration should be given to providing a continuous tempered air supply to the UV room that would pressurize the space. This supply air should be drawn done through the cover system to temper the air which is exhausted. This should improve humidity levels in the UV Room and reduce the likelihood of icing the exhaust fan in the winter.

Gravity Thickeners

Structural – No comments.

Process –

- Sludge from the primary clarifiers and waste activated sludge are co-thickened in the Gravity Thickeners.

Electrical – No comments.

Plumbing – No comments.

HVAC – No comments.

Anaerobic Digesters

Structural –

- The roofing and insulation over the building portion of the complex needs to be removed and replaced. A ballasted loose laid EPDM membrane is recommended.
- The exterior surface of the Digester #4 floating cover (top and skirt) needs to be repainted.
- The interior surfaces of all four digesters should be cleaned and inspected to determine if structural repairs and repainting are required.

Process –

- Gas handling equipment, including condensate traps and control valves are installed within the main gallery space which is physically connected to the rest of the structure. Locations with gas handling equipment installed should be physically separated from the rest of the structure and treated as a Class 1, Division 1, hazardous environment.
- The four digesters are operated as primary, single stage, mesophillic processes.
- Digesters are fed on a two hour cycle. Each digester is heated, recirculated and fed 12 times per day.
- Covers on digesters 1, 2 and 3 need to be replaced.
- The waste gas burner was installed 8-9 years ago. Capacity of the burner or piping problems feeding the burner limits it to a maximum observed flow of 6000 cf/hr. More burner capacity is needed.
- Only one digester can be heated at a time using the two heat exchangers that are connected in series. The two heat exchanges are near the end of their useful service life.
- The sludge heaters do not have automatic temperature control.
- Sludge feed from the gravity thickeners of greater than 3% TS causes recirculation problems with the digestion process.

Electrical –

- Per NFPA 820 drip traps and condensation traps make a space rated a class 1, division 1, group D, Hazardous classified location. Drip traps and condensate traps located in digester building making it a class 1, division 1, group D, Hazardous classified location.
- Per NFPA 820 the area 10'-0" above a digester tank is a class 1, division 1, group D, hazardous classified location along with the area 5'-0" out horizontally from the digester tank walls. Per NFPA 820 the area between 10'-0" and 15'-0" above a digester tank is a class 1, division 2, group D, hazardous classified location along with the area between 5'-0" and 10'-0" out horizontally from the digester tank walls. The electrical and I&C equipment in this area does not appear to be suitable for the hazardous classified location

Plumbing – No comments.

HVAC –

- No means of continuous ventilation noticed. NFPA 820 requires a continuous ventilation rate of 6 AC/Hr in spaces containing digester gas piping and gas utilization equipment (boilers) to be considered a Unclassified area, otherwise the space should be treated as a Class 1, Division 2 hazardous space.

Site Visit Notes
September 25, 2008
La Crosse, WI

Dewatering Building (Belt Press) Grade Level

Structural –

- The windows in this building are old and in some instances missing panes of glass. Consideration should be made to remove and replace the windows with modern windows or glass block.

Process –

- The belt press and centrifuges are not currently used to dewater sludge. The belt press was last used in 2006 and the centrifuges have not been used since 2005.

Electrical –

- The lower level contains sludge pumps. Per NFPA 820 the lower level should be a class I, division 2, Group D hazardous classified unless the lower level and connected spaces are ventilated continuously with 100% outside air at 6 air changes per hour (AC/hr). Any spaces connected to the lower level and not "physically separate" (no means for gas migration between spaces) from the lower level should also be a class I, division 2, Group D hazardous classified location. The electrical and process equipment in the lower level does not appear to be suitable for a class 1, division 2, group D hazardous classified location.
- The two motor control centers not located in the separate control room are old and obsolete.

Plumbing – No comments.

HVAC –

- No means of continuous ventilation were noticed in the facility. 10 States Standards recommends a continuous ventilation rate of 12 AC/Hr or intermittent rate of 30 AC/Hr for sludge dewatering spaces.
- Because of the below grade sludge pumps the entire structure requires a continuous ventilation rate of 6 AC/Hr to be considered Unclassified, otherwise the space should be considered a Class 1, Division 2 hazardous environment. No continuous ventilation systems were noticed. It did not appear that any of the electrical components installed within the space are suitable for a Class 1, Division 2 hazardous environment.

Dewatering Building Upper Level

Structural – No comments.

Process – No Comments.

Electrical – No Comments.

Plumbing – No Comments.

HVAC –

- Because of the below grade sludge pumps and the lack of physical separation, the entire structure requires a continuous ventilation rate of 6 AC/Hr to be considered Unclassified, otherwise the space should be considered a Class 1, Division 2 hazardous environment. It did not appear that any of the electrical components installed within the space are suitable for a Class 1, Division 2 hazardous environment.

Liquid Biosolids Storage Building-Grade Level

Structural – No comments.

Process – No Comments.

Electrical –

- See lower level for building rating.
- Since the lower level is "physically connected" to the rest of the building, the entire building should be a class 1, division 2, group D hazardous classified location. The electrical and process equipment in the building does not appear to be suitable for a class 1, division 2, group D hazardous classified location.

Plumbing – No Comments.

HVAC –

- Because of the below grade sludge pumps and the lack of physical separation, the entire structure requires a continuous ventilation rate of 6 AC/Hr to be considered Unclassified, otherwise the space should be considered a Class 1, Division 2 hazardous environment. It did not appear that any of the electrical components installed within the space are suitable for a Class 1, Division 2 hazardous environment.

Liquid Biosolids Storage Building-Lower Level

Structural – No comments.

Process – No Comments.

Electrical –

- The lower level contains sludge pumps. Per NFPA 820 the lower level should be a class I, division 2, Group D hazardous classified unless the lower level and connected spaces are ventilated continuously with 100% outside air at 6 air changes per hour (AC/hr). Any spaces connected to the lower level and not "physically separate" (no means for gas migration between spaces) from the lower level should also be a class I, division 2, Group D hazardous classified location. The electrical and process equipment in the lower level does not appear to be suitable for a class 1, division 2, group D hazardous classified location.

Plumbing – No Comments.

HVAC –

- Because of the below grade sludge pumps the entire structure requires a continuous ventilation rate of 6 AC/Hr to be considered Unclassified, otherwise the space should be considered a Class 1, Division 2 hazardous environment. No continuous ventilation systems were noticed. It did not appear that any of the electrical components installed within the space are suitable for a Class 1, Division 2 hazardous environment.

Liquid Biosolids Storage Tanks

Structural – No comments.

Process –

- The liquid sludge storage tanks are relatively new. They appear to be well maintained and no operational issues were cited based on the current use of these tanks.

Electrical – No comments.

Plumbing – No comments.

HVAC – No comments.

Cake Sludge Storage Building

Structural – No comments.

Process –

- The cake sludge storage building is in good condition, but it is no longer used to store sludge. Sludge hauling trucks and other equipment are currently stored in this building. The City is considering the sale of the cake slinger trucks.

Electrical – No comments.

Plumbing – No comments.

HVAC – No comments.

Other Process Structure

Structural – No comments.

Process –

- The facility currently does not use effluent process water for wash-down or other process purposes in the plant. Backflow preventers are in place to provide non-potable process water in the facility and the wastewater utility pays the water utility for the use.
- High strength waste from City Brewery is currently fed directly to the digesters. The waste is fed slowly from a hauling truck. It is very syrupy with a high COD in the range of 150,000 to 200,000 mg/L.
- Grease and septage receiving was discussed. Currently these wastes are discharged into a manhole outside of the grit/screening room. No metering is performed for billing purposes. Billing is done on an honor system. Operators would prefer to have the grease and/or septage receiving on the opposite end of the facility from the current location.

Electrical – No comments.

Plumbing – No comments.

HVAC – No comments.

Plant Site

Structural – No comments.

Process – No Comments.

Electrical – No Comments.

Plumbing –

- There is currently no pumped plant effluent (W3) system installed for process and washdown usage. Plant currently uses city water for all water demands. Consideration should be given to installation of a plant W3 system to offset the costs of city water.

HVAC –

- There are currently two boiler systems in the plant (Administration Building, Digester Building, and Dewatering Building). The boilers serving the Administration Building and the Dewatering Building appeared to near the end of their useful life. Because of this and the close proximity of these structures to each other, consideration should be given to installing a central boiler plant that can provide hot water or steam to each of these structures. System should be connected to the Digester Gas Boiler system to allow the use of digester gas for building heat when excess gas is available.

- The plant experiences premature failure on their air conditioning condensing unit coils (typical life of 2-3 years). It is assumed this is caused by hydrogen sulfide corrosion of the copper and aluminum coils. Plant staff has asked that a central chiller system be considered to provide cooling water for air conditioned spaces. These are predominantly located in the Administration Building. The practicality of this should be reviewed. If excess digester gas is available in the summer months, possibility of using an adsorption chiller using the waste heat as an energy source for the chilled water supply.

Instrumentation and Control

General –

- The plant is fully PLC controlled and fully automated. All process control operations are handled though the PLC programming and it is only necessary for operator intervention if an unusual condition is detected by the PLC systems located though the plant. It is manned 7 am to 3 pm 5 days a week with the lab manned 7 am to 1 pm on Saturday and a two hour maintenance walk though on Sunday. The PLC control system has a full SCADA system over the top of it monitoring, displaying and controlling the operation of the plant. The SCADA system is connected to a Raeco Dialer system to inform on call personnel of critical alarm information during hour in which the plant is unmanned. The plant personnel also have access to the SCADA system remotely though the City network via a VPN and using Remote Desktop. The communication is Ethernet based with point to point fiber connecting all the remote buildings.
- The is a 900 MHz Serial radio system to monitor critical information from the remote liftstations round the city. The system uses 900 MHz MDS radios with a repeater at City Hall. This information is fully integrated into the Plant SCADA System.

Ethernet System –

- The building to building Ethernet network is Fiber Based. The Fiber is not looped but is point to point from building to building. Inside the building is copper based Ethernet. The plant uses Cisco Ethernet equipment. The system is connected to the overall City network and this has been the cause of a few problems. Some work should be done to separate the control system network from City network traffic.

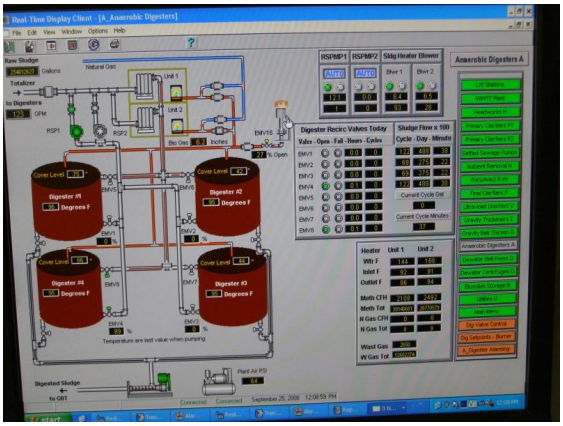
General PLC Systems –

- The Plant PLC system is Ethernet based and uses primarily Allen Bradley SLC 5/05 processors although there is one Allen Bradley Contrologix Process in the UV Disinfection area. There is also a new Compactlogix processor being installed Primarily Clarification area to control the new Scum pumps that are being installed.

- On smaller project the plant technicians handle the PLC programming on their own. On large projects the plant uses exclusively LW Allen out of Madison. This arrangement has given the process control system a very uniform and consistent PLC programs which aides in problem detection and troubleshooting.
- The plant is aware of the limited availability of the SLC 5/05 going into the future and the plant is satisfied with both the Compactlogix and Contrologix platforms and going forward will use the model consist with the requirements of the process being controlled. The plant has and knows how to use the programming packages for all the controllers that it has and plans to have in the future.
- The plant has RSLogix 500 programming software for the SLCs and the Micrologix and RSLogix 5000 for the Compact and Contologix along with the programming software for the older Panelviews. They will need to get RSView Studio for the newer Panelview Plus that will be coming in.

SCADA System –

- The HMI software being used at the plant is the FMT Software by Intellisys. It is primarily collecting data from the plant PLC via NetDDE but a conversion is under way to the KEPware OPC server. The plant is using several other Intellisys products where applicable. The system is setup for 6 client PCs to view the SCADA system. These are located at strategic locations around the plant. The ReportView is used at the plant for reporting.



- All graphics are well organized, functional and plant personnel are satisfied with the operation of the system.
- The SCADA System is accessible remotely to plant personnel though Sonic wall, a virtual private network and Remote Desktop. So that plant conditions and alarms can be observed and acknowledge.
- The FMT software needs to be upgraded as soon as the new release comes out which should occur end of next year.

Technical Memorandum 5
Alternatives Screening/Retained Alternatives
Strategic Plan: Wastewater Treatment
La Crosse Wastewater Treatment Facility
La Crosse, Wisconsin

Date: March 20, 2020

To: Bernard Lenz – Utilities Manager

Copy: Jared Greeno, WWTF Superintendent
Brian Hein – WWTF Assistant Superintendent
Greg Kozelek – City Engineer

From: Mike Gerbitz – Donohue & Associates

By: Bill Marten – Donohue & Associates
Eric Lynne – Donohue & Associates
Ben Stephens – Donohue & Associates

Purpose

Technical Memorandum No. 5 (TM 5) documents the results of the alternative screening workshop. The purpose of the workshop was to identify potential solutions to program issues and challenges or specific system needs. The system needs were grouped by general categories of each unit process. The workshop process identified and retained creative strategies for meeting the needs of performance, regulatory, capacity, and efficiency constraints at the Isle La Plume Wastewater Treatment Facility (WWTF). This session was intended to be non-judgmental, but rather provide a free exchange of ideas, options, concepts that could meet current and/or future needs.

In developing alternatives for the rehabilitation system needs, many times the best alternative was obvious and therefore only one alternative may be listed. It was agreed that although other potential solutions may exist, the alternatives identified herein are likely the most-feasible and other less-feasible alternatives were omitted to reduce confusion and clutter, but could be considered during detailed design.

For system needs which several improvement options exist, a preliminary screening discussion was performed at the workshop to organize the evaluation into sensible alternatives for detailed review. The final portion of the workshop was devoted to conceptual evaluation/discussion/critique of the lists of potential alternatives, with a goal of screening down to 2-3 alternatives per unit process to be retained for detailed development, costing and evaluation. Alternatives were eliminated from further consideration for a wide range of reasons, including inconsistent with the City's goals and traits, requiring excessive cost, high safety risk, incompatible with current City facilities/operations, unproven or failed technology, etc.

The following section summarizes the alternatives retained for detailed evaluation.

Alternatives List

A shorthand naming scheme was implemented to enhance organization and reference to the various assortment and pairing of alternatives. The following methodology was applied:

- For items that are considered separately implemented choices, a numeral designator was assigned (e.g., 1, 2, or 3).
- For competing alternatives that address a common system need, an alphabetic designator was assigned (e.g., a, b, or c).

The following is a unit-process by unit-process listing of the alternatives:

Headworks

TM4 identified issues related to comminutors performance, grit accumulation in the inactive comminutors channel, expediting grit systems for storm flows, replacement of aging HVAC systems, and providing improved septage receiving facilities for haulers.

- H-1 Fine Screen
- H-2 Grit System Programming
- H-3 HVAC Improvements
- H-4 Septage Receiving

Primary Clarifier

TM4 identified the normally unused primary clarifiers are not in service during peak flows due to poor scum removal systems at those tanks, this alternative resolves this concern.

- PC-1 Scum Pit 3 (Scum Pump) with High Strength Waste

TM4 also noted a need for high strength waste receiving. Subsequent alternatives indicate potential elimination of a gravity thickener, which could be repurposed for high strength wastes fed to anaerobic digestion or activated sludge.

- PC-2 High Strength Waste and Septage Receiving at Gravity Thickener No. 1

Activated Sludge

TM4 identified issues related to selector zone and activated sludge size, efficiency, and treatment performance. Additionally, minor modifications to return activated sludge provide operational control and flexibility to maximize treatment performance.

- AS-1 Activated Sludge Reactor Splitter Box
- AS-2 Large Blade Submersible Selector Mixers
- AS-3 Modified University of Cape Town
- AS-4 Secondary Clarifier Splitter Box
- AS-5a New Submersible Return Activated Sludge Pump Stations
- AS-5b Modify Return Activated Sludge Piping to Minimize Deposition
- AS-6 Secondary Clarifier FEDWA Inlets and Rapid Sludge Withdrawal
- AS-7 Secondary Clarifier Density Current Baffles

Effluent Phosphorus Treatment

TM4 identified issues related to improved tertiary treatment of phosphorus. These alternatives provide filtration and additional chemical addition.

- EP-1a Inside-Out Disk Filter with Coagulation Zones
- EP-1b Outside-In Cloth Disk Filter with Coagulation Zones
- EP-1c Reactive Upflow Sand Filter

TM4 identified concern for algae growth causing excess maintenance and overload to the phosphorus filtration system. This alternative provides covers at each secondary clarifier.

- EP-2 Secondary Clarifier Launder Covers

Disinfection

TM4 identified concern to the reliability of the disinfection system for the extended planning period. For a future placeholder, a replacement UV system was considered.

- DI-1 Replacement of Ultra-Violet System

Sludge Thickening

TM4 identified anaerobic digestion capacity and performance gains by thickening the raw sludges more prior to digestion. These alternatives replace or minimize dependence on the existing gravity thickeners. An overall perspective towards operation with separate thickening or combined thickening was inconclusive to provide a drastic benefit either direction, so each concept was retained for further analysis. Full scale trials of thickening in a combined or separate mode is recommended to validate performance abilities and identify operational concerns.

- ST-1a Combined Raw Sludge Disk Thickening
- ST-1b Separate Waste Activated Sludge Disk Thickening and Struvite Control
- ST-1c Combined Raw Sludge Gravity Belt Thickening
- ST-1d Separate Waste Activated Sludge Gravity Belt Thickening and Struvite Control
- ST-1e Combined Raw Sludge Rotary Drum Thickening
- ST-1f Separate Waste Activated Sludge Rotary Drum Thickening and Struvite Control

Digester Operation, Heating, and Recirculation

TM4 identified issues related to digestion capacity for current and future conditions.

- D-1 Status Quo (Mesophilic, Parallel Feed, Replace Pumps and Heat Exchangers In Kind)
- D-2 Thermophilic Anaerobic Digestion Conversion (One Thermophilic followed by Two or Three Mesophilic)
- D-3 Waste Activated Sludge Conditioning (Temperature and pH) and Potentially 2-3 Mesophilic Digesters

Digester Mixing

TM4 identified issues related to digestion capacity, to increase capacity in the digesters a thicker sludge is recommended, which also dictates improved digester mixing.

- DM-1 Digester 1&4 Draft Tube; Digester 2&3 Jet Mixing

Biosolids Reuse

TM4 identified issues related to the capacity of biosolids storage and the reliability of Class B biosolids land application.

- BR-1a Status Quo (80% Liquid 20% Cake to Land Application)
- BR-1b 15% Total Solids Liquid Handling (approx. 80% Liquid 20% Cake to Land Application)
- BR-1c Increase Cake Handling (50% Liquid 50% Cake to Land Application)
- BR-1cr Increase Cake Handling and Improve Logistics via Remote Cake Storage
- BR-1d Increase Diversity (approx. 50% Liquid 50% Dried Biosolids Belt Dryer, with Cake Optional)
- BR-1e Increase Diversity (approx. 50% Liquid 50% Dried Biosolids Solar, with Cake Optional)
- BR-1f Increase Diversity (100% Dried Biosolids, with Liquid or Cake Optional)
- BR-1g Increase Diversity (50% Liquid 50% Cake to Compost)
- BR-2 Improve Biosolids Quality (add raw Sludge Screening)

Biogas

TM4 identified issues related to improving biogas utilization for improved safety of flaring, increased heat energy capture, biogas to electricity, or biogas to renewable natural gas.

- BG-1 Replace Waste Gas Burner
- BG-2 Biogas Storage
- BG-3a Baseline Energy Consumption
- BG-3b Cogeneration Engine
- BG-3c Peak Shaving Cogeneration Engine
- BG-3d Cogeneration Microturbine
- BG-3e Pipeline to Utility

Site and Utilities

TM4 identified issues related to general site utility performance, efficiency, and safety.

- U-1 Replace Facility Wide Heating System
- U-2 Comply with NFPA 820 & 10-State Standards for Buildings
- U-3 Increase W3 System Capacity
- U-4 New Transformers and One Electrical Service
- U-5 Floodplain and Site Access Improvements

TM 6: Alternatives Evaluation will document the detailed evaluation of these alternatives in a manner that will group them into logical elements of the City's current and future wastewater treatment program.

Technical Memorandum 6
Alternatives Analysis
Strategic Plan: Wastewater Treatment
La Crosse Wastewater Treatment Facility
La Crosse, Wisconsin

Date: March 20, 2020

To: Bernard Lenz – Utilities Manager

Copy: Jared Greeno, WWTF Superintendent
Brian Hein – WWTF Assistant Superintendent
Greg Kozelek – City Engineer

From: Mike Gerbitz – Donohue & Associates

By: Bill Marten – Donohue & Associates
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Purpose and Background

Technical Memorandum No. 6 (TM 6) discusses and evaluates the alternatives selected for detailed evaluation for the La Crosse, Isle La Plume Wastewater Treatment Facility (WWTF), which were originally presented in TM 5 and discussed/screened at the Alternative Screening Workshop held December 7, 2018. TM 6 first provides brief background information and then presents detailed alternatives to resolve system needs. Following development of a thorough listing of alternatives, some alternatives were found to be common-sense or stand-alone, while others had a true set of choices between alternatives to address a core system need. These comparison alternatives are contrasted at the end of this TM using Total Present Worth and Non-Economic criteria, which were established in TM1, in a manner that develops a set of recommended improvements for implementation. The timing and financing of these improvements will be discussed in TM 7.

The 2008 Facilities Plan recommended several improvements, some of which have yet to be implemented. All alternatives were reviewed for relevance and priority. Near-term continued use of many of the existing facilities was identified to minimize impact to rate payers. The alternatives also present several mid- to long-term alternatives to provide an increased level of treatment (i.e., sludge stabilization to Class A biosolids). The alternatives are organized by unit-process, each includes a brief description of the proposed system, advantages and disadvantages, and pertinent costs.

The economic evaluations form the basis of cost-effectiveness analyses, and include the estimated cost of constructing the facilities with varying levels of operating costs for a 20-year planning period to treat the projected future flows and loadings identified in TM3.

The annual costs are converted to an equivalent present worth so that comparable alternatives can be evaluated on a total present worth basis. All total present worth costs were derived based on the WDNR prescribed 3.625% discount rate. In this way, alternatives with high initial costs and low operating costs can be compared equally to alternatives that offer low initial costs but may have high operating costs.

The detailed preliminary cost opinions are presented in Appendix A. The cost opinions in general include allowances for undefined design detail related to specific cost categories (civil/sitework, mechanical, controls, electrical, etc.). The allowances applied vary between alternatives based on the anticipated amount of work required for each category that was not explicitly listed. The cost opinions also include standard percentage allowances applied to the overall estimated total as follows:

- 30% allowance for undefined design detail.
- 25% for contractor overhead and profit.
- 15% for engineering (design and construction services).

Soil conditions on site were cited to be poor. New buildings were scoped to include pile foundations to a depth of approximately 50-ft. Soil borings from the City's cake storage building project confirmed this assumption.

Alternatives

This technical memorandum documents alternative approaches considered feasible in addressing identified system needs, organized by unit process. The section begins with brief descriptions of the system need, then presents preliminary alternatives to address those deficiencies. The alternatives evaluations conclude by listing those alternatives retained and evaluated during the Alternatives Evaluation Workshop for further consideration in further non-economic detail, from a conceptual implementation standpoint.

Headworks/Preliminary Treatment

H-1 Fine Screen

Purpose and Description

The headworks was upgraded in 2002 with the addition of a ¼-inch fine-opening step screen. The existing comminutors had been retained for back-up service and have provided value well past the equipment's expected service life. It was preferred to install a 6-mm perforated plate band screen; however, hydraulics and space constraints make this a non-feasible consideration. To improve the system performance without completely revising the influent structure, a traditional multi-rake screen is proposed.

This alternative provides the cost to remove the comminutors, modify the influent channel, and install a new ¼-inch multirake bar screen, shown schematically in Figure 1. Bar screens remove debris from the wastewater and are superior technology to comminutors which merely grind up the debris. The ground up debris from comminutors remain in the system and re-agglomerate in pipes and tanks causing maintenance issues for pumps, digesters and dewatering equipment. The alternative is expected to

remedy the influent channel grit accumulation concerns as the operators can regularly purge the grit with flow to the new screen.

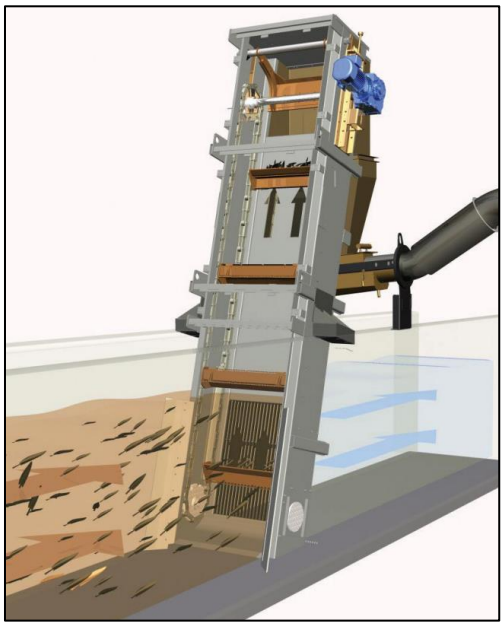


Figure 1 – Multirake Fine Screen

Advantages

- Provides full redundancy for the critical influent screening process
- Improves reliability of backup screening system
- Removes grit accumulation concern in piping between diversion box and comminutors

Disadvantages

- Multi-rake technology is considered a comprise of achieving high screenings capture while minimizing construction cost

Cost

$1,007,000 initial cost.

H-2 Grit System Programming

Purpose and Description

The grit system needs are related to the current system having a slow reaction time when high flows hit the plant. The proposed alternative solution resolves this by engaging the peak grit capacity sooner, based on high flows observed to be occurring in the collection system.

This alternative provides time and materials to identify the problem, develop strategies, revise the program logic, and travel to the site to verify program functionality.

Advantages

- Low cost project for potential increase in grit system performance.

Disadvantages

- None

Cost

$6,000 initial cost.

H-3 HVAC Improvements

Purpose and Description

The HVAC systems at the headworks facility are exposed to a corrosive environment and are currently nearing their useful life and are recommended for replacement during the planning period.

Advantages

- Improves air quality to protect equipment from corrosion and maintains operator safety

Disadvantages

- None.

Cost

$258,000 initial cost.

H-4 Septage Receiving

Purpose and Description

The existing septage and grease receiving system has no monitoring or pretreatment components. This alternative provides construction of a new septage receiving, screening, and control building for the introduction of septage at the plant headworks. This facility is proposed to be located north of the existing headworks facility and would include an external truck connection, fine screen, flowmeter, and a 10,000 gallon holding tank to prevent slugs to the raw wastewater. Flow is metered into the raw wastewater using a submersible pump, but could also be accomplished with a control valve. An example septage station from Grafton, WI is illustrated in Figure 2.

A phased approach towards this system is possible to install the flow management concept in the near term, while a screening system is added in the mid-term.

Figure 2 – Septage Receiving Station

Advantages

- Eliminates rocks, grit, and rags that could damage or overwhelm the main fine screen.
- Provides treatment services for septage produced in the regional area not served by the sewer service area.
- Improves accountability and billing for septage customers
- Enables metering of high strength wastes

Disadvantages

- Location likely congests vehicle traffic/parking in Administration and Headworks area on plant site

Cost

$1,541,000 initial cost.

Primary Clarification

PC-1 Scum Pit 3 (Scum Pump) with High Strength Waste

Purpose and Description

System needs associated with primary treatment require utilization of Primary Clarifiers No. 1-3 for peak flow capacity. This alternative provides improved scum handling systems to reduce operator demands when these tanks are online. This alternative provides a new scum well near Clarifier No. 3 with a dedicated scum pump allowing the sludge pump to remain in service for sludge demands. The scum system piping is recommended as glass lined ductile iron to minimize grease plugging concerns.

This alternative involves excavation, concrete construction of a pump room, and sludge piping modifications. The combination of these aligns well with the goal of adding high strength waste (HSW) to the anaerobic digesters. The proposed system was expanded slightly to include a trash rack, grit sump, and segmented tank for special high HSW (i.e., brewery membrane retentate) that are amenable

for co-digestion. The proposed scum pump system would be dual purposed for dosing HSW when not pumping scum.

Advantages

- Reduces or eliminates staff resistance to utilize existing tankage, thus improving peak flow treatment performance.
- Facilitates receipt of external high strength wastes for co-digestion. Revenue from tipping fees and increased biogas production are anticipated.
- Multi-function use of the scum system improves staff awareness of pump and piping system functionality for improved system reliability when required for peak flows.

Disadvantages

- Dosing of high strength waste must be temporarily halted to convey scum.
- Location is not directly adjacent to digestion, which could create concerns with plugging if scum not thoroughly flushed after usage (conveyance of warm HSW may alleviate potential plugging).

Cost

$623,000 initial cost.

PC-2 High Strength Waste and Septage Receiving at Gravity Thickener No. 1

Purpose and Description

An alternative (or complimentary) option to PC-1's HSW facilities is to provide a larger high strength waste receiving system as the program increases in demand. This alternative provides retrofit improvements to the north gravity thickener (GT) for high strength waste (HSW) receiving. Similar bar rack, grit sump, and odor control cover systems are included to meter HSW into the existing sludge piping to feed the anaerobic digesters. Reuse of the thickener offers pump and piping system savings as sludge conveyance already exists. However, due to the larger tank size and increased diversity of received wastes with this option, a mixing system is included. A corrosion protective coating is included to protect concrete and metallic surfaces from the low pH concerns related to holding high strength

wastes. Existing piping and pumping systems need to be verified for low pH material handling compatibility. An example HSW facility at Stevens Point, WI is depicted in Figure 3.

Figure 3 – High Strength Waste Receiving

Advantages

- High volume and wide range of acceptance for HSW. Revenue from tipping fees and increased biogas production are anticipated.
- Repurposes (potentially) unused tankage

Disadvantages

- Requires thickening system improvements to minimize tankage costs.

Cost

$490,000 initial cost.

Activated Sludge

AS-1 Activated Sludge Reactor Splitter Box

Purpose and Description

The existing primary effluent is divided to both activated sludge reactor trains using piping and valves, which does not provide a uniform flow split at all conditions. This alternative provides an upflow splitter box with overflow weirs to evenly divide the flow to each activated sludge reactor train. The proposed splitter box divides the flows and then reuses existing piping to convey the flow to the anaerobic zones.

Advantages

- Improved flow split to the two parallel trains at minimum, average, and peak flows.
- Increased treatment performance through the unaerated and aerated zones, due to reduced short circuiting from flow imbalances

- Increased aeration efficiency resulting from comparable oxygen demand between the dual aeration train zones served by the same aeration header control valve.

Disadvantages

- Increased headloss; however, primary effluent is pumped prior to this splitter box and headloss increase is anticipated to have negligible impact on pump performance or primary effluent conveyance capacity.

Cost

$353,000 initial cost.

AS-2 Large Blade Submersible Selector Mixers

Purpose and Description

The selector zone mixers are anticipated to require replacement during the planning period to improve reliability. A brief review of available replacement mixing systems was discussed; however, the continued use of submersible mixing technology is recommended as it can be performed at the lowest cost. A recent facility energy survey identified the selector zone mixers to exceed current industry standards for mixing in biological phosphorus removal selector zones. This alternative provides replacement of the current high speed submersible mixers with large blade low speed submersible mixers in the same location. An example of this type of mixer is presented in Figure 4. Although the current mixers are operated in an on/off mode, the proposed mixers are significantly lower horsepower, resulting in energy savings. Aside from the economic benefits, reduced mixing may also improve the performance of the unaerated selector through reduced air entrainment from surface vortexing. The proposed system was selected to run continuously; however, upon startup, a similar on/off operating strategy may be continued if filamentous conditions can be avoided.

Note, the implementation of the unaerated selector volume included conversion to the Modified University of Cape Town (MUCT) biological nutrient removal process (see AS-3) as the City indicated mixing systems would most likely not be converted until a major process change.

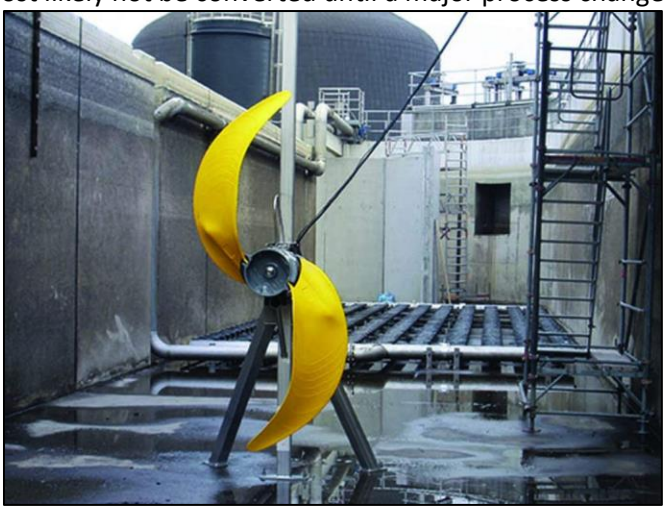


Figure 4 – Low Speed Submersible Mixer

Advantages

- Lower energy demand
- Fewer mixers for operation and maintenance
- Provides replacement mixers extending the system's useful life
- Utilizes existing electrical and control infrastructure
- Staff familiarity in mixing system

Disadvantages

- Requires installation of new tripod stands for mixers
- Mixing system maintenance components require mixer to be removed from service

Cost

$355,000 initial cost. Proposed annual energy savings of $23,000 would provide a 15 year simple payback.

AS-3 Modified University of Cape Town

Purpose and Description

The existing Anoxic/Anaerobic/Oxic (A2O) process was identified as inefficient and the anoxic/anaerobic portions consume a large portion (50%) of the existing bioreactor volume, thus limiting the aerobic volume/sludge retention time (SRT) for nitrification. This alternative provides improvements to convert the two trains into the Modified University of Cape Town (MUCT) process. The MUCT process conversion was simulated using Biowin® process modeling to demonstrate equivalent phosphorus treatment performance with improved ammonia treatment performance.

This alternative provides modifications to the existing activated sludge tanks by revising the location of and return activated sludge. The existing mixed liquor recycle pumps will be adapted for returning denitrified mixed liquor to the front of the anaerobic zones. The first pass of each activated sludge bioreactor will comprise the anaerobic and anoxic zones (33% of the total bioreactor volume,) and the second and third passes will be fully aerobic which will increase aerobic SRT and nitrification performance at any given MLSS concentration. The proposed unaerated selector zone configuration is illustrated in Figure 5.

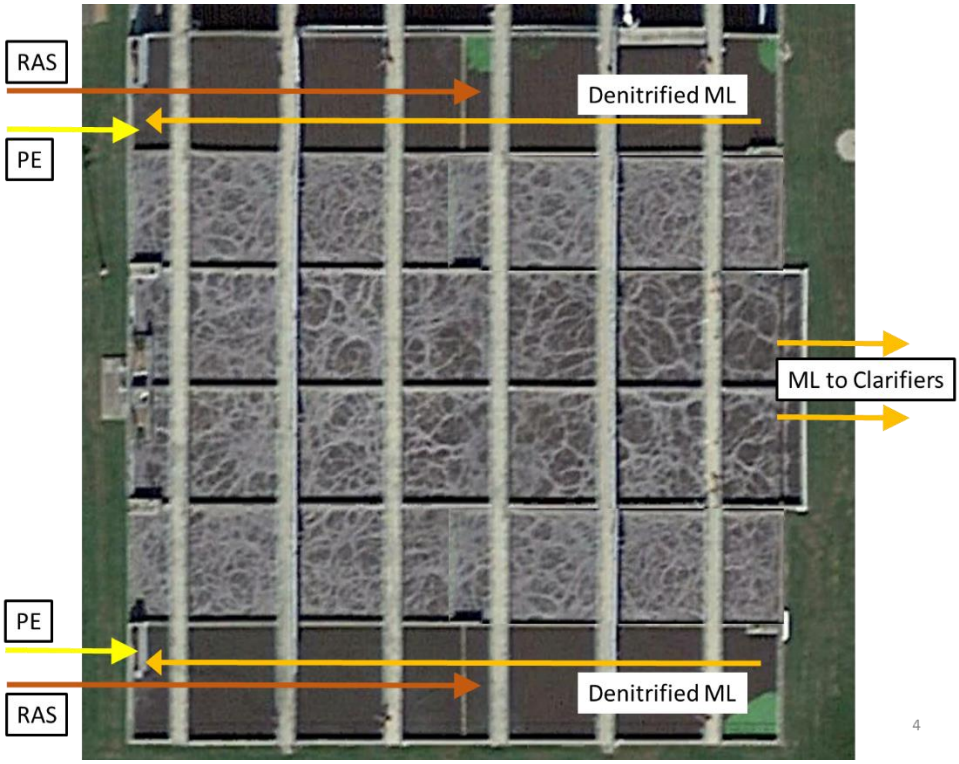


Figure 5 – MUCT Layout

Advantages

- Improved carbon efficiency for phosphorus removal
- Improved nitrification with a lower total SRT to minimize filamentous bacteria
- Decreased interference from recycled nitrate

Disadvantages

- Reduced anaerobic volume

Cost

$1,089,000 initial cost. Proposed aeration control improvements result in annual energy savings of $23,000.

AS-4 Secondary Clarifier Splitter Box

Purpose and Description

This alternative replaces the existing secondary clarifier splitter with a new structure which will be sized to slow the mixed liquor and use weirs to more equally split the flow. The proposed system includes 36”

piping to connect to existing mixed liquor piping that feeds each clarifier. An example splitter box is depicted in Figure 6.

Figure 6 – Splitter Box Example

Advantages

- Reliable flow split for increased clarifier performance under all flow and maintenance conditions

Disadvantages

- Challenging construction sequencing

Cost

$936,000 initial cost.

AS-5a New Submersible Return Activated Sludge Pump Stations

Purpose and Description

The current return activated sludge (RAS) pumping system provides central RAS collection and pumping. Although this is efficient, it does not provide ideal flexibility for operations and maintenance. The existing suction lines are long and not capable of being isolated to clear settled debris or monitor pipe integrity.

This alternative provides four new manhole pump stations, one at each clarifier, to capture the RAS and pump it back to the Plant 2 Building using adjustable speed submersible pumps (one per manhole). An on the shelf spare RAS pump would be kept available for quick replacement in any of the four pump stations. Existing piping will be reused where possible after adding a valves and flow metering for each pump. It is possible that the pump station for Clarifier No. 2 and 4. could be combined into one structure.

Advantages

- Flow monitoring and control of individual clarifiers
- Replacement of existing RAS pumping equipment

Disadvantages

- Submersible pumps
- On shelf redundancy

Cost

$1,168,000 initial cost.

AS-5b Modify Return Activated Sludge Piping to Minimize Deposition

Purpose and Description

The current return activated sludge (RAS) pumping system provides central RAS collection and pumping. Although this is efficient, it does not provide ideal flexibility for operations and maintenance. The existing suction lines are long and not capable of being isolated to clear settled debris or monitor pipe integrity.

This alternative provides a new buried plug valve on the RAS suction line of each clarifier. The intent is to enable staff the flexibility to isolate clarifiers and develop a scouring velocity for removal of any blockages that may occur in the lines by closing the suction lines for the other clarifiers in service. This will allow for the continued use of existing equipment and infrastructure.

Since this alternative does not provide the ability to monitor or control the active rate of sludge withdrawal, this alternative requires use of AS-4 to provide a uniform sludge loading to each clarifier.

Advantages

- Minimal cost
- Increased operator flexibility and troubleshooting
- Continued use of existing RAS system

Disadvantages

- No flow monitoring or control of individual clarifiers.

Cost

$224,000 initial cost.

AS-6 Secondary Clarifier FEDWA Inlets and Rapid Sludge Withdrawal

Purpose and Description

The existing clarifier mechanisms were recently refurbished and are adequate for current and future needs. However, replacement mechanisms should be anticipated during the planning period. This alternative provides replacement of the current sludge withdrawal mechanism with an updated style of

the flocculating energy dissipating well arrangement (FEDWA) and rapid sludge withdrawal system to increase settling performance. The center-well inlet baffling FEDWA is shown in Figure 7.

Figure 7 – FEDWA Clarifier Inlet

Advantages

- Improved flocculation for increased flow capacity
- Enhanced sludge removal and prevention of sludge blanket disturbance.

Disadvantages

- None

Cost

$1,600,000 initial cost.

AS-7 Secondary Clarifier Density Current Baffles

Purpose and Description

The existing clarifiers utilize center feed and peripheral overflow weirs, this arrangement has been documented to develop density currents that lead to short circuiting, thus limiting performance.
This alternative provides the addition of density current baffles to redirect the velocities inside the tank and prevent short circuiting of mixed liquor to the effluent. Figure 8 illustrates the before and after with solids being carried up and over the weirs or re-directed to the centerwell with and without baffling.

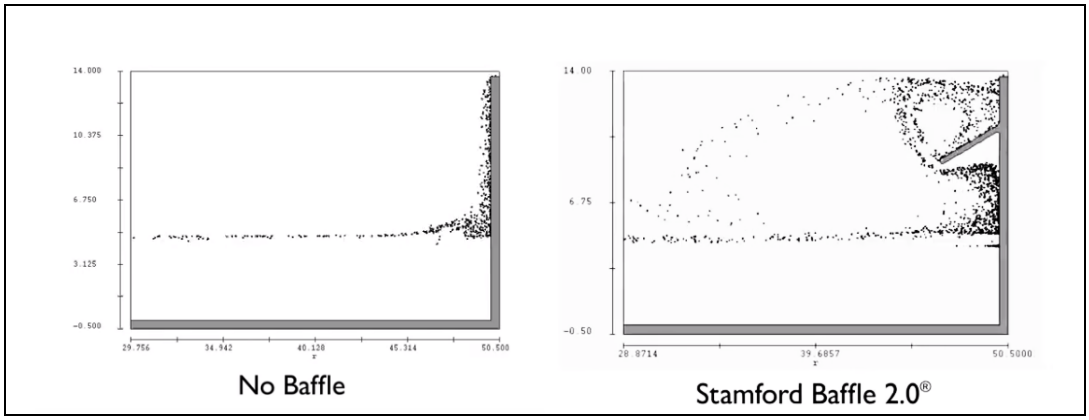


Figure 8 – Density Currents with and without Baffles

Advantages

- Improves clarifier capacity
- Improves secondary effluent quality

Disadvantages

- None

Cost

$315,000 initial cost.

Effluent Phosphorus Treatment

As identified in the City's Preliminary Compliance Alternatives Plan (PCAP), attached for reference as Appendix B, regulatory compliance with a future 0.1 mg/L TP limit is recommended to occur as a tertiary treatment process. The proposed limit is based on a seasonal 6-month average, which enables the facility to right-size the new effluent filters to meet effluent requirements using available tankage to minimize capital costs. The PCAP identified the minimum firm capacity required as 16 MGD for full tertiary capacity, where peak secondary effluent flows in excess of this capacity overtop a weir and re-combine with filtered effluent prior to discharge and provide reliable compliance with the monthly and 6-month limits. This intentional blending does not compromise the health and human safety of the receiving water, as all flows will receive full disinfection.

Alternatives EP-1a, EP-1b, and EP-1c provide effluent pumping, chemical addition, and filtration. The three alternatives represent the three most cost effective phosphorus precipitation and solids separation techniques for low level phosphorus removal filters on the market at this time.

EP-1a Inside-Out Cloth Disk Filter with Coagulation Zones

Purpose and Description

This alternative provides a new cloth media inside-outside disk filtration system. This system consists of three units, with a firm capacity of roughly 16 MGD and one redundant unit. The existing chlorine contact tank will be converted for tertiary phosphorus removal. A wet well with pumps will lift the secondary effluent into the tertiary system's rapid mix tank where coagulant (i.e., ferric chloride) will be mixed at a G-Factor of over 500 sec^{-1} to provide contact time for the chemical to bind with reactive phosphorus. Following precipitation, the coagulation and flocculation zones add a small dose of polymer to develop larger floc particles for efficient filtration. The inside-out filter units utilize a rotating drum of synthetic cloth filter mesh (10 or 5 micron openings) to capture the solids and allow filtered water to exit the unit. A backwash spray cleans the cloth media and is recycled to the WWTP drain, which is

anticipated at <3% of forward flow. Figure 9 shows a newly installed disk filter system at Medford, WI for low-level phosphorus removal.

Figure 9 – Inside-Out Cloth Disk Filter Schematic

Advantages

- Lowest total cost option
- Lowest footprint
- Backwash pump access from above unit

Disadvantages

- High chemical costs
- Few local installations with limits at or below 0.1 mg/L TP (however local pilot testing proved feasible to support full scale installations for low-level TP elsewhere in the country)

Cost

$6,871,000 initial cost, and an additional annual cost of $329,000. The resultant 20-year total present worth is $11,495,000.

EP-1b Outside-In Cloth Disk Filter with Coagulation Zones

Purpose and Description

This alternative provides a new cloth media outside-in disk filtration system. This system consists of three units, with a firm capacity of roughly 16 MGD and one redundant unit. The existing chlorine contact tank will be converted for tertiary phosphorus removal. A wet well with pumps will lift the secondary effluent into the tertiary system's rapid mix tank where coagulant (i.e., ferric chloride) will be mixed at a G-Factor of over 500 sec^{-1} to provide contact time for the chemical to bind with reactive phosphorus. Following precipitation, a flocculation zone adds a small dose of polymer to develop larger floc particles for efficient filtration. The filter units utilize a rotating drum of synthetic deep-pile cloth filter mesh to capture the solids and allow filtered water to exit the unit. A backwash suction header

cleans the cloth media and is recycled to the WWTP drain, which is anticipated at <3% of forward flow. Figure 10 provides a schematic of this style of disk filtration.

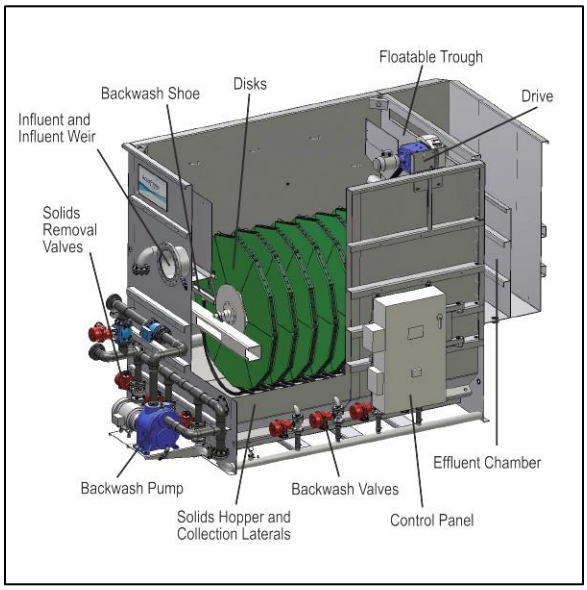


Figure 10 – Outside-In Cloth Disk Filter Schematic

Advantages

- Lowest initial cost option
- Low footprint

Disadvantages

- Requires dry-pit area for backwash pumps
- High chemical costs
- Few local installations with limits at or below 0.1 mg/L TP (however local pilot testing proved feasible to support full scale installations for low-level TP elsewhere in the country)

Cost

$5,617,000 initial cost, and an additional annual cost of $424,000. The resultant 20-year total present worth is $11,576,000.

EP-1c Reactive Upflow Sand Filter with Coagulation Zones

Purpose and Description

This alternative provides a new reactive upflow sand filtration system. This system consists of 16 separate cells/units functioning in parallel, with a firm capacity of roughly 16 MGD and one redundant unit. The existing chlorine contact tank will be converted for tertiary phosphorus removal. A wet well with pumps will pump the secondary effluent into the base of the tertiary system. The filter system consists of a ferric chloride impregnated sand for phosphorus precipitation. No additional polymer or mixing zones are required. As the flow works its way up the sand filter bed, soluble phosphorus reacts with the sand, precipitates, and is captured in the sand. An air lift pump withdrawals the reacted sand

and captured particles as a backwash. Since applied phosphorus is expected to be under 0.6 mg/L TP, only a single stage filter is required. Figure 11 provides a schematic of this style sand filtration.

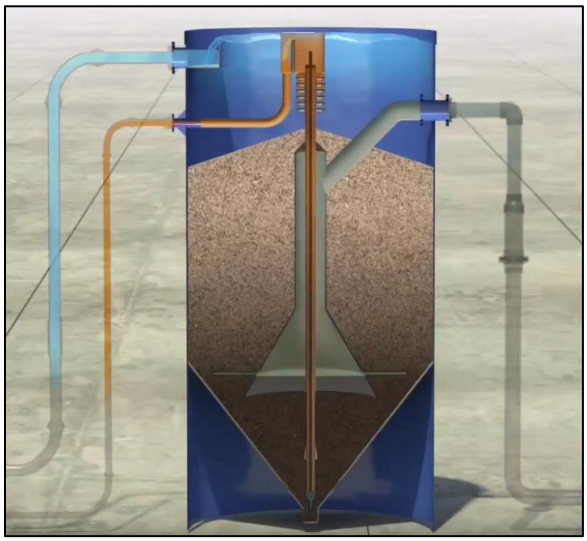


Figure 11 – Upflow Sand Filter Schematic

Advantages

- Highest initial cost option
- Largest footprint, but within existing tankage
- Regional installations
- Minimal control points

Disadvantages

- Multiple filter cells
- Highest headloss

Cost

$9,052,000 initial cost, and an additional annual cost of $269,000. The resultant 20-year total present worth is $12,833,000.

EP-2 Secondary Clarifier Launder Covers

Purpose and Description

The City's existing secondary clarifiers develop significant algae growth at the weirs and launders. To decrease maintenance towards algae control and improve the respective solids (pieces of algae) loading applied to the filters – a peripheral launder cover is recommended to shade the channels from sunlight.

This alternative provides fiberglass launder covers with magnetic clasps for each of the four secondary clarifiers. The covers shield sunlight and prevent the proliferation of algae on submerged surfaces. The panels are able to be tipped upwards for general observation or maintenance, as shown in Figure 12.

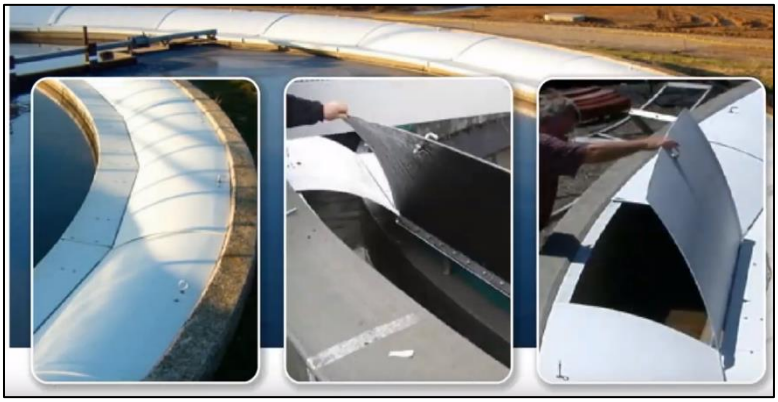


Figure 12 – Clarifier Launder Cover

Advantages

- No impact to tank construction or operation
- Limit algae growth for increased filter performance

Disadvantages

- Covered weirs prevent quick operator observations of tank performance

Cost

$627,000 initial cost.

Disinfection

DI-1 Replacement of Ultra-Violet System

Purpose and Description

The existing ultraviolet (UV) light disinfection system functions as required for current and future system needs; however, reliability of parts inventory may be a concern as the system reaches the end of its useful life. A replacement system was identified to budget for full system replacement during the planning period. Figure 13 illustrates a similar in-channel UV disinfection system that is proposed.

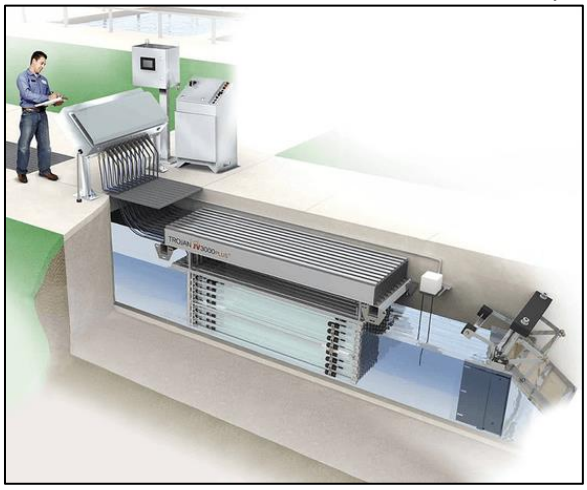


Figure 13 – Ultraviolet Disinfection System

Advantages

- Reduced hydraulic headloss with horizontal lamp system
- Ability to utilize non-proprietary bulbs
- Many local installations

Disadvantages

- None.

Cost

$1,919,000 initial cost.

Sludge Thickening

The facility is currently capacity limited by how much sludge volume can be processed through the anaerobic digesters. The projected flows and loadings would result in an anaerobic digestion hydraulic retention time (HRT) of 12.5 days if no improvements are enacted. This falls short of both the Wisconsin NR110 code required minimum of 15 days HRT, and the industry standard 20 day HRT. Two main improvements may resolve this: decrease the flow/hydraulic loading to the digesters (i.e., improve raw sludge thickening) or increase the anaerobic digestion reaction rates (i.e., operate at higher temperatures). The following alternatives provide varying techniques to accomplish sludge thickening prior to digestion.

ST-1a Combined Raw Sludge Disk Thickening

Purpose and Description

This project is for the thickening of both primary and waste activated sludge on a new raw sludge inclined disk thickening system. However, after reviewing the technology and the required flow rates, this application was disregarded as the manufacturer would require additional units and recommended against this application.

Advantages

- Not applicable.

Disadvantages

- Not applicable.

Cost

Not applicable.

ST-1b Separate Waste Activated Sludge Disk Thickening and Struvite Control

Purpose and Description

This alternative provides mechanical thickening of waste activated sludge (WAS) across a dual-unit disk thickener located in the thickener room. An example installation from Springfield, IL is shown in Figure 14. The existing gravity belt thickener (GBT) used for thickening digested sludge is plumbed for processing WAS, and will serve as a redundant unit. Likewise, the new WAS thickening device could serve as a redundant unit for digested sludge thickening. The thickening system is sized for continuous operation, monitored remotely by camera similar to the digested sludge GBT. The new thickener system

utilizes the WAS pumps in Plant 2 to feed the unit, a new emulsion polymer makedown/feed system, and a new thickened sludge pump to convey thickened WAS (TWAS) to the digesters. The disk thickener system would be expected to achieve a TWAS concentration of 5-6% total solids (TS) concentration, which will cut the WAS flow to digestion by approximately 50%.

With mechanical thickening of WAS, the primary sludge will continue to be thickened alone in the gravity thickener. The City trialed this and observed approximately 4% TS thickened primary sludge was achievable, which reduces the primary sludge flow to digestion by approximately 30%.

The combined impact of this thickening approach yields a future average anaerobic digestion HRT of 18 days.

By separating the contact time of WAS and primary sludge pre-digestion, less phosphorus release is expected and additional struvite concerns are anticipated, particularly on the filtrate after GBT thickening of the digested sludge. Therefore, this option includes an allowance for an additional maintenance dose of ferric chloride to the GBT filtrate to tie-up soluble phosphorus and minimize struvite potential.

Figure 14 – Disk Thickener Example

Advantages

- Low initial cost.
- Low annual cost.

Disadvantages

- Potential digestion stability near threshold HRT
- Ferric chloride costs

Cost

$883,000 initial cost, and an additional annual cost of $38,000. The resultant 20-year total present worth is $1,418,000.

ST-1c Combined Raw Sludge Gravity Belt Thickening

Purpose and Description

This alternative provides mechanical thickening of both primary sludge and WAS across a 2-meter gravity belt thickener located in the thickener room. The basic schematic of a GBT is provided in Figure 15. The existing gravity belt thickener (GBT) used for thickening digested sludge is plumbed for processing primary sludge and/or WAS, and will serve as a redundant unit. Likewise, the new WAS thickening device could serve as a redundant unit for digested sludge thickening. The thickening system is sized for continuous operation, monitored remotely by camera similar to the digested sludge GBT. The new thickener system utilizes the sludge pumps in Plant 2 to feed the unit, new emulsion polymer make-down, and a new thickened sludge pump to convey thickened raw sludge to the digesters. The City trialed this arrangement with the existing GBT and expects to achieve 7% TS concentration, which will cut the thickened sludge flow to digestion by approximately 60%. Other facilities have observed 9% TS output, once optimized.

The impact of this thickening approach yields a future average anaerobic digestion HRT of 23 days.

By maintaining the contact time of WAS and Primary Sludge pre-digestion in a single gravity thickener as well as across the thickener, a similar amount of phosphorus release is expected, thus not increasing concerns for struvite.

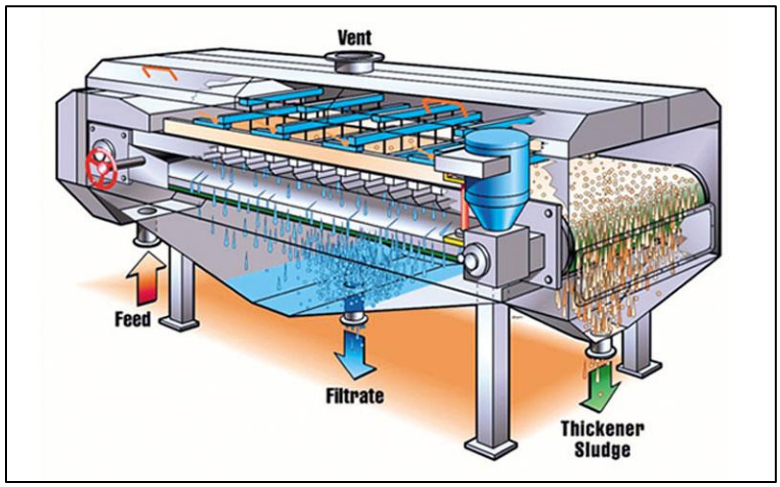


Figure 15 – Gravity Belt Thickener Schematic

Advantages

- Low initial cost. No capital cost change to switch to Alt ST-1d for reduced operational expenses.
- Increased digestion stability
- Minimizes heating demand at digestion
- Blended sludge to the thickener enhances performance

Disadvantages

- Increased polymer cost due to treating all sludge flows
- Higher solids concentration in digesters for mixing

Cost

$858,000 initial cost, and an additional annual cost of $76,000. The resultant 20-year total present worth is $1,927,000.

ST-1d Separate Waste Activated Sludge Gravity Belt Thickening and Struvite Control

Purpose and Description

This alternative provides mechanical thickening of WAS across a 2-meter gravity belt thickener located in the thickener room. The existing gravity belt thickener (GBT) used for thickening digested sludge is plumbed for processing WAS, and will serve as a redundant unit. Likewise, the new WAS thickening device could serve as a redundant unit for digested sludge thickening. The thickening system is sized for continuous operation, monitored remotely by camera similar to the digested sludge GBT. The new thickener system utilizes a sludge pump in Plant 2 to feed the unit, new emulsion polymer make-down, and a new thickened sludge pump to convey TWAS to the digesters. The GBT system on WAS only is expected to achieve 6% TS concentration, which will cut the WAS flow to digestion by approximately 50%.

With mechanical thickening of WAS, the primary sludge will continue to be thickened alone in the gravity thickener. The City trialed this and observed approximately 4% TS thickened primary sludge was achievable, which reduces the primary sludge flow to digestion by approximately 30%. An example of rotary drum thickened WAS is pictured in Figure 16.

The combined impact of this thickening approach yields a future average anaerobic digestion HRT of 18 days.

By separating the contact time of WAS and Primary Sludge pre-digestion, less phosphorus release is expected and additional struvite concerns are anticipated. Therefore, this option includes an additional maintenance dose of ferric chloride.

Advantages

- Low initial cost. No capital cost change to operate in combined mode; however, capacity is limiting.
- Lowest annual cost
- Familiar unit process for automation

Disadvantages

- Potential digestion stability near threshold HRT
- Ferric chloride costs

Cost

$858,000 initial cost, and an additional annual cost of $34,000. The resultant 20-year total present worth is $1,478,000.

ST-1e Combined Raw Sludge Rotary Drum Thickening

Purpose and Description

This alternative provides mechanical thickening of both primary sludge and WAS across two rotary drum thickeners (RDTs) located in the thickener room. The existing gravity belt thickener (GBT) used for thickening digested sludge is plumbed for processing primary sludge and/or WAS, and will serve as a redundant unit. Likewise, the new WAS thickening devices could serve as a redundant unit for digested sludge thickening. The thickening system is sized for continuous operation, monitored remotely by camera similar to the digested sludge GBT. The new thickener system utilizes new sludge pumps in Plant 2 to feed the units, new emulsion polymer make-down systems, and a new thickened sludge pump to push material to the digesters. Performance is anticipated to match the GBT concentrations, but at up to twice the polymer dose, thus the system should achieve 7% TS concentration, which will cut the thickened sludge flow to digestion by approximately 60%.

The impact of this thickening approach yields a future average anaerobic digestion HRT of 23 days.

By maintaining the contact time of WAS and primary sludge pre-digestion in a single gravity thickener as well as across the thickener, a similar amount of phosphorus release is expected, thus not increasing concerns for struvite.

Figure 16 – Rotary Drum Thickener Example

Advantages

- Sludge thickening upsets are contained
- Increased digestion stability
- Minimizes heating demand at digestion
- Blended sludge to the thickener enhances performance

Disadvantages

- Highest initial cost
- Highest annual cost

- Higher solids concentration in digesters for mixing
- Staff familiarity with RDT operation and ability to monitor visually with camera

Cost

$1,646,000 initial cost, and an additional annual cost of $151,000. The resultant 20-year total present worth is $3,769,000.

ST-1f Separate Waste Activated Sludge Rotary Drum Thickening and Struvite Control

Purpose and Description

This alternative provides mechanical thickening of WAS across a rotary drum thickener (RDT) located in the thickener room. The existing gravity belt thickener (GBT) used for thickening digested sludge is plumbed for processing WAS, and will serve as a redundant unit. Likewise, the new WAS thickening device could serve as a redundant unit for digested sludge thickening. The thickening system is sized for continuous operation, monitored remotely by camera similar to the digested sludge GBT. The new thickener system utilizes a sludge pump in Plant 2 to feed the unit, new emulsion polymer make-down, and a new thickened sludge pump to push material to the digesters. Performance is anticipated to match the GBT concentrations, but at up to twice the polymer dose, thus the system should achieve 6% TS concentration, which will cut the WAS flow to digestion by approximately 50%.

With mechanical thickening of WAS, the primary sludge will continue to be thickened alone in the gravity thickener. The City trialed this and observed approximately 4% TS thickened primary sludge was achievable, which reduces the primary sludge flow to digestion by approximately 30%.

The combined impact of this thickening approach yields a future average anaerobic digestion HRT of 18 days.

By separating the contact time of WAS and primary sludge pre-digestion, less phosphorus release is expected and additional struvite concerns are anticipated. Therefore, this option includes an additional maintenance dose of ferric chloride.

Advantages

- Simple and enclosed operation

Disadvantages

- Not amenable to operating in a combined thickening mode
- Potential digestion stability near threshold HRT
- Ferric chloride costs

Cost

$940,000 initial cost, and an additional annual cost of $60,000. The resultant 20-year total present worth is $1,784,000.

Digester Operation, Heating, and Recirculation

As identified in the previous section, the facility is currently capacity limited by anaerobic digester HRT. The projected flows and loadings would result in an anaerobic digestion HRT of 12.5 days if no improvements are enacted, while Wisconsin's NR110 code requires a minimum of 15 days HRT for mesophilic digestion. The previous section examined options to decrease hydraulic loading on digestion

through improved raw sludge thickening. The following alternatives provide varying techniques to accomplish higher-rate digestion.

Typical industry standards for detention time in mesophilic digestion, allow for a 15 to 20 days HRT for stable digestion in a well heated and mixed reactor. Thermophilic reactors often allow for 5 days HRT, but are followed by a 10 day mesophilic to reduce odors, improve gas characteristics, and solids dewatering. The proposed thickening concepts in the previous section enable the projected sludge loadings to satisfy either of these conditions, and a better understanding of operation at max month conditions should be verified to confirm facility tolerance to the minimum HRT for reliable operation.

D-1 Status Quo (Mesophilic, Parallel Feed, Replace Pumps and Heat Exchangers In Kind)

Purpose and Description

This alternative provides a continuation of the current mesophilic anaerobic digestion system. Based on the HRT summary above, this alternative requires sludge thickening improvements to meet code capacity requirements. The costs for sludge thickening are not included herein, but rather the costs within this status quo alternative provide renovation and replacement of equipment at the anaerobic digestion complex. New mixing systems are required under Alternative DM-1 below.

Proposed system improvements include: new dual fuel (biogas and natural gas) boilers, heat exchangers and sludge recirculation pumps and a hot water loop system to share heat between systems, which would also be amenable to heat recovery from a cogeneration system. New structures are required for NFPA 820 compliance, improving suction head on the recirculation pumps, and providing space for the boilers. Estimated average heating demand is 1.7M BTU/hr, 3M BTU/hr peak.

The proposed flow scheme is illustrated in Figure 17. To improve the City's timeframe on when to decide if liquid or cake biosolids should be produced, a post-digester liquid storage buffer tank of 0.7 million gallons was included. This tankage will prevent the City from making cake biosolids from the thickened liquid storage tanks, which limits performance and requires higher operating costs.

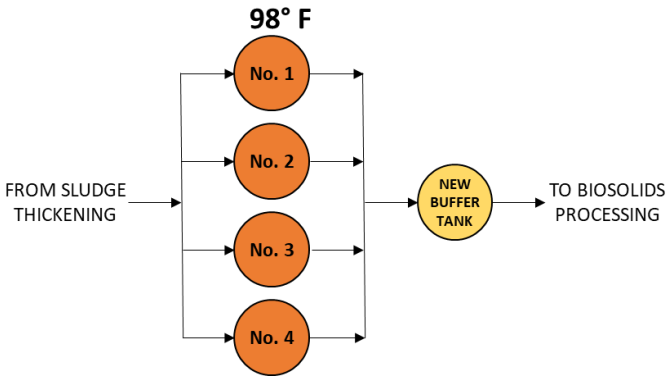


Figure 17 – Mesophilic Digestion Flow Schematic

Advantages

- Familiar unit process operation and control, and biosolids products
- Less sensitive mesophilic temperatures

Disadvantages

- Lower rate system limits total system capacity
- Requires all digesters and high rate thickening to reach goal HRT of over 20 days
- Digested sludge buffer tank consumes WWTP footprint

Cost

$3,486,000 initial cost.

D-2 Temperature Phased Anaerobic Digestion (TPAD) Conversion

Purpose and Description

This alternative provides a higher temperature thermophilic anaerobic digestion system followed by mesophilic often termed temperature phased anaerobic digestion (TPAD). The proposed system is a continuous flow through process, not intended to directly meet the Class A requirements which would require the thermophilic phase be conducted in batches. This alternative maintain digestion stability and performance at higher rates. Although thermophilic systems can be operated at lower HRTs, a minimum of 15 days total is still recommended to maintain high quality methane production and fully stabilized biosolids. Given the higher heating demand with a thermophilic system, sludge thickening is recommended. The costs for sludge thickening are not included herein, but rather the costs within this thermophilic alternative provide renovation and upgraded of equipment at the anaerobic digestion complex. New mixing systems are required under Alternative DM-1 below.

Proposed system improvements include: new dual fuel (biogas and natural gas) boilers, heat exchangers and sludge recirculation pumps and a hot water loop system to share heat between systems, which would also be amenable to heat recovery from a cogeneration system. A sludge cooling heat exchanger is also included to rapidly drop the sludge temperature from 131°F to 98°F and preheat feed sludge. New structures are required for NFPA 820 compliance, improving suction head on the recirculation pumps, and providing space for the boilers. Estimated average heating demand is 3.1M BTU/hr, 5M BTU/hr peak.

The proposed flow scheme is illustrated in Figure 18Figure 17. Since the TPAD digestion system can operate with reduced detention times compared to mesophilic digestion, operation at roughly 75% of the HRT of a mesophilic system, the fourth digester could be multi-purposed as the post-digester liquid storage buffer tank prior to solids thickening/dewatering.

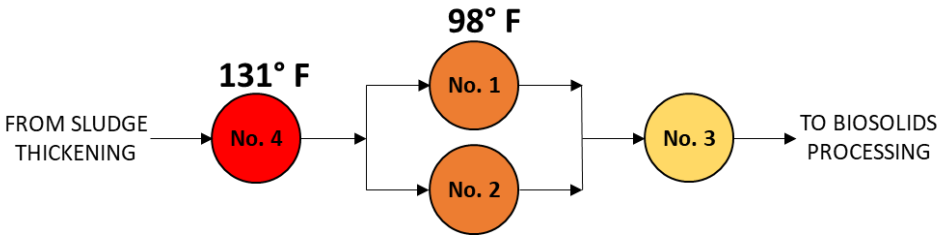


Figure 18 – TPAD Schematic

Advantages

- Lower cost due to eliminated tankage
- Smaller footprint

- Increased capacity for future growth or acceptance of high strength wastes
- Potential for increased volatile solids destruction
- Flexibility for future conversion to batch mode for Class A liquid biosolids

Disadvantages

- Non-familiar system
- Potentially increased carbon dioxide content in biogas
- Potential for odorous biosolids if problems or insufficient mesophilic digestion polishing occurs

Cost

$2,962,000 initial cost. Operational costs are anticipated to be slightly higher than Alternative D-1 due to the higher heating losses at elevated temperatures; however, with heat recovery systems and improved gas production, additional natural gas is not anticipated.

D-3 Waste Activated Sludge Pre-Digestion Conditioning (Temperature and pH)

Purpose and Description

This alternative provides a high temperature and high pH environment to accelerate the decomposition of the difficult to digest cell membranes of the waste activated sludge. Often termed a thermal chemical hydrolysis (TCH) process, the most cost effective versions use higher temperatures (150°F) and dose sodium hydroxide to elevate the pH. The hydrolysis reactor has been demonstrated to increase the digestibility of the WAS, thus increasing gas production and decreasing solids for disposal.

The proposed system is a continuous flow through process, not intended to directly meet the Class A requirements as only WAS is pre-treated. The reactor would be located in the Dewatering Building to minimize new structures. Although the preconditioned system is more digestible, a minimum of 15 days total is still recommended to maintain high quality methane production and fully stabilized biosolids.

Given the higher heating demand to support the preconditioning reactor, WAS thickening improvements are required, but excluded from this alternative. New mixing systems are required under Alternative DM-1 below.

Proposed system improvements include: new dual fuel (biogas and natural gas) boilers, heat exchangers and sludge recirculation pumps and a hot water loop system to share heat between systems, which would also be amenable to heat recovery from a cogeneration system. New structures are required for NFPA 820 compliance, improving suction head on the recirculation pumps, and providing space for the boilers. Also included is a TCH vendor package consisting of: hydrolysis reactor, sodium hydroxide storage and dosing system, dedicated heat exchanger for the high-temperature reactor, recirculation pump, controls and commissioning assistance.

The proposed flow scheme is illustrated in Figure 19Figure 17. Since the TCH system can operate with reduced detention times compared to traditional mesophilic digestion, operation at roughly 75% of the HRT of a traditional mesophilic system, the fourth digester could be multi-purposed as the post-digester liquid storage buffer tank prior to solids thickening/dewatering.

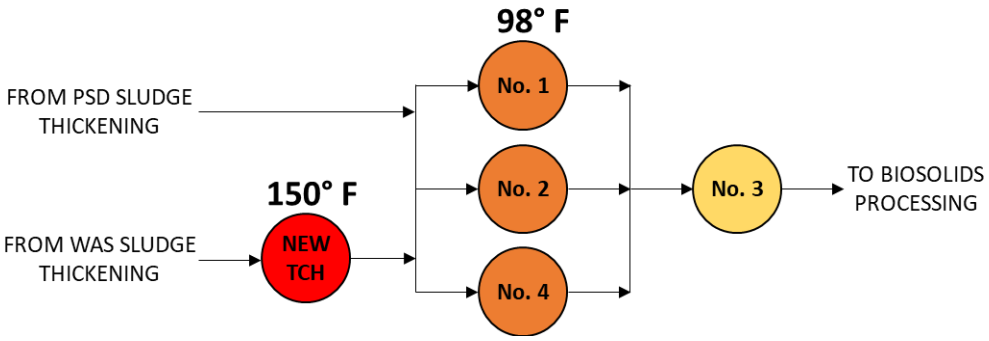


Figure 19 – WAS Pre-Conditioning Example

Advantages

- Increased volatile solids destruction
- Lower cost due to eliminated tankage
- Smaller footprint

Disadvantages

- Increased complexity
- Vulnerability to capacity issues during system maintenance
- Non-familiar system
- Increased chemical costs and handling

Cost

$5,653,000 initial cost, and an additional annual cost of $25,000. The resultant 20-year total present worth is $6,005,000.

Digester Mixing

DM-1 Digester Mixing with Draft Tube & Jet Mixing

Purpose and Description

The City's existing digesters are unmixed, aside from agitation provided by feed and withdrawal, heating system recirculation pumping, and rising biogas bubbles. This level of mixing is not sufficient for high-rate digestion systems with thicker, more viscous sludge. Mechanical mixing was recommended in 2008, and the City has been working towards a plan to implement digester mixing at each of the tanks. As each tank was taken offline for cover repairs and cleaning, new piping penetrations were added to accommodate a pump and nozzle (jet mixing) system in Digesters No. 4, and Digester No. 1 (scheduled to occur in 2019). Digesters No. 1 and No. 4 are situated higher out of the ground, which makes these tanks more amenable to draft tube installation; however, tank 4 has a gas holding side skirt. Schematics of the two types of mixing systems are provided in Figure 20. The City indicated low cost crane services, which enhance service on a draft tube system.

This alternative provides a 30 HP jet mixing systems on the two smaller tanks, operated on VFD to minimize foaming and enable energy savings. Dual 10 HP draft tubes are provided for the two larger tanks. These mixing systems will be tuned upon startup to minimize energy use.

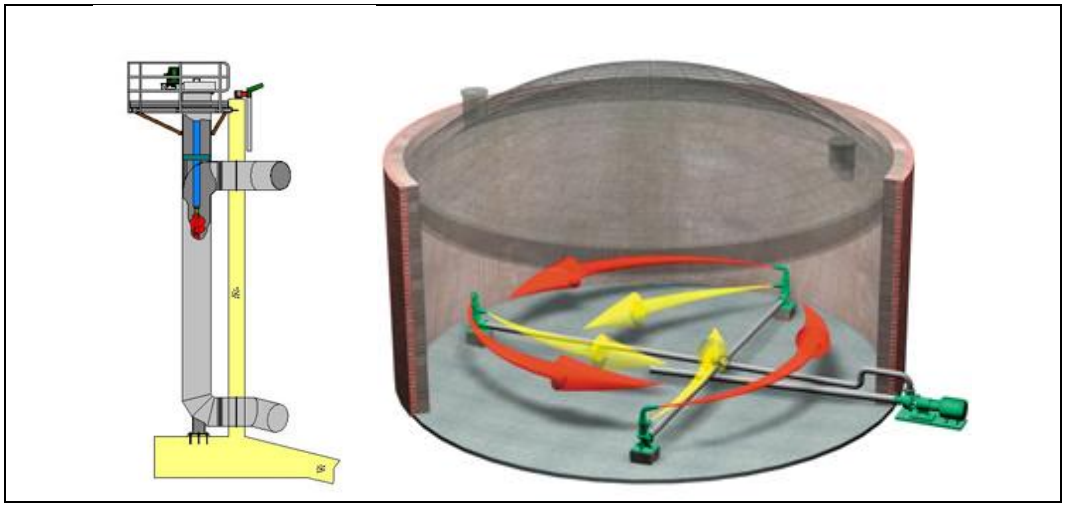


Figure 20 – Digester Mixing Systems (Left: Draft Tube and Right: Jet Mixing)

Advantages

- Increased digester active volume resulting in reliable and efficient digestion
- Allows for high-rate digestion

Disadvantages

- Increased energy cost

Cost

$1,637,000 initial cost, and an additional annual cost of up to $60,000. The resultant 20-year total present worth is $2,481,000.

Biosolids Reuse

The City's current biosolids reuse program has restricted reuse options, as it is a Class B biosolids. The two methods of disposal include agricultural liquid and cake fertilizer and landfilling of cake biosolids. Landfilling is only utilized when all other options have been exhausted. The goals of the following Biosolids Reuse Alternatives are to provide increased storage (up to 330 days), reduce disposal costs, and provide additional pathways for biosolids reuse.

BR-1a Status Quo (80% Liquid 20% Cake to Land Application)

Purpose and Description

This alternative provides a baseline of expected capital and operating costs to provide expanded biosolids storage at a similar proportion of biosolids reuse as primarily liquid, with cake used to supplement when applicable. Liquid biosolids was noted in earlier project workshops to be preferential to most landowners; however, some land types may only be permitted for the application of cake biosolids.

The proposed improvements provide an additional four liquid biosolids storage tanks, and almost 150,000 cf of additional cake biosolids storage. Example storage tanks are pictured in Figure 21. These

improvements, combined with the existing facilities, provide of 330 days total biosolids storage to facilitate annual biosolids land application if weather conditions prevent semi-annual land application.

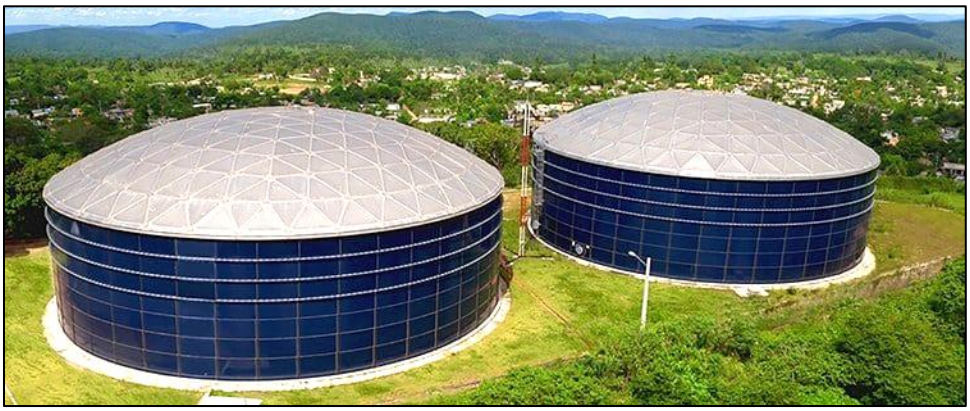


Figure 21 – Liquid Biosolids Storage Tanks

Advantages

- Annual land application ability
- Continued operation familiar to plant staff
- No change to mechanical equipment
- Amenable to phased installation

Disadvantages

- Retains similar land application reliance on weather
- Not Class A biosolids
- Footprint
- Truck traffic
- Hauling costs

Cost

$16,808,000 initial cost, and annual costs of up to $1,425,000, which includes final disposal. Note, this is the projected case of the costs that the WWTF is currently paying. The resultant 20-year total present worth is $36,834,000.

BR-1b 15% Total Solids Liquid Handling (75% Liquid 25% Cake to Land Application)

Purpose and Description

This alternative provides a thermal hydrolysis cell lysis conditioning system on digested sludge to create a liquid/flowable 14-15% TS to significantly increase the storage available, up to 75%, within the existing 12 million gallons of liquid storage. The resulting thickened biosolids are the concentration of a cake biosolids, yet due to cell hydrolysis remain pumpable. The remainder of the 330 day sludge storage is provided within an expanded cake storage facility.

The proposed process utilizes the existing belt press to dewater biosolids directly from digestion. Since the current press achieves 20% TS, a decrease in polymer (or increased hydraulic loading) is expected to de-tune the dewatering to avoid producing cake above the 15% TS goal of a TCH system; higher solids

may exceed the system's mixing and pumping ability. The solids are held in a hopper, prior to being pumped to a batch reactor where low-pressure steam is used to increase temperatures to 167°F (75°C) for 1 hour. High speed shear mixing is used to blend the heated slurry with alkali (typically potassium hydroxide, KOH) to a pH of 9.5. An example thermal hydrolysis system is pictured in Figure 22. The typical KOH feed is 240-280 lb/dT. The system has potential to operate in a recirculation mode, where the lysed biosolids are used to return to digestion for more biogas production, or to the liquid train for a carbon source for releasing phosphorus.

The proposed annual costs include annual marketing, hauling, and disposal cost that reflects the optional biosolids program management offered by Lystek. Their system's output has a high affinity towards a saleable product, due to the added potassium and Class A status.

Since this alternative no longer utilizes the digested sludge gravity belt thickener, this existing device may be repurposed for full-time raw sludge thickening and thereby offset costs associated with new equipment for that purpose. Cost savings to offset this investment are included in this alternative.

The liquid sludge system costs were minimized by excluding redundant systems and extending operational hours. Thus, when the system experiences unexpected shutdowns the system will stop producing the "de-tuned" cake and the belt press "high-solids" settings can be restored to discharge cake to the biosolids truck for normal cake land application purposes.

Figure 22 – Thermal Hydrolysis Reactor Example

Advantages

- Potential to produce Class A biosolids
- Annual land application ability
- Improves fertilizer value to farmers, with revenue potential

- Reuse of existing equipment and structure
- Minimal site footprint required
- Lowest initial cost
- Amenable to phased installation

Disadvantages

- Retains similar land application reliance on weather
- Does not include future reinvestment costs for existing dewatering system repairs
- Retains use of the cake sludge shuttle truck system
- Additional chemical costs

Cost

$13,391,000 initial cost, and annual costs of up to $1,017,000, which includes final disposal, thus, this cost should be contrasted against the status quo annual cost of BR-1a. The resultant 20-year total present worth is $27,683,000.

BR-1c Increase Cake Handling (50% Liquid 50% Cake to Land Application)

Purpose and Description

Evaluation of the operating costs of the liquid and cake handling facilities indicated a lower operational cost associated with production of cake biosolids. The total cost for handling, polymer, labor, hauling, and land application is $256/dry ton (liquid), and $223/dry ton (cake). The majority of the higher costs for liquid are associated with trucking the liquid biosolids to the fields. However, the cost savings associated with an increased cake program can only be realized until the system reaches capacity.

This alternative provides improvements to the biosolids handling system to provide 330 days of sludge storage as half liquid and half cake biosolids. The increased diversity towards cake storage is anticipated to expedite land application during adverse weather. A new dewatering facility will be constructed adjacent to the proposed cake storage to eliminate the capacity limitation associated with the existing cake solids shuttle truck. An example image of cake biosolids land application is provided in Figure 23.

This plan would also require the expansion of the existing liquid storage to an additional 4.3 million gallons of liquid storage tanks similar to the facility's existing biosolids storage tanks.

Despite a reduced cost for land application, this alternative is the highest total present worth alternative. This is due to the high cost of storage, disposal of non-Class A biosolids, and continued use of liquid sludge for half of the material.

Figure 23 – Land Application of Cake Biosolids

Advantages

- Annual land application ability
- Continued operation familiar to plant staff.
- Minimal oversight dewatering operation
- Amenable to phased installation

Disadvantages

- Retains similar land application reliance on weather
- Not Class A biosolids
- Footprint
- Still relatively high truck traffic
- Hauling costs

Cost

$17,779,000 initial cost, and annual costs of up to $1,429,000, which includes final disposal, thus, this cost should be contrasted against the status quo annual cost of BR-1a. The resultant 20-year total present worth is $37,861,000.

BR-1cr Increase Cake Handling and Improve Logistics via Remote Cake Storage

Purpose and Description

This alternative is very similar to BR-1c (see above), in that additional sludge storage is provided for both liquid and cake biosolids, with a preference given to cake biosolids to increase the proportion of cake land applied. In an effort to expedite hauling (the slowest portion of the hauling system), two remote storage facilities would be developed. The proposed remote sites provide approximately 30-days of storage at each of two locations, depicted in Figure 24. The proposed remote sites are scoped for construction on typical load bearing soils, thus a capital cost savings for deep pile foundations was identified.

Figure 24 – La Crosse Regional Area

Advantages

- Annual land application ability
- Continued operation familiar to plant staff.
- Minimal oversight dewatering operation
- Amenable to phased installation
- Decreased truck traffic during land application

Disadvantages

- Retains similar land application reliance on weather
- Not Class A biosolids
- Regular hauling to remote site

Cost

$17,296,000 initial cost, and annual costs of up to $1,304,000, which includes final disposal, thus, this cost should be contrasted against the status quo annual cost of BR-1a. The resultant 20-year total present worth is $35,622,000.

BR-1d Increase Diversity (30% Liquid 70% Dried Biosolids Belt Dryer, with Cake Optional)

Purpose and Description

This alternative provides additional opportunities for biosolids reuse by adding techniques that create a product that can be reused all year. Utilizing less than half of the total biosolids for land application limits the City from being subject to weather related uncertainty associated with the land application program. Of the available methods to achieve Class A Exceptional Quality (EQ) biosolids status, thermal

drying was selected to provide a high-rate, controllable, and minimal footprint process alternative. The total present worth cost of this alternative was optimized by recognizing the intrinsic value of the existing liquid storage tanks. These tanks provide 30% of the projected total biosolids storage requirement, thus a dryer was sized to handle 70% of the biosolids production capacity to avoid the need to build additional storage. Since the heat drying system requires a dewatered cake, the City may retain its ability to land apply a Class B cake for increased biosolids reuse diversity. However, it is anticipated that due to the convenience and predictability of sludge drying, it will be the primary method for biosolids handling.

Thermal drying is listed as a process to further reduce pathogens (PFRP) in 40 Code of Federal Regulations (CFR) Part 503 and utilizes heat to evaporate water from biosolids to produce a Class A product. 40 CFR Part 503 requires that the dryer reduce the moisture content in the biosolids to less than 10% and the temperature of either the biosolids or the wet bulb temperature of the gas in contact with the biosolids exceed 80°C (176°F). Dryers are classified by the method of heat transfer to the wet solids; the two main classifications are convection (direct) and conduction (indirect). Direct dryers consist of heating gas that comes into direct contact with the wet solids, whereas indirect dryers transfer heat from hot oil or steam to the wet solids via a solid plate. Common direct dryers include the rotary drum dryer and the belt dryer. Common indirect dryers include the fluidized-bed dryer, tray dryer, paddle dryer, and rotary chamber dryer. The belt dryer typically provides the most flexibility for using alternative energy sources and for recovering energy, as it utilizes the lowest temperature regime to dry the biosolids. Due to the reduced energy use and increased safety, the belt dryer was selected for evaluation. A typical belt dryer arrangement is depicted in Figure 25.

The existing cake storage area will be repurposed to incorporate a new dewatering room with screw presses (or similar) for dewatering anaerobically digested sludge is anticipated to achieve 20% TS cake. The material is held in a small cake hopper prior to pumping to the sludge dryer. The sludge is evenly applied to the surface of the belt to increase surface area and slowly passes through heated air to evaporate water. Operated with air temperatures between 180°F to 200°F enable the dryer to utilize waste heat from biogas cogeneration equipment. The biosolids are dried to at least 90% TS; which combined with the applied heat, achieves the EPA Class A process to further reduce pathogens and for vector attraction reduction. A biosolids cooler is required to prevent undesirable fires if the product is placed into storage at high temperatures; however, with the low-temperature drying systems the need for a biosolids cooler may be site specific. The final product is conveyed to a storage silo system with a nitrogen purge for safe handling prior to loading trucks.

The dryer capacity is targeted for handling 70% of the sludge load at max week loadings, operating 120 hours per week (24 hour per day, 5 day per week). Continuous operation is efficient for the dryer; however, staff may elect to operate the facility at full capacity for shorter durations during average to low loading conditions. Utilization of recovered waste heat limits the dryer capacity. If dryer capacity is limiting throughput, natural gas may be needed to supplement for operation at higher temperatures (up to 400°F).

Preliminary discussions to haul the dried biosolids for combustion at local biomass power plants have been limited but promising. The main constraint with inputting the dried product to a biomass facility is safe and effective material handling to avoid a damaging public relations fire, and to avoid unwanted material handling complexity with blending the new product. Four major benefits to this consideration

are 1) the ability to off-load biosolids daily, 2) the elimination of a hauling cost, and potential to receive payment or renewable energy credits for diverting biosolids from a worst-case of landfilling, 3) that the biosolids energy is maximized to offset fossil fuels rather than used for fertilizer, and 4) incineration does not require Class A biosolids, which would enable the WWTP to operate the dryer at an aggressive rate to minimize costs and hazards.

Xcel Energy's representative (Brett Connoly) informed us that they have a fluidized bed incinerator located on French Island that is used to incinerate solid waste (Refuse Derived Fuel, RDF) from La Crosse County. The fluidized bed incinerator is the best type of incinerator for burning biosolids because the fluidizing sand bumps the ash off the particle and allows the fire to continue burning the particle. Less unburned ash is produced by this type of incinerator. The incinerator is located in the City of La Crosse and hauling cost would be low. Xcel, however, has a contract with the County of La Crosse to burn all the solid refuse in the county and is at capacity. Of the total amount incinerated, the City's WWTP biosolids would represent less than 10% of the system capacity. Major concerns for material handling and plugging concerns were identified by Xcel. For these reasons, at this time, Xcel will not accept the City's biosolids.

Dairyland Power's representative (Neil Kersback) stated in 2008 (during the previous facility planning) that they have a multiple-hearth incinerator. They burn pulverized coal that is sprayed into the incinerator. The incinerator requires a clean low-moisture fuel. The biosolids would need to be screened, dewatered, and dried before they could be hauled to the site and incinerated. The incinerator is located in Genoa City, Wisconsin. Dairyland would be willing to incinerate the biosolids and test for air stack emissions. The La Crosse biosolids volume would represent less than1% of the estimated BTU value needed to generate electricity at their Genoa City facility. Dairyland would be willing to work with the City and provide some payback if the alternative is cost-effective. The amount of payback would be based upon the BTU value of the biosolids and the cost to test the air stack emissions.

Gundersen Lutheran Medical Center's facility manager (Alan Eber) met with the City and discussed the proposed concept, and was very interested. Gundersen installed a biomass to steam/electricity boiler system in 2013, which they use all year. Mr. Eber expressed confidence that air emissions would not be a deterrent and that their facility could accept biosolids without facility modification. Some minor feed rate and product receiving changes may be required to help make the project a success. Minor testing is required to confirm the residual ash content is acceptable. Gundersen is currently paying to receive wood chips, thus if WWTP biosolids were utilized they could help offset Gundersen's operating costs.

A biosolids drying project has a high initial commitment and capital investment, but drastically improves the diversity towards how biosolids are reused. This option would also transition the City's biosolids towards a Class A product, which could become a future regulatory requirement during the planning period.

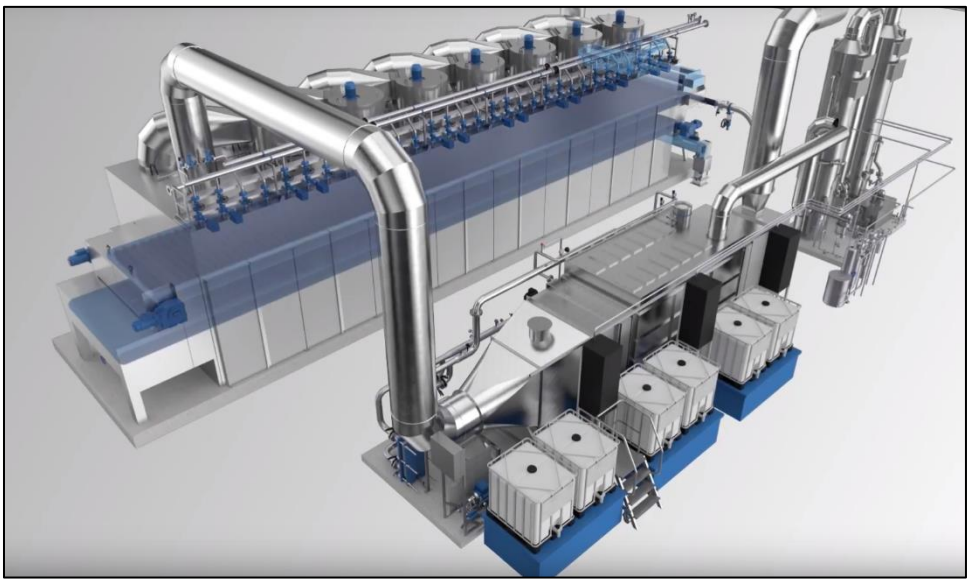


Figure 25 – Sludge Drying System

Advantages

- Partial Class A EQ biosolids
- High likelihood of decreased annual costs due to regular disposal of dried biosolids
- Very robust (future proof) technology/alternative for biosolids stabilization
- Retains liquid storage for cost-reducing opportunities and peak capacity
- Footprint

Disadvantages

- Increased operational complexity
- Increased safety concerns
- High initial cost, minimal phasing ability.

Cost

$23,743,000 initial cost, and annual costs of up to $642,000, which includes final disposal, thus, this cost should be contrasted against the status quo annual cost of BR-1a. The resultant 20-year total present worth is $32,766,000. A sensitivity analysis on disposal and natural gas expenses indicates that the total present worth of this alternative could range $5 million, which could shift recommendations based on the given inputs. Scenarios where biosolids reuse generates revenue would improve this financial analysis; yet, are not recommended to be relied upon for justification of this alternative.

BR-1e Increase Diversity (50% Liquid, 40% Cake, and 10% Dried Biosolids Solar)

Purpose and Description

This alternative provides a similar increased biosolids diversity approach as BR-1d, but provides biosolids drying using solar energy. Similar to belt dryers, solar dryers evaporate water from cake solids to produce a granular biosolids product. Solar dryers operate on the basis of relative humidity using large ventilation fans and a greenhouse effect to provide the evaporative load. Due to the lower loading rate, the surface area is much larger than a belt dryer, especially in northern climates. Typically, solar dryers

have a mobile sludge agitation device that stirs up the sludge, which can create approximately 70% TS material. Solar dryers have been tested and proven to meet Class A biosolids standards, however each installation is site specific and would require extensive testing. An example solar drying greenhouse is shown in Figure 26.

Due to the large area required for each module, only a few modules are able to be sited on the WWTP property. The available footprint restricts dried biosolids capacity to 10% of the total biosolids handling requirement, thus liquid and cake handling and storage are required for the remainder.

Figure 26 – Solar Drying Example

Advantages

- Potential Class A biosolids; requires testing to confirm
- Reduces solids disposal costs
- Low energy requirements
- Safer dried product handling
- Modular design

Disadvantages

- Footprint, limits capacity and consumes space for other treatment needs
- Difficulty achieving Class A status in the winter

Cost

$20,310,000 initial cost, and annual costs of up to $1,278,000, which includes final disposal, thus, this cost should be contrasted against the status quo annual cost of BR-1a. The resultant 20-year total present worth is $38,270,000.

BR-1f Increase Diversity (100% Dried Biosolids, with Liquid or Cake Optional)

Purpose and Description

Similar to alternative BR-1d, this alternative provides additional opportunities for biosolids reuse by processing all of the biosolids to create a product that can be reused all year. Developing a Class A Exceptional Quality biosolids that may be utilized for unrestricted reuse and has the potential to

eliminate the City from being subject to weather related uncertainty associated with the current land application program. This increased ability does not prevent reuse of the biosolids for land application (agricultural fertilizer), but opens new opportunities for more predictable year round uses. Of the available methods to achieve Class A Exceptional Quality biosolids status, thermal drying was selected to provide a high-rate, controllable, and minimal footprint. Operational complexity was minimized by sizing the drying system for 100% of capacity.

This alternative requires construction of many new facilities. In order to minimize the level of new construction, concepts to repurpose existing systems were included whenever feasible. For example, this alternative no longer utilizes the digested sludge gravity belt thickener, this existing device may be utilized to offset costs for raw sludge thickening. Additionally, any proposed cost for a sludge buffer tank (included in Alternative D-1) is not required, as only one method for biosolids handling and the existing liquid storage tanks may be utilized to hold digested sludge during an unplanned solids handling system shutdown. These respective cost savings are included in this alternative.

Since the heat drying system requires a dewatered cake, the City may retain its ability to land apply a Class B cake for increased biosolids reuse diversity. However, it is anticipated that due to the convenience and predictability of sludge drying, it would be the primary method for biosolids handling.

The same thermal drying discussions apply to this alternative as were discussed regarding operational temperatures, equipment types, material handling, and safety as were presented in Alternative BR-1d.

The dryer capacity is targeted for handling 100% of the sludge load at max week loadings, operating 120 hours per week (24 hour per day, 5 day per week). Continuous operation is efficient for the dryer; however, staff may elect to operate the facility at full capacity for shorter durations during average to low loading conditions. Utilization of recovered waste heat limits the dryer capacity. If dryer capacity is limiting throughput, natural gas may be needed to supplement for operation at higher temperatures (up to 400°F).

Preliminary discussions to haul the dried biosolids for combustion at local biomass power plants have been limited but promising. The main constraint with inputting the dried product to a biomass facility is safe and effective material handling to avoid a damaging safety and public relations fire, and to avoid unwanted hassle with blending the new product. Four major benefits to this consideration are 1) the ability to reuse biosolids daily, 2) the elimination of a hauling cost, and potential to receive payment or renewable energy credits for diverting biosolids from a worst-case of landfilling, 3) that the biosolids energy is maximized to offset fossil fuels rather than used for fertilizer, and 4) incineration does not require Class A biosolids, which would enable the WWTP to operate the dryer at an aggressive rate to minimize costs and hazards. The same biosolids incineration discussions apply to this alternative as were discussed regarding Xcel Energy, Dairyland Power, and Gundersen Lutheran as were presented in Alternative BR-1d.

This project has a high initial cost, but drastically improves the diversity towards how biosolids are reused. This option would also transform the City's biosolids into purely a Class A product, which mitigates future regulatory requirements that may develop during the planning period.

Advantages

- Class A EQ biosolids
- Simplified operational decisions
- High likelihood to offset annual costs due to regular disposal of dried biosolids
- Most future proof technology for biosolids stabilization
- Footprint

Disadvantages

- Decreased flexibility/diversity without liquid program
- Increased operational complexity
- Increased safety concerns
- High initial cost, potential phasing ability to install one of the two required dryers.

Cost

$28,982,000 initial cost, and annual costs of up to $671,000, which includes final disposal, thus, this cost should be contrasted against the status quo annual cost of BR-1a. The resultant 20-year total present worth is $38,412,000. A sensitivity analysis on disposal and natural gas expenses indicates that the total present worth of this alternative could range $5 million, which could shift recommendations based on the given inputs. Scenarios where biosolids reuse generates revenue would improve this financial analysis; yet, are not recommended to be relied upon for justification of this alternative.

BR-1g Increase Diversity (50% Liquid 50% Cake to Compost)

Purpose and Description

This alternative was developed to produce an increased quantity of cake biosolids which would be further processed with composting techniques. Composting for Class A biosolids is a viable technique, but requires additional monitoring than merely composting yard wastes. The 2008 Facility Plan considered composting on Isle La Plume; however, was screened from consideration due to odor concerns. The concept of composting was revisited during this evaluation as a partnership with a local composting company which would stockpile bulking agent and biosolids outside of City limits.

This alternative was highly dependent upon cooperation with local composting business owner(s) and since no response was obtained, the evaluation was discontinued as it was not confirmed to be a viable partnership.

Advantages

- Not applicable.

Disadvantages

- Not applicable.

Cost

Not applicable.

BR-2 Improve Biosolids Quality

Purpose and Description

Primary sludge often contains a significant amount of non-biodegradable material that has bypassed influent screening and can accumulate in the digesters, solids handling systems, and biosolids. The City has been questioned about debris observed in the land applied material, which degrades the key public relations component of the biosolids reuse program. In order to extract these inert materials, facilities have successfully added a fine-mesh (5 mm) sludge screen that captures screenings from the raw sludge. The technology is often termed a strainpress, as it receives a pressurized sludge flow and the screenings are pressed out of the unit into a dumpster. The screened sludge is conveyed to digestion for stabilization with no hair or rags to re-agglomerate and consume effective digester volume or cause issues on future dewatering or potential drying systems. Common to screening raw wastewater, the screenings are washed and compacted to approximately 40% TS before being hauled to landfill.

This alternative provides redundant sludge screening for the entire flow of primary sludge using two units. Each unit, depicted in Figure 27, is capable of up to 440 gpm, and could be mounted upstream or downstream of the gravity thickener. If placed upstream of the gravity thickener, the screened sludge could flow by gravity to the gravity thickener and avoid adding another set of sludge pumps to the flow schematic. If placed after the primary sludge is thickened, the system is recommended to be located near the primary digesters.

The proposed system is not intended to screen WAS or TWAS as these streams are not commonly associated with adding debris to the sludge/biosolids. However, the proposed system, intended for primary sludge only, appears to have excess capacity that could be utilized for screening of TWAS if ragging concerns persist.

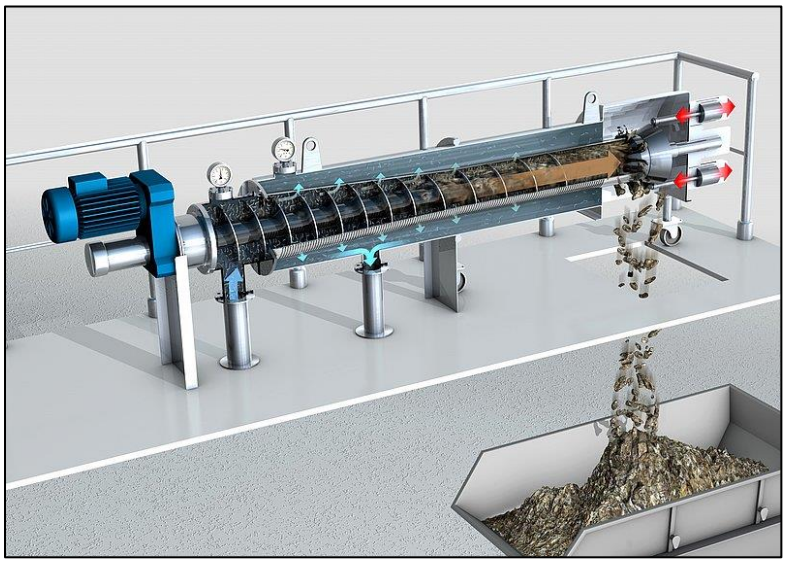


Figure 27 – Sludge Screen Schematic

Advantages

- Decreased requirement for digester cleaning
- Decreased ash content of biosolids after incineration

- Decreased biosolids drying maintenance shutdown events and duration with respect to debris
- Increased runtime before failure for positive displacement sludge and cake pumps

Disadvantages

- Increased landfill costs
- Potential for additional sludge pumping
- Site footprint

Cost

$1,122,00 initial cost.

Biogas

BG-1 Replace Waste Gas Burner

Purpose and Description

A waste gas burner is used to flare the excess gas. The City is planning for increased loadings from the collection system as well as increases to the hauled-in waste program and digestion improvements, all of which will produce more gas. The gas is normally intended to be used for heat and power generation; however, excess gas will need to be flared when these systems are offline or not consuming more than the produced amount. The existing waste gas burner can pass 22,500 cubic feet of gas per hour and is not automatically ignited. This rate may be insufficient at specific operating conditions. If the waste gas burner does not have sufficient capacity then the gas pressure will build and gas will vent from the digester covers' pressure relief valves. Emergency venting out relief valves is provided to prevent cover damage and/or tipping, but is not acceptable for excess gas venting. The need for a second (or replacement) waste gas burner should be evaluated as the City proceeds with solids handling improvements. An example waste gas flare system is shown in Figure 28.

Figure 28 – Waste Gas Flare Example

Advantages

- Auto ignite (higher destruction of volatile compounds)
- Higher capacity system

Disadvantages

- None

Cost

$374,000 initial cost.

BG-2 Biogas Storage

Purpose and Description

Currently, biogas is stored under the floating gas holder cover of one digester. When this digester is taken offline, there is no effective biogas storage. To decouple the digester operation from gas storage, remote, pad-mounted storage was recommended. Additionally, this type of system increases the quantity and control of biogas storage for future biogas utilization.

This alternative is for the construction of a new biogas storage membrane remotely mounted from the digester complex. The size of the storage provides a 12-hour detention for potential peak shaving capabilities. An example installation is pictured in Figure 29.

Figure 29 – Remote Biogas Storage Example

Advantages

- Large storage volume, minimize wasted gas energy
- Enables cogeneration system to operate in peak shaving mode
- Decoupled from digester status

Disadvantages

- Electrical fan required for pressurization
- Additional site space required

Cost

$1,191,000 initial cost.

BG-3a Baseline Energy Consumption

Purpose and Description

Currently, the biogas is only utilized in the sludge boilers. This alternative serves as a baseline to compare with new biogas utilization alternatives in a manner that represents the opportunity expense associated with the status quo during the same 20-year period.

The proposed baseline energy cost uses historical electric utility bills and adds an additional 30% power demand for an assumed set of recommended improvements (phosphorus removal, sludge thickening, and digester mixing).

Advantages

- No capital investment

Disadvantages

- High annual cost
- Wasted renewable biogas energy

Cost

$0 initial cost, and projected annual costs of up to $618,000. Note, this is the projected case of the cost that the WWTF is currently paying. The resultant 20-year total present worth is $8,685,000.

BG-3b Cogeneration Engine

Purpose and Description

Installation of new biogas fueled engine-generator along with gas treatment system for moisture, siloxane and sulfide removal is proposed for this alternative.

Based on the historical gas production and potential future conditions, one 400-kW high efficiency engine generator could be installed and run continuously. Due to the advantageous exhaust and engine block heat recovery, natural gas may not be required to heat the digesters. The gas from the digesters would be cleaned to remove moisture, hydrogen sulfide and siloxanes. Moisture and hydrogen sulfide is removed to prevent corrosion. Siloxanes deposit on hot moving engine parts causing additional wear and can ultimately lead to complete failure. The operation and maintenance costs reflect routine maintenance as well as media replacement and long term overhaul costs. The new engine would be located in an outdoor enclosure north of the digesters, near the cold storage building. An example of these packaged systems is depicted in Figure 30. An alternate location could be inside the cold storage building if the school district allows use of the building. A new gas conditioning room is included to improve operation and maintenance on the key components of the gas skid.

The recovered heat would be sent to the digester gas boiler system for process and potentially building heat. Power that is generated will be conditioned through switchgear and synchronized with the incoming line power for use in the facility's electric power grid via the proposed main switchgear at Plant 2. Cogeneration could be integrated to the existing 2400V main gear, but would require a step-up 480V:2400V transformer that would be replaced when the main gear is updated. The engine generator system typically exhibits modulating turndown for moderate flexibility for pacing to gas production based on available gas in storage. Although a second engine is not provided, this should be considered for future expansion. Backup power diesel engine generators are already familiar to plant staff, which are relatively similar to cogeneration systems.

Figure 30 – Cogeneration Example

Advantages

- Minimized capital cost
- Engine is always fully utilized

Disadvantages

- Peak biogas not fully utilized
- Does not offset entire WWTP electrical demand

Cost

$3,907,000 initial cost, the projected annual costs of $618,000 will be reduced by power generation offsets of $261,000; however added maintenance costs of $88,000 per year are expected. The net energy savings results in an estimated simple payback of 17-23 years. Focus on Energy grants are typically awarded to renewable energy projects like this, and assist in decreasing the payback period by a year or two.

BG-3c Peak Shaving Cogeneration Engine

Purpose and Description

This alternative is similar to Alternative BG-3b (cogeneration engine with gas treatment), but provides a larger generator to utilize more biogas. Installation of a larger biogas fueled engine-generator would result in more periods of exporting energy. The buy-back (exporting) electric rate from Xcel energy is not heavily incentivized for new contracts. Xcel indicated 2019 agreements would provide $0.03202/kWh and $0.02391/kWh for on-peak and off-peak, respectively. The more cost-effective strategy is to offset WWTP electricity usage, and maximize the offset of all peak usage charges as these cost $0.076/kWh, which is 50% more than the off-peak rate, excluding demand charges.

In tandem with 12-hours of biogas storage (identical to Alternative BG-2, included herein), this engine will be able to utilize nearly all of the biogas and provide more kW during the peak kW-hr period at the facility and thus reduce monthly charges significantly. Power demand meters could be added to a new main switchgear to alert the operations staff to ramp up the engine generator for optimal peak demand shaving abilities.

Based on the historical gas production and potential future conditions, one 600-kW high efficiency engine generator could be installed and run continuously. Due to the advantageous exhaust and engine block heat recovery, natural gas may not be required to heat the digesters. The gas from the digesters would be cleaned to remove moisture, hydrogen sulfide and siloxanes. Moisture and hydrogen sulfide is removed to prevent corrosion. Siloxanes deposit on hot moving engine parts causing additional wear and can ultimately lead to complete failure. The operation and maintenance costs reflect routine maintenance as well as media replacement and long term overhaul costs. The new engine would be located in an outdoor enclosure north of the digesters, near the cold storage building. An alternate location could be inside the cold storage building if the school district allows use of the building. A new gas conditioning room is included to improve operation and maintenance on the key components of the gas skid.

The recovered heat would be sent to the digester gas boiler system for process and potentially building heat. Power that is generated will be conditioned through switchgear and synchronized with the incoming line power for use in the facility's electric power grid via the proposed main switchgear at Plant 2. Cogeneration could be integrated to the existing 2400V main gear, but would require a step-up 480V:2400V transformer that would be replaced when the main gear is updated. The engine generator system typically exhibits modulating turndown for moderate flexibility for pacing to gas production based on available gas in storage. Backup power diesel engine generators are already familiar to plant staff, which are relatively similar to cogeneration systems.

Advantages

- Optimized capital cost with biogas utilization (better economy of scale)
- Additional capacity to capture current and future gas production
- Includes Alt BG-2 costs
- Potential to offset entire WWTP electrical demand

Disadvantages

- More complicated operational strategy to maximize return on investment

Cost

$5,344,000 initial cost, the projected annual costs of $618,000 will be reduced by power generation offsets of $373,000; however added maintenance costs of $110,000 per year are expected. The net energy savings results in an estimated simple payback of 16-20 years. Focus on Energy grants are typically awarded to renewable energy projects like this, and assist in decreasing the payback period by a year or two.

BG-3d Cogeneration Microturbine

Purpose and Description

Installation of new biogas fueled microturbine generators along with gas treatment system for moisture, siloxane and sulfide removal is proposed for this alternative.

Based on the historical gas production and potential future conditions, two 200-kW (or six 65-kW) microturbine generators could be installed and run continuously.

Unlike reciprocating engines, microturbines lack engine block heat recovery, thus natural gas is anticipated to heat the digesters. The gas from the digesters would be cleaned to remove moisture, hydrogen sulfide and siloxanes. Moisture and hydrogen sulfide is removed to prevent corrosion. Siloxanes deposits are extremely damaging to microturbines, which operate at very high rpms and can ultimately lead to complete failure. The operation and maintenance costs reflect minimal maintenance, but include a long-term (10-year) expected overhaul of the entire turbine core. The new units would be located in separate outdoor enclosures north of the digesters, near the cold storage building. A similar example is depicted in Figure 31, below, from Sheboygan, WI. An alternate location could be inside the cold storage building if the school district allows use of the building. A new gas conditioning room is included to improve operation and maintenance on the key components of the gas skid.

The recovered exhaust heat would be sent to the digester gas boiler system for process and potentially building heat. Power that is generated will be conditioned through switchgear and synchronized with the incoming line power for use in the facility's electric power grid via the proposed main switchgear at Plant 2. Cogeneration could be integrated to the existing 2400V main gear, but would require a step-up 480V:2400V transformer that would be replaced when the main gear is updated. The engine generator system typically exhibits modulating turndown for moderate flexibility for pacing to gas production based on available gas in storage.

Figure 31 – Microturbine Example

Advantages

- Low maintenance
- Multiple units enable continued generation during maintenance

Disadvantages

- Does not provide adequate heat recovery for the steady 2 MMBTU sludge heat load
- Reduced total energy captured
- Local installations have experienced reliability/robustness concerns

Cost

$3,929,000 initial cost, the projected annual costs of $618,000 will be reduced by power generation offsets of $212,000; however added maintenance and energy costs of $60,000 per year are expected. The net energy savings results in an estimated simple payback of 23-26 years. Focus on Energy grants are typically awarded to renewable energy projects like this, and assist in decreasing the payback period by a year or two.

BG-3e Pipeline to Utility

Purpose and Description

This alternative captures 100% of the biogas and provides gas conditioning to create a pure methane gas (similar in characteristics to natural gas) which can be exported (sold) to the natural gas utility. The current legislature provides incentives to the generation of renewable fuel credits, especially those linked to use in vehicles. The payment for these Renewable Identification Numbers (RINs) is currently very attractive, in that systems could show a payback in under 5 years. However, the compressed natural gas market is growing but still in its development, therefore, the ability to claim long-term credits is concerning.

New private venture capital companies are exploring this market and may offer a risk-adverse option that enables the City to tap into this attractive RIN market with a minimal investment usually through a

vehicle fueling system. These systems are usually structured to control revenue sharing such that the private entity is paid first; however, careful negotiation of contracts could result in a favorable option. A positive feature of these systems is that the gas treatment investment is also amenable to cogeneration.

A major capital cost to this system is the gas treatment, compression, and conveyance to the nearest interstate transmission line per guidance from natural gas utility representatives. The gas handling system is depicted in Figure 32. Xcel Energy services the local natural gas lines; however, Northern Gas owns the transmission line which crosses the Mississippi River at Barron Island, 1.5 miles upriver. The proposed system would use trenchless construction to install an HDPE gas line from the WWTP to the transmission line. The receiving line pressures are unknown, but were estimated at 1,000 psi for system sizing and O&M costs.

Since this alternative utilizes 100% of the biogas to generate RINs, no biogas would be available for heating at the WWTP; which requires the purchase of natural gas. However, given the current incentives the cost differential makes this concept a financially feasible alternative that some utilities are moving forward with construction.

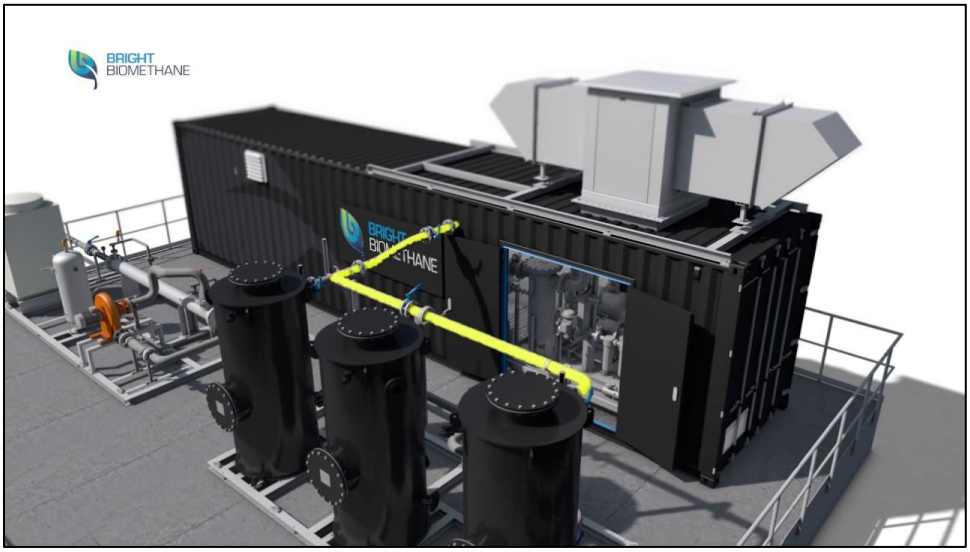


Figure 32 – Biogas Cleaning and Compression System Example

Advantages

- 100% biogas utilization
- Currently high value for renewable energy credits

Disadvantages

- Unsustainable economics, requires purchase of natural gas
- Difficult communication/cooperation with natural gas utility
- Environmental/wetland restrictions
- Liability concern with high pressure gas leaks/explosions

Cost

$9,014,000 initial cost, the projected annual costs of $618,000 will be reduced by RIN sales of $473,000; however added maintenance and energy costs of $76,000 per year are expected. The net energy

savings results in an estimated simple payback of 23 years, pending certainty of the RIN market. Focus on Energy grants are typically awarded to renewable energy projects like this, and assist in decreasing the payback period by a year or two.

Site and Utilities

U-1 Replace Facility Wide Heating System

Purpose and Description

The existing heating system in the facility includes two boiler systems with hot-water heat, and unit heaters at various locations. The boilers heat Plant 1 and the dewatering/chemical buildings. The boilers are old, at the end of their useful life, and in need of replacement. Some of the unit heaters are also in need of replacement. A facility-wide heating system would replace the existing boilers with either hot-water heat. The new boilers would be more efficient and could work in cooperation with the anaerobic digestion heating system. Digester gas would be the main fuel to heat the facilities through the digester gas boilers discussed in Alternate D-1 or D-2 and natural gas fired backup boilers would be used as needed. There is presently sufficient excess gas to provide at least 1.5-MMBH of heat to the building heating system.

The boilers would be located near or with the digester heating boilers in a central area. The boilers create hot water to match with those heating the anaerobic digesters. Eliminating 1.5-MMBH of natural gas consumption has the potential to save $50,000/year. However, not all of these savings will be directly seen as an offset, but rather an avoidance because building heating requirements should increase as the ventilation rates increase to meet NFPA 820 code requirements for wastewater treatment facilities. This will impact the boiler size and fuel requirements for the plant.

Advantages

- Equipment replacement
- Improved efficiency
- Utilization of digester gas
- Reduced maintenance

Disadvantages

- Routing gas or heat loop to each room

Cost

$605,000 initial cost.

U-2 Comply with NFPA 820 & 10-State Standards for Buildings

Purpose and Description

NFPA 820 is the Standard for Fire Protection in Wastewater Treatment and Collection Facilities. This standard has been adopted to provide guidance for determining classification of hazardous spaces in treatment facilities. Based upon the classification of hazardous spaces, ventilation and equipment requirements are determined. The intent of the document is to develop safeguards against fire and explosion hazards.

This alternative provides improvements to existing structures up to code to improve safety, equipment longevity, and enable modifications to electrical and controls. The wastewater facilities were generally reviewed for conformance with NFPA 820 and found to have a need to implement additional ventilation, equipment changes and/or separation to meet the intent of the standard. The Administration Building, Plant 1, and Primary Effluent Pump Building, Plant 2, need separation and additional ventilation. The Digester Building also requires separation of equipment from the gas handling equipment (drip and condensate traps) as well as ventilation improvements. The Dewatering and Liquid Sludge Storage Buildings require upgrades to their ventilation.

Advantages

- Improved safety and equipment life.
- Comply with hazardous code requirements
- Prevent fire and explosion
- Improved aesthetics in hazardous rated areas

Disadvantages

- Requires physical separation
- Operational expense for increased ventilation rates

Cost

$2,183,000 initial cost.

U-3 Increase W3 System Capacity

Purpose and Description

The facility installed a reclaimed effluent (W3) system to service process needs throughout the facility instead of purchasing potable water from the La Crosse Water Department. Historically, the annual cost for water purchase was roughly $120,000. The W3 system provides sufficient capacity for the existing gravity belt thickener, but cannot sustain supply to other major loads such as the belt filter press simultaneously.

This alternative would construct additional plant water (W3) pumps for higher capacity, chlorination system, controls, piping and valves to provide the non-potable water needs. Two additional 150 gpm pumps are included to increase the capacity of the W3 system for operation of new mechanical sludge dewatering equipment.

Advantages

- Minimizes use of City water supply to supplement during periods of heavy water demand

Disadvantages

- None

Cost

$369,000 initial cost.

U-4 New Transformers and One Electrical Service

Purpose and Description

This project provides new primary metering and switchgear from the utility with increased redundancy for long-term reliability and reduced maintenance. The new main power distribution gear will backfeed new 13.8 kV transformers to step power down at all existing transformers to 480 V, as opposed to the current and obsolete 2400 V distribution system.

The proposed system includes the following:

- A fusible 13.8 kV switchgear cabinet of four sections: Primary Meter, Disconnect, and a pair of redundant feeders to the indoor main power distribution. The redundant main-tie-main arrangement minimizes single point failures. This gear would be exterior on the utility feed west of the Plant 2 building.
- An indoor 13.8 kV distribution board of feeding the following: Plant 1, Plant 2, Sludge, UV Disinfection, and Future Cogen. These sections would feed new 13.8 kV concrete encased ductbanks to each respective building. New 13.8 kV stepdown to 480 V transformers would replace the current 2400 V to 480 V transformers across the site. This new 13.8 kV distribution board could be constructed adjacent to the existing 2400 V system; and as loads are transferred, added sections can be located in place of removed sections to optimize layout in the Plant 2 Blower Room.
- Consideration could be given to purchasing the existing utility owned 13.8 kV to 480 V UV transformer.
- Two of the existing 400kW 480V standby generators (serving Plant 1 and Plant 2) are recommended for replacement. Replacement with natural gas was included to best-match the existing system; however, diesel power could be considered for a cost savings.
- The other two existing 480 V standby generators throughout the facility would remain and would be utilized to continue powering the facility during construction sequencing.
- A new 480V standby generator is recommended for providing reliable standby power to the HSi Blower system to serve operation of two existing blowers.

Advantages

- Single utility meter
- Enhanced plant redundancy and reliability
- Increased electrical system longevity
- Improved compatibility with future cogeneration
- Compliance with permit limits during power failure

Disadvantages

- Limited construction phasing options due to cost savings with merged systems

Cost

$4,521,000 initial cost.

U-5 Floodplain and Site Access Improvements

Purpose and Description

One of the concerns at the facility is flooding due to high Mississippi River stages. Specifically, flooding occurs at the north end of the facility through the northwest gate. The City has historically sandbagged this location, which is time consuming and blocks the entrance until removed. The other portions of the site do not exhibit the same level of flooding risk, but should be reviewed further to avoid floodwaters from entering an alternate location. To block the intrusion of floodwaters, this project installs a flood control gate and improved earthen berms at that entrance. The flood gate is a double walled aluminum lift-hinged gate that does not require recessed ground channels or raised ground beams or ramps. When open, the gate swings 90-degrees and would be operated manually. High compression seals require a flat surface, thus mounting walls/abutments are included. The gate is ratcheted lower at the hinge upon closing the gate to create a tight seal, and is held down with a latch. A schematic of this type of gate is provided in Figure 33.

Figure 33 – Flood Gate Example

A lower cost method of flood control could consider 1) a stop-log style gate (manually inserted upon predicted high flood elevation similar to sandbags) or 2) a gradually elevated grade at the entrance to provide a passive bermed entrance. This option requires a topographical survey to confirm feasibility.

Also included in this option is a hydrogen sulfide control system for the La Crescent forcemain. A basic bioxide chemical feed system injects nitrate to the water to prevent the bacteria from making sulfides. This is a low-cost option for corrosion control; however, note that the system adds nitrates which are undesirable from a biological phosphorus removal perspective.

Advantages

- Reduced risk of flood hazard
- Reduced labor to establish protection
- Increased access pre- and post- each event

Disadvantages

- Adds complexity to truck traffic access and existing security gate

Cost

$361,000 initial cost.

Alternatives Summary

The alternatives were presented and discussed in depth at the Alternatives Evaluation Workshop. The project team selected the following lowest initial cost items, listed in Table 1, as "baseline" improvements that would be required to continue the current treatment requirements. These serve as a minimum standard for which modified packages can be considered.

Table 1 – Baseline Improvements Package

Unit Process	Alternative	Description
Headworks	**H-1**	**Fine Screen** Replace the existing comminutors with a second fine screen
	H-2	**Grit System Programming** Revise grit system programming to react faster to incoming peak flows
	H-3	**HVAC Replacement** Replace existing headworks make up air units and exhaust fans
	H-4	**Septage and Holding Receiving** Add new septage and holding waste receiving facilities to controllably receive waste from regional haulers serving the greater La Crosse County area not in the sewer service area
Primary Clarification	**PC-1**	**Scum Pit 3 (Scum Pump) w/ HSW** Revise existing scum handling system for Primary Clarifiers No. 1, 2, and 3 inclusive of additional high strength waste receiving for anaerobic digestion
	PC-2	**HSW and Septage Receiving at GT 1** Repurpose Gravity Thickener No. 1 to equalize loadings of high strength waste for anaerobic digestion
Activated Sludge	**AS-1**	**A/S Reactor Splitter Box** Add new primary effluent splitter box prior to the activated sludge reactors for improved biological stability and performance
	AS-2	**Large Blade Submersible Selector Mixers** Replace existing selector zone mixers with more efficient large blade submersible mixers
	AS-3	**Modified UCT** Revise existing unaerated selectors to the modified University of Cape Town (UCT) process for improved nutrient removal
	AS-4	**Sec Clar Splitter Box** Add new mixed liquor suspended solids splitter box prior to the secondary clarifiers for improved effluent quality when loaded uniformly

Unit Process	Alternative	Description
	AS-5b	**Modify RAS Piping to Minimize Deposition** Add new buried valves on the existing return activated sludge suction piping to facilitate system maintenance
	AS-6	**Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal** Future planning level cost for new secondary clarifier mechanisms with improved flocculating inlets and rapid sludge withdrawal
	AS-7	**Sec Clar Density Current Baffles** Add new density current baffles to existing secondary clarifiers for improved effluent TSS quality
Effluent Phosphorus Treatment	**EP-1b**	**Outside-In Cloth Disk Filter with Coagulation Zones** Add new right-sized, tertiary pumping system, chemical conditioning system for phosphorus precipitation, and disc filters prior to disinfection
	EP-2	**Clarifier Launder Covers** Add new secondary clarifier effluent launder covers to minimize algae growth prior to the tertiary disc filters
Disinfection	**DI-1**	**Replacement UV System** Future planning level cost for effluent ultraviolet disinfection system replacement when existing system reaches its end of useful life
Sludge Thickening	**ST-1d**	**Separate WAS Sludge GBT and Struvite Control** Add new gravity belt thickener system to provide WAS thickening to improve anaerobic digestion detention time. Piping will include the ability to process primary sludge for future phased digestion thickening needs.
Digester Operation, Heating, and Recirculation	**D-1**	**Mesophilic Digestion** Replace existing digester heating system with new boilers, heat exchangers, recirculation pumps, and heat loop system
Digester Mixing	**DM-1**	**Digester 1&4 Draft Tube 2&3 Jet Mixing** Add new digester mixing systems to each digester
Biosolids Reuse	**BR-1a**	**Status Quo (80% Liquid 20% Cake to Land Application)** Add additional liquid and cake biosolids storage volume to increase capacity for annual biosolids land application.
	BR-2	**Improve Biosolids Quality** Add new primary sludge screen to remove debris prior to thickening, digestion, and land application or drying
Biogas	**BG-1**	**Replace Waste Gas Burner** Replace existing biogas waste gas burner with larger capacity automatic flare for improved emissions control
	BG-3a	**Baseline Energy Consumption** Continue purchasing energy from the electric utility as needed for current and future treatment needs.
Site and Utilities	**U-1**	**Replace Facility Wide Heating System** Replace existing aging, independent, and inefficient house boilers with a facility wide heating system connected to the digester heat loop
	U-2	**Comply with NFPA 820 & 10-State Stds for Buildings** Replace existing ventilation systems, provide physical separation for

Unit Process	Alternative	Description
		hazardous areas, and modify electrical systems to comply with National Fire Protection Association (NFPA) 820 and State code for buildings
	U-3	**Increase W3 System Capacity** Revise existing non-potable effluent water pumps to increase system capacity for proposed systems
	U-4	**New Transformers and One Electrical Service** Replace existing electrical services, main distribution gear, conduits and conductors, and transformers to all facility motor control centers. Also replace and add key standby generators.
	U-5	**Floodplain and Site Access Improvements** Revise existing site entrance to provide improved flood control and revised pavement for hauler access

The total initial cost of this Baseline Package is approximately $49.3 million; with a 20-year total present worth of $85.2 million.

Detailed in TM1, methodology was outlined to evaluate and consider alternatives that may have a higher initial cost, but provided a higher value, either as a lower total present worth or better non-economic score. This technique enables the City to use a big-picture “end-in-mind” approach, to avoid the potential of constructing facilities that would limit future flexibility or expansion.

Non Economic Evaluations

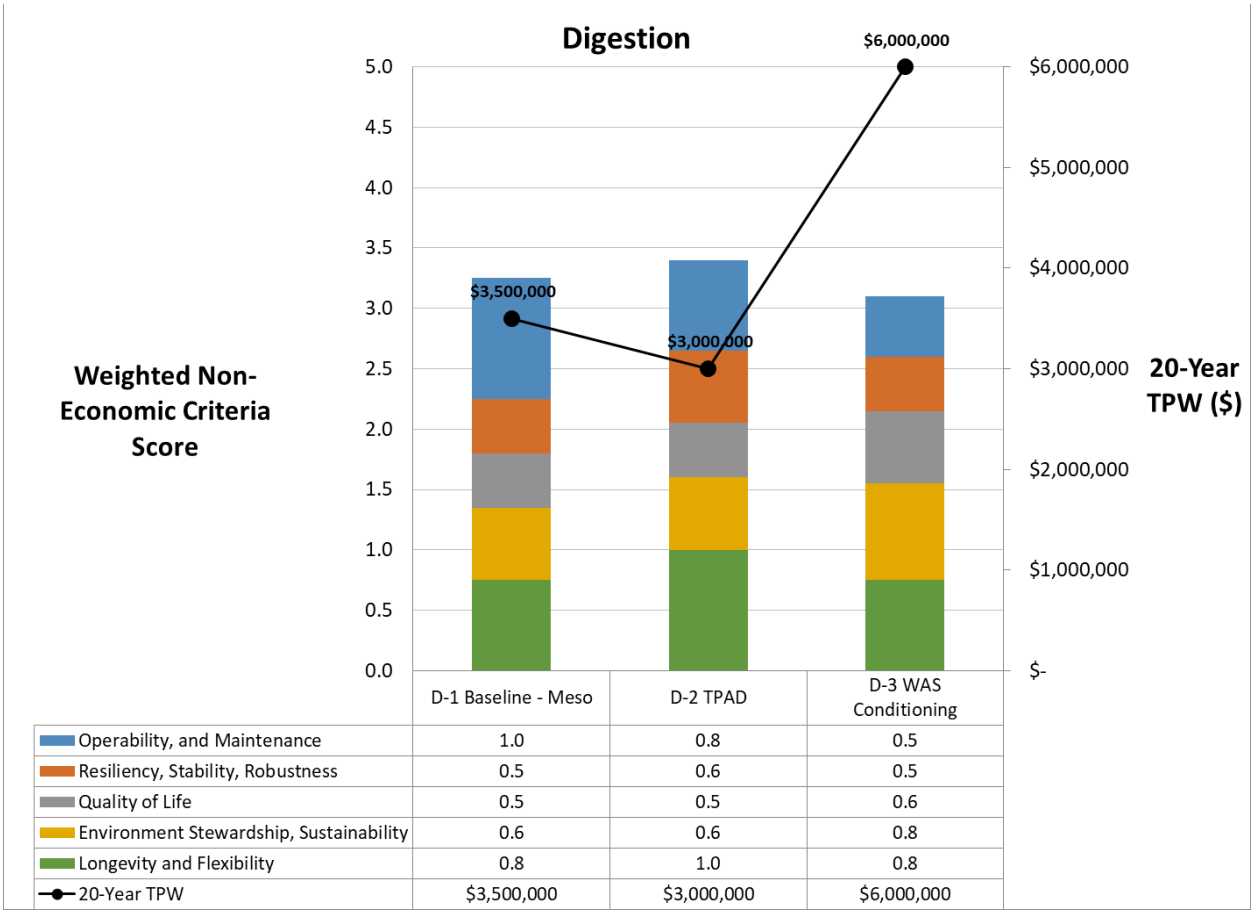
The following evaluations present non-economic evaluations developed by the project team for three unit processes identified to have potentially improved project value if a non-baseline alternative was selected. The following unit processes were reviewed in detail:

- Digester Operation, Heating, and Recirculation
- Biosolids Reuse
- Biogas Utilization

Each evaluation contrasted the relative score between the baseline, and proposed alternatives for five main categories:

- Operability and Maintenance
- Resiliency, Stability, and Robustness
- Quality of Life
- Environment Stewardship and Sustainability
- Longevity and Flexibility

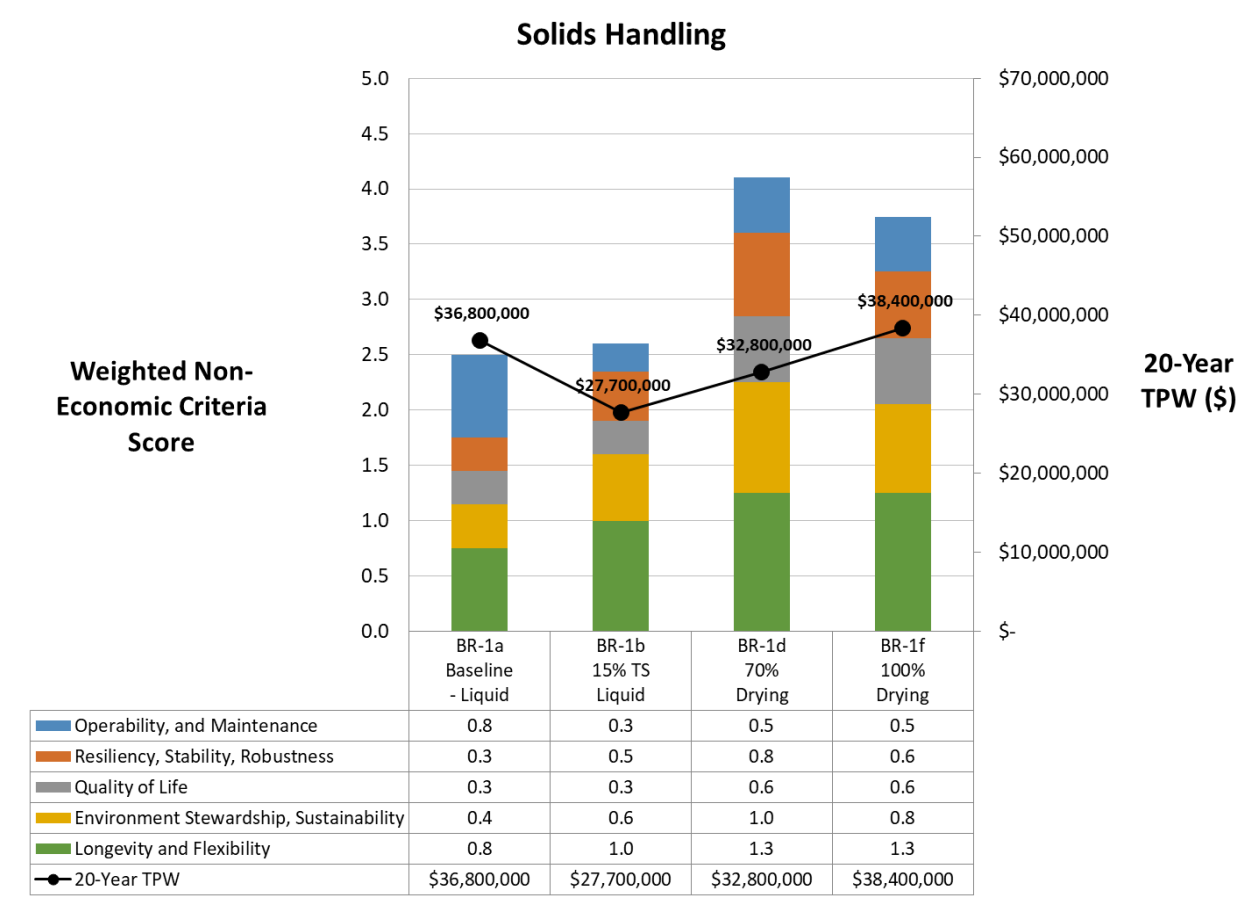
As prescribed in TM1, each alternative was scored from 1-5 in each of these areas, and a weighting factor was applied based on the overall importance of that category to the WWTP’s end goals. Figure 34, Figure 35, and Figure 36 exhibit the result of this non-economic review. Although selection of the preferred alternative is priority, the project team kept a focus on costs by including the total present worth on each figure. This enabled the team to review the alternatives’ economic and non-economic values simultaneously.



	D-1 Baseline - Meso	D-2 TPAD	D-3 WAS Conditioning
Operability, and Maintenance	1.0	0.8	0.5
Resiliency, Stability, Robustness	0.5	0.6	0.5
Quality of Life	0.5	0.5	0.6
Environment Stewardship, Sustainability	0.6	0.6	0.8
Longevity and Flexibility	0.8	1.0	0.8
20-Year TPW	$3,500,000	$3,000,000	$6,000,000

Figure 34 – Digester Operation, Heating, and Recirculation Non-Economic Scores

As exhibited in Figure 34, Alternative D-2 (TPAD) provides a higher non-economic score at a lower total present worth and is recommended to replace the baseline Alternative D-1.



	BR-1a Baseline - Liquid	BR-1b 15% TS Liquid	BR-1d 70% Drying	BR-1f 100% Drying
Operability, and Maintenance	0.8	0.3	0.5	0.5
Resiliency, Stability, Robustness	0.3	0.5	0.8	0.6
Quality of Life	0.3	0.3	0.6	0.6
Environment Stewardship, Sustainability	0.4	0.6	1.0	0.8
Longevity and Flexibility	0.8	1.0	1.3	1.3
20-Year TPW	$36,800,000	$27,700,000	$32,800,000	$38,400,000

Figure 35 – Biosolids Reuse Non-Economic Scores

As exhibited in Figure 35, Alternative BR-1b (15% TS Liquid) provides a similar non-economic score, at a lower total present worth. However, the significantly higher non-economic score, and similar total present worth to the baseline for Alternative BR-1d provides a larger value to the City and is recommended to replace the baseline Alternative BR-1a. Due to conservatism applied to the projected operating costs, Alternative BR-1d has a high potential to further reduce the total present worth with a network of dried biosolids end users.

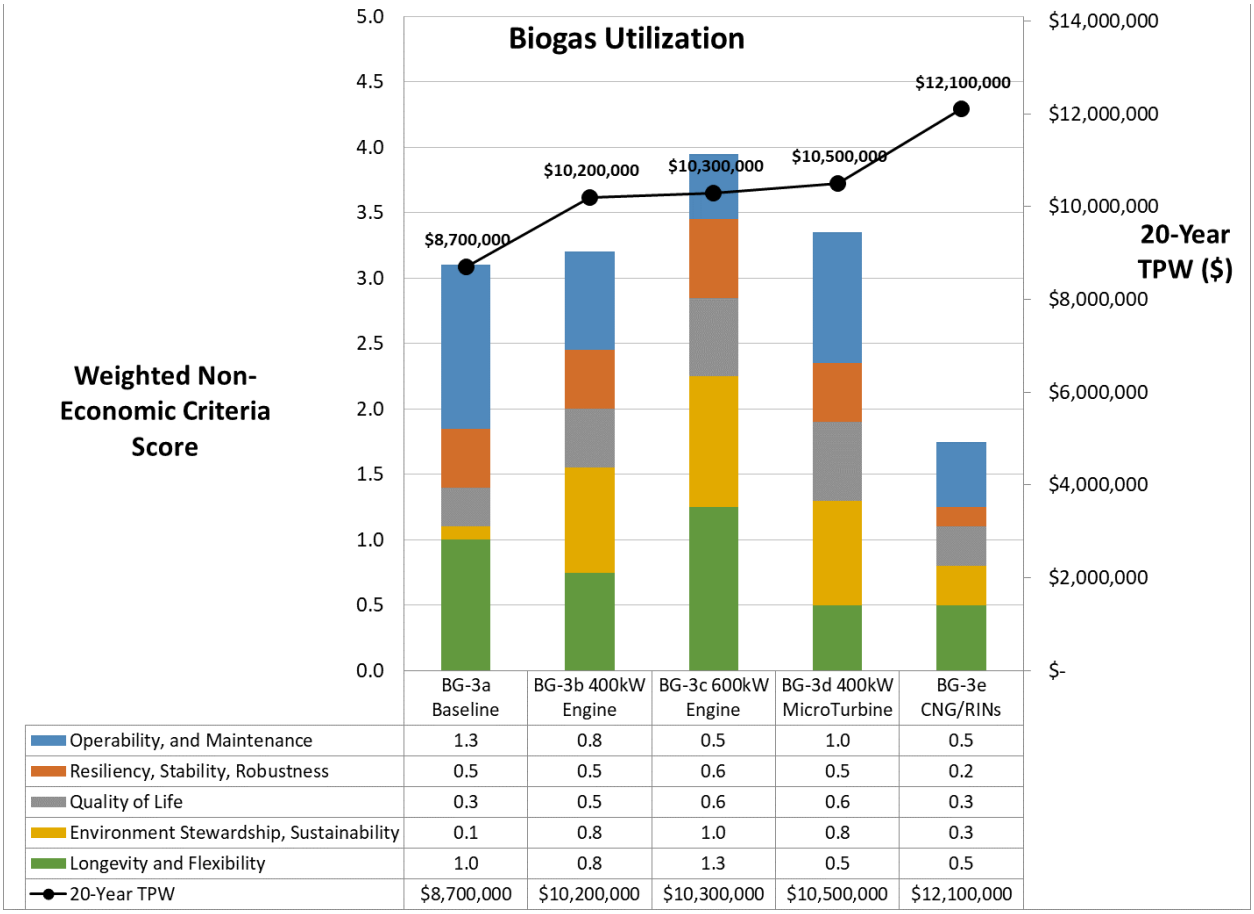


Figure 36 – Biogas Utilization Non-Economic Scores

As exhibited in Figure 36, Alternative BG-3c (600 kW engine) provides the highest non-economic score, at a slightly higher total present worth. The main non-economic factor which increased was Environment Stewardship and Sustainability. Alternative BG-3C is recommended to replace the baseline Alternative BG-3a as it involves paying a little extra (+15-20% total present worth) to gain a lot more value to the community. This vision aligns well with the La Crosse City and County Sustainability Goal 4H to achieve 25% renewable power by 2025 as identified in the 2009 Sustainability Plan.

Recommended Improvements

Modification of the Baseline Package results in the following listing of improvements, in Table 2:

Table 2 – Preferred Improvements Package A

Unit Process	Alternative	Description
Headworks	**H-1**	**Fine Screen** Replace the existing comminutors with a second fine screen
	H-2	**Grit System Programming** Revise grit system programming to react faster to incoming peak flows

Unit Process	Alternative	Description
	H-3	**HVAC Replacement** Replace existing headworks make up air units and exhaust fans
	H-4	**Septage and Holding Receiving** Add new septage and holding waste receiving facilities to controllably receive waste from regional haulers serving the greater La Crosse County area not in the sewer service area
Primary Clarification	**PC-1**	**Scum Pit 3 (Scum Pump) w/ HSW** Revise existing scum handling system for Primary Clarifiers No. 1, 2, and 3 inclusive of additional high strength waste receiving for anaerobic digestion
	PC-2	**HSW and Septage Receiving at GT 1** Repurpose Gravity Thickener No. 1 to equalize loadings of high strength waste for anaerobic digestion
Activated Sludge	**AS-1**	**A/S Reactor Splitter Box** Add new primary effluent splitter box prior to the activated sludge reactors for improved biological stability and performance
	AS-2	**Large Blade Submersible Selector Mixers** Replace existing selector zone mixers with more efficient large blade submersible mixers
	AS-3	**Modified UCT** Revise existing unaerated selectors to the modified University of Cape Town (UCT) process for improved nutrient removal
	AS-4	**Sec Clar Splitter Box** Add new mixed liquor suspended solids splitter box prior to the secondary clarifiers for improved effluent quality when loaded uniformly
	AS-5b	**Modify RAS Piping to Minimize Deposition** Add new buried valves on the existing return activated sludge suction piping to facilitate system maintenance
	AS-6	**Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal** Future planning level cost for new secondary clarifier mechanisms with improved flocculating inlets and rapid sludge withdrawal
	AS-7	**Sec Clar Density Current Baffles** Add new density current baffles to existing secondary clarifiers for improved effluent TSS quality
Effluent Phosphorus Treatment	**EP-1b**	**Outside-In Cloth Disk Filter with Coagulation Zones** Add new right-sized, tertiary pumping system, chemical conditioning system for phosphorus precipitation, and disc filters prior to disinfection
	EP-2	**Clarifier Launder Covers** Add new secondary clarifier effluent launder covers to minimize algae growth prior to the tertiary disc filters
Disinfection	**DI-1**	**Replacement UV System** Future planning level cost for effluent ultraviolet disinfection system replacement when existing system reaches its end of useful life

Unit Process	Alternative	Description
Sludge Thickening	**ST-1d**	**Separate WAS Sludge GBT and Struvite Control** Add new gravity belt thickener system to provide WAS thickening to improve anaerobic digestion detention time. Piping will include the ability to process primary sludge for future phased digestion thickening needs.
Digester Operation, Heating, and Recirculation	**D-2**	**TPAD Conversion** Replace existing digester heating system with new boilers, heat exchangers, recirculation pumps, and heat loop to operate in a thermophilic/mesophilic temperature phased anaerobic digestion mode
Digester Mixing	**DM-1**	**Digester 1&4 Draft Tube 2&3 Jet Mixing** Add new digester mixing systems to each digester
Biosolids Reuse	**BR-1d**	**Increase Diversity (30% Liquid 70% Dried Biosolid)** Add new digested sludge dewatering equipment and low-temperature belt drying equipment with dried biosolids handling facilities. Capacity of new systems minimized with continued use of the existing liquid biosolids land application system
	BR-2	**Improve Biosolids Quality** Add new primary sludge screen to remove debris prior to thickening, digestion, and land application or drying
Biogas	**BG-1**	**Replace Waste Gas Burner** Replace existing biogas waste gas burner with larger capacity automatic flare for improved emissions control
	BG-3c	**Peak Shaving Cogeneration Engine** Add new 600kW biogas generator, biogas conditioning system, heat recovery loop, electrical distribution gear, and remote mounted biogas storage membrane
Site and Utilities	**U-1**	**Replace Facility Wide Heating System** Replace existing aging, independent, and inefficient house boilers with a facility wide heating system connected to the digester heat loop
	U-2	**Comply with NFPA 820 & 10-State Stds for Buildings** Replace existing ventilation systems, provide physical separation for hazardous areas, and modify electrical systems to comply with National Fire Protection Association (NFPA) 820 and State code for buildings
	U-3	**Increase W3 System Capacity** Revise existing non-potable effluent water pumps to increase system capacity for proposed systems
	U-4	**New Transformers and One Electrical Service** Replace existing electrical services, main distribution gear, conduits and conductors, and transformers to all facility motor control centers. Also replace and add key standby generators.
	U-5	**Floodplain and Site Access Improvements** Revise existing site entrance to provide improved flood control and revised pavement for hauler access

The total initial cost of this Package A is approximately $55.5 million; with a 20-year total present worth of $80 million.

Other Issues & Considerations

Other issues and factors could affect the overall implementation of improvements, or the selection of processes and technologies during the planning period. As a result the City should consider the recommended plan as a dynamic plan – and should periodically review and revise recommendations based on future conditions. Examples of future changes/issues/considerations that could affect the recommended plan include the items listed below.

- The system needs identified a future long-term concern with compliance of a total nitrogen limit that could occur due to a Mississippi River Total Maximum Daily Load (TMDL). An added benefit to Alternative AS-3 (convert from A2O to MUCT) was identified as the ability to optimize the facility for simultaneous nitrification-denitrification beyond the denitrification that is enabled in the dedicated anoxic zone. The ability to optimize for both total nitrogen, without sacrificing total phosphorus removal is unknown and should be trialed after startup.
- The capital costs for Alternative ST-1c and ST-1d (combined or separate sludge thickening) was identified to be equal; with only operational costs and performance as the distinguishing features. It was recommended to include separate raw sludge thickening; however, upon startup staff should consider full scale operation as a combined sludge prior to deciding which mode to operate. For example, the cost for additional polymer associated with combined sludge thickening could be offset by the tipping fee and additional biogas received by the ability to add more high strength wastes.
- The proposed end-users for dried biosolids may be capable of receiving truckloads of biosolids on a regular (daily or weekly) basis, such that the onsite silo capacity may be decrease, saving significant capital cost from the proposed concepts.
- Capacity required for industry growth and peaking factors. Industrial growth projections created prior to understanding future rate impacts. Recommend continued discussion with industries to confirm rate and extent of growth projections to recalculate projected flows and loadings and equipment sizes. It is anticipated that this sensitivity analysis may have a drastic impact on the biosolids handling and storage alternatives.
- Future changes to the volume of hauled-in waste received and added directly to digestion may significantly increase the quantity of sludge/biosolids for handling and reuse. The sizing of solids equipment will be based upon the design basis loadings; however each system should be re-evaluated upon determination of significant future loadings.
- Although specific unit processes were selected as an acceptable improvement fit for the City's needs, upon preliminary design of each respective alternative a re-assessment of available technologies should be performed. For example, screw press dewatering was selected as the preferred technology in the evaluation. However, if the City's (or other installations) current/future experiences with this dewatering technology prove undesirable, the City should reconsider the applicable technologies.

- Additional chemical phosphorus removal may be required to control sidestream struvite and maintain process stability. Should this dose become undesirable or unsustainable, the facility should consider phosphorus recovery processes (e.g., Ostara) to provide further benefits. There currently are several available technologies for phosphorus removal; however, each of them are still in the developing stage and the available manufacturers and techniques should be reconsidered at that time.
- Land requirements at or near the WWTP are restrictive and the City has invested significant infrastructure to convey the wastewater to this location. Future City planning and site development should consider reserving space for long-term (50-100 year) WWTP replacement or expansion needs.
- The solids handling system was noted to be a limiting unit process to WWTP rated capacity. After construction of the proposed solids handling improvements, a re-rating of the facility would be recommended to identify the next limiting unit process and to pursue an increase to the facility's rated capacity.
- Electrical improvements related to standby generator replacements can be more cost effective if loads are merged on a new centralized standby generator(s) and electrical distribution switchgear.
- Since all work is primarily inside the fence and minimal new structures, no special construction methods were considered to mitigate for an endangered species or archeological item found in the area of construction. A preliminary environmental review is provided in Appendix C.

City of La Crosse
Wastewater Treatment Facilities Plan
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SUMMARY

INITIAL COST ESTIMATE

ALTERNATIVE NO. AND NAME	Initial Cost ($)	Annual O&M ($)	Present Worth of Annual O&M ($)	Total Present Worth ($)
Headworks/Preliminary Treatment				
H-1 Fine Screen	1,007,000	0	0	**1,007,000**
H-2 Grit System Programming	6,000	0	0	**6,000**
H-3 HVAC Replacement	258,000	0	0	**258,000**
H-4 Septage and Holding Receiving	1,541,000	0	0	**1,541,000**
Primary Clarification				
PC-1 Scum Pit 3 (Scum Pump) w/ HSW	623,000	0	0	**623,000**
PC-2 HSW and Septage Receiving at GT 1	490,000	0	0	**490,000**
Activated Sludge				
AS-1 A/S Reactor Splitter Box	353,000	0	0	**353,000**
AS-2 Large Blade Submersible Selector Mixers	355,000	-23,000	-324,000	**31,000**
AS-3 Modified UCT	1,089,000	-23,000	-324,000	**765,000**
AS-4 Sec Clar Splitter Box	936,000	0	0	**936,000**
AS-5a New Submersible RAS Pump Stations	1,168,000	0	0	**1,168,000**
AS-5b Modify RAS Piping to Minimize Deposition	224,000	0	0	**224,000**
AS-6 Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal	1,600,000	0	0	**1,600,000**
AS-7 Sec Clar Density Current Baffles	315,000	0	0	**315,000**
Effluent Phosphorus Treatment				
EP-1a Inside-Out Cloth Disk Filter with Coagulation Zones	6,871,000	329,000	4,624,000	**11,495,000**
EP-1b Outside-In Cloth Disk Filter with Coagulation Zones	5,617,000	424,000	5,959,000	**11,576,000**
EP-1c Reactive Upflow Sand Filter	9,052,000	269,000	3,781,000	**12,833,000**
EP-2 Clarifier Launder Covers	627,000	0	0	**627,000**
Disinfection				
DI-1 Replacement UV System	1,919,000	0	0	**1,919,000**
Sludge Thickening				
ST-1a Combined Raw Sludge Disk Thickener	0	0	0	**0**
ST-1b Separate WAS Sludge Disk Thickener and Struvite Control	883,000	38,000	535,000	**1,418,000**
ST-1c Combined Raw Sludge GBT	858,000	48,000	675,000	**1,533,000**
ST-1d Separate WAS Sludge GBT and Struvite Control	648,000	37,000	520,000	**1,168,000**
ST-1e Combined Raw Sludge RDT	1,646,000	151,000	2,123,000	**3,769,000**
ST-1f Separate WAS Sludge RDT and Struvite Control	940,000	60,000	844,000	**1,784,000**
Digester Operation, Heating, and Recirculation				
D-1 Status Quo Mesophilic Digestion	3,486,000	0	0	**3,486,000**
D-2 TPAD Conversion	2,962,000	0	0	**2,962,000**
D-3 WAS Conditioning (Temperature and pH)	5,653,000	25,000	352,000	**6,005,000**
Digester Mixing				
DM-1 Digester 1&4 Draft Tube 2&3 Jet Mixing	1,637,000	60,000	844,000	**2,481,000**
Biosolids Reuse				
BR-1a Status Quo (80% Liquid 20% Cake to Land Application)	11,175,000	1,093,000	15,360,000	**26,535,000**
BR-1b 15%TS Liquid Handling (75% Liquid 25% Cake to Land Application)	12,348,000	823,000	11,566,000	**23,914,000**
BR-1c Increase Cake Handling (50% Liquid 50% Cake to Land Application)	11,526,000	1,094,000	15,374,000	**26,900,000**
BR-1cr Improve Logistics (Remote Cake Storage)	11,181,000	1,000,000	14,053,000	**25,234,000**
BR-1d Increase Diversity (30% Liquid 70% Dried Biosolids Belt Dryer, with Cake Optional)	19,526,000	536,000	7,533,000	**27,059,000**
BR-1e Increase Diversity (50% Liquid, 40% Cake, and 10% Dried Biosolids Solar)	13,729,000	983,000	13,815,000	**27,544,000**
BR-1f Increase Diversity (100% Dried Biosolids, with Liquid or Cake Optional)	26,235,000	556,000	7,814,000	**34,049,000**
BR-1g Increase Diversity (50% Liquid, 50% Cake, with 10% Cake to Compost)	0	0	0	**0**
BR-2 Improve Biosolids Quality (add Primary Sludge Screening)	1,122,000	0	0	**1,122,000**
Biogas				
BG-1 Replace Waste Gas Burner	374,000	0	0	**374,000**
BG-2 Biogas Storage	1,191,000	0	0	**1,191,000**
BG-3a Baseline Energy Consumption	0	618,000	8,685,000	**8,685,000**
BG-3b Cogeneration Engine	3,907,000	445,000	6,254,000	**10,161,000**
BG-3c Peak Shaving Cogeneration Engine	5,344,000	355,000	4,989,000	**10,333,000**
BG-3d Cogeneration Microturbine	3,929,000	467,000	6,563,000	**10,492,000**
BG-3e Pipeline to Utility	9,014,000	222,000	3,120,000	**12,134,000**
Site and Utilities				
U-1 Replace Facility Wide Heating System	605,000	0	0	**605,000**
U-2 Comply with NFPA 820 & 10-State Stds for Buildings	2,183,000	0	0	**2,183,000**
U-3 Increase W3 System Capacity	369,000	0	0	**369,000**
U-4 New Transformers and One Electrical Service	4,521,000	0	0	**4,521,000**
U-5 Floodplain and Site Access Improvements	361,000	0	0	**361,000**

City of La Crosse
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H-1 Fine Screen

INITIAL COST ESTIMATE

General Description
Add static overflow fine screen with auger to retain screenings in main channel to be captured in downstream existing step screen.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			26,000
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			2,000
New 1/4" Multi-Rake Bar Screen (20 mgd)	Each	1	322,000	322,000
Wash Press	Each	1	104,500	104,500
Demo Existing Comminutors	Lump Sum	1	4,000	4,000
Civil Not Listed Above	Lump Sum	1	10,000	10,000
Electrical Not Listed Above	Lump Sum	1	30,000	30,000
Instrumentation and Control Not Listed Above	Lump Sum	1	40,000	40,000
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				538,500
Contingency			30%	161,550
Subtotal				700,050
Contractor Overhead & Profit			25%	175,013
Total Construction Cost				**875,063**
Engineering			15%	131,259
Total Initial Cost				**1,007,000**

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H-1 Fine Screen

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	Lump Sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	sq ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork: Backfill	Lump Sum			
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds	10	1,000	10,000
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds	10	1,500	15,000
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Grout Infill	Lump Sum	1	1,000	1,000
Concrete				**26,000**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals: Aluminum Hatch	Lump Sum	0	10,000	0
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition: Cut Concrete Walls	lump sum	1	2,000	2,000
Demolition:	lump sum			
Demoltion				**2,000**

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H-2 Grit System Programming

INITIAL COST ESTIMATE

General Description
This project incorporates the time it will take to incorporate minor changes to the exisitng grit system. This includes problem identification, potential travel, and programming changes.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Identify Program Change Requirements	Hour	8	125	1,000
Develop Operational Strategy	Hour	2	125	250
Programing Changes	Hour	2	125	250
Trip (hours)	Hour	8	125	1,000
Trip (mileage)	Each	2	150	300
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				2,800
Contingency			30%	840
Subtotal				3,640
Contractor Overhead & Profit			25%	910
Total Construction Cost				**4,550**
Engineering			15%	683
Total Initial Cost				**6,000**

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H-2 Grit System Programming

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum	1		
Earthwork: Excavation	cu yds	1		
Earthwork: Underdrain System	sq yds	1		
Earthwork: Pile Foundation	ft	1		
Earthwork: Flood Protection Levee	cu yds	1		
Earthwork: Flood Protection Gravel Road	sq yds	1		
Earthwork:		1		
Earthwork				**0**
Concrete: Footings	cu yds	1		
Concrete: Base Slab	cu yds	1		
Concrete: Walls	cu yds	1		
Concrete: Floor Slabs	cu yds	1		
Concrete: Structural Slabs	cu yds	1		
Concrete: Columns	cu yds	1		
Concrete: Channels	cu yds	1		
Concrete: Precast Roof	ft	1		
Concrete				**0**
Metals: Aluminum Grating	sq ft	1		
Metals: Aluminum Handrail	ft	1		
Metals: Aluminum Stairway	risers	1		
Metals: Baffles and Weirs	sq ft	1		
Metals:		1		
Metals				**0**
Building:	sq ft	1		
Building:	sq ft	1		
Building:	sq ft	1		
Building:	sq ft	1		
Building:	sq ft	1		
Building:	sq ft	1		
Buildings				**0**
Demolition:	cu ft	1		
Demolition:	cu ft	1		
Demolition:	lump sum	1		
Demolition:	lump sum	1		
Demoltion				**0**

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H-2 Grit System Programming

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	0
Brake Horsepower of Each Operating Pump	10
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
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H-3 HVAC Replacement

INITIAL COST ESTIMATE

General Description
This alternative is for the replacement of an air handling unit (AHU) at the administration/headworks facility. Note: additional upgrades necessary to upgrading the structure to NFPA 820 standards can be found in project U-2.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
New AHU	Each	1	138,000	138,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				138,000
Contingency			30%	41,400
Subtotal				179,400
Contractor Overhead & Profit			25%	44,850
Total Construction Cost				**224,250**
Engineering			15%	33,638
Total Initial Cost				**258,000**

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H-3 HVAC Replacement

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

H-3 HVAC Replacement

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	30
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

H-4 Septage and Holding Receiving

INITIAL COST ESTIMATE

General Description
This alternative is for the addition of a new septage building for introduction of septage at the plant headworks. This building will have a truck connection, fine screen, flowmeter, and 10,000 gal tank.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			13,400
Concrete	See Worksheet for Detailed Cost Breakdown			101,926
Metals	See Worksheet for Detailed Cost Breakdown			30,000
Buildings	See Worksheet for Detailed Cost Breakdown			160,000
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Septage Screen and Compactor	Lump Sum	1	320,000	320,000
Piping	Lump Sum	1	40,000	40,000
Civil Not Listed Above	Lump Sum	1	12,000	12,000
Electrical Not Listed Above	Lump Sum	1	77,000	77,000
Instrumentation and Control Not Listed Above	Lump Sum	1	39,000	39,000
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum	1	31,000	31,000
Subtotal				824,326
Contingency			30%	247,298
Subtotal				1,071,624
Contractor Overhead & Profit			25%	267,906
Total Construction Cost				**1,339,530**
Engineering			15%	200,929
Total Initial Cost				**1,541,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

H-4 Septage and Holding Receiving

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	sq ft	800	16.75	13,400
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**13,400**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	30	400	11,852
Concrete: Walls	cu yds	62	1,200	74,667
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds	7	1,000	7,407
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	sq ft	800	10	8,000
Concrete				**101,926**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals: Hoist	lump sum	1	10,000	10,000
Metals: Hatch	lump sum	1	20,000	20,000
Metals				**30,000**
Building: Septage (40' x 20')	sq ft	800	200	160,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**160,000**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
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La Crosse, WI

H-4 Septage and Holding Receiving

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	40
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

PC-1 Scum Pit 3 (Scum Pump) w/ HSW

INITIAL COST ESTIMATE

General Description

This project includes changes to the scum piping system of primary clarifiers No. 1-3 to allow for regular operation of these clarifiers without major operational concerns. This includes the change of the piping from CI to GL-DI, the creation of a new structure to decrease the amount of pipe that is gravity fed, and the addition of two pumps. In addition, this structure also incorporates a wet well for recieving HSW from the local area. The pumps force all scum and HSW to the digester

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			14,050
Concrete	See Worksheet for Detailed Cost Breakdown			99,854
Metals	See Worksheet for Detailed Cost Breakdown			17,050
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Scum/HSW Pumps	Each	2	20,000	40,000
GLDI Piping (6")	ft	450	94	42,255
Fittings	Lump Sum	1	8,350	8,350
Valves	Lump Sum	1	4,586	4,586
Civil Not Listed Above	Lump Sum	1	5,000	5,000
Electrical Not Listed Above	Lump Sum	1	40,000	40,000
Instrumentation and Control Not Listed Above	Lump Sum	1	30,000	30,000
Plumbing Not Listed Above	Lump Sum	1	2,000	2,000
HVAC Not Listed Above	Lump Sum	1	30,000	30,000
Subtotal				333,145
Contingency			30%	99,943
Subtotal				433,088
Contractor Overhead & Profit			25%	108,272
Total Construction Cost				**541,360**
Engineering			15%	81,204
Total Initial Cost				**623,000**

City of La Crosse
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PC-1 Scum Pit 3 (Scum Pump) w/ HSW

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds	200	20	4,000
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	sq ft	600.00	16.75	10,050
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**14,050**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	22	400	8,889
Concrete: Walls	cu yds	73	1,000	73,481
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds	14	1,000	13,889
Concrete: Columns	cu yds	2	1,600	2,844
Concrete: Channels	cu yds			
Concrete: Precast Roof	sq ft	75	10	750
Concrete				**99,854**
Metals: Aluminum Grating	sq ft	30	35	1,050
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers	32	500	16,000
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**17,050**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
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PC-2 HSW and Septage Receiving at GT 1

INITIAL COST ESTIMATE

General Description
This alternative is to convert the North gravity thickener (GT) for high strength waste (HSW). This offers potential savings by reusing existing pumps and piping to push wastes to the digesters.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			68,722
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Truck receiving System (pipe, valve pit, bar rake)	Lump Sum	1	50,000	50,000
High Build Coating	Lump Sum	1	30,000	30,000
Mixing System	Lump Sum	1	83,200	83,200
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	15,000	15,000
Instrumentation and Control Not Listed Above	Lump Sum	1	15,000	15,000
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				261,922
Contingency			30%	78,577
Subtotal				340,499
Contractor Overhead & Profit			25%	85,125
Total Construction Cost				**425,624**
Engineering			15%	63,844
Total Initial Cost				**490,000**

City of La Crosse
Wastewater Treatment Facilities Plan
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PC-2 HSW and Septage Receiving at GT 1

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals: Aluminum Geodesic Dome	sq ft	1,963	35	68,722
Metals				**68,722**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

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Wastewater Treatment Facilities Plan
La Crosse, WI

PC-2 HSW and Septage Receiving at GT 1

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	**60**
Total Bhp	0
Motor Efficiency	**92%**
Adjustable Frequency Drive Efficiency	**90%**
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	**24**
Operating Days Per Week	**7**
Operating Weeks Per Year	**52**
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	**0.083**	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-1 A/S Reactor Splitter Box

INITIAL COST ESTIMATE

General Description
This alternative is to modify an existing structure which intercepts primary effluent at the the west end of the aeration basins and construct a splitter box with weirs to split flow and reconnect to existing piping.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			5,193
Concrete	See Worksheet for Detailed Cost Breakdown			40,400
Metals	See Worksheet for Detailed Cost Breakdown			3,220
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Locally Operated Isolation Gates	Each	2	15,000	30,000
Piping (CL-DI, 30")	Lump Sum	1	30,000	30,000
Fittings	Lump Sum	1	30,000	30,000
Bypass Pumping	Lump Sum	1	50,000	50,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				188,813
Contingency			30%	56,644
Subtotal				245,457
Contractor Overhead & Profit			25%	61,364
Total Construction Cost				**306,821**
Engineering			15%	46,023
Total Initial Cost				**353,000**

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AS-1 A/S Reactor Splitter Box

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum	1	866	866
Earthwork: Excavation	cu yds	81	20	1,618
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft^2	162	16.75	2,710
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**5,193**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	6	400	2,400
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds	32	1,200	38,000
Concrete: Precast Roof	ft			
Concrete				**40,400**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft	46	70	3,220
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**3,220**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

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AS-1 A/S Reactor Splitter Box

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	70
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
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AS-2 Large Blade Submersible Selector Mixers

INITIAL COST ESTIMATE

General Description

This alternative shows the costs associated with converting the current subermisble mixer assets to large blade submersibles. This will include installing more robust supports, purchase of the mixers, and installation. The number of mixers corresponds to the number needed for a conversion to modified UCT layout, and is not representative of a conversion under the current system.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Large Blade Submersible Mixer	Each	4	33,833	135,332
Tripod	Each	4	5,769	23,076
Startup	Lump Sum	1	2,500	2,500
Frieght	Lump Sum	1	9,000	9,000
Installation	Lump Sum	1	20,000	20,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				189,908
Contingency			30%	56,972
Subtotal				246,880
Contractor Overhead & Profit			25%	61,720
Total Construction Cost				**308,601**
Engineering			15%	46,290
Total Initial Cost				**355,000**

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AS-2 Large Blade Submersible Selector Mixers

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

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AS-2 Large Blade Submersible Selector Mixers

ANNUAL O&M COST ESTIMATE

General Description	New	Existing
Number of Motors Operating	4.00	8.00
Brake Horsepower of Each Operating Motor	5.4	15.0
Total Bhp	22	120
Motor Efficiency	92%	92%
Adjustable Frequency Drive Efficiency	100%	100%
Wire Horsepower	23	130
Wire Kilowatts	18	97
Operating Hours Per Day	24	12
Operating Days Per Week	7	7
Operating Weeks Per Year	52	52
Operating Hours Per Year	8,736	4,368

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity (Savings)	Kw-hrs	-272,016	0.083	-22,577
Total Annual Cost				**-23,000**

Present Worth Analysis	
Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**-324,000**

City of La Crosse
Wastewater Treatment Facilities Plan
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AS-3 Modified UCT

INITIAL COST ESTIMATE

General Description

This alternative involves modifying the BNR system from the A2O process to the Modified University of Cape Town (MUCT) Variation process. It involves extending the RAS piping to the beginning of the anoxic zones and relocating the existing ML recycle pumps to pump denitrified mixed liquor back to the beginning of the first anaerobic zones.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
9" Membrane Diffuser	Lump Sum	2,700	35	95,500
24" RAS Piping	Ft	460	300	138,000
Relocated Denitrified ML Recycle Pumps	Each	2	8,000	16,000
30" ML Recycle Piping	Each	240	350	84,000
Install	Lump Sum	1	100,000	100,000
Airflow Control Improvements	Lump Sum	1	89,000	89,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	15,000	15,000
Instrumentation and Control Not Listed Above	Lump Sum	1	45,000	45,000
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				582,500
Contingency			30%	174,750
Subtotal				757,250
Contractor Overhead & Profit			25%	189,313
Total Construction Cost				**946,563**
Engineering			15%	141,984
Total Initial Cost				**1,089,000**

City of La Crosse
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AS-3 Modified UCT

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

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AS-3 Modified UCT

ANNUAL O&M COST ESTIMATE

General Description	**New**	**Existing**
Number of Blowers Operating	**2.00**	**2.00**
Brake Horsepower of Each Operating Unit	**157.5**	**175.0**
Total Bhp	315	350
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**
Wire Horsepower	380	423
Wire Kilowatts	284	315
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**7**	**7**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	8,736	8,736

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity (Savings)	Kw-hrs	-275,479	**0.083**	-22,865
Total Annual Cost				**-23,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**-324,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-4 Sec Clar Splitter Box

INITIAL COST ESTIMATE

General Description

This alternative is for the addition of a new structure to more equally split ML flow between the final clarifiers.. This includes the new piping routed to the clarifiers, new locally controlled isolation gates, and installation of these new systems.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			24,658
Concrete	See Worksheet for Detailed Cost Breakdown			185,378
Metals	See Worksheet for Detailed Cost Breakdown			22,785
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			8,000
Locally Operated Isolation Gates (10')	Each	4	15,000	60,000
Install	Lump Sum	1	20,000	20,000
ML Piping (CL-DI, 36")	Lump Sum	1	150,000	150,000
Civil Not Listed Above	Lump Sum	1	25,000	25,000
Electrical Not Listed Above	Lump Sum	1	5,000	5,000
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				500,821
Contingency			30%	150,246
Subtotal				651,068
Contractor Overhead & Profit			25%	162,767
Total Construction Cost				**813,834**
Engineering			15%	122,075
Total Initial Cost				**936,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-4 Sec Clar Splitter Box

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum	1	4,110	4,110
Earthwork: Excavation	cu yds	482	20	9,644
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	sq ft	651	16.75	10,904
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**24,658**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	72	400	28,933
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds	130	1,200	156,444
Concrete: Precast Roof	ft			
Concrete				**185,378**
Metals: Aluminum Grating	sq ft	651	35	22,785
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**22,785**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition existing piping	lump sum	1	8,000	8,000
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**8,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-4 Sec Clar Splitter Box

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-5a New Submersible RAS Pump Stations

INITIAL COST ESTIMATE

General Description

This project is for the major reworking of the RAS pumping process. This includes the creation of four new RAS stations, one dedicated to each clarifier. Each pump would be submerged in a manhole and connections would make use of existing lines. Additional allowance is made for the inclusion of valve vault for pump isolation and metering.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			30,000
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			10,000
RAS Pumps	Each	4	39,000	156,000
Valves (1x check, 1x hand operated plug)	Each	4	24,700	98,800
20" Magmeter	Each	4	13,000	52,000
RAS Pump Manhole/Valve Vault	Each	4	39,000	156,000
Civil Not Listed Above	Lump Sum	1	56,000	56,000
Electrical Not Listed Above	Lump Sum	1	56,000	56,000
Instrumentation and Control Not Listed Above	Lump Sum	1	10,000	10,000
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				624,800
Contingency			30%	187,440
Subtotal				812,240
Contractor Overhead & Profit			25%	203,060
Total Construction Cost				**1,015,300**
Engineering			15%	152,295
Total Initial Cost				**1,168,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-5a New Submersible RAS Pump Stations

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	Per Manhole	4	5,000	20,000
Earthwork: Excavation	Per Manhole	4	2,500	10,000
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**30,000**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition: Existing Pumps	lump sum	1	10,000	10,000
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**10,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-5a New Submersible RAS Pump Stations

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	**0**
Brake Horsepower of Each Operating Pump	**35**
Total Bhp	0
Motor Efficiency	**92%**
Adjustable Frequency Drive Efficiency	**90%**
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	**24**
Operating Days Per Week	**3.5**
Operating Weeks Per Year	**52**
Operating Hours Per Year	4,368

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	**0.083**	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-5b Modify RAS Piping to Minimize Deposition

INITIAL COST ESTIMATE

General Description

This alternative is for the inclusion of isolation valves on the suction RAS lines emerging from each clarifier. These valves will allow for the clearing of blockages in the lines.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
20" Buried RAS Valve	Each	4	20,000	80,000
RAS Chlorination System	Lump Sum	1	35,000	35,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	2,500	2,500
Instrumentation and Control Not Listed Above	Lump Sum	1	1,500	1,500
Plumbing Not Listed Above	Lump Sum	1	500	500
HVAC Not Listed Above	Lump Sum			
Subtotal				119,500
Contingency			30%	35,850
Subtotal				155,350
Contractor Overhead & Profit			25%	38,838
Total Construction Cost				**194,188**
Engineering			15%	29,128
Total Initial Cost				**224,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-5b Modify RAS Piping to Minimize Deposition

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-5b Modify RAS Piping to Minimize Deposition

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-6 Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal

INITIAL COST ESTIMATE

General Description
This alternative includes the modifications necessary to install Tow Bro sludge withdrawal mechanisms as well s FEDWA inlets. Together, these technologies help to ensure settling and prevent excessive disturbance of the sludge blanket.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Tow Brow/FEDWA	Each	4	209,000	836,000
Equipment	Lump Sum	1	10,000	10,000
Labor	Lump Sum	1	10,000	10,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				856,000
Contingency			30%	256,800
Subtotal				1,112,800
Contractor Overhead & Profit			25%	278,200
Total Construction Cost				**1,391,000**
Engineering			15%	208,650
Total Initial Cost				**1,600,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-6 Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-6 Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-7 Sec Clar Density Current Baffles

INITIAL COST ESTIMATE

General Description
This alternative is for the installation of density current baffles which prevent short ciruiting within the clarifiers.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Density Current Baffles	Each	4	36,030	144,120
Install	Each	4	6,000	24,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				168,120
Contingency			30%	50,436
Subtotal				218,556
Contractor Overhead & Profit			25%	54,639
Total Construction Cost				**273,195**
Engineering			15%	40,979
Total Initial Cost				**315,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-7 Sec Clar Density Current Baffles

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

AS-7 Sec Clar Density Current Baffles

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-1a Inside-Out Cloth Disk Filter with Coagulation Zones

INITIAL COST ESTIMATE

General Description

This alternative includes disc filters to bring effluent phosphorus down to future permit levels. This also includes the expected cost of storing the dosing chemicals and maintaing the system. System is located within the area of the chlorine contact tank.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			20,912
Concrete	See Worksheet for Detailed Cost Breakdown			336,601
Metals	See Worksheet for Detailed Cost Breakdown			29,157
Buildings	See Worksheet for Detailed Cost Breakdown			460,349
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Disk Filter (firm capacity)	MGD	16	78,125	1,250,000
Disk Filter (redundancy)	MGD	8.0	78,125	625,000
Disk Filter Installation	Lump Sum	1	120,000	120,000
Pre-Filtration Pumping (5 MGD)	Each	4	45,000	180,000
Polymer Makedown and Dose System	Each	2	15,000	30,000
5000 Gallon Alum Storage Tank (1 month)	Each	1	15,000	15,000
Piping/Fittings (30", CL-DI)	Lump Sum	1	153,750	153,750
Valves	Per Filter	3	72,000	216,000
4'x4' Roof Hatch (pump access)	Each	4	2,500	10,000
Civil Not Listed Above	Lump Sum	1	5,000	5,000
Electrical Not Listed Above	Lump Sum	1	100,000	100,000
Instrumentation and Control Not Listed Above	Lump Sum	1	80,000	80,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum	1	40,000	40,000
Subtotal				3,676,768
Contingency			30%	1,103,030
Subtotal				4,779,798
Contractor Overhead & Profit			25%	1,194,950
Total Construction Cost				**5,974,748**
Engineering			15%	896,212
Total Initial Cost				**6,871,000**

EP-1a Inside-Out Cloth Disk Filter with Coagulation Zones

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum	1	3,485	3,485
Earthwork: Excavation	cu yds	342	20	6,833
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft	632	16.75	10,594
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**20,912**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	23	400	9,370
Concrete: Walls	cu yds	244	1,200	292,446
Concrete: Floor Slabs	cu yds		1,000	0
Concrete: Structural Slabs	cu yds		1,000	0
Concrete: Columns	cu yds		1,600	0
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft	3,478	10	34,785
Concrete				**336,601**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft	196	70	13,728
Metals: Aluminum Stairway	risers	31	500	15,429
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**29,157**
Building: Over Disk Filters	sq ft	3,478	100	347,849
Building: Over Floc/Coag/Mix and Chem Struct	sq ft	750	150	112,500
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**460,349**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

La Crosse, WI

EP-1a Inside-Out Cloth Disk Filter with Coagulation Zones

ANNUAL O&M COST ESTIMATE

General Description	Rapid Mix	Coag Mix	Floc Mix	Submersible pumps
Number of Pumps Operating	1	1	1	3
Brake Horsepower of Each Operating Pump	5.0	7.5	1.0	45.0
Total Bhp	5	8	1	135
Motor Efficiency	92%	92%	92%	92%
Adjustable Frequency Drive Efficiency	90%	90%	90%	90%
Wire Horsepower	6	9	1	163
Wire Kilowatts	5	7	1	122
Operating Hours Per Day	24	24	24	24
Operating Days Per Week	7	7	7	7
Operating Weeks Per Year	52	52	52	52
Operating Hours Per Year	8,736	8,736	8,736	8,736

General Description	Backwash Pumps	Filter Rotate
Number of Pumps Operating	2	2
Brake Horsepower of Each Operating Pump	25.0	1.5
Total Bhp	50	3
Motor Efficiency	92%	92%
Adjustable Frequency Drive Efficiency	90%	90%
Wire Horsepower	60	4
Wire Kilowatts	45	3
Operating Hours Per Day	4	4
Operating Days Per Week	7	7
Operating Weeks Per Year	52	52
Operating Hours Per Year	1,456	1,456

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	1,238,346	0.083	102,783
Ferric Chloride	Gal	169,875	1.17	198,753
Polymer	lb	21,931	1.21	26,536
Total Annual Cost				**329,000**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**4,624,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-1b Outside-In Cloth Disk Filter with Coagulation Zones

INITIAL COST ESTIMATE

General Description

This alternative includes cloth disk filters to bring effluent phosphorus down to future permit levels. This also includes the expected cost of storing the dosing chemicals and maintaing the system.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			34,920
Concrete	See Worksheet for Detailed Cost Breakdown			550,528
Metals	See Worksheet for Detailed Cost Breakdown			15,500
Buildings	See Worksheet for Detailed Cost Breakdown			180,000
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Disk Filter (firm capacity)	MGD	16	62,222	995,552
Disk Filter (redundancy)	MGD	8.0	62,222	497,776
Disk Filter Installation	Lump Sum	1	180,000	180,000
Pre-Filtration Pumping (5 MGD)	Each	4	45,000	180,000
Polymer Makedown and Dose System	Each	2	15,000	30,000
5000 Gallon Alum Storage Tank (1 month)	Each	1	15,000	15,000
Coag Mixer	Each	1	10,000	10,000
Inlet Gates w/ Electric Actuators	Each	3	22,000	66,000
4'x4' Roof Hatch (pump access)	Each	4	2,500	10,000
Civil Not Listed Above	Lump Sum	1	15,000	15,000
Electrical Not Listed Above	Lump Sum	1	100,000	100,000
Instrumentation and Control Not Listed Above	Lump Sum	1	80,000	80,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum	1	40,000	40,000
Subtotal				3,005,276
Contingency			30%	901,583
Subtotal				3,906,859
Contractor Overhead & Profit			25%	976,715
Total Construction Cost				**4,883,574**
Engineering			15%	732,536
Total Initial Cost				**5,617,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-1b Outside-In Cloth Disk Filter with Coagulation Zones

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			5,820
Earthwork: Excavation	cu yds	450	20	9,000
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	sq ft	1,200	16.75	20,100
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**34,920**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	14	400	5,600
Concrete: Walls	cu yds	380	1,200	456,240
Concrete: Floor Slabs	cu yds	22	1,000	22,330
Concrete: Structural Slabs	cu yds	25	1,000	25,000
Concrete: Columns	cu yds	22	1,600	34,608
Concrete: Channels	cu yds			
Concrete: Precast Roof	sq ft	675	10	6,750
Concrete				**550,528**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers	31	500	15,500
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**15,500**
Building: Filter Room, Backwash Pump Room	sq ft	1,200	150	180,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**180,000**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-1b Outside-In Cloth Disk Filter with Coagulation Zones

ANNUAL O&M COST ESTIMATE

General Description	Rapid Mix	Coag Mix	Floc Mix	Submersible pumps
Number of Pumps Operating	1	1	1	3
Brake Horsepower of Each Operating Pump	15.0	2.0	2.0	45.0
Total Bhp	15	2	2	135
Motor Efficiency	92%	92%	92%	92%
Adjustable Frequency Drive Efficiency	90%	90%	90%	90%
Wire Horsepower	18	2	2	163
Wire Kilowatts	14	2	2	122
Operating Hours Per Day	24	24	24	24
Operating Days Per Week	7	7	7	7
Operating Weeks Per Year	52	52	52	52
Operating Hours Per Year	8,736	8,736	8,736	8,736

General Description	Backwash Pumps	Filter Rotate
Number of Pumps Operating	2	2
Brake Horsepower of Each Operating Pump	20.0	2.0
Total Bhp	40	4
Motor Efficiency	92%	92%
Adjustable Frequency Drive Efficiency	90%	90%
Wire Horsepower	48	5
Wire Kilowatts	36	4
Operating Hours Per Day	4	4
Operating Days Per Week	7	7
Operating Weeks Per Year	52	52
Operating Hours Per Year	1,456	1,456

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	1,269,829	0.083	105,396
Ferric Chloride	Gal	154,432	1.17	180,685
Polymer	lb	21,931	1.21	26,536
Replacement Media	sq ft	369	300.00	110,657
Total Annual Cost				**424,000**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**5,959,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-1c Reactive Upflow Sand Filter

INITIAL COST ESTIMATE

General Description

This alternative includes upflow reactive sand filters to bring effluent phosphorus down to future permit levels. This also includes the expected cost of storing the dosing chemicals and maintaing the system. System is located within the area of the chlorine contact tank.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			892,537
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			112,500
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Sand Filter (firm capacity)	MGD	16	177,891	2,846,250
Sand Filter (redundancy)	MGD	1.5	177,891	258,750
Sand Filter Installation	Lump Sum	1	215,000	215,000
Pre-Filtration Pumping (5 MGD)	Each	4	45,000	180,000
5000 Gallon Alum Storage Tank (1 month)	Each	1	15,000	15,000
12" Filter Isolation Valves	Each	21	1,800	37,800
Inlet Gates w/ Electric Actuators	Each	3	22,000	66,000
4'x4' Roof Hatch (pump access)	Each	4	2,500	10,000
Civil Not Listed Above	Lump Sum	1	5,000	5,000
Electrical Not Listed Above	Lump Sum	1	100,000	100,000
Instrumentation and Control Not Listed Above	Lump Sum	1	80,000	80,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum	1	20,000	20,000
Subtotal				4,843,837
Contingency			30%	1,453,151
Subtotal				6,296,988
Contractor Overhead & Profit			25%	1,574,247
Total Construction Cost				**7,871,235**
Engineering			15%	1,180,685
Total Initial Cost				**9,052,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-1c Reactive Upflow Sand Filter

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum	1	0	
Earthwork: Excavation	cu yds		20	0
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft		16.75	0
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	700	400	280,000
Concrete: Walls	cu yds	510	1,200	612,537
Concrete: Floor Slabs	cu yds		1,000	0
Concrete: Structural Slabs	cu yds		1,000	0
Concrete: Columns	cu yds		1,600	0
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft		10	0
Concrete				**892,537**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft		70	0
Metals: Aluminum Stairway	risers		500	0
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building: Pumps/Chemicals	sq ft	750	150	112,500
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**112,500**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-1c Reactive Upflow Sand Filter

ANNUAL O&M COST ESTIMATE

General Description	**Pre-Filt Pumps**	**Compressors**
Number of Pumps Operating	**3**	**1**
Brake Horsepower of Each Operating Pump	**45.0**	**60.0**
Total Bhp	135	60
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**
Wire Horsepower	163	72
Wire Kilowatts	122	54
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**7**	**7**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	8,736	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	1,062,563	**0.083**	88,193
Ferric Chloride	Gal	**154,432**	**1.17**	180,685
Total Annual Cost				**269,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**3,781,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-2 Clarifier Launder Covers

INITIAL COST ESTIMATE

General Description
This alternative includes launder covers for the secondary clarifiers to prevent algal growth.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Launder Covers	Each	4	67,000	268,000
Labor	Each	4	16,750	67,000
Civil Not Listed Above	Lump Sum	0	0	
Electrical Not Listed Above	Lump Sum	0	0	
Instrumentation and Control Not Listed Above	Lump Sum	0	0	
Plumbing Not Listed Above	Lump Sum	0	0	
HVAC Not Listed Above	Lump Sum	0	0	
Subtotal				335,000
Contingency			30%	100,500
Subtotal				435,500
Contractor Overhead & Profit			25%	108,875
Total Construction Cost				**544,375**
Engineering			15%	81,656
Total Initial Cost				**627,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-2 Clarifier Launder Covers

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

EP-2 Clarifier Launder Covers

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	**90**
Total Bhp	0
Motor Efficiency	**92%**
Adjustable Frequency Drive Efficiency	**90%**
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	**24**
Operating Days Per Week	**7**
Operating Weeks Per Year	**52**
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	**0.083**	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

DI-1 Replacement UV System

INITIAL COST ESTIMATE

General Description
Replace vertical bulb system with horizontal bulb system.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			10,000
Horizontal Low Pressure High Output	Channel	3	338,800	1,016,400
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				1,026,400
Contingency			30%	307,920
Subtotal				1,334,320
Contractor Overhead & Profit			25%	333,580
Total Construction Cost				**1,667,900**
Engineering			15%	250,185
Total Initial Cost				**1,919,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

DI-1 Replacement UV System

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition: Existing UV	lump sum	1	10,000	10,000
Demolition:	lump sum			
Demoltion				**10,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

DI-1 Replacement UV System

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Electricity: Lamps	Kw-hrs			0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1a Combined Raw Sludge Disk Thickener

INITIAL COST ESTIMATE

General Description
Not recommended by manufacturer

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				0
Contingency			30%	0
Subtotal				0
Contractor Overhead & Profit			25%	0
Total Construction Cost				**0**
Engineering			15%	0
Total Initial Cost				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1a Combined Raw Sludge Disk Thickener

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1a Combined Raw Sludge Disk Thickener

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	**90**
Total Bhp	0
Motor Efficiency	**92%**
Adjustable Frequency Drive Efficiency	**90%**
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	**24**
Operating Days Per Week	**7**
Operating Weeks Per Year	**52**
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	**0.083**	0
Maintenance	hours	0	**35**	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1b Separate WAS Sludge Disk Thickener and Struvite Control

INITIAL COST ESTIMATE

General Description
This alternative is to thicken the WAS to 5% TS prior to digestion on a disk thickener. Primary sludge would thicken separately in the south gravity thickener to 5% TS.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			2,000
Metals	See Worksheet for Detailed Cost Breakdown			20,000
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Twin Disk Thickener	Each	1	263,350	263,350
Thin Sludge Feed Pump/Meter	Each	0	20,000	0
Polymer Unit	Each	1	21,000	21,000
Thickened Sludge Pump	Each	1	16,000	16,000
Piping, Fittings, and Valves	Lump Sum	1	65,000	65,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	40,000	40,000
Instrumentation and Control Not Listed Above	Lump Sum	1	40,000	40,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum			
Subtotal				472,350
Contingency			30%	141,705
Subtotal				614,055
Contractor Overhead & Profit			25%	153,514
Total Construction Cost				**767,569**
Engineering			15%	115,135
Total Initial Cost				**883,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1b Separate WAS Sludge Disk Thickener and Struvite Control

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab (Equipment Pads)	Lump Sum	1	2,000	2,000
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**2,000**
Metals: Aluminum Grating and Platforms	Lump Sum	1	20,000	20,000
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**20,000**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1b Separate WAS Sludge Disk Thickener and Struvite Control

ANNUAL O&M COST ESTIMATE

General Description	**Drive**	**W3**
Number of Pumps Operating	**2**	**1**
Brake Horsepower of Each Operating Pump	**2.25**	**0.70**
Total Bhp	5	1
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**100%**
Wire Horsepower	5	1
Wire Kilowatts	4	1
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**3**	**3**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	3,844	3,844

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	17,766	**0.083**	1,475
Polymer	lb	**22,995**	**1.21**	27,824
Ferric Chloride	Gal	**7,300**	**1.17**	8,541
Total Annual Cost				**38,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**535,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1c Combined Raw Sludge GBT

INITIAL COST ESTIMATE

General Description
This alternative is for the thickening of both primary sludge and WAS on a new GBT (2-meter) adjacent to the digested sludge GBT. This is expected to result in 7-9% TS on thickened sludge.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			2,000
Metals	See Worksheet for Detailed Cost Breakdown			20,000
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Gravity Belt Thickener (2-Meter)	Each	1	250,000	250,000
Thin Sludge Feed Pump/Meter	Each	0	20,000	0
Polymer Unit	Each	1	21,000	21,000
Thickened Sludge Pump	Each	1	16,000	16,000
Piping, Fittings, and Valves	Lump Sum	1	65,000	65,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	40,000	40,000
Instrumentation and Control Not Listed Above	Lump Sum	1	40,000	40,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum			
Subtotal				459,000
Contingency			30%	137,700
Subtotal				596,700
Contractor Overhead & Profit			25%	149,175
Total Construction Cost				**745,875**
Engineering			15%	111,881
Total Initial Cost				**858,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1c Combined Raw Sludge GBT

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab (Equipment Pads)	Lump Sum	1	2,000	2,000
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**2,000**
Metals: Aluminum Grating and Platforms	Lump Sum	1	20,000	20,000
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**20,000**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1c Combined Raw Sludge GBT

ANNUAL O&M COST ESTIMATE

General Description	**Drive**	**W3**
Number of Pumps Operating	**1**	**1**
Brake Horsepower of Each Operating Pump	**2**	**1.2**
Total Bhp	2	1
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**100%**
Wire Horsepower	2	1
Wire Kilowatts	2	1
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**3**	**3**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	3,162	3,162

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	8,776	**0.083**	728
Polymer	lb	**38,892**	**1.21**	47,059
Total Annual Cost				**48,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**675,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1d Separate WAS Sludge GBT and Struvite Control

INITIAL COST ESTIMATE

General Description
This alternative is to thicken the WAS to 5% TS prior to digestion on a GBT. Primary sludge would thicken separately in the south gravity thickener to 5% TS.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			2,000
Metals	See Worksheet for Detailed Cost Breakdown			20,000
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Gravity Belt Thickener (1-Meter)	Each	1	175,000	175,000
Thin Sludge Feed Pump/Meter	Each	0	20,000	0
Polymer Unit	Each	1	13,650	13,650
Thickened Sludge Pump	Each	1	10,400	10,400
Piping, Fittings, and Valves	Lump Sum	1	48,750	48,750
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	36,000	36,000
Instrumentation and Control Not Listed Above	Lump Sum	1	36,000	36,000
Plumbing Not Listed Above	Lump Sum	1	4,500	4,500
HVAC Not Listed Above	Lump Sum			
Subtotal				346,300
Contingency			30%	103,890
Subtotal				450,190
Contractor Overhead & Profit			25%	112,548
Total Construction Cost				**562,738**
Engineering			15%	84,411
Total Initial Cost				**648,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1d Separate WAS Sludge GBT and Struvite Control

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab (Equipment Pads)	Lump Sum	1	2,000	2,000
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**2,000**
Metals: Aluminum Grating and Platforms	Lump Sum	1	20,000	20,000
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**20,000**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1d Separate WAS Sludge GBT and Struvite Control

ANNUAL O&M COST ESTIMATE

General Description	**Drive**	**W3**
Number of Pumps Operating	**1**	**1**
Brake Horsepower of Each Operating Pump	**2**	**1.2**
Total Bhp	2	1
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**100%**
Wire Horsepower	2	1
Wire Kilowatts	2	1
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**2**	**2**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	2,446	2,446

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	6,788	**0.083**	563
Polymer	lb	**22,982**	**1.21**	27,808
Ferric Chloride	Gal	**7,300**	**1.17**	8,541
Total Annual Cost				**37,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**520,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1e Combined Raw Sludge RDT

INITIAL COST ESTIMATE

General Description
This alternative is for the thickening of both primary sludge and WAS on a new RDT adjacent to the digested sludge GBT. This is expected to result in 7-9% TS on thickened sludge.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			4,000
Metals	See Worksheet for Detailed Cost Breakdown			20,000
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Rotary Drum Thickener (2100 lb/hr each)	Each	2	283,750	567,500
Thin Sludge Feed Pump/Meter	Each	2	20,000	40,000
Polymer Unit	Each	2	21,000	42,000
Thickened Sludge Pump	Each	2	16,000	32,000
Piping, Fittings, and Valves	Lump Sum	1	90,000	90,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	40,000	40,000
Instrumentation and Control Not Listed Above	Lump Sum	1	40,000	40,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum			
Subtotal				880,500
Contingency			30%	264,150
Subtotal				1,144,650
Contractor Overhead & Profit			25%	286,163
Total Construction Cost				**1,430,813**
Engineering			15%	214,622
Total Initial Cost				**1,646,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1e Combined Raw Sludge RDT

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab (Equipment Pads)	Lump Sum	2	2,000	4,000
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**4,000**
Metals: Aluminum Grating and Platforms	Lump Sum	1	20,000	20,000
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**20,000**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1e Combined Raw Sludge RDT

ANNUAL O&M COST ESTIMATE

General Description	**Drive**	**W3**
Number of Pumps Operating	**2**	**2**
Brake Horsepower of Each Operating Pump	**6**	**0.5**
Total Bhp	11	1
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**100%**
Wire Horsepower	13	1
Wire Kilowatts	10	1
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**4**	**4**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	5,329	5,329

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	57,134	**0.083**	4,742
Polymer	lb	**120,689**	**1.21**	146,034
Total Annual Cost				**151,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**2,123,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1f Separate WAS Sludge RDT and Struvite Control

INITIAL COST ESTIMATE

General Description
This alternative is to thicken the WAS to 5% TS prior to digestion on a Rotary Drum Thickener. Primary sludge would thicken separately in the south gravity thickener to 5% TS.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			2,000
Metals	See Worksheet for Detailed Cost Breakdown			20,000
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Rotary Drum Thickener (2100 lb/hr)	Each	1	283,750	283,750
Thin Sludge Feed Pump/Meter	Each	1	20,000	20,000
Polymer Unit	Each	1	21,000	21,000
Thickened Sludge Pump	Each	1	16,000	16,000
Piping, Fittings, and Valves	Lump Sum	1	65,000	65,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	30,000	30,000
Instrumentation and Control Not Listed Above	Lump Sum	1	40,000	40,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum			
Subtotal				502,750
Contingency			30%	150,825
Subtotal				653,575
Contractor Overhead & Profit			25%	163,394
Total Construction Cost				**816,969**
Engineering			15%	122,545
Total Initial Cost				**940,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1f Separate WAS Sludge RDT and Struvite Control

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab (Equipment Pads)	cu yds	1	2,000	2,000
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**2,000**
Metals: Aluminum Grating and Platforms	sq ft	1	20,000	20,000
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**20,000**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

ST-1f Separate WAS Sludge RDT and Struvite Control

ANNUAL O&M COST ESTIMATE

General Description	**Drive**	**W3**
Number of Pumps Operating	**1**	**1**
Brake Horsepower of Each Operating Pump	**6**	**0.5**
Total Bhp	6	1
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**100%**
Wire Horsepower	7	1
Wire Kilowatts	5	0
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**6**	**6**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	6,989	6,989

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	37,465	**0.083**	3,110
Polymer	lb	**39,551**	**1.21**	47,857
Ferric Chloride	Gal	**7,300**	**1.17**	8,541
Total Annual Cost				**60,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**844,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

D-1 Status Quo Mesophilic Digestion

INITIAL COST ESTIMATE

General Description

Construct new boilers, heat exchangers and pumps for all four digesters, and a new boiler bulding with heat exchangers in existing boiler room. Relocate recirculation pumps of Digesters No. 2 and 3 to a lower elevation for improved hydraulics. Also includes a liquid storage tank as a buffer prior to solids handling (0.7 MG).

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			20,000
Buildings	See Worksheet for Detailed Cost Breakdown			290,000
Demoltion	See Worksheet for Detailed Cost Breakdown			10,000
Boilers	Each	2	140,000	280,000
Heat Exchangers	Each	4	90,000	360,000
Recirculation Pumps	Each	4	25,000	100,000
Sludge Piping	Lump Sum	1	80,000	80,000
Hot Water Piping and Pumps	Lump Sum	1	50,000	50,000
Liquid Storage Buffer Tank	Lump Sum	1	400,000	400,000
Civil Not Listed Above	Lump Sum	1	70,000	70,000
Electrical Not Listed Above	Lump Sum	1	100,000	100,000
Instrumentation and Control Not Listed Above	Lump Sum	1	60,000	60,000
Plumbing Not Listed Above	Lump Sum	1	15,000	15,000
HVAC Not Listed Above	Lump Sum	1	30,000	30,000
Subtotal				1,865,000
Contingency			30%	559,500
Subtotal				2,424,500
Contractor Overhead & Profit			25%	606,125
Total Construction Cost				**3,030,625**
Engineering			15%	454,594
Total Initial Cost				**3,486,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

D-1 Status Quo Mesophilic Digestion

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	Lump Sum	1	20,000	20,000
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**20,000**
Building: Boiler Room	sq ft	1,200	175	210,000
Building: Recirculation Pump Room	sq ft	400	200	80,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**290,000**
Demolition: Remove Existing Boilers	lump sum	1	10,000	10,000
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**10,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

D-1 Status Quo Mesophilic Digestion

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	**0**
Total Bhp	0
Motor Efficiency	**92%**
Adjustable Frequency Drive Efficiency	**90%**
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	**24**
Operating Days Per Week	**7**
Operating Weeks Per Year	**52**
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	**0.083**	0
Maintenance	hours	0	**35**	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

D-2 TPAD Conversion

INITIAL COST ESTIMATE

General Description

This alternative is similar to D-1, but the size of the boilers and heat exchangers has been increased for thermophilic temperatures. The increased capacity of TPAD frees up one digester to use as the liquid buffer prior to solids handling.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			20,000
Buildings	See Worksheet for Detailed Cost Breakdown			290,000
Demoltion	See Worksheet for Detailed Cost Breakdown			10,000
Boilers	Each	2	160,000	320,000
Heat Exchangers	Each	4	90,000	360,000
Recirculation Pumps	Each	4	25,000	100,000
Sludge Piping	Lump Sum	1	80,000	80,000
Hot Water Piping and Pumps	Lump Sum	1	50,000	50,000
Sludge Cooling Heat Exchanger	Lump Sum	1	80,000	80,000
Civil Not Listed Above	Lump Sum	1	70,000	70,000
Electrical Not Listed Above	Lump Sum	1	100,000	100,000
Instrumentation and Control Not Listed Above	Lump Sum	1	60,000	60,000
Plumbing Not Listed Above	Lump Sum	1	15,000	15,000
HVAC Not Listed Above	Lump Sum	1	30,000	30,000
Subtotal				1,585,000
Contingency			30%	475,500
Subtotal				2,060,500
Contractor Overhead & Profit			25%	515,125
Total Construction Cost				**2,575,625**
Engineering			15%	386,344
Total Initial Cost				**2,962,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

D-2 TPAD Conversion

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	Lump Sum	1	20,000	20,000
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**20,000**
Building:	sq ft	1,200	175	210,000
Building:	sq ft	400	200	80,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**290,000**
Demolition:	lump sum	1	10,000	10,000
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**10,000**

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Wastewater Treatment Facilities Plan
La Crosse, WI

D-2 TPAD Conversion

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	0
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Maintenance	hours	0	35	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

D-3 WAS Conditioning (Temperature and pH)

INITIAL COST ESTIMATE

General Description
This alternative is a modification of D-1 by inclusion of temperature, chemical, heat, and pressure cell lysis to increase digestion rate of WAS. These additional components are located in the dewatering building.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			20,000
Buildings	See Worksheet for Detailed Cost Breakdown			290,000
Demoltion	See Worksheet for Detailed Cost Breakdown			10,000
TCHP Cell Lysis	Lump Sum	1	1,560,000	1,560,000
Boilers	Each	2	140,000	280,000
Heat Exchangers	Each	4	90,000	360,000
Recirculation Pumps	Each	4	25,000	100,000
Sludge Piping	Lump Sum	1	80,000	80,000
Hot Water Piping and Pumps	Lump Sum	1	50,000	50,000
Civil Not Listed Above	Lump Sum	1	70,000	70,000
Electrical Not Listed Above	Lump Sum	1	100,000	100,000
Instrumentation and Control Not Listed Above	Lump Sum	1	60,000	60,000
Plumbing Not Listed Above	Lump Sum	1	15,000	15,000
HVAC Not Listed Above	Lump Sum	1	30,000	30,000
Subtotal				3,025,000
Contingency			30%	907,500
Subtotal				3,932,500
Contractor Overhead & Profit			25%	983,125
Total Construction Cost				**4,915,625**
Engineering			15%	737,344
Total Initial Cost				**5,653,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

D-3 WAS Conditioning (Temperature and pH)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	Lump Sum	1	20,000	20,000
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**20,000**
Building:	sq ft	1,200	175	210,000
Building:	sq ft	400	200	80,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**290,000**
Demolition:	lump sum	1	10,000	10,000
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**10,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

D-3 WAS Conditioning (Temperature and pH)

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	**1**
Brake Horsepower of Each Operating Pump	**20**
Total Bhp	20
Motor Efficiency	**92%**
Adjustable Frequency Drive Efficiency	**90%**
Wire Horsepower	24
Wire Kilowatts	18
Operating Hours Per Day	**24**
Operating Days Per Week	**7**
Operating Weeks Per Year	**52**
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	157,417	**0.083**	13,066
Maintenance	hours	0	**35**	0
NaOH	gal	18,250	**0.625**	11,406
Total Annual Cost				**25,000**

Present Worth Analysis

Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**352,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

DM-1 Digester 1&4 Draft Tube 2&3 Jet Mixing

INITIAL COST ESTIMATE

General Description
This alternative is for the construction of external draft tubes for mixing the two 74.5' diameter digesters and the construction of jet (pump & nozzle) mixing for two 65' diameter digesters.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			3,000
Concrete	See Worksheet for Detailed Cost Breakdown			8,000
Metals	See Worksheet for Detailed Cost Breakdown			1,120
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			8,000
Jet Mixing	Each	2	94,375	188,750
Jet Mixing - 30 hp VFD	Each	2	5,500	11,000
Jet Mixing - Piping	Lump Sum	1	26,000	26,000
10 hp Draft Tube Mixers (2 per digester)	Each	4	125,000	500,000
Civil Not Listed Above	Lump Sum	1	15,000	15,000
Electrical Not Listed Above	Lump Sum	1	70,000	70,000
Instrumentation and Control Not Listed Above	Lump Sum	1	40,000	40,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum			
Subtotal				875,870
Contingency			30%	262,761
Subtotal				1,138,631
Contractor Overhead & Profit			25%	284,658
Total Construction Cost				**1,423,289**
Engineering			15%	213,493
Total Initial Cost				**1,637,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

DM-1 Digester 1&4 Draft Tube 2&3 Jet Mixing

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds	75	40	3,000
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**3,000**
Concrete: Footings	cu yds			
Concrete: Base Slab (Equipment Pads)	lump sum	2	4,000	8,000
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**8,000**
Metals: Aluminum Grating	sq ft	32	35	1,120
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**1,120**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition: 2' x 2' Hole	Per Hole	4	2,000	8,000
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**8,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

DM-1 Digester 1&4 Draft Tube 2&3 Jet Mixing

ANNUAL O&M COST ESTIMATE

General Description	**Jet Mixing**	**Draft Tube**
Number of Motors Operating	**2**	**4**
Brake Horsepower of Each Operating Pump	**28**	**8.7**
Total Bhp	56	35
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**
Wire Horsepower	68	42
Wire Kilowatts	50	31
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**7**	**7**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	8,736	8,736

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	714,672	**0.083**	59,318
Total Annual Cost				**60,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**844,000**

City of La Crosse
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BR-1a Status Quo (80% Liquid 20% Cake to Land Application)

INITIAL COST ESTIMATE

General Description
This option is for operating the plant in the same configuration as is current, with both liquid storage and cake storage increased proportionally to accommodate 330 days of storage.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			455,222
Concrete	See Worksheet for Detailed Cost Breakdown			756,470
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			691,040
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Liquid Sludge Storage Tanks Expansion (6.7 MG)	Lump Sum	1	3,076,715	3,076,715
Tank Mixing System	EA	3	250,000	750,000
Piping, Fittings, Valves	Lump Sum	1	80,000	80,000
Civil Not Listed Above	Lump Sum	1	30,000	30,000
Electrical Not Listed Above	Lump Sum	1	60,000	60,000
Instrumentation and Control Not Listed Above	Lump Sum	1	40,000	40,000
Plumbing Not Listed Above	Lump Sum	1	10,000	10,000
HVAC Not Listed Above	Lump Sum	1	30,000	30,000
Subtotal				5,979,447
Contingency			30%	1,793,834
Subtotal				7,773,281
Contractor Overhead & Profit			25%	1,943,320
Total Construction Cost				**9,716,601**
Engineering			15%	1,457,490
Total Initial Cost				**11,175,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1a Status Quo (80% Liquid 20% Cake to Land Application)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds	2,500	10	25,000
Earthwork: Pile Foundation - Cake Storage	ft	2,375	16.75	39,789
Earthwork: Pile Foundation - Liquid Storage	ft	23,309	16.75	390,433
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**455,222**
Concrete: Base Slab - Cake Storage	cu yds	427	400	170,627
Concrete: Base Slab - Liquid Storage	cu yds	1,043	400	417,336
Concrete: Walls - Cake Storage	cu yds	140	1,200	168,507
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**756,470**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building: Cake Storage	sq ft	17,276	40	691,040
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**691,040**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1a Status Quo (80% Liquid 20% Cake to Land Application)

ANNUAL O&M COST ESTIMATE

General Description	**GBT**	**BFP**
Number of Motors Operating	**1**	**1**
Brake Horsepower of Each Operating Pump	**15**	**35**
Total Bhp	15	35
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**
Wire Horsepower	18	42
Wire Kilowatts	14	32
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**1.6**	**0.8**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	1,948	1,048

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	59,385	**0.083**	4,929
Liquid Sludge Disposal	Gal	**14,453,725**	**0.0605**	874,450
Cake Disposal	Dry Ton	**904**	**182**	164,714
Polymer	Gal	**39,790**	**1.21**	48,146
Total Annual Cost				**1,093,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**15,360,000**

City of La Crosse
Wastewater Treatment Facilities Plan
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BR-1b 15%TS Liquid Handling (75% Liquid 25% Cake to Land Application)

INITIAL COST ESTIMATE

General Description
This alternative includes modifications to the existing belt press discharge conveyros above the cake truck to enable cake conveyande to a Lystek cake hopper. Lystek hopper cake pump feeds the reactor where sludge is blended with a high pH and temperature to cause cell dysis. Final product is flowable 15% TS liquid. The GBT can also be reused for predigestion thickening.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			79,054
Concrete	See Worksheet for Detailed Cost Breakdown			480,936
Metals	See Worksheet for Detailed Cost Breakdown			50,000
Buildings	See Worksheet for Detailed Cost Breakdown			938,800
Demoltion	See Worksheet for Detailed Cost Breakdown			112,500
GBT Credit (ST-1c)	Lump Sum	1	-459,000	-459,000
Lystek System (6 wet-ton/hr)	Lump Sum	1	2,500,000	2,500,000
Lystek Installation	Lump Sum	1	600,000	600,000
Cake Conveyors	ft	70	1,500	105,000
Biogas Conditioning	Each	1	200,000	200,000
Odor Control	Each	2	150,000	300,000
Tank Mixing System	Each	0	250,000	0
Civil Not Listed Above	Lump Sum	1	5,000	5,000
Electrical Not Listed Above	Lump Sum	1	1,100,000	1,100,000
Instrumentation and Control Not Listed Above	Lump Sum	1	400,000	400,000
Plumbing Not Listed Above	Lump Sum	1	60,000	60,000
HVAC Not Listed Above	Lump Sum	1	135,000	135,000
Subtotal				6,607,290
Contingency			30%	1,982,187
Subtotal				8,589,477
Contractor Overhead & Profit			25%	2,147,369
Total Construction Cost				**10,736,846**
Engineering			15%	1,610,527
Total Initial Cost				**12,348,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1b 15%TS Liquid Handling (75% Liquid 25% Cake to Land Application)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds	2,500	10	25,000
Earthwork: Pile Foundation - Cake Storage	ft	3,227	16.75	54,054
Earthwork: Pile Foundation - Liquid Storage	ft		16.75	0
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**79,054**
Concrete: Base Slab - Cake Storage	cu yds	580	400	231,802
Concrete: Base Slab - Liquid Storage	cu yds		400	0
Concrete: Walls - Cake Storage	cu yds	166	1,200	199,133
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	Lump Sum	1	50,000	50,000
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**480,936**
Metals: Aluminum Grating	Lump Sum	1	50,000	50,000
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**50,000**
Building: Cake Storage	sq ft	23,470	40	938,800
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**938,800**
Demolition: Cut Floor	cu ft	225	500	112,500
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**112,500**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1b 15%TS Liquid Handling (75% Liquid 25% Cake to Land Application)

ANNUAL O&M COST ESTIMATE

General Description	**BFP**	**Lystek Mixer**
Number of Motors Operating	**1**	**1**
Brake Horsepower of Each Operating Pump	**35**	**150**
Total Bhp	35	150
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**
Wire Horsepower	42	181
Wire Kilowatts	32	135
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**4.3**	**3.0**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	5,329	3,744

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	674,025	**0.083**	55,944
Liquid Sludge Disposal	Gal	**5,420,147**	**0.0605**	327,919
Cake Disposal	Ton	**1,130**	**182**	205,892
Polymer	Gal	**40,695**	**1.21**	49,240
Alkali Dosing	lb	**483,226**	**0.380**	183,626
Fuel	Therms	**65,043**	**0.650**	42,278
Fuel (Biogas)	Therms	**65,043**	**-0.650**	-42,278
Total Annual Cost				**823,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053

Present Worth of Total Annual Cost **11,566,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1c Increase Cake Handling (50% Liquid 50% Cake to Land Application)

INITIAL COST ESTIMATE

General Description
This option is for maintaining dual solids handling trains; one liquid and one cake. Each train handles 50% of the load. To make this more viable, the dewatering equipment has been expanded as well as the cake storage and liquid storage facilities.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			259,819
Concrete	See Worksheet for Detailed Cost Breakdown			1,093,653
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			2,545,600
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Screw Press (800 lb/hr)	Each	2	462,500	925,000
Polymer System	Each	2	30,000	60,000
Liquid Sludge Storage Tanks Expansion (1.8 MG)	Lump Sum	1	828,994	828,994
Tank Mixing System	Each	1	250,000	250,000
Piping, Fittings, Valves	Lump Sum	1	68,000	68,000
Civil Not Listed Above	Lump Sum	1	25,500	25,500
Electrical Not Listed Above	Lump Sum	1	46,750	46,750
Instrumentation and Control Not Listed Above	Lump Sum	1	32,000	32,000
Plumbing Not Listed Above	Lump Sum	1	8,500	8,500
HVAC Not Listed Above	Lump Sum	1	23,800	23,800
Subtotal				6,167,615
Contingency			30%	1,850,284
Subtotal				8,017,899
Contractor Overhead & Profit			25%	2,004,475
Total Construction Cost				**10,022,374**
Engineering			15%	1,503,356
Total Initial Cost				**11,526,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1c Increase Cake Handling (50% Liquid 50% Cake to Land Application)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds	2,500	10	25,000
Earthwork: Pile Foundation - Cake Storage	ft	7,739	16.75	129,620
Earthwork: Pile Foundation - Liquid Storage	ft	6,281	16.75	105,199
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**259,819**
Concrete: Base Slab - Cake Storage	cu yds	1,412	400	564,938
Concrete: Base Slab - Liquid Storage	cu yds	281	400	112,448
Concrete: Walls - Cake Storage	cu yds	347	1,200	416,267
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**1,093,653**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building: Cake Storage	sq ft	54,440	40	2,177,600
Building: Dewatering Building	sq ft	1,840	200	368,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**2,545,600**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1c Increase Cake Handling (50% Liquid 50% Cake to Land Application)

ANNUAL O&M COST ESTIMATE

General Description	**GBT**	**Screw Press**
Number of Motors Operating	**1**	**2**
Brake Horsepower of Each Operating Pump	**15**	**5.5**
Total Bhp	15	11
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**
Wire Horsepower	18	13
Wire Kilowatts	14	10
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**1.0**	**2.3**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	1,223	2,883

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	45,100	**0.083**	3,743
Liquid Sludge Disposal	Gal	**9,033,578**	**0.0605**	546,531
Cake Disposal	Ton	**2,261**	**182**	411,784
Polymer	Gal	**108,519**	**1.2**	131,308
Total Annual Cost				**1,094,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**15,374,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1cr Improve Logistics (Remote Cake Storage)

INITIAL COST ESTIMATE

General Description
This option is similar to that presented in BR-1c, but differs in that the cake storage is expanded to allow 2 months of storage capacity off site in two separate facilities (Note: each facility has 1 month of storage).

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			236,251
Concrete	See Worksheet for Detailed Cost Breakdown			1,093,653
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			2,347,636
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Screw Press (800 lb/hr)	Each	2	462,500	925,000
Polymer System	Each	2	30,000	60,000
Liquid Sludge Storage Tanks Expansion (1.8 MG)	Lump Sum	1	828,994	828,994
Tank Mixing System	Each	1	250,000	250,000
Piping, Fittings, Valves	Lump Sum	1	68,000	68,000
Land	Acre	2	10,000	20,000
Civil Not Listed Above	Lump Sum	1	42,500	42,500
Electrical Not Listed Above	Lump Sum	1	46,750	46,750
Instrumentation and Control Not Listed Above	Lump Sum	1	32,000	32,000
Plumbing Not Listed Above	Lump Sum	1	8,500	8,500
HVAC Not Listed Above	Lump Sum	1	23,800	23,800
Subtotal				5,983,084
Contingency			30%	1,794,925
Subtotal				7,778,009
Contractor Overhead & Profit			25%	1,944,502
Total Construction Cost				**9,722,512**
Engineering			15%	1,458,377
Total Initial Cost				**11,181,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1cr Improve Logistics (Remote Cake Storage)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds	2,500	10	25,000
Earthwork: Pile Foundation - Cake Storage (WWTP)	ft	6,332	16.75	106,053
Earthwork: Pile Foundation - Liquid Storage	ft	6,281	16.75	105,199
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**236,251**
Concrete: Base Slab - Cake Storage	cu yds	1,412	400	564,938
Concrete: Base Slab - Liquid Storage	cu yds	281	400	112,448
Concrete: Walls - Cake Storage	cu yds	347	1,200	416,267
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**1,093,653**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building: Cake Storage	sq ft	44,542	40	1,781,673
Building: Cake Storage Minimal	sq ft	9,898	20	197,964
Building: Dewatering Building	sq ft	1,840	200	368,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**2,347,636**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1cr Improve Logistics (Remote Cake Storage)

ANNUAL O&M COST ESTIMATE

General Description	**GBT**	**Screw Press**
Number of Pumps Operating	**1**	**2**
Brake Horsepower of Each Operating Pump	**15**	**5.5**
Total Bhp	15	11
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**
Wire Horsepower	18	13
Wire Kilowatts	14	10
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**2.0**	**2.3**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	2,446	2,883

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	61,629	**0.083**	5,115
Liquid Sludge Disposal	Gal	**9,033,578**	**0.0605**	546,531
Cake Disposal	Ton	**2,261**	**140**	316,757
Polymer	Gal	**108,519**	**1.2**	131,308
Total Annual Cost				**1,000,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**14,053,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1d Increase Diversity (30% Liquid 70% Dried Biosolids Belt Dryer, with Cake Optional)

INITIAL COST ESTIMATE

General Description
In this alternative, post-digestion solids handling is completed via thickening 30% of the load with the existing GBT while dewatering and drying the other 70%.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			44,464
Concrete	See Worksheet for Detailed Cost Breakdown			58,914
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			1,173,400
Demoltion	See Worksheet for Detailed Cost Breakdown			0
~~Liquid Sludge Storage Tanks Expansion (0 MG)~~	Lump Sum	0	0	
Tank Mixing System	Lump Sum	0	250,000	0
Piping, Fittings, Valves	Lump Sum	1	0	
Polymer System	Each	2	30,000	
Screw Press (800 lb/hr)	Each	2	462,500	925,000
Low Temperature Dryer	Each	1	3,770,000	3,770,000
Dried Cake Silo	Lump Sum	1	2,023,566	2,023,566
Wet Cake Hopper	Lump Sum	1	200,000	200,000
Civil Not Listed Above	Lump Sum	1	130,000	130,000
Electrical Not Listed Above	Lump Sum	1	985,000	985,000
Instrumentation and Control Not Listed Above	Lump Sum	1	590,000	590,000
Plumbing Not Listed Above	Lump Sum	1	220,000	220,000
HVAC Not Listed Above	Lump Sum	1	328,000	328,000
Subtotal				10,448,344
Contingency			30%	3,134,503
Subtotal				13,582,847
Contractor Overhead & Profit			25%	3,395,712
Total Construction Cost				**16,978,559**
Engineering			15%	2,546,784
Total Initial Cost				**19,526,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1d Increase Diversity (30% Liquid 70% Dried Biosolids Belt Dryer, with Cake Optional)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds	2,500	10	25,000
Earthwork: Pile Foundation - Dewatering/Drying	ft	6,238	16.75	104,485
Earthwork: Pile Foundation - Liquid Storage	ft	-5,076	16.75	-85,021
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**44,464**
Concrete: Base Slab - Dewatering/Drying	cu yds	374	400	149,793
Concrete: Base Slab - Liquid Storage	cu yds	-227	400	-90,879
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**58,914**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building: Dewatering Building (reuse cake storage)	sq ft	1,840	10	18,400
Building: Drying Building	sq ft	7,700	150	1,155,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**1,173,400**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1d Increase Diversity (30% Liquid 70% Dried Biosolids Belt Dryer, with Cake Optional)

ANNUAL O&M COST ESTIMATE

General Description	**GBT**	**Screw Press**	**Dryer W3**	**Dryer**
Number of Motors Operating	**1**	**2**	**1**	**1**
Brake Horsepower of Each Operating Pump	**15**	**5.5**	**13.4**	**210.0**
Total Bhp	15	11	13	210
Motor Efficiency	**92%**	**92%**	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**	**90%**	**90%**
Wire Horsepower	18	13	16	254
Wire Kilowatts	14	10	12	189
Operating Hours Per Day	**24**	**24**	**24**	**24**
Operating Days Per Week	**0.6**	**3.2**	**3.8**	**3.8**
Operating Weeks Per Year	**52**	**52**	**52**	**52**
Operating Hours Per Year	786	4,019	4,717	4,717

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	50,452	**0.083**	4,188
Electricity - Dryer	Kw-hrs	949,663	**0.083**	78,822
Liquid Sludge Disposal	Gal	**2,890,800**	**0.0605**	174,893
Dried Product Disposal	Dry Ton	**3,165**	**35**	110,875
Polymer	Gal	**137,467**	**1.2**	166,335
Fuel (biogas)	Therm	**408,755**	**-0.65**	-265,691
Fuel (natural gas)	Therm	**408,755**	**0.65**	265,691
Total Annual Cost				**536,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053

Present Worth of Total Annual Cost	**7,533,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1e Increase Diversity (50% Liquid, 40% Cake, and 10% Dried Biosolids Solar)

INITIAL COST ESTIMATE

General Description
This alternative modifies BR-1c to include a solar dryer for drying 10% annually of the biosolids cake up to 75% TS primarily in the March-October season. Class A potential with testing.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			231,288
Concrete	See Worksheet for Detailed Cost Breakdown			1,419,973
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			2,050,080
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Solar Dryer	Each	1	1,590,000	1,590,000
Screw Press (800 lb/hr)	Each	2	462,500	925,000
Polymer System	Each	2	30,000	60,000
Liquid Sludge Storage Tanks Expansion (1.8 MG)	Lump Sum	1	422,924	422,924
Tank Mixing System	Each	1	250,000	250,000
Piping, Fittings, Valves	Lump Sum	1	68,000	68,000
Civil Not Listed Above	Lump Sum	1	30,000	30,000
Electrical Not Listed Above	Lump Sum	1	190,000	190,000
Instrumentation and Control Not Listed Above	Lump Sum	1	72,000	72,000
Plumbing Not Listed Above	Lump Sum	1	9,000	9,000
HVAC Not Listed Above	Lump Sum	1	28,000	28,000
Subtotal				7,346,265
Contingency			30%	2,203,879
Subtotal				9,550,144
Contractor Overhead & Profit			25%	2,387,536
Total Construction Cost				**11,937,680**
Engineering			15%	1,790,652
Total Initial Cost				**13,729,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1e Increase Diversity (50% Liquid, 40% Cake, and 10% Dried Biosolids Solar)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds	2,500	10	25,000
Earthwork: Pile Foundation - Cake Storage	ft	6,035	16.75	101,089
Earthwork: Pile Foundation - Liquid Storage	ft	6,281	16.75	105,199
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**231,288**
Concrete: Base Slab - Cake Storage	cu yds	1,106	400	442,588
Concrete: Base Slab - Liquid Storage	cu yds	281	400	112,448
Concrete: Walls - Cake Storage	cu yds	278	1,200	333,680
Concrete: Base Slab - Solar	cu yds	1,088	400	435,258
Concrete: Walls - Solar	cu yds	80	1,200	96,000
Concrete: Columns	cu yds			
Concrete:	Lump Sum			
Concrete: Precast Roof	ft			
Concrete				**1,419,973**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building: Cake Storage	sq ft	42,052	40	1,682,080
Building: Dewatering Building	sq ft	1,840	200	368,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**2,050,080**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1e Increase Diversity (50% Liquid, 40% Cake, and 10% Dried Biosolids Solar)

ANNUAL O&M COST ESTIMATE

General Description	GBT	Screw Press	Solar HVAC
Number of Pumps Operating	1	2	4
Brake Horsepower of Each Operating Pump	15	5.5	20.0
Total Bhp	15	11	80
Motor Efficiency	92%	92%	92%
Adjustable Frequency Drive Efficiency	90%	90%	90%
Wire Horsepower	18	13	97
Wire Kilowatts	14	10	72
Operating Hours Per Day	24	24	24
Operating Days Per Week	1.0	2.3	2.2
Operating Weeks Per Year	52	52	52
Operating Hours Per Year	1,223	2,883	2,683

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	238,498	0.083	19,795
Liquid Sludge Disposal	Gal	9,033,578	0.0605	546,531
Cake Disposal	Dry Ton	1,809	182	329,427
Dried Biosolids Disposal	Dry Ton	452	70	31,676
Polymer	Gal	45,216	1.2	54,712
Total Annual Cost				**983,000**

Present Worth Analysis	
Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**13,815,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1f Increase Diversity (100% Dried Biosolids, with Liquid or Cake Optional)

INITIAL COST ESTIMATE

General Description
In this alternative, post-digestion solids handling is completed via thickening 50% of the load with the existing GBT while dewatering and drying the other 50%.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			166,338
Concrete	See Worksheet for Detailed Cost Breakdown			202,306
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			1,668,400
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Liquid Sludge Buffer Tank Credit (D-1 partial)	Lump Sum	1	-400,000	-400,000
Polymer System	Each	3	30,000	
Screw Press (800 lb/hr)	Each	3	462,500	1,387,500
Low Temperature Dryer	Each	2	3,020,000	6,040,000
Dried Cake Silo	Lump Sum	1	2,900,000	2,900,000
Wet Cake Hopper	Lump Sum	1	200,000	200,000
GBT Credit (ST-1c)	Lump Sum	1	-459,000	-459,000
Civil Not Listed Above	Lump Sum	1	130,000	130,000
Electrical Not Listed Above	Lump Sum	1	1,135,000	1,135,000
Instrumentation and Control Not Listed Above	Lump Sum	1	590,000	590,000
Plumbing Not Listed Above	Lump Sum	1	190,000	190,000
HVAC Not Listed Above	Lump Sum	1	288,000	288,000
Subtotal				14,038,544
Contingency			30%	4,211,563
Subtotal				18,250,108
Contractor Overhead & Profit			25%	4,562,527
Total Construction Cost				**22,812,635**
Engineering			15%	3,421,895
Total Initial Cost				**26,235,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1f Increase Diversity (100% Dried Biosolids, with Liquid or Cake Optional)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds	2,500	10	25,000
Earthwork: Pile Foundation - Dewatering/Drying	ft	8,438	16.75	141,338
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**166,338**
Concrete: Base Slab - Dewatering/Drying	cu yds	506	400	202,306
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**202,306**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building: Dewatering Building (reuse cake storage)	sq ft	1,840	10	18,400
Building: Drying Building	sq ft	11,000	150	1,650,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**1,668,400**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1f Increase Diversity (100% Dried Biosolids, with Liquid or Cake Optional)

ANNUAL O&M COST ESTIMATE

General Description	**GBT**	**Screw Press**	**Dryer W3**	**Dryer**
Number of Motors Operating	**1**	**3**	**1**	**2**
Brake Horsepower of Each Operating Pump	**15**	**5.5**	**13.4**	**150.0**
Total Bhp	15	17	13	300
Motor Efficiency	**92%**	**92%**	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**	**90%**	**90%**
Wire Horsepower	18	20	16	362
Wire Kilowatts	14	15	12	270
Operating Hours Per Day	**24**	**24**	**24**	**24**
Operating Days Per Week	**0.0**	**2.2**	**2.7**	**2.7**
Operating Weeks Per Year	**52**	**52**	**52**	**52**
Operating Hours Per Year	0	2,683	3,407	3,407

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs	39,888	**0.083**	3,311
Electricity - Dryer	Kw-hrs	962,073	**0.083**	79,852
Liquid Sludge Disposal	Gal	**0**	**0.0605**	0
Dried Product Disposal	Dry Ton	**4,522**	**35**	158,378
Polymer	Gal	**180,865**	**1.2**	218,846
Fuel (biogas)	Therm	**438,000**	**-0.65**	-284,700
Fuel (biogas)	Therm	**583,880**	**0.65**	379,522
Total Annual Cost				**556,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**7,814,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1g Increase Diversity (50% Liquid, 50% Cake, with 10% Cake to Compost)

INITIAL COST ESTIMATE

General Description
No feedback from compost facility

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				0
Contingency			30%	0
Subtotal				0
Contractor Overhead & Profit			25%	0
Total Construction Cost				**0**
Engineering			15%	0
Total Initial Cost				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1g Increase Diversity (50% Liquid, 50% Cake, with 10% Cake to Compost)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft		16.75	0
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds		400	0
Concrete: Walls	cu yds		1,200	0
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft		40	0
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-1g Increase Diversity (50% Liquid, 50% Cake, with 10% Cake to Compost)

ANNUAL O&M COST ESTIMATE

General Description	**GBT**	**Screw Press**
Number of Pumps Operating		
Brake Horsepower of Each Operating Pump	**15**	**5.5**
Total Bhp	0	0
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**90%**
Wire Horsepower	0	0
Wire Kilowatts	0	0
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**1.3**	**2.2**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	1,591	2,683

ITEM	**Units**	**Annual Quantity**	**Unit Cost ($)**	**Annual Cost ($)**
Electricity	Kw-hrs		**0.083**	0
Liquid Sludge Disposal	Gal		**0.0605**	0
Cake Disposal	Ton		**182**	0
Polymer	Gal		**1.2**	0
Total Annual Cost				**0**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-2 Improve Biosolids Quality (add Primary Sludge Screening)

INITIAL COST ESTIMATE

General Description

This alternative allows for the removal of debris from the primary sludge. Unit would be mounted near Plant 2 building, and receive pumped primary sludge prior to the gravity thickener. Screened sludge would fall into the gravity thickener for further thickening and pumping to digestion or solids handling. Screenings are compacted to a dumpster

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			19,263
Concrete	See Worksheet for Detailed Cost Breakdown			36,048
Metals	See Worksheet for Detailed Cost Breakdown			1,920
Buildings	See Worksheet for Detailed Cost Breakdown			160,000
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Huber Screen Press	Each	2	129,000	258,000
Civil Not Listed Above	Lump Sum	1	10,000	10,000
Electrical Not Listed Above	Lump Sum	1	30,000	30,000
Instrumentation and Control Not Listed Above	Lump Sum	1	50,000	50,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum	1	30,000	30,000
Subtotal				600,231
Contingency			30%	180,069
Subtotal				780,300
Contractor Overhead & Profit			25%	195,075
Total Construction Cost				**975,375**
Engineering			15%	146,306
Total Initial Cost				**1,122,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-2 Improve Biosolids Quality (add Primary Sludge Screening)

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	sq ft	1,150	16.75	19,263
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**19,263**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	43	400	17,037
Concrete: Walls	cu yds	6	1,200	7,511
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	sq ft	1,150	10	11,500
Concrete				**36,048**
Metals: Aluminum Grating	sq ft	48	40	1,920
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**1,920**
Building:	sq ft	800	200	160,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**160,000**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BR-2 Improve Biosolids Quality (add Primary Sludge Screening)

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-1 Replace Waste Gas Burner

INITIAL COST ESTIMATE

General Description
Replace the existing waste gas burner with a new higher capacity burner.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			30,000
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
8" Waste Gas Burner	Lump Sum	1	65,000	65,000
Installation	Lump Sum	1	10,000	10,000
Piping Modifications	Lump Sum	1	30,000	30,000
Gas Handling Equipment	Lump Sum	1	45,000	45,000
Civil Not Listed Above	Lump Sum	1	10,000	10,000
Electrical Not Listed Above	Lump Sum	1	5,000	5,000
Instrumentation and Control Not Listed Above	Lump Sum	1	5,000	5,000
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				200,000
Contingency			30%	60,000
Subtotal				260,000
Contractor Overhead & Profit			25%	65,000
Total Construction Cost				**325,000**
Engineering			15%	48,750
Total Initial Cost				**374,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-1 Replace Waste Gas Burner

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab (Equipment Pad)	Lump Sum	1	30,000	30,000
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**30,000**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-1 Replace Waste Gas Burner

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Maintenance	hours	0	35	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-2 Biogas Storage

INITIAL COST ESTIMATE

General Description
This alternative is for construction of a new biogas storage membrane remotely mounted from the digester complex. Sizing provides 12-hour detention for peak shaving.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			8,250
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Slab on Grade Membrane Storage (12 hr)	cf	100,000	5.5	550,629
Digester gas piping	lump sum	1	30,000	30,000
Civil Not Listed Above	Lump Sum	1	5,000	5,000
Electrical Not Listed Above	Lump Sum	1	18,000	18,000
Instrumentation and Control Not Listed Above	Lump Sum	1	25,000	25,000
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				636,879
Contingency			30%	191,064
Subtotal				827,942
Contractor Overhead & Profit			25%	206,986
Total Construction Cost				**1,034,928**
Engineering			15%	155,239
Total Initial Cost				**1,191,000**

BG-2 Biogas Storage

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	25	330	8,250
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**8,250**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-2 Biogas Storage

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	0
Brake Horsepower of Each Operating Pump	5
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

Maintenance Hours Per Year

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Maintenance	hours	0	35	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3a Baseline Energy Consumption

INITIAL COST ESTIMATE

General Description
Baseline condition

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				0
Contingency			30%	0
Subtotal				0
Contractor Overhead & Profit			25%	0
Total Construction Cost				**0**
Engineering			15%	0
Total Initial Cost				**0**

BG-3a Baseline Energy Consumption

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building: Gas Handling Room	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3a Baseline Energy Consumption

ANNUAL O&M COST ESTIMATE

General Description	Existing WWTP Loads	Proposed WWTP Loads
Number of Facilities Operating	1	1
Brake Horsepower of Each Operating Motors		246
Total Bhp		246
Motor Efficiency		92%
Adjustable Frequency Drive Efficiency		90%
Wire Horsepower		298
Wire Kilowatts	630	222
Operating Hours Per Day	24	24
Operating Days Per Week	7	7
Operating Weeks Per Year	52	52
Uptime	100%	100%
Operating Hours Per Year	8,736	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Status Quo Electricity	Kw-hrs	5,503,680	0.083	456,805
Proposed Loads Electricity	Kw-hrs	1,939,000	0.083	160,937
Total Annual Cost				**618,000**

Present Worth Analysis	
Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**8,685,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3b Cogeneration Engine

INITIAL COST ESTIMATE

General Description

This alternative is to construct a digester gas engine generator to convert digester gas energy into electric energy and recovered heat. Includes a new gas conditioning room and a containerized engine with connections to existing biogas, hot water, and electrical systems. New engine mounted near cold storage building north of digesters.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			59,722
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			135,000
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Engine-Generator (400 kW)	Each	1	538,462	538,462
Engine-Generator Install	Lump Sum	1	24,600	24,600
H2S Removal	Each	1	344,000	344,000
H2S Removal Installation	Lump Sum	1	77,500	77,500
Gas Conditioning W/ Siloxane	Each	1	442,000	442,000
Gas Conditioning W/ Siloxane Installation	Each	1	45,500	45,500
Gas Piping	Lump Sum	1	62,500	62,500
Water Piping	Lump Sum	1	50,000	50,000
Civil Not Listed Above	Lump Sum	1	15,000	15,000
Electrical Not Listed Above	Lump Sum	1	173,000	173,000
Instrumentation and Control Not Listed Above	Lump Sum	1	68,000	68,000
Plumbing Not Listed Above	Lump Sum	1	15,000	15,000
HVAC Not Listed Above	Lump Sum	1	40,000	40,000
Subtotal				2,090,284
Contingency			30%	627,085
Subtotal				2,717,369
Contractor Overhead & Profit			25%	679,342
Total Construction Cost				**3,396,711**
Engineering			15%	509,507
Total Initial Cost				**3,907,000**

Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3b Cogeneration Engine

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	199	300	59,722
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**59,722**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building: Gas Handling Room	sq ft	900	150	135,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**135,000**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3b Cogeneration Engine

ANNUAL O&M COST ESTIMATE

General Description	Existing WWTP Loads	Proposed WWTP Loads	Proposed Cogen
Number of Facilities Operating	1	1	1
Brake Horsepower of Each Operating Pump		246	
Total Bhp		246	
Motor Efficiency		92%	
Adjustable Frequency Drive Efficiency		90%	
Wire Horsepower		298	
Wire Kilowatts	630	222	400
Operating Hours Per Day	24	24	24
Operating Days Per Week	7	7	7
Operating Weeks Per Year	52	52	52
Uptime	100%	100%	90%
Operating Hours Per Year	8,736	8,736	7,862

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Status Quo Electricity	Kw-hrs	5,503,680	0.083	456,805
Proposed Loads Electricity	Kw-hrs	1,939,000	0.083	160,937
Self-Serve Electricity	Kw-hrs	3,144,960	-0.083	-261,032
Exporting Electricity	Kw-hrs	0	-0.030	0
Maintenance	Kw-hrs	3,144,960	0.028	88,059
Natural Gas	therms	0	0.650	0
Total Annual Cost				**445,000**

Present Worth Analysis	
Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**6,254,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3c Peak Shaving Cogeneration Engine

INITIAL COST ESTIMATE

General Description
This alternative is for construction of a new biogas storage membrane remotely mounted from the digester complex. Sizing provides 12-hour detention for peak shaving of a new 600kW biogas engine and gas conditioning systems.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			8,250
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Slab on Grade Membrane Storage (12 hr)	cf	100,000	5.5	550,629
Digester gas piping	lump sum	1	30,000	30,000
Engine-Generator (600 kW)	Each	1	800,000	800,000
Engine-Generator Install	Lump Sum	1	24,600	24,600
H2S Removal	Each	1	354,000	354,000
H2S Removal Installation	Lump Sum	1	77,500	77,500
Gas Conditioning W/ Siloxane	Each	1	452,000	452,000
Gas Conditioning W/ Siloxane Installation	Each	1	45,500	45,500
Gas Piping	Lump Sum	1	125,000	125,000
Water Piping	Lump Sum	1	50,000	50,000
Civil Not Listed Above	Lump Sum	1	15,000	15,000
Electrical Not Listed Above	Lump Sum	1	204,000	204,000
Instrumentation and Control Not Listed Above	Lump Sum	1	68,000	68,000
Plumbing Not Listed Above	Lump Sum	1	15,000	15,000
HVAC Not Listed Above	Lump Sum	1	40,000	40,000
Subtotal				2,859,479
Contingency			30%	857,844
Subtotal				3,717,322
Contractor Overhead & Profit			25%	929,331
Total Construction Cost				**4,646,653**
Engineering			15%	696,998
Total Initial Cost				**5,344,000**

BG-3c Peak Shaving Cogeneration Engine

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	25	330	8,250
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**8,250**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3c Peak Shaving Cogeneration Engine

ANNUAL O&M COST ESTIMATE

General Description	Existing WWTP Loads	Proposed WWTP Loads	Proposed Cogen	Proposed Cogen
Number of Facilities Operating	1	1	1	1
Brake Horsepower of Each Operating Pump		246		
Total Bhp		246		
Motor Efficiency		92%		
Adjustable Frequency Drive Efficiency		90%		
Wire Horsepower		298		
Wire Kilowatts	630	222	600	400
Operating Hours Per Day	24	24	12	12
Operating Days Per Week	7	7	7	7
Operating Weeks Per Year	52	52	52	52
Uptime	100%	100%	90%	90%
Operating Hours Per Year	8,736	8,736	3,931	3,931

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Status Quo Electricity	Kw-hrs	5,503,680	0.083	456,805
Proposed Loads Electricity	Kw-hrs	1,939,000	0.083	160,937
Self-Serve Electricity (600 kW)	Kw-hrs	2,358,720	-0.103	-242,948
Self-Serve Electricity (400 kW)	Kw-hrs	1,572,480	-0.083	-130,516
Exporting Electricity	Kw-hrs	0	-0.030	0
Maintenance	Kw-hrs	3,931,200	0.028	110,074
Natural Gas	therms	0	0.650	0
Total Annual Cost				**355,000**

Present Worth Analysis	
Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**4,989,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3d Cogeneration Microturbine

INITIAL COST ESTIMATE

General Description
This alternative is to construct a digester gas microturbine generator to convert digester gas energy into electric energy and recovered heat. Includes a new gas conditioning room and two enclosed microturbines with connections to existing biogas, hot water, and electrical systems. New units mounted near cold storage building north of digesters.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			59,722
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			135,000
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Microturbine (200 kW)	Each	2	275,000	550,000
Microturbine Install	Lump Sum	1	25,000	25,000
H2S Removal	Each	1	344,000	344,000
H2S Removal Installation	Lump Sum	1	77,500	77,500
Gas Conditioning W/ Siloxane	Each	1	442,000	442,000
Gas Conditioning W/ Siloxane Installation	Each	1	45,500	45,500
Gas Piping	Lump Sum	1	62,500	62,500
Water Piping	Lump Sum	1	50,000	50,000
Civil Not Listed Above	Lump Sum	1	15,000	15,000
Electrical Not Listed Above	Lump Sum	1	173,000	173,000
Instrumentation and Control Not Listed Above	Lump Sum	1	68,000	68,000
Plumbing Not Listed Above	Lump Sum	1	15,000	15,000
HVAC Not Listed Above	Lump Sum	1	40,000	40,000
Subtotal				2,102,222
Contingency			30%	630,667
Subtotal				2,732,889
Contractor Overhead & Profit			25%	683,222
Total Construction Cost				**3,416,111**
Engineering			15%	512,417
Total Initial Cost				**3,929,000**

BG-3d Cogeneration Microturbine

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	199	300	59,722
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**59,722**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building: Gas Handling Room	sq ft	900	150	135,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**135,000**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3d Cogeneration Microturbine

ANNUAL O&M COST ESTIMATE

General Description	Existing WWTP Loads	Proposed WWTP Loads	Proposed Cogen
Number of Facilities Operating	1	1	1
Brake Horsepower of Each Operating Pump		246	
Total Bhp		246	
Motor Efficiency		92%	
Adjustable Frequency Drive Efficiency		90%	
Wire Horsepower		298	
Wire Kilowatts	630	222	308
Operating Hours Per Day	24	24	24
Operating Days Per Week	7	7	7
Operating Weeks Per Year	52	52	52
Uptime	100%	100%	95%
Operating Hours Per Year	8,736	8,736	8,299

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Status Quo Electricity	Kw-hrs	5,503,680	0.083	456,805
Proposed Loads Electricity	Kw-hrs	1,939,000	0.083	160,937
Self-Serve Electricity	Kw-hrs	2,556,154	-0.083	-212,161
Exporting Electricity	Kw-hrs	0	-0.030	0
Maintenance / Replacement Fund	Kw-hrs	2,556,154	0.020	51,123
Natural Gas	therms	15,000	0.650	9,750
Total Annual Cost				**467,000**

Present Worth Analysis	
Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**6,563,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3e Pipeline to Utility

INITIAL COST ESTIMATE

General Description

Condition and compress biogas, convey to nearest transmission line, and inject to main line. Renewable credits generated based on the sale of renewable vehicle fuel by consumers. Xcel services local natural gas, however Northern Gas owns the nearest inter-state transmission line; which crosses the river at Barron Island

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			240,000
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Gas Conditioning System (Sulfur, Siloxanes, CO2)	Lump Sum	1	1,739,130	1,739,130
Gas Compression and Injection System (+/-1000 psi)	Lump Sum	1	1,304,348	1,304,348
Transmission Line to Barron Island	Lump Sum	1	1,200,000	1,200,000
Civil Not Listed Above	Lump Sum	1	60,000	60,000
Electrical Not Listed Above	Lump Sum	1	150,000	150,000
Instrumentation and Control Not Listed Above	Lump Sum	1	80,000	80,000
Plumbing Not Listed Above	Lump Sum	1	10,000	10,000
HVAC Not Listed Above	Lump Sum	1	40,000	40,000
Subtotal				4,823,478
Contingency			30%	1,447,043
Subtotal				6,270,522
Contractor Overhead & Profit			25%	1,567,630
Total Construction Cost				**7,838,152**
Engineering			15%	1,175,723
Total Initial Cost				**9,014,000**

Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3e Pipeline to Utility

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building: Gas Room	sq ft	1,200	200	240,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**240,000**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

Wastewater Treatment Facilities Plan
La Crosse, WI

BG-3e Pipeline to Utility

ANNUAL O&M COST ESTIMATE

General Description	Existing WWTP Loads	Proposed WWTP Loads	Proposed CNG Loads
Number of Facilities Operating	1	1	1
Brake Horsepower of Each Operating Pump		246	100
Total Bhp		246	100
Motor Efficiency		92%	92%
Adjustable Frequency Drive Efficiency		90%	90%
Wire Horsepower		298	121
Wire Kilowatts	630	222	90
Operating Hours Per Day	24	24	24
Operating Days Per Week	7	7	7
Operating Weeks Per Year	52	52	52
Uptime	100%	100%	100%
Operating Hours Per Year	8,736	8,736	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Status Quo Electricity	Kw-hrs	5,503,680	0.083	456,805
Proposed Loads Electricity	Kw-hrs	1,939,000	0.083	160,937
Natural Gas for Heating	MMBtu	17,520	0.65	11,388
Electricity	Kw-hrs	787,084	0.083	65,328
D3 RIN Sales	MMBtu	31,536	-15	-473,040
D5 RIN Sales	MMBtu	0	-5	0
Total Annual Cost	YR 0-5 only			**222,000**
Total Annual Cost YR 5-20				**537,360**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**3,120,000**

Conservative Estimate If RIN Pricing Decreases	
Present Worth of YR 0-5	1,242,000
Present Worth of YR 5-20	6,751,000
Conservative Present Worth of Total Annual Cost	7,993,000

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-1 Replace Facility Wide Heating System

INITIAL COST ESTIMATE

General Description

Construct a new central boiler system and facility heating system, providing the heat for the digestion process and the buildings. Boilers shall use digester gas with backup natural gas. This estimate includes costs for high efficiency, natural gas stand -by boilers to serve as back-ups to the digester gas fired boilers. No costs included for digester gas fired boilers, it is assumed that either D-1 or D-2 is selected with this alternate that includes costs for the digester gas boilers. No HVAC heating equipment included in this costs, it is assumed that the digesters will only be capable of heating the digester and dewatering buildings, costs for that equipment in U-2.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Boilers	Each	2	60,000	120,000
Pumps and Piping	Lump Sum	1	25,000	25,000
Building Interconnecting Piping	Lump Sum	1	35,000	35,000
Remote Building Piping	Lump Sum	1	60,000	60,000
Civil Not Listed Above	Lump Sum	1	16,000	16,000
Electrical Not Listed Above	Lump Sum	1	29,000	29,000
Instrumentation and Control Not Listed Above	Lump Sum	1	16,000	16,000
Plumbing Not Listed Above	Lump Sum	1	6,500	6,500
HVAC Not Listed Above	Lump Sum	1	16,000	16,000
Subtotal				323,500
Contingency			30%	97,050
Subtotal				420,550
Contractor Overhead & Profit			25%	105,138
Total Construction Cost				**525,688**
Engineering			15%	78,853
Total Initial Cost				**605,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-1 Replace Facility Wide Heating System

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-1 Replace Facility Wide Heating System

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Maintenance	hours	0	35	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-2 Comply with NFPA 820 & 10-State Stds for Buildings

INITIAL COST ESTIMATE

General Description
Bring existing structures up to code to improve safety, equipment longevity, and enable modifications to electrical and controls

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Admin Building				
Ventilation for Dry Wells	Lump Sum	1	42,000	42,000
Stairway Access	Lump Sum	2	118,000	236,000
Replace RWW Pumps w/ Dry Pit Submersible	Each	5	53,000	265,000
Seperation of Clarifier Inlet Channel Area	Lump Sum	1	18,000	18,000
Primary Effluent Pump Station				
Ventilation Upgrades	Lump Sum	1	67,000	67,000
Seperation of Blower Room	Lump Sum	1	2,000	2,000
Seperation of Sludge Well	Lump Sum	1	13,000	13,000
Dewatering Building				
Ventilation Upgrades	Lump Sum	1	338,000	338,000
Digester Building				
Ventilation Upgrades	Lump Sum	1	67,000	67,000
Gas Handling Room	Sq Ft	200	300	60,000
DG Piping	Lump Sum	1	11,000	11,000
Liquid Sludge Storage Building				
Ventilation Upgrades	Lump Sum	1	49,000	49,000
Subtotal				1,168,000
Contingency			30%	350,400
Subtotal				1,518,400
Contractor Overhead & Profit			25%	379,600
Total Construction Cost				**1,898,000**
Engineering			15%	284,700
Total Initial Cost				**2,183,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-2 Comply with NFPA 820 & 10-State Stds for Buildings

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-2 Comply with NFPA 820 & 10-State Stds for Buildings

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Maintenance	hours	0	35	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-3 Increase W3 System Capacity

INITIAL COST ESTIMATE

General Description
Provide additional W3 pumps to satisfy non-potable water demand when operating multiple mechanical sludge handling (thickening/dewatering) equipment.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
150 gpm Non-Potable Pump	Each	2	30,000	60,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	120,000	120,000
Instrumentation and Control Not Listed Above	Lump Sum	1	12,000	12,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum			
Subtotal				197,000
Contingency			30%	59,100
Subtotal				256,100
Contractor Overhead & Profit			25%	64,025
Total Construction Cost				**320,125**
Engineering			15%	48,019
Total Initial Cost				**369,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-3 Increase W3 System Capacity

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-3 Increase W3 System Capacity

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Maintenance	hours	0	35	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-4 New Transformers and One Electrical Service

INITIAL COST ESTIMATE

General Description

Provide new primary metering and switchgear from utility with increased redundancy for improved maintenance and reliability. New main power distribution gear will backfeed new 13.8kV transformers to step power down at all existing transformers to 480V.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
13.8kV SWGR, 4 sections	Each	1	100,000	100,000
Wiring from SWGR to Indoor Main	Lump Sum	1	20,000	20,000
13.8kV Indoor Main Distribution Board, 6 sections	Each	1	500,000	500,000
13.8kV:480V TFMR @ Plant 1, 1000kVa	Each	1	60,000	60,000
Wiring from Main to TFMR	ft	500	450	225,000
13.8kV:480V TFMR @ Plant 2, 1000kVa	Each	1	60,000	60,000
Wiring from Main to TFMR	ft	25	450	11,250
13.8kV:480V TFMR @ Sludge, 500kVa	Each	1	37,500	37,500
Wiring from Main to TFMR	ft	700	360	252,000
13.8kV:480V TFMR @ UV, 300kVa	Each	1	30,000	30,000
Wiring from Main to TFMR	ft	200	216	43,200
13.8kV:480V TFMR @ Cogen, 750kVa	Each	0	52,500	0
Wiring from Main to TFMR	ft	0	380	0
Standby Generator (Plant 1 400kW replacement)	Lump Sum	1	285,000	285,000
Standby Generator (Plant 2 400kW replacement)	Lump Sum	1	285,000	285,000
Standby Generator (HSi Blowers 800kW+ new)	Lump Sum	1	510,000	510,000
Subtotal				2,418,950
Contingency			30%	725,685
Subtotal				3,144,635
Contractor Overhead & Profit			25%	786,159
Total Construction Cost				**3,930,794**
Engineering			15%	589,619
Total Initial Cost				**4,521,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-4 New Transformers and One Electrical Service

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-4 New Transformers and One Electrical Service

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	**90**
Total Bhp	0
Motor Efficiency	**92%**
Adjustable Frequency Drive Efficiency	**90%**
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	**24**
Operating Days Per Week	**7**
Operating Weeks Per Year	**52**
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	**0.083**	0
Maintenance	hours	0	**35**	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-5 Floodplain and Site Access Improvements

INITIAL COST ESTIMATE

General Description
Install a flood control gate on the northwest plant entrance to prevent high river stages from entering the facility. Consideration could be given to an elevated entrance (graded) if topo survey data confirms feasibility.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
New Floodgate	Each	1	35,000	35,000
Berm Structural Modifications	Lump Sum	1	10,000	10,000
Revise site roadways for improved truck traffic	sf	8,800	10	88,000
H2S Control for La Crescent Forcemain	Lump Sum	1	60,000	60,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				193,000
Contingency			30%	57,900
Subtotal				250,900
Contractor Overhead & Profit			25%	62,725
Total Construction Cost				**313,625**
Engineering			15%	47,044
Total Initial Cost				**361,000**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-5 Floodplain and Site Access Improvements

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse
Wastewater Treatment Facilities Plan
La Crosse, WI

U-5 Floodplain and Site Access Improvements

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	**90**
Total Bhp	0
Motor Efficiency	**92%**
Adjustable Frequency Drive Efficiency	**90%**
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	**24**
Operating Days Per Week	**7**
Operating Weeks Per Year	**52**
Operating Hours Per Year	8,736
Maintenance Hours Per Year	

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	**0.083**	0
Maintenance	hours	0	**35**	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse
Sanitary Sewer Utility
905 Houska Park Drive |La Crosse, WI, 54601

City of La Crosse
Sanitary Sewer Utility
Preliminary Phosphorus Compliance Plan

December 2018

Prepared by:

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Donohue Project No.: 12947

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ABBREVIATIONS

A2O	Anaerobic Aerobic Oxic
Bio-P	Enhanced Biological Phosphorus Removal
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CAFO	Confined Animal Feedlot Operation
EBPR	Enhanced Biological Phosphorus Removal
FCAP	Final Compliance Alternatives Plan
mg/L	milligrams/liter
MGD	Million Gallons per Day
MDV	Multi-Discharger Variance
MHI	Mean Household Income
MS4	Municipal Separate Storm Sewer System
MUCT	Modified University of Cape Town
O&M	Operations and Maintenance
PCAP	Preliminary Compliance Alternatives Plan
PP	Particulate Phosphorus
ppd	Pounds per Day
SP	Soluble Phosphorus
SRP	Soluble Reactive Phosphorus
TP	Total Phosphorus
TPW	Total Present Worth
US EPA	United States Environmental Protection Agency
WAS	Waste Activated Sludge
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollutant Discharge Elimination System
WQBEL	Water Quality Based Effluent Limit
WWTP	Wastewater Treatment Plant

CHAPTER 1 - EXECUTIVE SUMMARY

The City of La Crosse evaluated a number of alternative approaches to complying with its future Water Quality Based Effluent Limits (WQBELs) for phosphorus. These limits include a monthly average of 0.300 mg/L and a 6 month average of 0.100 mg/L. These WQBELs are both significantly lower than the current interim limit of 1.0 mg/L. The existing wastewater treatment plant (WWTP) is capable of reliable compliance with the interim limit but not capable of meeting the future WQBELs on a consistent, reliable basis.

As part of its phosphorus compliance schedule the City is required to submit a Preliminary Compliance Alternatives Plan (PCAP) on or before January 1, 2019 and a Final Compliance Alternatives Plan (FCAP) on or before January 1, 2020. This report is intended to serve as the PCAP.

Alternatives considered for compliance with the future WQBELs included:

- Advanced Treatment through constructed modifications at the WWTP
- Adaptive Management
- Water Quality Trading
- Variance

A preliminary screening resulted in retaining seven advanced treatment options for further development and evaluation. The estimated costs, expressed as both Initial Cost and a Total Present Worth (TPW) Basis, for these alternatives are summarized in Table 1-1.

Table 1-1 Phosphorus Alternative Total Present Worth Estimated Costs

Alternative	Initial Cost ($)	Annual O&M Cost ($/yr)	TPW of Annual O&M ($)	Total Present Worth ($)
Alt 1 Optimize Activated Sludge & Upgrade SCADA	3,783,000	-23,000	-324,000	3,459,000
Alt 3 Optimize BNR Activated Sludge by Converting A2O System to MUCT System	1,089,000	-23,000	-324,000	765,000
Alt 7 Install Effluent Filtration Plus Enhanced Chemical Feed Facilities	7,498,000	329,000	4,624,000	12,122,000
Alt 8 Install Separate WAS Thickening/Continue Gravity Thickening Primary Sludge	858,000	25,000	352,000	1,210,000
Alt 9 Install Sidestream Struvite Harvesting System	6,561,000	-206,000	-2,895,000	3,666,000

Alt 11 Add Storage Tank at WWTP to Feed HSW to BNR System or Digesters	306,000	0	0	306,000
Alt 16 Investigate MS4 Trading with La Crosse and/or Onalaska	N/A	N/A	N/A	N/A

For the purposes of this Preliminary Compliance Alternatives Plan alternatives 1, 3, 7, 8, and 11 have been selected as the preferred suite of alternatives to maximize compliance. In the next 12 months, however, prior to submitting the Final Compliance Alternatives Plan, the City intends to further investigate MS4 trading as part of a side activity that may alleviate the operational demands of the recommended project.

CHAPTER 2 - BACKGROUND

2.1 EXISTING FACILITY

The Sanitary Sewer Utility for the City of La Crosse operates the Isle La Plume Wastewater Treatment Plant (WWTP). This WWTP is a regional wastewater treatment facility with an average day design flow of 20 MGD. The plant receives wastewater from the City of La Crosse and surrounding areas in Minnesota and Wisconsin, including the City of Onalaska, WI, the City of La Crescent, MN, the Town of Campbell, WI, and two sanitary districts that include parts of the Town of Shelby, WI.

Figure 1 presents a process flow diagram of the plant. The liquid treatment train consists of fine screening, grit removal, primary settling, nitrifying activated sludge configured in the anaerobic/anoxic/oxic (A2O) process configuration to achieve biological phosphorus removal (Bio-P), secondary settling, and ultraviolet disinfection. The solids handling treatment train consists of co-thickening of primary sludge and waste activated sludge (WAS) in gravity thickeners, and anaerobic digestion. The digested sludge, termed biosolids, are thickened using gravity belt thickeners or dewatered using a belt filter press. Liquid and dewatered biosolids are stored onsite prior to being recycled on agricultural land. The other residual material produced at the plant, from raw wastewater screening and grit removal, is disposed of by landfilling.

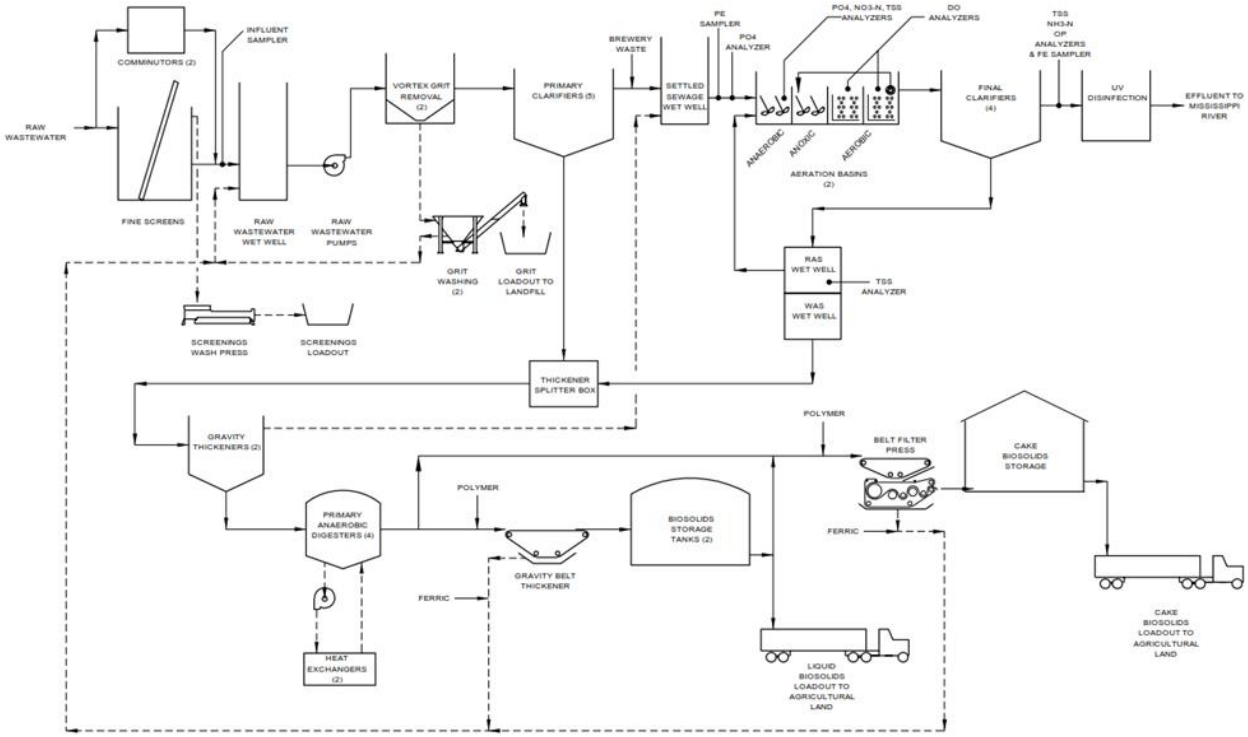

Figure 1 - Isle La Plume WWTP Flow Schematic

The City uses several chemical feed options to supplement Bio-P in achieving effluent phosphorus compliance, including ferric chloride addition to digested sludge thickening/dewatering sidestreams as well as high strength waste addition (typically wastewater from the City Brewery trucked to the plant) to boost Bio-P performance.

2.2 PHOSPHORUS DISCHARGE LIMITS

The WWTP is permitted to discharge treated effluent to the Mississippi River under the rules of the Wisconsin Pollutant Discharge Elimination System (WPDES), specifically operating under the conditions contained in its WPDES Permit No. WI-0029581-09-0. The current permit contains both interim and final (future) limits for effluent total phosphorus (TP) as follows:

- Interim Limit: 1.0 mg/L monthly average.
- Final Water Quality Based Effluent Limit (WQBEL): 0.100 mg/L 6 month average; 0.300 mg/L monthly average.

The final limits become effective January 1, 2025 unless an alternative compliance plan, such as Adaptive Management, is implemented by the City and approved by the Wisconsin Department of Natural Resources (WDNR).

2.3 CURRENT FACILITY LOADINGS & PERFORMANCE

Table 2-1 summarizes current loadings and effluent quality for the WWTP, based on plant operating data for 2013-2015.

Table 2-1 WWTP Loadings & Performance

Location	Flow	BOD5	TSS	TP
Influent Wastewater	10.1 MGD	308 mg/L 25,900 ppd	352 mg/L 29,600 ppd	6.6 mg/L 550 ppd
Final Effluent	9.6 MGD	4.5 mg/L 360 ppd	6.4 mg/L 512 ppd	0.38 mg/L 30.4 ppd

As can be seen in Table 2-1, over the course of the period of record, effluent phosphorus has averaged less than half of the interim effluent limit, but individual monthly averages have at times been significantly higher.

2.4 SPECIAL PHOSPHORUS CHARACTERIZATION SAMPLING

To aid in identifying and evaluating phosphorus removal strategies that may be required for compliance with the future effluent phosphorus limits, the City implemented a limited duration special sampling program during October 2015 to characterize the phosphorus content of its effluent. The results of this special sampling program are summarized in Table 2-2.

Table 2-2 Phosphorus Characterization Special Sampling Summary

Location	TP (mg/L)	RP (mg/L)	AHP (mg/L)	OP (mg/L)
Total Effluent (Unfiltered)	0.235 (0.161-0.311)	0.058 (0.023-0.117)	0.115 (0.008-0.163)	0.061 (0.027-0.088)
Effluent Soluble Fraction (Filtered)	0.096 (0.035-0.190)	0.047 (0.018-0.128)	0.026 (ND-0.060)	0.024 (ND-0.062)
Effluent Particulate Fraction	0.139 (0.031-0.190)	0.011 (ND-0.036)	0.090 (ND-0.125)	0.038 (ND-0.082)

Notes: TP = Total Phosphorus (Digested Sample)
RP = Reactive Phosphorus – Orthophosphorus (PO4-P)
AHP = Acid Hydrolysable Phosphorus
OP = Organic Phosphorus
Values shown in bold are averages, values in parentheses indicate range of values.
ND = Not detected
Particulate Fraction values are calculated as difference between Total and Soluble values for each day/sample.

With regard to these results, the most notable observations are:

- Effluent phosphorus was over half particulate, which should be amenable to filtration with proper coagulation/flocculation followed by properly sized and functioning effluent filters.
- About half of the soluble portion of effluent phosphorus was reactive orthophosphorus, which is the form available for chemical precipitation. The other half would expected to be tiny particulate matter small enough to pass a 0.45 micron filter, and hence defined as soluble. This portion will be more challenging to remove through filtration – but with proper coagulation and flocculation, including high energy coagulation mixing energy, the bulk of it should be amenable to removal by effluent filtration as well.
- Additional sampling is recommended to confirm the system's sensitivity towards high concentrations of difficult to remove fractions of phosphorus.

CHAPTER 3 - PHOSPHORUS COMPLIANCE ALTERNATIVE SCREENING

This chapter documents alternative approaches considered feasible in achieving compliance with the future effluent phosphorus limits. The chapter begins with brief descriptions of the potential alternatives, then presents results of a preliminary screening of alternatives to eliminate any deemed impractical or unlikely able to meet the City's needs. The chapter concludes by listing those alternatives retained for further consideration in further detail, from a conceptual implementation standpoint.

3.1 POTENTIAL COMPLIANCE ALTERNATIVE CATEGORIES/APPROACHES

The potential alternative approaches toward compliance include the following general categories:

1. Advanced Treatment at the WWTP to achieve compliance with the 0.100/0.300 mg/L TP limits.
2. Implementing an "Adaptive Management" program in the surrounding watershed.
3. Implementation of "Water Quality Trading".
4. Obtaining a "Variance" derived alternative effluent limit.

Each of these is described further below.

1. Advanced Treatment

   The 2015 special sampling suggests that the majority of the effluent phosphorus will be amenable to effluent filtration with proper chemical pretreatment (coagulation/flocculation). As such baseline alternatives include effluent chemical conditioning (ferric/polymer) in rapid mix/flocculation tanks followed by effluent filtration in the form of either sand filters, cloth media disk filters or semi-permeable membrane filters.

   Removal to meet the new limits will likely involve other modifications to the treatment facility to make it more efficient at removing phosphorus throughout, including such things as:

   - Ferric chloride feed to raw wastewater and possibly to aeration basin effluent, to step-wise decrease phosphorus concentrations through the liquid treatment train via multi-point chemical addition.
   - Reconfiguration of the A2O Bio-P activated sludge configuration to a more efficient EBPR configuration for nitrifying activated sludge systems, such as the Modified University of Cape Town (MUCT) configuration.
   - Consideration of other improvements to help minimize effluent TSS and TP, such as improving the plant's secondary clarifiers to enhance flocculation of clarifier influent, improve hydraulic characteristics through the clarifiers, or improve settled solids (RAS) removal.

2. Adaptive Management

   Adaptive management is a watershed improvement concept where the City would implement and monitor the effect of non-treatment measures in the Mississippi River regional watershed aimed at bringing water quality in the river into compliance with water quality phosphorus standards. It would require the City to authorize funding and activities for implementation of best management practices (BMPs) in an attempt to control non-point sources of phosphorus to the river. In addition to these BMPs, the City would need to provide significant person-hours required to implement the program throughout a multi-year, multi-permit cycle plan.

There is a risk associated with adaptive management in that if the water quality of the river does not show progress to meeting the phosphorus water quality criteria, the facility would be required to continue implementing more BMPs or in the end implement needed upgrades to attain compliance with the 0.100 mg/L WQBEL at the treatment facility. However, if the program were successful, the recalculated water quality based effluent limit would be significantly less stringent (i.e., 0.5 mg/L TP) compared to the 0.100 mg/L WQBEL. Despite this less restrictive limit, it is possible that compliance with a recalculated limit would still require filtration.

The cost for implementing an adaptive management plan can be highly variable, due to varying levels of BMP types and the associated engineering and watershed management efforts required.

3. Trading

Nutrient trading is not common but can be a potential option as a piece of an overall compliance strategy. In such a scenario, typically an upstream stakeholder removes phosphorus more than its permit requires and a downstream stakeholder can "trade" for the excess phosphorus removed. In effect the downstream stakeholder pays the upstream entity to receive credit for some of those pounds of phosphorus removed, to avoid or minimize changes related to enhancing phosphorus removal at its own treatment plant. The result is the downstream stakeholder potentially receives a slightly relaxed phosphorus limit due to the extra treatment provided upstream.

Nutrient trading can involve trading with non-point or point sources of phosphorus discharge. Examples of the former would be trading with agricultural land or municipal separate storm sewer systems (MS4s) to reduce non-point loadings to the watershed upstream of the plant discharge. Examples of point to point source trades would be trading with another WWTP upstream of the City that is removing more phosphorus than it is required to. In either case trade ratios buffer the uncertainty in if a specified trade will provide the needed relief, thus a ratio requires additional mass removal. For example, a minimum of 1.1 pound must be removed for every pound of phosphorus credit in the trade. Costs for trading are often evaluated on a $/lb of phosphorus traded to compare their net value provided.

Trades with non-point source BMPs in the La Crosse region of the Mississippi River valley will result in a higher proportion of individual trades due to the landscape. Although the terrain is steep and prone to erosion, the smaller parcel size makes obtaining sufficient trade credits for the WWTP offset a very large endeavor.

4. Variance

There are two types of variance that are potentially attainable for some communities.

The first (4.a) is an economic hardship variance, which would require that the cost to modify the plant, to achieve compliance with the WQBEL, when applied on a per user basis, results in user fees exceeding 2% of the mean household income (MHI) of the community.

The second variance option (4.b) is the Statewide Phosphorus Variance, sometimes referred to as the Multi-Discharger Variance (MDV) or the Act 378 Clean Waters Healthy Economy Act. Essentially, this alternative would require the WWTP to comply with 0.8, 0.6 and 0.5 mg/L TP effluent limits over the next three permit cycles, respectively, and pay a fee to participating counties in the watershed to implement non-point BMPs to reduce phosphorus applied to the watershed. At the end of the third permit cycle the City would potentially be required to meet the WQBEL limit of 0.100 mg/L. However,

if the Mississippi River has shown significant improvement in water quality by this time, it is possible the City could receive an alternative, less stringent future limit.

For WWTPs in La Crosse County eligibility for the MDV requires additional stressors – in effect compliance through treatment resulting in user rates exceeding 2% of the community MHI – the same criteria for the hardship variance.

In either case (hardship or MDV) the 2% user rate criteria is not anticipated, or desired. The city's current wastewater collection/treatment user rates are the lowest in the State of Wisconsin.

3.2 IDENTIFICATION/SCREENING OF POTENTIAL COMPLIANCE ALTERNATIVES

Twenty-two potential compliance alternatives were identified and considered as approaches, either stand-alone or in combination, to meet the City's needs. These alternatives were reviewed, discussed and screened to eliminate those considered not practical, with retained alternatives carried forward for further consideration by the City.

Table 3-1 on the next page summarizes the results of the alternative identification/screening activities.

3.3 RETAINED COMPLIANCE ALTERNATIVES

As noted in Table 3-1 the following phosphorus compliance alternatives were carried forward for further evaluation:

- Alternative 1: Optimize Activated Sludge System including Plant SCADA Control System.
- Alternative 3: Optimize Biological Nutrient Removal System: MUCT Process.
- Alternative 5: Install Multi-Point Chemical Feed Facilities. Upon further discussion this alternative was combined to be an included as part of Alternatives 7/7A since those alternatives required additional chemical feed facilities as well.
- Alternative 7: Install Effluent Filtration for Full Peak Flow – Membrane or Cloth Media Disk Filters.
- Alternative 7A: Install Effluent Filtration for Max Month Flow – Membrane or Disk Filters.
- Alternative 8: Install Separate WAS Thickening/Continue Gravity Thickening Primary Sludge.
- Alternative 9: Install Sidestream Struvite Harvesting System.
- Alternative 11: Add Storage Tank at WWTP to Feed HSW to BNR System or Digesters.
- Alternative 16: Investigate MS4 Trading with La Crosse and/or Onalaska.

Table 3-1 Phosphorus Compliance Alternatives Identification/Screening Results

Alternative	Retained or Eliminated	Discussion
1. Optimize Activated Sludge System: Final Clarifier, Aeration System & Scum Control Modifications	Retained	Includes upgrades to existing activated sludge facilities including final clarifier modifications (flocculating inlets, effluent weir baffling, and improved rapid sludge withdrawal mechanisms) as well as air supply/control system & other SCADA improvements.
2. Optimize Biological Nutrient Removal System: Johannesburg Process	Eliminated	Eliminate in favor of MUCT (Alt 3) - better use of tankage for higher rate system. Both configurations can outperform existing A2O system for Bio-P in nitrifying activated sludge, but MUCT process outperforms Johannesburg when tankage/space is limiting.
3. Optimize Biological Nutrient Removal System: Modified University Cape Town (MUCT) Process	Retained	Most advantageous/efficient Bio-P nitrifying activated sludge configuration for La Crosse WWTP's situation.
4. Replace Final Clarifiers With Membranes – MBR System	Eliminated	Eliminate - only consider membranes as a secondary effluent filtration alternative.
5. Install Multi-Point Chemical Feed Facilities	Retained	Retained, combine into other alternatives, as it is a preferred concept for all effluent compliance options.
6. Install Effluent Sand Filtration Facilities - Full Peak Flow	Eliminated	Eliminate sand filtration in favor of disk filters due to footprint requirements. Pilot testing has shown smaller footprint disk filters capable of achieving low-level effluent TP.
6.A. Install Effluent Sand Filtration Facilities - Max Month Flow	Eliminated	Eliminate sand filtration in favor of disk filters due to footprint requirements.
7. Install Effluent Filtration Facilities - Full Peak Flow	Retained	Evaluate disk filters and membranes, will likely require effluent pumping.
7.A. Install Effluent Filtration Facilities - Max Week Flow (Right Size)	Retained	Evaluate disk filters and membranes, will likely require effluent pumping.
8. Install Separate WAS Thickening Process/Only Primary Sludge to Gravity Thickeners	Retained	Retained, gravity thickening primary sludge may be supplemental VFA source. Separate thickening may help to minimize sidestream phosphorus loadings.
9. Install Sidestream Struvite Harvesting System	Retained	Retained for placeholder cost purposes for future implementation.

Alternative	Retained or Eliminated	Discussion
10. Upgrade SCADA Control System for Enhanced Process Monitoring & Control	(Retained)	Eliminate as stand-alone alternative, include as part of BNR activated sludge optimization (Alt 1). City has already initiated key SCADA enhancements.
11. Install Dedicated Pipeline from Brewery to High Strength Waste Holding Tank With Ability to Feed Digesters or BNR Anaerobic Zones	(Retained)	Modified as: no pipeline but add storage tank to allow increased hauling along with feed control system using online ortho-P analysis. Pipeline option may be added when trucking is discontinued.
12. Replace Activated Sludge System with Anaerobic Treatment System Plus Nutrient Harvesting	Eliminated	Eliminate, emerging technology not yet proven.
13. Adaptive Management	Eliminated	Eliminate based on the high manpower effort involved to collect and analyze background data, implement BMPs, and monitor results coupled with the likely outcome that efforts will show no appreciable change in the Mississippi River water quality. End result would be a lot of cost and effort expended by the City with no actual benefit apart from potentially delaying construction of new effluent polishing facilities for one or several permit cycles.
14. Effluent Trading: Purchase Phosphorus Credits	(Eliminated)	Eliminated as impractical – unlikely the City could find trading partners to sell enough phosphorus credits (likely in range of 10,000-20,000 lbs P/year) to avoid adding effluent filtration, coupled with the risk if new sources come into system and that trading quantity ended up insufficient, leading to the need to add effluent filtration anyways. Trading may be re-evaluated if effluent filtration becomes insufficient for compliance.
15. Effluent Trading: Exceed Limits and Sell Credits	Eliminated	Eliminate, difficult to exceed limits sufficiently to have credits to sell, and would need to find downstream plant or MS4 to sell to. Best fit would be if City's WWTP exceeds limits and a downstream facility's rates were shown to exceed 2% MHI.
16. Effluent Trading: Trade with LaCrosse/Onalaska MS4 (TP Reductions Exceeding 20% TSS Reduction)	Retained	Retain and evaluate further, along with potential trading with CAFOs in area.
17. Permit Variance: Hardship Variance	Eliminated	Eliminate – City's user rates are lowest in State, considered very unlikely they would rise to exceed 2% of MHI in community.

Alternative	Retained or Eliminated	Discussion
18. Permit Variance: Multi-Discharge Variance	Eliminated	Eliminate - same criteria needed as for hardship variance, plus interim threshold TP limits and payments therefore considered not feasible for same reason.
19. Permit Variance: Site Specific Criteria	Eliminated	Eliminate - requires that receiving waters not impaired, however the Mississippi River already listed as impaired for TSS and phosphorus. A TMDL is likely, however the timing and extend of watershed coverage is unknown.
20. Permit Variance: Contest the Permit	Eliminated	Eliminate for same reasons as variance based on site specific criteria – potentially very costly with unlikely positive outcome at.

CHAPTER 4 - DEVELOPMENT/EVALUATION OF PHOSPHORUS COMPLIANCE ALTERNATIVES

4.1 BASIS OF ALTERNATIVE EVALUATIONS

Table 4-1 documents projected flows which were used to develop sizing and pricing information for treatment alternatives for which projected flows were needed. These flow projections were developed from ongoing 2018 facilities planning projections.

Table 4-1 WWTP Projected Future Influent Flows

Location	Average Day	Maximum Month	Maximum Week	Maximum Day	Peak Hour
Influent Wastewater	13 mgd	13.3 mgd	14.9 mgd	21.2 mgd	42.5 mgd

Ten States Standards sizing for tertiary filtration indicates filters shall be sized for peak hourly flow with one unit out of service. This concept requires a full treatment design flow of 42.5 MGD for new effluent filtration facilities. However, a right-sizing approach, as shown in Figure 4-1, resulted in a firm filter capacity of 16 mgd – which would only intentionally divert flows around filtration for peak/maximum day conditions. This figure shows the future 6-month limit of 0.1 mg/L TP (red dashed line), the future monthly average limit of 0.3 mg/L TP (blue dashed line), and the resulting effluent daily (black dots), monthly average (blue solid line) and 6-month average (red solid line) effluent phosphorus projected to occur assuming that plant flows up to 16 MGD receive full chemical treatment and filtration resulting in an effluent concentration of 0.08 mg/L TP, with any effluent flow exceeding this having an effluent phosphorus concentration of 1.0 mg/L TP (the current interim effluent limit). As can be seen in the figure, effluent filtration to 16 MGD will provide reliable compliance with both the monthly and 6-month limits while avoiding excessive costs for sizing the filters to handle shorter term high flow conditions. The flows used to develop the figure were based on historical plant flow data from 1/1/13 through 12/31/17 escalated by a factor of 1.3 to approximate a similar flow record at future conditions in approximately 20 years.

In terms of economic analysis, a simple Total Present Worth (TPW) analysis was used for comparing alternative costs. This analysis included estimated Initial Costs (design and construction) and only the estimated difference in annual operating costs between alternatives. The annual operating cost values were converted to an equivalent present worth assuming an interest rate of 3%, with the present worth of the annual costs added to the Initial Costs to estimate the TPW of each alternative.

Appendix A presents the TPW analyses for the alternatives discussed below.

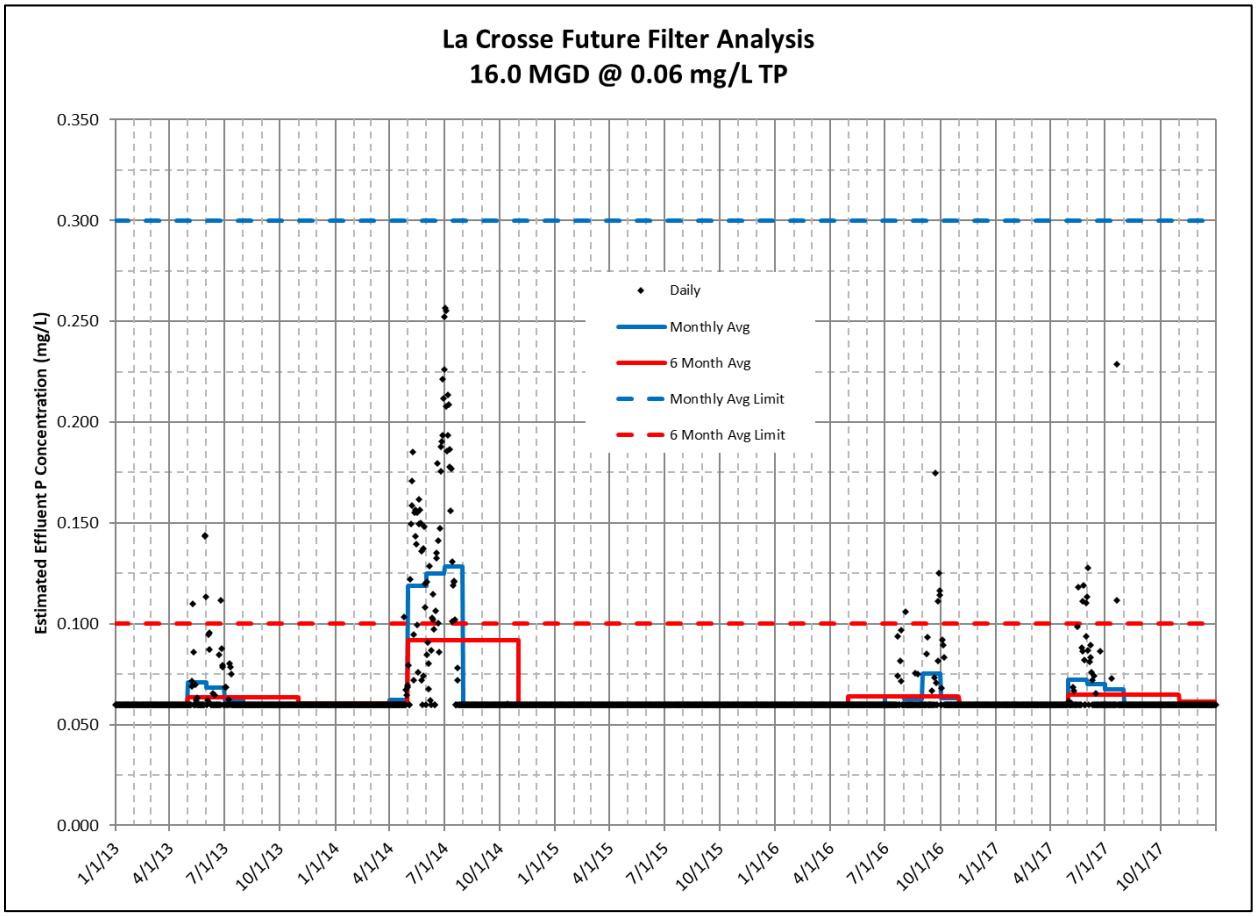

Figure 4-1 Effluent Filter Sizing Estimated Performance

4.2 ALTERNATIVE 1: OPTIMIZE ACTIVATED SLUDGE & UPGRADE SCADA

Alternative 1 includes the following new/revised facilities:

- Primary effluent flow splitting upgrade to better control feed to parallel bioreactors.
- Bioreactor modifications to improve compartmentalization/plug flow through added baffling and by modifying existing baffle walls to allow surface overflow to downstream zones.
- Reconfiguration of aerated versus non-aerated bioreactor zones to enhance biological nutrient removal and overall system performance.
- New final clarifier influent (aeration/mixed liquor effluent) flow splitter box.
- Final clarifier improvements including new flocculating inlets, density current baffles and rapid sludge withdrawal mechanisms.
- RAS piping improvements with dedicated flow isolation valves.

Figure 4-2 is a conceptual plan view showing

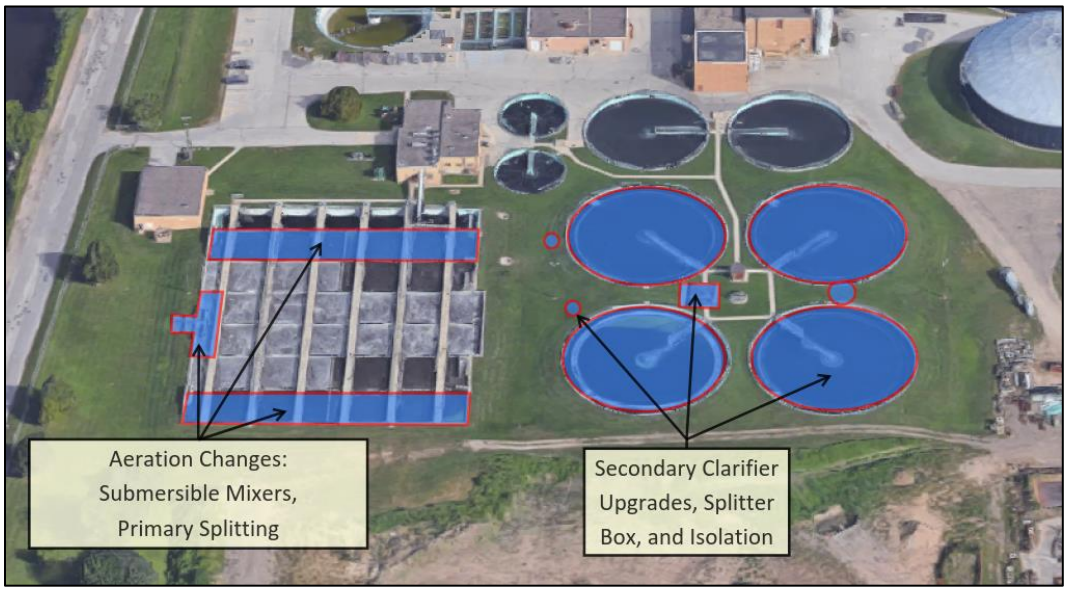

Figure 4-2 Alternative 1 Site Layout

The conceptual TPW analysis for this alternative is shown in Appendix A and result in the following:

- Estimated Initial Cost of $3.78 million.
- Estimated incremental annual O&M cost of $-23,000.
- Estimated TPW of $3.46 million.

4.3 ALTERNATIVE 3: OPTIMIZE BNR ACTIVATED SLUDGE BY CONVERTING A2O SYSTEM TO MUCT SYSTEM

Alternative 3 is depicted in Figure 4-3 and involves converting from the A2O Bio-P configuration to the Modified University of Cape Town (MUCT) configuration. The alternative includes the following new/revised facilities:

- In concert with Alternative 1, resizing the aerated versus unaerated bioreactor volumes to optimize BNR performance.
- Upgraded aeration system controls (flow control valves, flowmeters, D.O. probes for each half aeration basin) and control system programming.
- Relocating the return activated sludge (RAS) piping from the first unaerated bioreactor zone (anaerobic zone) to instead discharge into the downstream anoxic bioreactor zone.
- Installing new or relocating the existing mixed liquor recycle pumps to pull from the end of each downstream anoxic zone and recycle this denitrified mixed liquor to the influent of each upstream anaerobic zone where the PE is added. This gives the Bio-P organisms the best opportunity to take up the VFAs in the PE and maximize Bio-P performance.

Figure 4-3 Conceptual Plan for MUCT Retrofit

The conceptual TPW analysis for this alternative is shown in Appendix A and result in the following:

- Estimated Initial Cost of $1.1 million.
- Estimated incremental annual O&M cost of $-23,000.
- Estimated TPW of $0.765 million.

4.4 ALTERNATIVE 7/7A: INSTALL EFFLUENT FILTRATION PLUS ENHANCED CHEMICAL FEED FACILITIES

Alternative 7/7A involves adding effluent polishing coupled with enhanced chemical feed facilities in the form of added phosphorus analyzer monitoring, added chemical feed locations (multi-point chemical feed) and effluent filters in the form of either membrane filters or cloth media disk filters. Common parts of either option include the multi-point chemical feed and additional online phosphorus analyzer(s) capable of low-level orthophosphate monitoring.

With regard to the filtration portion of this alternative there are four possible options:

- Membrane filters sized to handle full peak flows (42.5 mgd)
- Membrane filters sized to handle approximately design max week flows, with higher peak flows bypassing filtration and blending with the filtered effluent.
- Disk filters sized to handle full peak flows (42.5 mgd)
- Disk filters sized to handle approximately design max week flows, with higher peak flows bypassing filtration and blending with the filtered effluent.

With regard to the design flows, section 4.1 above discussed the concept of “right sizing” effluent filtration and showed that full compliance with both the monthly and 6-month average phosphorus limits is expected using a filtration design capacity approximately equal to the design max month flow with higher flows bypassing filtration and blended in. As a result the analysis of filtration alternatives focused on right-

sizing filtration facilities for a capacity of at least 16 MGD, and filtration capacities to handle the full peak hourly flow was eliminated.

With regard to the filtration alternatives, both membrane filters and disk filters are considered adequate to meet the City's requirements. Preliminary cost estimates (both initial capital and TPW) for equal capacity facilities showed disk filters to be roughly 50% of the cost of membrane filters. As a result disk filters were carried forward as the City's preferred low-level TP compliance filtration alternative.

As a result this alternative involves the following aspects:

- Effluent pumping to provide adequate hydraulic capacity for tertiary filtration
- Additional chemical dosing facilities for coagulant (ferric chloride) and flocculant (anionic polymer)
- New rapid mix tankage to ensure coagulant contacts all available soluble phosphorus to precipitate efficiently in a coagulation tank.
- New flocculation tank to agglomerate precipitated particles can merge with the aide of the polymer. This creates larger particles for more effective filtration performance.
- Additional ortho-P analyzer (and potentially turbidity analyzers) for optimizing chemical feed
- New disc filters and surrounding structure
- Clarifier launder covers to prevent algae from restricting filtration performance.

Figure 4-4 shows a conceptual plan of the filtration facility layout on the plant site – with the new filtration facilities located in the plant's no longer needed chlorine contact tank (the plant now uses UV disinfection). The style of filtration (inside-out, or outside-in) may be decided upon preliminary design as it does not restrict the layout or total present worth significantly.

The conceptual TPW analysis for this alternative is shown in Appendix A and result in the following:

- Estimated Initial Cost of $7.5 million.
- Estimated incremental annual O&M cost of $329,000
- Estimated TPW of $12.1 million.

Figure 4-4 New Effluent Filtration Conceptual Layout

4.5 ALTERNATIVE 8: INSTALL SEPARATE WAS THICKENING/CONTINUE GRAVITY THICKENING PRIMARY SLUDGE.

Alternative 8 includes the following new/revised facilities:

- One 2-meter gravity belt thickener (or similar technology) for thickening <1%TS WAS to 5-7%TS.
- Thickened sludge feed pump to push the TWAS to the digester.
- Emulsion polymer makedown and dosing system

The conceptual TPW analysis for this alternative is shown in Appendix A and result in the following:

- Estimated Initial Cost of $0.86 million.
- Estimated incremental annual O&M cost of $25,000
- Estimated TPW of $1.2 million.

4.6 ALTERNATIVE 9: INSTALL SIDESTREAM STRUVITE HARVESTING SYSTEM

Alternative 9 includes the following new/revised facilities:

- Filtrate pumps at the GBT and BFP to capture the high phosphorus concentration flowstreams
- Upflow fluidized bed reactor system with pH adjustment and magnesium addition to create a spherical or shard of struvite. Struvite harvested will be dried and sieved to create a marketable fertilizer product.

The conceptual TPW analysis for this alternative is shown in Appendix A and result in the following:

- Estimated Initial Cost of $6.5 million.
- Estimated incremental annual O&M cost of $-206,000
- Estimated TPW of $3.67 million.

4.7 ALTERNATIVE 11: ADD STORAGE TANK AT WWTP TO FEED HSW TO BNR SYSTEM OR DIGESTERS.

Alternative 11 includes the following new/revised facilities:

- Recoats and covers the gravity thickener that is abandoned as part of Alternative 8, to facilitate the receipt, equilization, mixing, and dosing of high strength wastes to either the anaerobic selector zones (for bio-P enhancements), or the anaerobic digesters (for biogas enhancements).

The conceptual TPW analysis for this alternative is shown in Appendix A and result in the following:

- Estimated Initial Cost of $0.3 million.
- Estimated incremental annual O&M cost of $0
- Estimated TPW of $0.3 million.

4.8 ALTERNATIVE 16: INVESTIGATE MS4 TRADING WITH LA CROSSE AND/OR ONALASKA

Alternative 16 involves exploring the potential for trading for phosphorus credits with the municipal separate storm sewer system utilities in La Crosse and Onalaska. There is potential that these facilities have removed excess phosphorus and are able to generate credits. The annual quantity of these credits is unknown at this time and is pending further review by the City. The City intends to summarize their status with MS4 requirements during 2019 to confirm if these credits are available for the WWTP.

The majority of storm outfalls are within the HUC-12 or are upstream within the City limits thus providing a favorable trade ratio.

As mentioned previously with non-point trading, any available MS4 trade is not anticipated to provide sufficient pounds to offset filtration requirements. However, this common sewer service area trade would provide a useful safety factor to the operation of the tertiary disc filter system.

No conceptual costs were identified for this trade.

4.9 ALTERNATIVE CONSIDERATIONS AND DISCUSSION

Table 4-2 summarizes the TPW analyses for the retained alternatives discussed in the preceding sections.

Table 4-2 Phosphorus Alternative TPW Estimated Costs

Alternative	Initial Cost ($)	Annual O&M Cost ($/yr)	TPW of Annual O&M ($)	Total Present Worth ($)
Alt 1 Optimize Activated Sludge & Upgrade SCADA	3,783,000	-23,000	-324,000	3,459,000
Alt 3 Optimize BNR Activated Sludge by Converting A2O System to MUCT System	1,089,000	-23,000	-324,000	765,000
Alt 7 Install Effluent Filtration Plus Enhanced Chemical Feed Facilities	7,498,000	329,000	4,624,000	12,122,000
Alt 8 Install Separate WAS Thickening/Continue Gravity Thickening Primary Sludge	858,000	25,000	352,000	1,210,000
Alt 9 Install Sidestream Struvite Harvesting System	6,561,000	-206,000	-2,895,000	3,666,000
Alt 11 Add Storage Tank at WWTP to Feed HSW to BNR System or Digesters	306,000	0	0	306,000
Alt 16 Investigate MS4 Trading with La Crosse and/or Onalaska	N/A	N/A	N/A	N/A

Of these retained alternatives, the recommended plan is to implement Alternative 1, 3, 7, 8, and 11. The total initial cost of these improvements is $13.3 million.

Alternative 9 is not recommended at this time due to the system's high capital cost and indirect benefits to effluent quality. This type of system may be considered at anytime after the effluent filter system is operational to minimize costs and reduce phosphorus to land application. Alternative 16 is not included as the true cost of this alternative is undefined. If said alternative is deemed feasible, and cost-effective, these costs will be included in the Final Compliance Alternatives Plan (FCAP).

During the course of the next year, the City will further refine the alternatives to develop the FCAP.

APPENDIX A: TOTAL PRESENT WORTH COST EVALUATIONS

The pages that follow present the conceptual TPW evaluations for the retained alternatives.

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

SUMMARY

INITIAL COST ESTIMATE

ALTERNATIVE NO. AND NAME	Initial Cost ($)	Annual O&M ($)	Present Worth of Annual O&M ($)	Total Present Worth ($)
Alternative 1				
AS-1 A/S Reactor Splitter Box	353,000	0	0	**353,000**
AS-2 Large Blade Submersible Selector Mixers	355,000	-23,000	-324,000	**31,000**
AS-4 Sec Clar Splitter Box	936,000	0	0	**936,000**
AS-5b Modify RAS Piping to Minimize Deposition	224,000	0	0	**224,000**
AS-6 Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal	1,600,000	0	0	**1,600,000**
AS-7 Sec Clar Density Current Baffles	315,000	0	0	**315,000**
	3,783,000	-23,000	-324,000	3,459,000
Alternative 2				
AS-3 Modified UCT	1,089,000	-23,000	-324,000	**765,000**
	1,089,000	-23,000	-324,000	765,000
Alternative 7				
EP-1a Cloth Disk Filter with Coagulation Zones	6,871,000	329,000	4,624,000	**11,495,000**
EP-2 Clarifier Launder Covers	627,000	0	0	**627,000**
	7,498,000	329,000	4,624,000	12,122,000
Alternative 8				
ST-1d Separate WAS Sludge GBT and Struvite Control	858,000	25,000	352,000	**1,210,000**
	858,000	25,000	352,000	1,210,000
Alternative 9				
SC-1 Sidestream Struvite Harvesting System	6,561,000	-206,000	-2,895,000	**3,666,000**
	6,561,000	-206,000	-2,895,000	3,666,000
Alternative 11				
PC-2 HSW and Septage Receiving at GT 1	306,000	0	0	**306,000**
	306,000	0	0	306,000

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-1 A/S Reactor Splitter Box

INITIAL COST ESTIMATE

General Description
This alternative is to modify an existing structure which intercepts primary effluent at the the west end of the aeration basins and construct a splitter box with weirs to split flow and reconnect to existing piping.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			5,193
Concrete	See Worksheet for Detailed Cost Breakdown			40,400
Metals	See Worksheet for Detailed Cost Breakdown			3,220
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Locally Operated Isolation Gates	Each	2	15,000	30,000
Piping (CL-DI, 30")	Lump Sum	1	30,000	30,000
Fittings	Lump Sum	1	30,000	30,000
Bypass Pumping	Lump Sum	1	50,000	50,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				188,813
Contingency			30%	56,644
Subtotal				245,457
Contractor Overhead & Profit			25%	61,364
Total Construction Cost				**306,821**
Engineering			15%	46,023
Total Initial Cost				**353,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-1 A/S Reactor Splitter Box

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum	1	866	866
Earthwork: Excavation	cu yds	81	20	1,618
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft^2	162	16.75	2,710
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**5,193**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	6	400	2,400
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds	32	1,200	38,000
Concrete: Precast Roof	ft			
Concrete				**40,400**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft	46	70	3,220
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**3,220**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-1 A/S Reactor Splitter Box

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	70
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-2 Large Blade Submersible Selector Mixers

INITIAL COST ESTIMATE

General Description
This alternative shows the costs associated with converting the current subermisble mixer assets to large blade submersibles. This will include installing more robust supports, purchase of the mixers, and installation. The number of mixers corresponds to the number needed for a conversion to modified UCT layout, and is not representative of a conversion under the current system.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Large Blade Submersible Mixer	Each	4	33,833	135,332
Tripod	Each	4	5,769	23,076
Startup	Lump Sum	1	2,500	2,500
Frieght	Lump Sum	1	9,000	9,000
Installation	Lump Sum	1	20,000	20,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				189,908
Contingency			30%	56,972
Subtotal				246,880
Contractor Overhead & Profit			25%	61,720
Total Construction Cost				**308,601**
Engineering			15%	46,290
Total Initial Cost				**355,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-2 Large Blade Submersible Selector Mixers

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-2 Large Blade Submersible Selector Mixers

ANNUAL O&M COST ESTIMATE

General Description	**New**	**Existing**
Number of Motors Operating	**4.00**	**8.00**
Brake Horsepower of Each Operating Motor	**5.4**	**15.0**
Total Bhp	22	120
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**100%**	**100%**
Wire Horsepower	23	130
Wire Kilowatts	18	97
Operating Hours Per Day	**24**	**12**
Operating Days Per Week	**7**	**7**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	8,736	4,368

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity (Savings)	Kw-hrs	-272,016	**0.083**	-22,577
Total Annual Cost				**-23,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**-324,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-4 Sec Clar Splitter Box

INITIAL COST ESTIMATE

General Description
This alternative is for the addition of a new structure to more equally split ML flow between the final clarifiers.. This includes the new piping routed to the clarifiers, new locally controlled isolation gates, and installation of these new systems.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			24,658
Concrete	See Worksheet for Detailed Cost Breakdown			185,378
Metals	See Worksheet for Detailed Cost Breakdown			22,785
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			8,000
Locally Operated Isolation Gates (10')	Each	4	15,000	60,000
Install	Lump Sum	1	20,000	20,000
ML Piping (CL-DI, 36")	Lump Sum	1	150,000	150,000
Civil Not Listed Above	Lump Sum	1	25,000	25,000
Electrical Not Listed Above	Lump Sum	1	5,000	5,000
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				500,821
Contingency			30%	150,246
Subtotal				651,068
Contractor Overhead & Profit			25%	162,767
Total Construction Cost				**813,834**
Engineering			15%	122,075
Total Initial Cost				**936,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-4 Sec Clar Splitter Box

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum	1	4,110	4,110
Earthwork: Excavation	cu yds	482	20	9,644
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	sq ft	651	16.75	10,904
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**24,658**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	72	400	28,933
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds	130	1,200	156,444
Concrete: Precast Roof	ft			
Concrete				**185,378**
Metals: Aluminum Grating	sq ft	651	35	22,785
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**22,785**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition existing piping	lump sum	1	8,000	8,000
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**8,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-4 Sec Clar Splitter Box

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-5b Modify RAS Piping to Minimize Deposition

INITIAL COST ESTIMATE

General Description
This alternative is for the inclusion of isolation valves on the suction RAS lines emerging from each clarifier. These valves will allow for the clearing of blockages in the lines.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
20" Buried RAS Valve	Each	4	20,000	80,000
RAS Chlorination System	Lump Sum	1	35,000	35,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	2,500	2,500
Instrumentation and Control Not Listed Above	Lump Sum	1	1,500	1,500
Plumbing Not Listed Above	Lump Sum	1	500	500
HVAC Not Listed Above	Lump Sum			
Subtotal				119,500
Contingency			30%	35,850
Subtotal				155,350
Contractor Overhead & Profit			25%	38,838
Total Construction Cost				**194,188**
Engineering			15%	29,128
Total Initial Cost				**224,000**

City of La Crosse - Wastewater Treatment Plant
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La Crosse, WI

AS-5b Modify RAS Piping to Minimize Deposition

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
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La Crosse, WI

AS-5b Modify RAS Piping to Minimize Deposition

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse - Wastewater Treatment Plant
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AS-6 Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal

INITIAL COST ESTIMATE

General Description
This alternative includes the modifications necessary to install Tow Bro sludge withdrawal mechanisms as well s FEDWA inlets. Together, these technologies help to ensure settling and prevent excessive disturbance of the sludge blanket.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Tow Brow/FEDWA	Each	4	209,000	836,000
Equipment	Lump Sum	1	10,000	10,000
Labor	Lump Sum	1	10,000	10,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				856,000
Contingency			30%	256,800
Subtotal				1,112,800
Contractor Overhead & Profit			25%	278,200
Total Construction Cost				**1,391,000**
Engineering			15%	208,650
Total Initial Cost				**1,600,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-6 Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
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AS-6 Sec Clar FEDWA Inlet / Rapid Sludge Withdrawal

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse - Wastewater Treatment Plant
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AS-7 Sec Clar Density Current Baffles

INITIAL COST ESTIMATE

General Description
This alternative is for the installation of density current baffles which prevent short ciruiting within the clarifiers.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Density Current Baffles	Each	4	36,030	144,120
Install	Each	4	6,000	24,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum			
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				168,120
Contingency			30%	50,436
Subtotal				218,556
Contractor Overhead & Profit			25%	54,639
Total Construction Cost				**273,195**
Engineering			15%	40,979
Total Initial Cost				**315,000**

City of La Crosse - Wastewater Treatment Plant
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La Crosse, WI

AS-7 Sec Clar Density Current Baffles

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
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La Crosse, WI

AS-7 Sec Clar Density Current Baffles

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse - Wastewater Treatment Plant
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AS-3 Modified UCT

INITIAL COST ESTIMATE

General Description

This alternative involves modifying the BNR system from the A2O process to the Modified University of Cape Town (MUCT) Variation process. It involves extending the RAS piping to the beginning of the anoxic zones and relocating the existing ML recycle pumps to pump denitrified mixed liquor back to the beginning of the first anaerobic zones.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
9" Membrane Diffuser	Lump Sum	2,700	35	95,500
24" RAS Piping	Ft	460	300	138,000
Relocated Denitrified ML Recycle Pumps	Each	2	8,000	16,000
30" ML Recycle Piping	Each	240	350	84,000
Install	Lump Sum	1	100,000	100,000
Airflow Control Improvements	Lump Sum	1	89,000	89,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	15,000	15,000
Instrumentation and Control Not Listed Above	Lump Sum	1	45,000	45,000
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				582,500
Contingency			30%	174,750
Subtotal				757,250
Contractor Overhead & Profit			25%	189,313
Total Construction Cost				**946,563**
Engineering			15%	141,984
Total Initial Cost				**1,089,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-3 Modified UCT

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

AS-3 Modified UCT

ANNUAL O&M COST ESTIMATE

General Description	New	Existing
Number of Blowers Operating	2.00	2.00
Brake Horsepower of Each Operating Unit	157.5	175.0
Total Bhp	315	350
Motor Efficiency	92%	92%
Adjustable Frequency Drive Efficiency	90%	90%
Wire Horsepower	380	423
Wire Kilowatts	284	315
Operating Hours Per Day	24	24
Operating Days Per Week	7	7
Operating Weeks Per Year	52	52
Operating Hours Per Year	8,736	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity (Savings)	Kw-hrs	-275,479	0.083	-22,865
Total Annual Cost				**-23,000**

Present Worth Analysis	
Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**-324,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

EP-1a Cloth Disk Filter with Coagulation Zones

INITIAL COST ESTIMATE

General Description
This alternative includes disc filters to bring effluent phosphorus down to future permit levels. This also includes the expected cost of storing the dosing chemicals and maintaing the system. System is located within the area of the chlorine contact tank.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			20,912
Concrete	See Worksheet for Detailed Cost Breakdown			336,601
Metals	See Worksheet for Detailed Cost Breakdown			29,157
Buildings	See Worksheet for Detailed Cost Breakdown			460,349
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Disk Filter (firm capacity)	MGD	16	78,125	1,250,000
Disk Filter (redundancy)	MGD	8.0	78,125	625,000
Disk Filter Installation	Lump Sum	1	120,000	120,000
Pre-Filtration Pumping (5 MGD)	Each	4	45,000	180,000
Polymer Makedown and Dose System	Each	2	15,000	30,000
5000 Gallon Alum Storage Tank (1 month)	Each	1	15,000	15,000
Piping/Fittings (30", CL-DI)	Lump Sum	1	153,750	153,750
Valves	Per Filter	3	72,000	216,000
4'x4' Roof Hatch (pump access)	Each	4	2,500	10,000
Civil Not Listed Above	Lump Sum	1	5,000	5,000
Electrical Not Listed Above	Lump Sum	1	100,000	100,000
Instrumentation and Control Not Listed Above	Lump Sum	1	80,000	80,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum	1	40,000	40,000
Subtotal				3,676,768
Contingency			30%	1,103,030
Subtotal				4,779,798
Contractor Overhead & Profit			25%	1,194,950
Total Construction Cost				**5,974,748**
Engineering			15%	896,212
Total Initial Cost				**6,871,000**

EP-1a Cloth Disk Filter with Coagulation Zones

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum	1	3,485	3,485
Earthwork: Excavation	cu yds	342	20	6,833
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft	632	16.75	10,594
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**20,912**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds	23	400	9,370
Concrete: Walls	cu yds	244	1,200	292,446
Concrete: Floor Slabs	cu yds		1,000	0
Concrete: Structural Slabs	cu yds		1,000	0
Concrete: Columns	cu yds		1,600	0
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft	3,478	10	34,785
Concrete				**336,601**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft	196	70	13,728
Metals: Aluminum Stairway	risers	31	500	15,429
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**29,157**
Building: Over Disk Filters	sq ft	3,478	100	347,849
Building: Over Floc/Coag/Mix and Chem Struct	sq ft	750	150	112,500
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**460,349**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

La Crosse, WI

EP-1a Cloth Disk Filter with Coagulation Zones

ANNUAL O&M COST ESTIMATE

General Description	Rapid Mix	Coag Mix	Floc Mix	Submersible pumps
Number of Pumps Operating	1	1	1	3
Brake Horsepower of Each Operating Pump	5.0	7.5	1.0	45.0
Total Bhp	5	8	1	135
Motor Efficiency	92%	92%	92%	92%
Adjustable Frequency Drive Efficiency	90%	90%	90%	90%
Wire Horsepower	6	9	1	163
Wire Kilowatts	5	7	1	122
Operating Hours Per Day	24	24	24	24
Operating Days Per Week	7	7	7	7
Operating Weeks Per Year	52	52	52	52
Operating Hours Per Year	8,736	8,736	8,736	8,736

General Description	Backwash Pumps	Filter Rotate
Number of Pumps Operating	2	2
Brake Horsepower of Each Operating Pump	25.0	1.5
Total Bhp	50	3
Motor Efficiency	92%	92%
Adjustable Frequency Drive Efficiency	90%	90%
Wire Horsepower	60	4
Wire Kilowatts	45	3
Operating Hours Per Day	4	4
Operating Days Per Week	7	7
Operating Weeks Per Year	52	52
Operating Hours Per Year	1,456	1,456

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	1,238,346	0.083	102,783
Ferric Chloride	Gal	169,875	1.17	198,753
Polymer	lb	21,931	1.21	26,536
Total Annual Cost				**329,000**

Present Worth Analysis	
Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**4,624,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

EP-2 Clarifier Launder Covers

INITIAL COST ESTIMATE

General Description
This alternative includes launder covers for the secondary clarifiers to prevent algal growth.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Launder Covers	Each	4	67,000	268,000
Labor	Each	4	16,750	67,000
Civil Not Listed Above	Lump Sum	0	0	
Electrical Not Listed Above	Lump Sum	0	0	
Instrumentation and Control Not Listed Above	Lump Sum	0	0	
Plumbing Not Listed Above	Lump Sum	0	0	
HVAC Not Listed Above	Lump Sum	0	0	
Subtotal				335,000
Contingency			30%	100,500
Subtotal				435,500
Contractor Overhead & Profit			25%	108,875
Total Construction Cost				**544,375**
Engineering			15%	81,656
Total Initial Cost				**627,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

EP-2 Clarifier Launder Covers

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

EP-2 Clarifier Launder Covers

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	90
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

ST-1d Separate WAS Sludge GBT and Struvite Control

INITIAL COST ESTIMATE

General Description
This alternative is to thicken the WAS to 5% TS prior to digestion on a GBT. Primary sludge would thicken separately in the south gravity thickener to 5% TS.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			2,000
Metals	See Worksheet for Detailed Cost Breakdown			20,000
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Gravity Belt Thickener (2-Meter)	Each	1	250,000	250,000
Thin Sludge Feed Pump/Meter	Each	0	20,000	0
Polymer Unit	Each	1	21,000	21,000
Thickened Sludge Pump	Each	1	16,000	16,000
Piping, Fittings, and Valves	Lump Sum	1	65,000	65,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum	1	40,000	40,000
Instrumentation and Control Not Listed Above	Lump Sum	1	40,000	40,000
Plumbing Not Listed Above	Lump Sum	1	5,000	5,000
HVAC Not Listed Above	Lump Sum			
Subtotal				459,000
Contingency			30%	137,700
Subtotal				596,700
Contractor Overhead & Profit			25%	149,175
Total Construction Cost				**745,875**
Engineering			15%	111,881
Total Initial Cost				**858,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

ST-1d Separate WAS Sludge GBT and Struvite Control

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab (Equipment Pads)	Lump Sum	1	2,000	2,000
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**2,000**
Metals: Aluminum Grating and Platforms	Lump Sum	1	20,000	20,000
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**20,000**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

ST-1d Separate WAS Sludge GBT and Struvite Control

ANNUAL O&M COST ESTIMATE

General Description	**Drive**	**W3**
Number of Pumps Operating	**1**	**1**
Brake Horsepower of Each Operating Pump	**2**	**1.2**
Total Bhp	2	1
Motor Efficiency	**92%**	**92%**
Adjustable Frequency Drive Efficiency	**90%**	**100%**
Wire Horsepower	2	1
Wire Kilowatts	2	1
Operating Hours Per Day	**24**	**24**
Operating Days Per Week	**7**	**7**
Operating Weeks Per Year	**52**	**52**
Operating Hours Per Year	8,736	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	24,242	**0.083**	2,012
Polymer	lb	**11,498**	**1.21**	13,912
Ferric Chloride	Gal	**7,300**	**1.17**	8,541
Total Annual Cost				**25,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**352,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

SC-1 Sidestream Struvite Harvesting System

INITIAL COST ESTIMATE

General Description
This option is for installation of a filtrate precipitation system to harvest phosphorus in the form of struvite (Magnesium, Ammonia, and Phosphorus). Controlled formation of shards or pearls of struvite is obtained in an opflow bed reactor at a pH of 7.8 with excess magnesium added. The reactor precipitation will reduce the dependence on ferric chloride.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			9,500
Concrete	See Worksheet for Detailed Cost Breakdown			26,400
Metals	See Worksheet for Detailed Cost Breakdown			0
Buildings	See Worksheet for Detailed Cost Breakdown			5,000
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Ostara System	ea	1	2,805,000	2,805,000
GBT/BFP filtrate submersible pumps	ea	2	16,500	33,000
Civil Not Listed Above	%	1	35,109	35,109
Process Mechanical Not Listed Above	%	2	70,217	140,434
Electrical Not Listed Above	%	2	70,217	140,434
Instrumentation and Control Not Listed Above	%	2	70,217	140,434
Plumbing Not Listed Above	%	1	35,109	35,109
HVAC Not Listed Above	%	2	70,217	140,434
Subtotal				3,510,854
Contingency			30%	1,053,256
Subtotal				4,564,110
Contractor Overhead & Profit			25%	1,141,027
Total Construction Cost				**5,705,137**
Engineering			15%	855,771
Total Initial Cost				**6,561,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

SC-1 Sidestream Struvite Harvesting System

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum	1	1,500	1,500
Earthwork: Excavation	cu yds	200	40	8,000
Earthwork: Excavation	ft			
Earthwork: Excavation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**9,500**
Concrete: Base Slab	cu yds	12	400	4,800
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds	13	1,200	15,600
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds	5	1,200	6,000
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**26,400**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals:				
Metals				**0**
Building:	sq ft	500	10	5,000
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**5,000**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

SC-1 Sidestream Struvite Harvesting System

ANNUAL O&M COST ESTIMATE

General Description	**Ostara System**
Number of Motors Operating	**1**
Brake Horsepower of Each Operating Pump	**30**
Total Bhp	30
Motor Efficiency	**92%**
Adjustable Frequency Drive Efficiency	**90%**
Wire Horsepower	36
Wire Kilowatts	27
Operating Hours Per Day	**24**
Operating Days Per Week	**7.0**
Operating Weeks Per Year	**52**
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	236,125	**0.083**	19,598
Ferric Chloride Savings	Gal	**-150,000**	**1.17**	-175,500
Solids Disposal Savings	Ton	**-270**	**183.00**	-49,410
Struvite Harvested	lb	**-81,633**	**0.00**	0
Total Annual Cost				**-206,000**

Present Worth Analysis	
Interest Rate Per Year	**3.62500%**
Number of Years	**20**
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**-2,895,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

PC-2 HSW and Septage Receiving at GT 1

INITIAL COST ESTIMATE

General Description
This alternative is to convert the North gravity thickener (GT) for high strength waste (HSW). This offers potential savings by reusing existing pumps and piping to push wastes to the digesters.

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Architectural/Structural				
Earthwork	See Worksheet for Detailed Cost Breakdown			0
Concrete	See Worksheet for Detailed Cost Breakdown			0
Metals	See Worksheet for Detailed Cost Breakdown			68,722
Buildings	See Worksheet for Detailed Cost Breakdown			0
Demoltion	See Worksheet for Detailed Cost Breakdown			0
Truck receiving System (pipe, valve pit, bar rake)	Lump Sum	1	50,000	50,000
High Build Coating	Lump Sum	1	30,000	30,000
Civil Not Listed Above	Lump Sum			
Electrical Not Listed Above	Lump Sum			
Instrumentation and Control Not Listed Above	Lump Sum	1	15,000	15,000
Plumbing Not Listed Above	Lump Sum			
HVAC Not Listed Above	Lump Sum			
Subtotal				163,722
Contingency			30%	49,117
Subtotal				212,839
Contractor Overhead & Profit			25%	53,210
Total Construction Cost				**266,049**
Engineering			15%	39,907
Total Initial Cost				**306,000**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

PC-2 HSW and Septage Receiving at GT 1

ARCHITECTURAL/STRUCTURAL WORKSHEET

ITEM	Units	Quantity	Unit Cost ($)	Initial Cost ($)
Earthwork: Dewatering	lump sum			
Earthwork: Excavation	cu yds			
Earthwork: Underdrain System	sq yds			
Earthwork: Pile Foundation	ft			
Earthwork: Flood Protection Levee	cu yds			
Earthwork: Flood Protection Gravel Road	sq yds			
Earthwork:				
Earthwork				**0**
Concrete: Footings	cu yds			
Concrete: Base Slab	cu yds			
Concrete: Walls	cu yds			
Concrete: Floor Slabs	cu yds			
Concrete: Structural Slabs	cu yds			
Concrete: Columns	cu yds			
Concrete: Channels	cu yds			
Concrete: Precast Roof	ft			
Concrete				**0**
Metals: Aluminum Grating	sq ft			
Metals: Aluminum Handrail	ft			
Metals: Aluminum Stairway	risers			
Metals: Baffles and Weirs	sq ft			
Metals: Aluminum Geodesic Dome	sq ft	1,963	35	68,722
Metals				**68,722**
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Building:	sq ft			
Buildings				**0**
Demolition:	cu ft			
Demolition:	cu ft			
Demolition:	lump sum			
Demolition:	lump sum			
Demoltion				**0**

City of La Crosse - Wastewater Treatment Plant
Preliminary Compliance Alternatives Plan
La Crosse, WI

PC-2 HSW and Septage Receiving at GT 1

ANNUAL O&M COST ESTIMATE

General Description

Number of Pumps Operating	
Brake Horsepower of Each Operating Pump	60
Total Bhp	0
Motor Efficiency	92%
Adjustable Frequency Drive Efficiency	90%
Wire Horsepower	0
Wire Kilowatts	0
Operating Hours Per Day	24
Operating Days Per Week	7
Operating Weeks Per Year	52
Operating Hours Per Year	8,736

ITEM	Units	Annual Quantity	Unit Cost ($)	Annual Cost ($)
Electricity	Kw-hrs	0	0.083	0
Total Annual Cost				**0**

Present Worth Analysis

Interest Rate Per Year	3.62500%
Number of Years	20
Present Worth Factor	14.053
Present Worth of Total Annual Cost	**0**

Endangered Resources Preliminary Assessment

Created on **12/27/2018**. This report is good for one year after the created date.

Results

Endangered resources are present and the species present are legally protected. **Further actions are required to ensure compliance** with Wisconsin's Endangered Species Law (s. 29.604 Wis. Stats.) and the Federal Endangered Species Act (16 USC ss 1531-43). Therefore you should request an Endangered Resources Review http://dnr.wi.gov/topic/ERReview/Review.html.

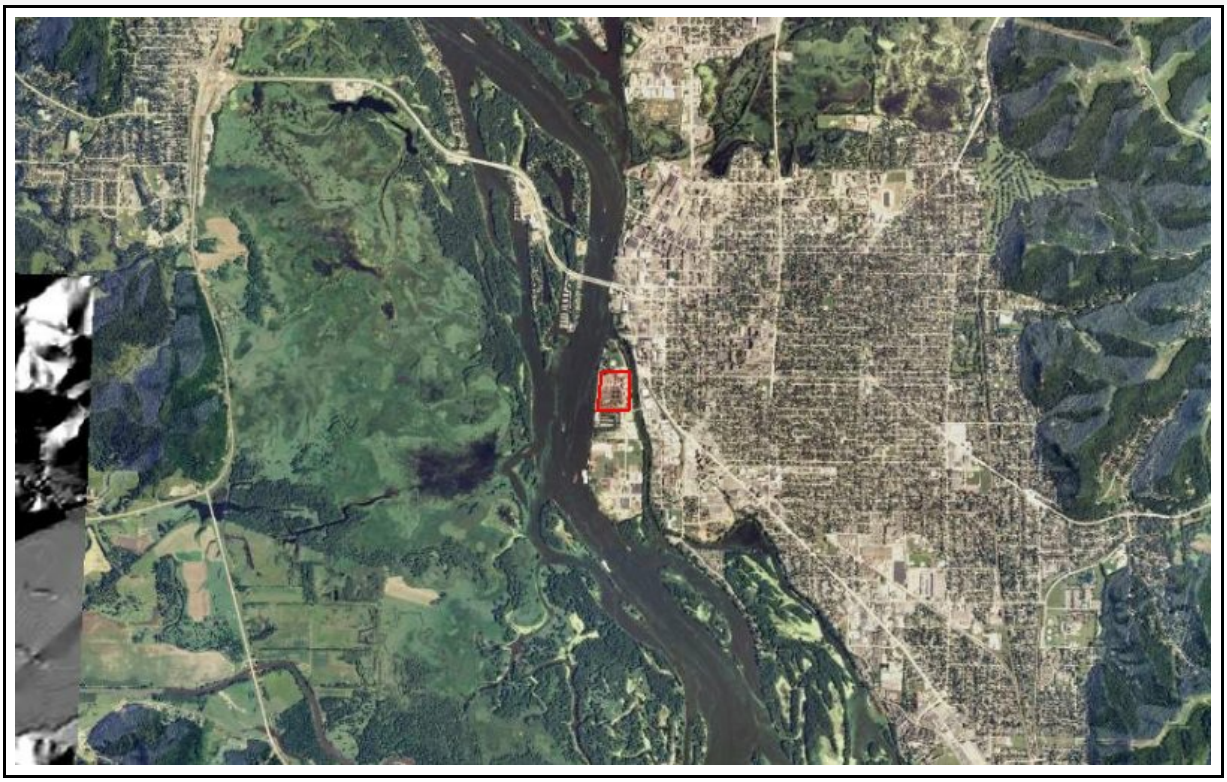
Project Information

Landowner name	City of La Crosse
Project address	905 Joseph Houska Drive, La Crosse, WI 54601
Project description	Wastewater Treatment Plant - construction within existing fenceline

Project Questions

Does the project involve a public property?	Yes
Is there any federal involvement with the project?	No
Is the project a utility, agricultural, forestry or bulk sampling (associated with mining) project?	Yes
Is the project property in Managed Forest Law or Managed Forest Tax Law?	No

Project Area Maps



The information shown on these maps has been obtained from various sources, and is of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access. Users of these maps should confirm the ownership of land through other means in order to avoid trespassing. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal/.

Technical Memorandum 7
Recommended Plan
Strategic Plan: Wastewater Treatment
La Crosse Wastewater Treatment Facility
La Crosse, Wisconsin

Date: March 20, 2020

To: Bernard Lenz – Utilities Manager

Copy: Jared Greeno, WWTF Superintendent
Brian Hein – WWTF Assistant Superintendent
Greg Kozelek – City Engineer

From: Mike Gerbitz – Donohue & Associates

By: Bill Marten – Donohue & Associates
Eric Lynne – Donohue & Associates
Ben Stephens – Donohue & Associates

Purpose

The purpose of this Technical Memorandum (TM) is to present the Recommended Plan for the implementation of upgrades to the wastewater treatment facility resulting from the wastewater facilities planning process. While TM 6 evaluated the cost effectiveness of alternatives and identified the recommended improvements to meet the City's 20-year wastewater treatment needs, this TM 7 provides a summary of the recommended plan and the implementation packages that were considered for the 20-year treatment needs. Sewer rate impacts were also determined for the various implementation packages.

Technical Plan

During the Alternatives Evaluation Workshop, the project team discussed the priority level for each improvement. The majority of the improvements were identified as a near-term priority, with only the following list as a mid- to long-term priority. Recent maintenance improvements to these unit processes has extended their implementation schedule; thus deferring the respective capital expenditures to minimize rate impacts. It is anticipated these improvements would be implemented in subsequent years of the planning period when equipment maintenance exceeds the replacement cost. Table 1 summarizes the recommended capital improvements plan.

A general layout of the treatment facility indicating the various improvements is provided in Figure 1.

Table 1 – WWTF Capital Improvements Plan

Unit Process	Description	YR 0-5	YR 5-10	YR 10+
Headworks	Fine Screen	**$1.0M**		
	Grit System Programming	**$0.01M**		
	HVAC Replacement	**$0.3M**		
	Septage and Holding Receiving	**$0.5M**		**$1.0M**
Primary Clarification	Scum Pit 3 Pump w/ HSW Tank	**$0.6M**		
	HSW and Septage Receiving at GT 1		**$0.5M**	
Activated Sludge	A/S Reactor Splitter Box	**$0.4M**		
	Large Blade Submersible Selector Mixers	**$0.4M**		
	Modified UCT	**$1.0M**		
	Sec Clar Splitter Box	**$0.9M**		
	Modify RAS Piping to Minimize Deposition	**$0.2M**		
	Sec Clar FEDWA Inlet / Rapid Sludge Removal			**$1.6M**
	Sec Clar Density Current Baffles	**$0.3M**		
Effluent Phosphorus	Cloth Disk Filter with Coagulation Zones	**$5.6M**		
	Clarifier Launder Covers	**$0.6M**		
Disinfection	Replacement UV System			**$1.9M**
Sludge Thickening	WAS GBT and Struvite Control	**$0.7M**		
Digestion	TPAD Conversion	**$3.0M**		
	Digester Mixing with Draft Tube & Jet Mixing	**$1.6M**		
Biosolids Reuse	Increase Diversity by Drying 70% of Biosolids	**$25.5M**		
	Improve Biosolids Quality	**$1.1M**		
Biogas	Replace Waste Gas Burner	**$0.4M**		
	Cogeneration Engine with Gas Storage	**$5.3M**		
Site and Utilities	Replace Facility Wide Heating System	**$0.6M**		
	Comply with NFPA 820 & 10-State Standards	**$2.2M**		
	Increase W3 System Capacity	**$0.4M**		
	New Transformers and One Electrical Service	**$2.5M**	**$2.0M**	
	Floodplain, Site Access, and Misc	**$0.4M**		
	Subtotal	**$55.5M**	**$2.5M**	**$4.5M**

Deferment of these projects reduces the total initial cost of near-term recommended improvements to $55.5 million. It is recommended that these projects be clustered into one (or a few) larger set(s) for efficiency with design, bidding, construction pricing, and convenience to operations staff. To implement the near-term items, an schedule was developed to prepare for action items and deliverables associated with this major set of projects to be developed.

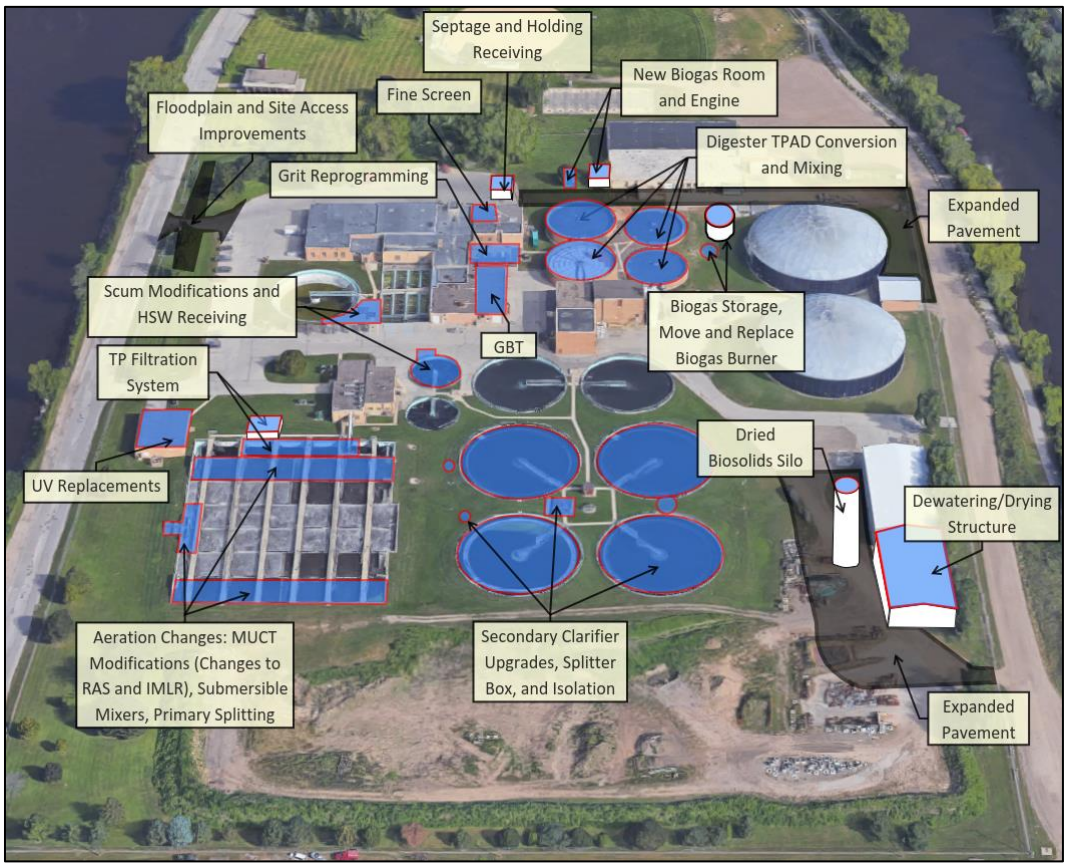


Figure 1 – Treatment Plant 20-Year CIP Improvements

The near-term implementation schedule is provided in Figure 2. The current discharge permit requires initiation of construction in 2022, with ultimate compliance by January 1, 2025. The staff indicated preference to have a minimum of one year prior to this compliance deadline to run the new system allowing the operators to become familiar with the new technology. The schedule in Figure 2 was developed to provide a defensible path towards implementation. The schedule could be condensed by reducing the preliminary design phase; however, this phase is critical to the City to obtain stakeholder input and initialize technologies and equipment preferences. A key benefit to a separate preliminary design, is its ability to control costs, as many of the rate payers cannot tolerate an unexpected increase in project costs.

Additionally, during this preliminary layout phase, it is recommended to conduct demonstration scale validation tests for the main treatment changes (phosphorus and biosolids) confirm performance, sizing, and operating costs prior to entering detailed design.

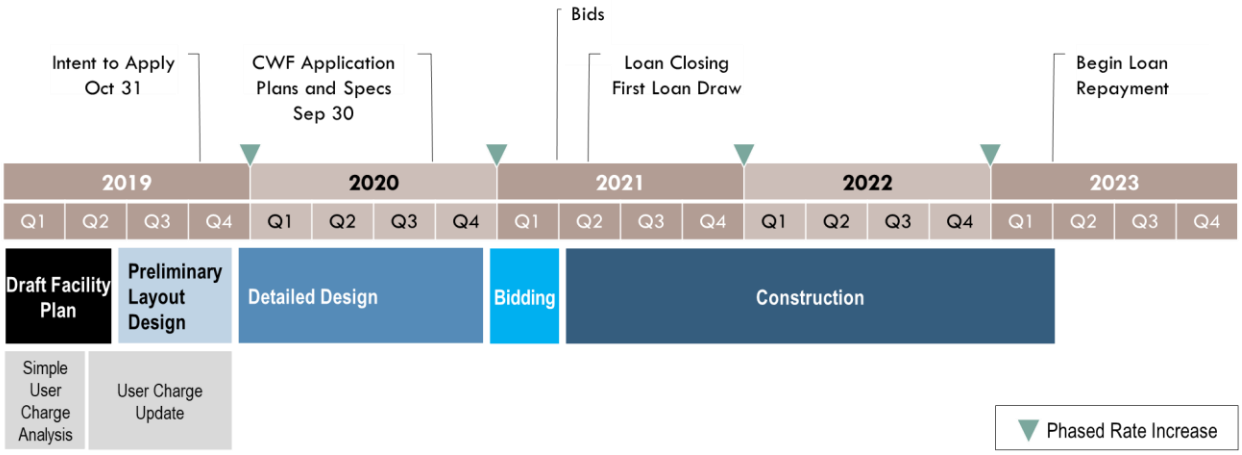


Figure 2 – Implementation Schedule

Financial Plan

The City has been preparing for this major improvement for several years. Prior to this facility plan, many routine capital projects (clarifier rehabilitation and digester cover repairs) have been cash funded over the past several years without increasing sewer utility rates. During this time (the last 5-10 years) the City has projected a major capital project on the Capital Improvements Plan for phosphorus and solids estimated from $10 million to $60 million in 2014. As identified above, the recommended near-term projects sum to approximately $50 million, which include the historical projections for phosphorus and solids as well as other long-overdue energy and reliability improvements to avoid another major upgrade in the foreseeable future. The total project costs can be broken down into these key categories as summarized in Figure 3.

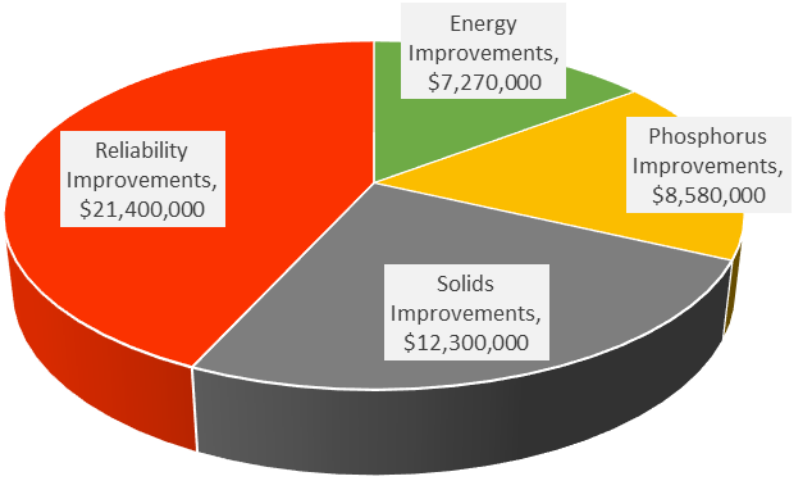


Figure 3 – Project Categories

Implemented as one main project, this is recommended to be financed with a Wisconsin Department of Natural Resources (WDNR) Clean Water Fund (CWF) Loan. These loans are available from revolving funds loaned and paid back from other utilities in the state. CWF loans also can include subsidizes for

specific users based on the community's application score due to affordability, regionalization, and phosphorus improvements. Conservatively, these potential grants were not included at this time. The WDNR Environmental Loans department applies a parallel cost ratio, which reduces the effective interest rate subsidy based on future development, industrial, and government user projections.

Assuming the project is fully financed by the CWF, the annual revenue required to cover debt service can be estimated, assuming current rates are adequate for current treatment costs. The implementation schedule in Figure 2 highlights a few traditional moments to introduce a phased rate increase for a project of this size. This enables the users to become accustomed to the rate change gradually, as many industrial stakeholders may have long-term contracts that restrict their ability to recoup rate increases. Secondly, adjusting rates incrementally, enables the City to control the final rates as the project team refines project costs through planning, design, and construction.

Figure 4 provides a general breakdown of revenue from customers as presented in a 2014 rate review. Overall, revenue is obtained from the following main categories identified in TM1:

- City of La Crosse Sewer Customers
- Major Commercial and Industrial Customers
    - City Brewery
    - Kwik Trip Dairy
    - Great Lakes Cheese
    - Trane Company
- Partner Municipalities
    - City of Onalaska
    - City of La Crescent, MN
    - Town of Campbell
    - Town of Shelby Sanitary District 1
    - Town of Shelby Sanitary District 2

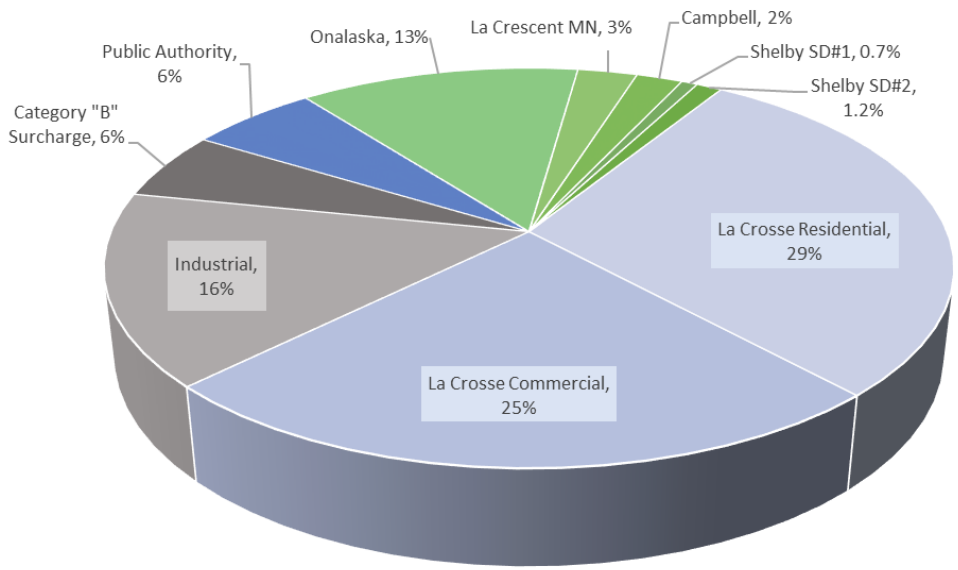


Figure 4 – Revenue From Customers

Financing from the CWF requires 110% debt coverage obtained through sewer fee revenues. To simplify the rates and provide an assessment of the typical residential connection, the following assumptions were used:

- 45,400 gallons of water consumed per year (equivalent to 15 CCF/quarter)
- 1.98% interest rate

For the proposed $55.5 million project, the rates would increase approximately $5.87/month, from $11.38/month to $17.24/month.

Figure 5 presents this proposed residential rate graphically to demonstrate the sensitivity to rates based on the final cost of the recommended project. Although this rate increase is significant, the final cost for sewer services at the La Crosse WWTP remains the one of the lowest utilities among similar sized facilities. Rates of similar facilities compared to current and proposed La Crosse sewer rates is presented in Figure 6.

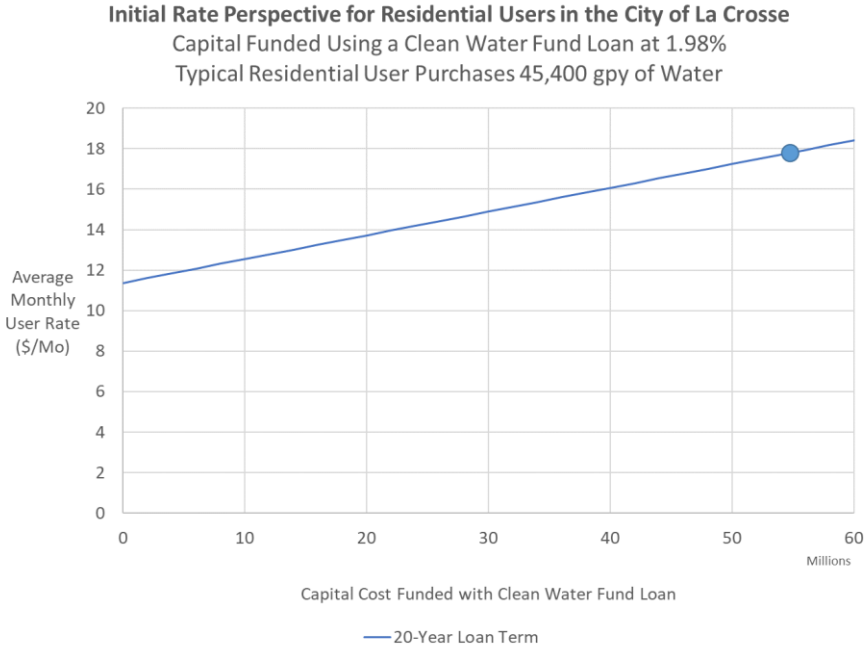


Figure 5 – Proposed Residential Sewer Rate

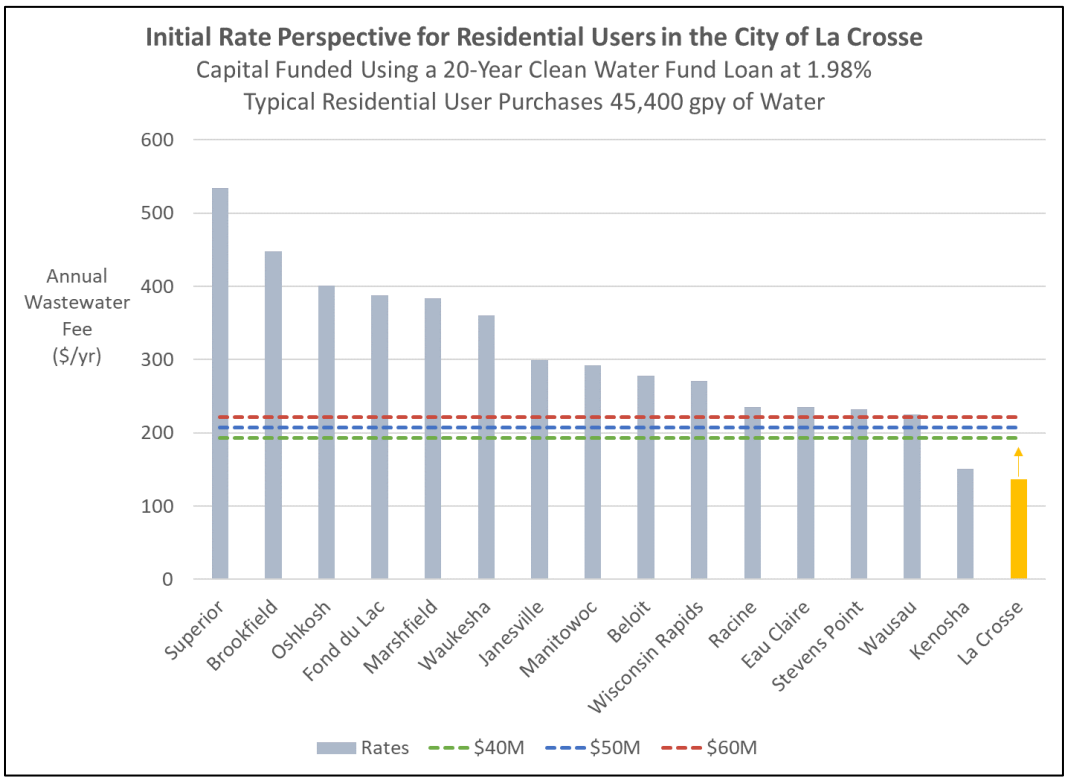


Figure 6 – Residential Sewer Rate Comparison

The proposed rate evaluation presented is a coarse determination and should be followed up with a formal rate study once stakeholder buy-in of the recommended project is obtained. Additionally, the formal rate study should consider the proportion of rates attributed to flow, biological oxygen demand (BOD), total suspended solids (TSS), ammonia, and phosphorus such that appropriate cost allocations or rate structures can be identified for equitable rates from all stakeholders.

Technical Memorandum 8
Modified Recommended Plan
Strategic Plan: Wastewater Treatment
La Crosse Wastewater Treatment Facility
La Crosse, Wisconsin

Date: March 20, 2020

To: Bernard Lenz – Utilities Manager

Copy: Jared Greeno, WWTF Superintendent
Brian Hein – WWTF Assistant Superintendent
Greg Kozelek – City Engineer

From: Mike Gerbitz – Donohue & Associates

By: Bill Marten – Donohue & Associates
Eric Lynne – Donohue & Associates
Ben Stephens – Donohue & Associates

Purpose

The purpose of this Technical Memorandum (TM) is to recreate the steps of generating TM 1 through TM 7 for the La Crosse Wastewater Treatment Facility with respect to no contribution from the City of Onalaska, Town of Onalaska, the City of La Crescent, the Town of Campbell, and the Town of Shelby. These contracted areas currently purchase treatment from the City of La Crosse. Additionally, future service area expansion for loads provided from the Towns of Hamilton and Medary were not included. The contracts for these municipal groups are currently open for renewal and could result in changes to future loadings if the sewer service area plan was revised.

Conclusions

The contents of this TM are not included with the final plan as this approach to projected conditions is not consistent with the current WDNR approved sewer service area plan.

Technical Memorandum 9
Final Plan
Strategic Plan: Wastewater Treatment
La Crosse Wastewater Treatment Facility
La Crosse, Wisconsin

Date: March 20, 2020

To: Bernard Lenz – Utilities Manager

Copy: Jared Greeno, WWTF Superintendent
Brian Hein – WWTF Assistant Superintendent
Greg Kozelek – City Engineer

From: Eric Lynne – Donohue & Associates

By: Mike Gerbitz – Donohue & Associates
Bill Marten – Donohue & Associates
Chris Lockett – Donohue & Associates

Purpose

The purpose of this Technical Memorandum (TM) is to further develop the Recommended Plan presented in TM7. The Final Plan presented herein summarizes changes identified during a preliminary design phase where each improvement was reviewed in depth by all design disciplines to establish a refined cost opinion.

After discussing the draft recommendations with the stakeholders, several adjustments to the recommended plan were identified and presented in this TM.

- Flows and Loadings
- Project Scope Elements
- Opinion of Probable Construction Cost

Flows and Loadings

The following Table 1 presents a revised summary of influent flows and loadings to displace Table 8 of TM3. Changes were a result of modifications to the expected growth from contributing municipalities and local industry. Primary sludge, waste activated sludge, and digested sludge production estimates are now included in this table. A detailed mass balance to support these values is provided in Appendix 9A.

Table 1 – Updated Flows and Loadings

		Existing Conditions					Year 2040 Conditions					
Parameters	Units	AA	MinW	MM	MaxW	MD	AA	MinW	MM	MaxW	MD	PH
Raw Wastewater												
Flow	mgd	10.1	7.8	12.5	13.2	17.9	13.0	10.0	15.8	17.7	28.8	42.5
BOD5	ppd	26,000	9,300	30,800	35,200	64,300	31,300	11,196	39,700	45,000	91,000	
TSS	ppd	29,400	16,100	49,800	60,900	77,000	36,600	20,043	56,700	70,000	126,000	
TKN	ppd	2,912	1,042	3,450	3,942	7,202	3,506	1,254	4,446	5,040	10,192	
TP	ppd	549	286	687	793	1,540	700	365	800	950	1,900	
Solids Production												
PSD	ppd	23,918	12,901	39,845	39,010	33,388	29,656	16,009	45,408	44,875	56,461	
WAS	ppd	11,170	4,339	14,130	19,938	19,938	13,576	5,249	17,698	25,080	25,080	
DSD	ppd	15,604	7,624	23,804	27,016	24,492	19,170	9,375	28,383	33,664	38,625	

Abbreviations

AA = annual average, MinW = minimum week, MM = maximum month, MaxW = maximum week, MD = maximum day, PH = peak hour
BOD5 = 5-day biochemical oxygen demand, TSS = total suspended solids, TKN = Total Kjeldahl nitrogen, TP = total phosphorus
PSD = primary solids, WAS = waste activated solids, DSD = digested solids (solids post anaerobic digestion)

Note that the values shown for Existing Conditions list the max day primary sludge loadings as less than the max week loadings. This is correct in that the max day column is a defined by the conditions observed during maximum influent flow and load, not the max day primary sludge loading was observed. The values reflect poorer primary clarifier performance under max week and max day loadings due to high flows (reduced ability to settle the lighter material) and it results in a slightly higher loading to the activated sludge system – however, the associated waste activated sludge loading does not respond to the effect until the storm passes and is buffered to the max week. This phenomena is not carried into the future 2040 conditions as the plan restores under-utilized primary clarifier capacity.

Project Scope Elements

After conducting detailed interviews and investigations on site, certain alternatives were deemed unnecessary and removed from the recommended plan (TM 7) project scope while new improvements were identified and incorporated into the project scope. This section provides an updated list of alternatives and upgrades that are to be included in the Final Plan. Appendix 9B illustrates the below project scope elements through figures of a conceptual site plan, hydraulic profile, and a process flow schematic.

The following sections are divided by unit process with a brief summary of changes from TM7.

Headworks

1. Fine Screens (H-1), **Structure 101**:
    a. Remove existing comminutors
    b. Modify existing concrete channel to accommodate new screen

c. Install new screen and washer/compactor system. The feasibility for retrofitting the existing channel for fine screening limits screen selection and increased equipment costs; however, these costs are substantially less than construction of a new building.

2. Grit System Programming (H-2):
    a. Modify treatment system programming to proactively engage the peak grit capacity based on high flows observed in the collection system. In TM7 consideration was given to reacting to upstream lift stations; however, preference was later given to a new HACH (or equal) influent flow meter mounted in a manhole after the siphon.

3. HVAC Replacement (H-3):
    a. Replace make-up air units and exhaust fans in the headworks building

4. Septage and Holding Receiving (H-4):
    a. Removed from scope of work. The staff identified the current method of discharge to the headworks is acceptable, provided the high-strength waste (HSW) to digestion system alleviates some of the grease loadings that cause issues with the screening system.

Primary Clarification

1. Scum Pit 3 Pump w/ HSW Tank (PC-1), **Structure 136**:
    a. Removed scope of work and will be completed in the future via capital improvements project. It was discovered that scum from Primary Clarifier 1, 2, and 3 may be pumped together with the primary sludge. Staff will review the valve operability and test this solution during the next time these tanks are in service. Any replacements required will be performed using the replacement fund.

2. HSW and Septage Receiving at Gravity Thickener 1 (PC-2):
    a. Removed scope of work. The staff identified an operational benefit to retaining the existing gravity thickener for WAS flow equalization. The HSW receiving was relocated to Structure 331 in Item 4 below.

3. ADDED: Primary Sludge and WAS Transfer (PC-4), **Structure 160**:
    a. Install divider in existing WAS / Primary box (**located east of Structure 160**) to segregate WAS from screened primary sludge
    b. Segregate Gravity Thickener 1 for primary sludge and Gravity Thickener 2 for WAS
    c. Add a third pump to existing sludge pumping system in Plant 2 (**Structure 162**) to provide for a backup spare.
    d. Modify existing sludge piping in Plant 2 for the following normal operation:
        i. Gravity Thickener 1 Primary Sludge to Sludge Pump 1 to Digesters, AND
        ii. Gravity Thickener 2 WAS to Sludge Pump 2 to Thickening Building GBT
    e. Modify existing sludge piping in Plant 2 to allow the following flexibility:

i. Gravity Thickener 1 or 2 to Sludge Pump 1,2, or 3 to Thickening Building, OR
ii. Gravity Thickener 1 or 2 to Sludge Pump 1,2, or 3 to Digesters

f. Replace 10 to 15 feet of existing buried SCH 40 PVC primary sludge line to digesters

4. ADDED: High Strength Waste (HSW) Storage System (PC-5), **Structure 331**:
   a. Remove existing infrastructure and platforms in the HSW Building (**Structure 330**) to accommodate the HSW receiving, storage, and feed system
   b. Install new HSW receiving and holding system that will consist of:
      i. Dual basket in-line strainers on offloading pipeline
      ii. Offloading Pump
      iii. One (1) 15,000 gal SSTL HSW holding tank with level control and mixers
      iv. HSW Feed pump
   c. Provide provisions to use the new HSW Unloading Pump to pump HSW to the existing HSW tanks located in the upper mezzanine level of the HSW Building (**Structure 330**) for supplemental carbon source.

* NOTE: For cost control, a second HSW holding tank has not been included in the Final Plan budget but will be included in the design and bid as an Alternate for evaluation and consideration

Activated Sludge

1. Activated Sludge (A/S) Reactor Splitter Box (AS-1):
   a. Removed scope of work. The cost implications of adding a flow dividing splitter box was identified to be more costly than anticipated due to very tight gravity hydraulics. Upon field review and further interviews with staff the flow split was identified to be closely balanced even without a uniform flow control device.

2. Large Blade Submersible Selector Mixers (AS-2), **Structures 191A and 192A**:
   a. Remove existing in-basin submersible mixers
   b. Install high efficiency large blade submersible mixers in each zone of the biological treatment system to reduce power consumption.

3. Modified UCT (AS-3), **Structure 190**:
   a. Modify the existing aeration basin to allow operation as a Modified University of Cape Town (MUCT) system
   b. Install a baffle wall in the first pass of each process train in order to establish a higher food-to-microorganism ratio in the anaerobic zone (and anoxic zone if possible) for each process train (**Structures 191A and 192A**)
   c. Install a new recirculation pump at the end of the anoxic zone with discharge piping that allows for recycled mixed liquor to be recycled to the head of the process train (**Structures 191A and 192A**). Consider larger piping if existing pumps are reused.

* NOTE: A second redundant recirculation pump has not been included in the overall budget but will be included in the design and bid as an Alternate for evaluation and consideration

d. Modify the existing RAS system to promote the MUCT system:
    i. Tie into the existing RAS pipeline north of the existing aeration basin
    ii. Split the RAS line into two separate pipelines
    iii. Install a flow control valve and flow meter on each of the two RAS pipelines
        1. RAS flow meters and flow control valves shall be located in the lower level of the proposed Filter Building (**Structure 240**)
    iv. Route each RAS line to the head of the first anoxic zone in each process train
e. Install the required DO and ORP probes through the basin, as required, for accurate monitoring and operations
f. Remove the existing aeration grids in each process train and reinstall new aeration grids and diffusers that are designed for the new MUCT system
g. ADDED: Replace existing diffuser membranes throughout entire aeration basin

4. Secondary Clarifier Splitter Box (AS-4):
    a. <u>Removed scope of work.</u> The cost implications of adding a flow dividing splitter box was identified to be more costly than anticipated due to very tight gravity hydraulics. Upon field review and further interviews with staff the flow split was identified to be closely balanced even without a uniform flow control device.

5. Modify RAS Piping to Minimize Deposition (AS-5b), **Structures 211, 212, 213, and 214**:
    a. Add new buried plug valves to the existing RAS suction piping from each secondary clarifier to provide tank isolation
        i. Valve placement shall be upstream of any interconnecting RAS piping from other secondary clarifiers to provide the ability to completely isolate each individual tank

6. Secondary Clarifier Flocculating Energy Dissipating Well Arrangement (FEDWA) Inlet and Rapid Sludge Removal (AS6):
    a. As defined in TM7, this scope of work from AS-6 related to providing new secondary clarifier mechanisms with improved flocculating inlets and rapid sludge withdrawal system is not included with this phase of construction.

7. Secondary Clarifier Density Current Baffles (AS-7), **Structures 211, 212, 213, and 214**:
    a. Install new density current baffles to the four (4) existing secondary clarifiers for improved effluent TSS quality

8. NEW ITEM: Aeration System Upgrades (AS-8):
    a. <u>Removed scope of work and will be completed in the future via capital improvements project.</u> Replace high speed turbo blower(s) to replace the existing four blowers that are failing prematurely (**Structure 163**). Prior to purchase, consideration for larger blowers should be given based on the desire to handle higher oxygen demands for nitrification despite limited requirement for nitrification in the current permit.

b. Modify / replace existing aeration piping to provide enhanced air flow / DO control throughout the aeration basin (**Structure 190)**
    i. Provide three (3) distinct aeration zones in each process train where the air flow can be monitored and automatically controlled via modulation valves to meet a preset DO concentration set point
    ii. Provide isolation valves to all diffuser sections to provide flexibility of isolating air flows to certain areas of the aeration basin or to manually control / modulate air flow rates and enable simultaneous nitrification-denitrification for energy savings.

9. ADDED: Painting Aeration Basins:
    a. Paint the upper 4 to 5 feet of the aeration basins to protect the concrete structure at the air / water interface

* NOTE: Painting the aeration basins has not been included in the overall budget but will be included in the design and bid as an Alternate for evaluation and consideration

Effluent Phosphorus

1. Cloth Disk Filter with Coagulation Zones (EP-1b):
    a. Modify existing unused Chlorine Contact Channel (**Structure 241**) to include the following:
        i. Pump Chamber and three (3) axial pumps to provide the additional necessary head to flow through the new filters
        ii. Overflow weir flow monitoring system to control the axial pump flow rate
        iii. One (1) Rapid Mix Chamber
        iv. One (1) Coagulation Chamber
        v. One (1) Flocculation Chamber
        vi. Means for chemically treated water to flow by gravity to the adjacent Tertiary Filtration Building (**Structure 240**)
        vii. Means for filtered water to flow by gravity from the adjacent Tertiary Filtration Building back to the existing Chlorine Contact Channel or overflow weir box
        viii. Provisions to allow flow in excess of 16 MGD to overflow the pump chamber and bypass the Rapid Mix Chambers, Coagulation Chambers, and Flocculation Chambers and ultimately discharge into the overflow weir box
        ix. Provisions to reduce stagnant water in unused portion of the Chlorine Contact Channel
    b. Recommend disc filter manufacturer
        i. Develop a Request for Proposal for disk filter manufacturers and obtain “for purchase” quotes from multiple vendors
        ii. Evaluate each proposal and provide a recommendation to the Owner
        iii. Design new filtration building around recommended filter manufacturer
        iv. Incorporate recommended filter manufacturer in Bid Documents

c. Added: Construct a new concrete Filtration Building (**Structure 240**) to include the following systems:
    i. Tertiary disk filters
    ii. Tertiary filter backwash pumping / piping system
    iii. Polymer storage and feed systems
    iv. Sodium Hypochlorite storage and feed systems
    v. Safety shower / eye washes as required
    vi. Seal Water / Reuse Water pumping system including in-line self-cleaning strainers
    vii. RAS piping and RAS flow control valves and flow meters
    viii. Control Room
    ix. Mechanical Room
    x. Electrical Room
d. ADDED: Construction bypass of existing Chlorine Contact Chamber to allow for future maintenance of filter rapid mix, coagulation and flocculation tanks.

2. Clarifier Launder Covers (EP-2), **Structures 211, 212, 213, and 214**:
    a. Install launder covers on all four (4) Secondary Clarifiers to prevent large clumps of algae from inhibiting disk filter phosphorus removal performance .

Disinfection

1. Replacement UV System (DI-1):
    a. As defined in TM7, this scope of work from DI-1 related to the replacement of the UV disinfection system is not included with this phase of construction.

Sludge Thickening

1. ADDED: Gravity Thickening Device Evaluation (ST-0):
    a. Provide an evaluation to determine the optimal sludge thickening device based on pilot test results.
    b. Compare a GBT to an Orege sludge thickening unit
        i. Footprint
        ii. Performance
        iii. Reliability
        iv. Capital Cost
        v. Polymer Usage
        vi. Operating Cost
        vii. Cake Solids Content
        viii. Ability to Thicken Primary Sludge
        ix. Impact to digester mixing, dewatering, and drying

2. Separate WAS Sludge GBT and Struvite Control (ST-1d):
    a. Install a new WAS thickening unit (GBT or Orege) in the Thickener Building (**Structure 105**) adjacent to the existing GBT (**Structure 104**)

b. Install new polymer system for new thickening unit
c. Modify existing piping to allow the following:
    i. WAS from Sludge Pumps to new thickening unit, AND
    ii. Digested solids from Digesters to existing GBT, AND
    iii. Thickened WAS from new thickening unit to Digesters, AND
    iv. Thickened digested solids from Digesters to existing Solids Holding Tanks
d. Modify existing piping to allow for the following flexibility:
    i. WAS or primary sludge from Sludge Pumps to existing GBT, OR
    ii. Digested sludge from Digesters to new thickening unit
    iii. Thickened solids from new thickening unit or existing GBT to Digesters, OR
    iv. Thickened solids from new thickening unit or existing GBT to Solids Holding Tanks
e. Install a means of struvite control by providing a dose of ferric chloride from the new Filter Building (**Structure 240**) to the WAS sludge box just east of Structure 240.

3. Existing GBT Solids End Replacement:
    a. Removed scope of work and will be completed in the future via capital improvements project: Replace existing GBT solids collection and transfer system

Digester Operation, Heating, and Recirculation

1. TPAD Conversion (D-2):
    a. Upon site visits at temperature phased anaerobic digestion facilities, the project team decided to forego the decision to convert to a TPAD facility. This scope of work was removed, but replaced with rehabilitation of existing Mesophilic Digestion systems similar to Alternative D-1 from TM6.

2. ADDED: New Digester Building (D-6):
    a. Construct a new Digester Control Building (**Structure 390**) to include the following systems:
        i. Digester 3 and 4 (**Structures 362 and 363**) jet mixing pumps
        ii. Digester 3 and 4 (**Structures 362 and 363**) heating pumps
        iii. Shell and tube heat exchangers for all four digesters (**Structures 361, 362, 363, and 364)**
        iv. Digester draw pumps
        v. Biogas booster fans
        vi. Safety shower / eye washes as required
        vii. Electrical Room

3. ADDED: Digester Feed (D-3), **Structure 360**:
    a. Utilize the existing digester feed line and modify existing digester heating loop piping to act as the digester feed pipe

b. Utilize the four (4) existing electric control valves on the digester feed piping to provide the flexibility to automatically change which Digester is being fed
c. Remove excess piping and cap (as required) piping that is no longer required

4. ADDED: Digester Discharge (D-4):
    a. Utilize the existing digester discharge piping to draw from each digester
    b. Utilize the four (4) existing electric control valves on the digester discharge piping to provide the flexibility to automatically change which Digester is being drawn from
    c. Tie into the existing suction piping of the existing Digester Heating Pump in the existing Anaerobic Digester Building (**Structure 360**) (which combines the discharge from all Digesters) and install a new combined digester discharge pipe to the new Digester Building (**Structure 390**)
    d. Remove excess piping and cap (as required) piping that is no longer required
    e. Install two (2) new progressive cavity pumps in the lower level of the new Digester Building (**Structure 390**) that can draw from the new combined digester discharge pipeline and that discharge to:
        i. New Belt Filer Press in the new Dryer Building (**Structure 501**)
        ii. The existing GBT and new sludge thickening unit (**Structures 104 & 105**)

Digester Mixing

1. Digester 1&4 Draft Tube and 2&3 Jet Mixing (DM-1):
    a. Upon site visits, project team decided to remove scope of work related to draft tube mixing and utilize one type of mixing for all tanks.
    b. Install four (4) independent jet mixing systems, one for each Digester 1 - 4
        i. Pumps for Digesters 1 and 4 (**Structures 361 and 364**) to be located in the existing Digester Building (**Structure 360**), adjacent to the tank, to minimize suction and discharge piping
            1. Suction and discharge piping for each Digester shall be independent of each other and of other piping
        ii. Pumps for Digesters 2 and 3 (**Structures 362 and 363**) to be located in the lower level of the new Digester Building (**Structure 390**), adjacent to tank, to minimize suction and discharge piping
            1. Suction and discharge piping for each Digester shall be independent of each other and of other piping

Biosolids Reuse

1. Increase Diversity by Drying 100% of Biosolids (BR-1f):
    a. Construct a new concrete Biosolids Dryer Building (**Structure 500**) to include the following systems:
        i. Belt Filter Press Systems (**Structure 501**)
        ii. Biosolids Belt Dryer (**Structure 502**)
        iii. Dried Biosolids Storage Silo (**Structure 503**)
        iv. Biogas Conditioning System (**Structure 504**)

v. Engine Generator for heat and power cogeneration (**Structure 505**)
vi. Boiler System (**Structure 506**)
vii. Biogas Cleaning Tanks (**Structure 507**)
viii. Control Room
ix. Lavatory
x. Polymer Feed System

b. Install new belt filter press for dewatering of digested solids
c. Construct access platform around the new belt filter presses
d. Provide conveyor and dewatered solids pumping systems to convey dewatered solids to the existing Dewatered Biosolids Storage Building (**Structure 440**) and to the new Biosolids dryer (**Structure 502**)
e. Install polymer make-down system and feed system to belt filter press
f. Install medium temperature biosolids belt dryer and associated appurtenances:
    i. Biosolids belt dryer
    ii. Air handling system
    iii. Dried solids conveyance system
    iv. Dried solids storage silo
    v. Nitrogen generation system
    vi. Dryer hot water system and heating pumps
g. System shall provide for future expansion into a potential biosolids incineration furnace

2. ADDED: Dryer Exhaust Air Odor Control System:
    a. Include building footprint within the new Dryer Building for installation of an odor control system for the dryer exhaust air
    b. Install a chemical odor control system for the dryer exhaust air to control odors, including the following elements:
        i. Air Scrubber and Fan System
        ii. Sodium Hydroxide System
        iii. Sulfuric Acid System
        iv. Sodium Hypochlorite System

3. Improve Biosolids Quality (BR-2):
    a. Combine sludge from Primary Clarifiers 1 - 5 in existing unused solids vault adjacent to Plant 2 (**Structure 160**)
    b. Pump combined sludge to new Primary Sludge Screen located in Plant 2 (**Structure 160**) using new pumping system
    c. Install new primary sludge screening system including wash water system (**Structure 164**)
    d. Install screenings collection system for Primary Sludge Screen
    e. Install piping to allow screened primary sludge to flow back, by gravity, to the existing WAS / Primary Sludge box adjacent to Plant 2

Biogas

1. Replace Waste Gas Burner (BG-1):
    a. Remove the existing waste gas burner from its current location (currently just east of **Structures 382 and 383**)
    b. Install a new waste gas burner (**Structure 470**) that has automatic ignition and a natural gas pilot system that will only be ignited when the flare is called to run and that will turn off once a biogas flame has been detected

2. Biogas Storage (BG-2), **Structure 530**:
    a. Install a new, remote, biogas storage membrane
    b. Install all required interconnecting piping, pressure regulating and safety systems

    * NOTE: A biogas storage system has not been included in the overall budget but will be included in the design and bid as an Alternate for evaluation and consideration

3. Cogeneration engine with heat recovery and gas storage (BG-3b)
    a. Install a new biogas conditioning system (**Structure 504**) in the new Biosolids Drying Building (**Structure 390**)
        i. Sediment trap
        ii. Moisture trap
        iii. Chiller and cooling heat exchanger
        iv. Gas reheating system
    b. Install biogas cleaning system and media tanks (**Structure 507**)
        i. H2S removal system and media tank
        ii. Siloxanes removal system
    c. Install new high efficiency 633kW biogas engine generator (**Structure 505**)
        i. Include jacket and exhaust heat recovery systems
    d. Install provisions for diversion of biogas not used for generation of electrical energy to the dual gas boiler system

Site and Utilities

1. Replace Facility Wide Heating System (U-1):
    a. Install a new facility boiler system (**Structure 506**) that generates hot water (assumed to be approximately 284 deg F) to provide the necessary hot water for the Biosolids Dryer
    b. The primary fuel source for the boiler system will be natural gas, however, provide ability to use treated biogas as a fuel source
    c. Install required hot water loop and appurtenances to supply the hot water to the Biosolids Dryer
    d. Install a secondary heat exchanger that ties the 284 deg F hot water loop to a secondary 200 deg F heating loop that will be used for digester heating and facility heating
    e. Install heat recovery system from the engine generator to the 200 deg F hot water loop

f. Install new heating and recirculation pumps and appurtenances to pump water from the 200 deg F hot water loop to the new Digester Building (**Structure 390**) for use in heating the Digesters
g. Install new plant hot water recirculation pumps and heat recovery pumps and other appurtenances to use the 200 deg F hot water loop to provide hot water to heat the facility
h. Install new hot water heating systems in new buildings
i. Replace existing hot water unit heaters throughout the facility
j. Upon successful commissioning of the new hot water system, decommission and remove the existing boiler system

2. Comply with NFPA 820 & 10-States Standards (U2):
    a. Ensure all new buildings and systems comply with NFPA 820 and 10-States Standards
    b. Develop an implementation plan / design for bringing the existing facility into compliance with NFPA 820 and 10-States Standards, including:
        i. Hazardous classifications
        ii. Ventilation requirements
        iii. Explosion proof systems
        iv. Separation / segregation of classified area
        v. Other elements required for NFPA 820 compliance

3. Increase water reuse (W3) System Capacity (U3), **Structure 243**:
    a. Install new W3 system in the lower level of the new Filter Building (**Structure 240**)
    b. Install suction piping to the W3 system from the downstream side of the filtered effluent
    c. Install self-cleaning in-line strainers on the pump discharge side
    d. Tie the new W3 discharge system into the existing W3 system in order to provide reuse water to existing treatment system components
    e. Install new W3 pipelines to new systems with reuse water demands, including:
        i. New Influent Screen
        ii. New GBT
        iii. New Primary Sludge Screen
        iv. All New Polymer Systems
        v. New BFP system
        vi. Pump seal water
        vii. Hose bibs rinse down areas
        viii. All other reuse water demands
    f. Install sodium hypochlorite feed system to provide disinfection to W3 system
    g. Supplement W3 system with non-potable plant water back-up system

4. New Transformers and One Electrical Service (U4):
    a. Consolidate electric services provided by Xcel Energy
    b. Replace 2,400 volt switchgear with new distribution switchgear

c. Install new ground grid
d. Replace generators located in Plant 1 (**Structure 100**) and Plant 2 (**Structure 160**); determine most practical location for generators (physically and electrically)
e. Replace 2,400 volt cabling and transformers; determine most logical approach for site distribution
f. Additional Task Identified: Replace motor control centers (MCC's) 1 through 5 including secondary conductors from site transformers and conductors from MCC to equipment
The above task is not included in scope of work and will be completed in the future via capital improvements project

g. Additional Task Identified: Replace existing emergency backup generators
The above task is not included in scope of work and will be completed in the future via capital improvements project, consistent with the implementation plan of TM7.

5. Floodplain, Site Access, and Misc.

The following tasks are not included in the Final Plan and will be omitted or completed in the future via capital improvements project

a. After review of adding a flood gate or a bermed entry, staff identified the benefits for this improvement did not justify the cost. The City currently has an approved flood action plan which includes sandbagging compromised entries and utilizing off-road vehicles to access the site during times of flooding.
b. Additional Task Identified: Administrative and Laboratory Improvements
    i. Plant 1 (**Structure 100**) office areas:
        1. Increase space for office areas in Plant 1 in the backup generator room
        2. Modernize these facilities for better workflow for plant staff
        3. Utilize space where existing backup generator is if that generator is replaced with a new unit elsewhere on site
    ii. Laboratory (**Structure 100**):
        1. Replace corroded laboratory cabinets with non-ferrous cabinetry and new countertops
        2. Add second fume hood
        3. Review overall lab layout arrangement to best suit lab needs for shelving, disposable bottles, and new vacuum system
        4. Provide new desk areas to increase space for processing paperwork and file organization

Opinion of Probable Construction Cost

As part of the Preliminary Design Phase, a detailed opinion of probable construction cost was developed. The opinion of probable construction cost was divided into two portions 1) liquid train, and 2) solid train for the two main processes in the facility; Appendix 9C and 9D provide a summary by structure and division as well as the individual breakdowns for detailed cost information. This newly developed opinion of probable construction cost has further refinement and carries a lower overall

contingency than the costs that were previously developed. This is due to a better understanding of the construction elements (individual equipment components) and a more detailed assessment that includes considerations for constructability and future expansion.

The estimated overall cost of the project, including engineering, engineering services during construction, and permitting, is approximately $62.0 million. The value engineering items already considered and discussed above for deferred implementation are presented in Table 2. This cost includes several additional elements added to the project as was determined during the Preliminary Design Phase as well as a reduction in cost for some elements identified in previous technical memorandums that were deemed as not being required.

Table 2 – WWTF Final Plan for Facility Improvements

Description	Cost Million $	Include in Project	Cost Million $	Comment
Preliminary Engineering	$ 0.4	X	$ 0.4	***Currrently Under Contract***
Final Engineering	$ 2.2	X	$ 2.2	Proposal in Review
CRS Fee	$ 3.0	X	$ 3.0	Anticipted Cost
Preliminary Design Final Cost Opinion	$ 64.2	X	$ 64.2	Total Construction Cost from Preliminary Design Phase without Value Engineering
TOTAL PROJECT COST SUBTOTAL			**$ 69.8**	**Total Project Cost from Preliminary Design Phase without Value Engineering**
Value Engineering Items				
Dryer 70% Drying to 100% Drying	$ 3.1	X	included	Consider modular design
Cogeneration Engine and Gas Treatment	$ 1.9	X	included	Include in Project
Odor Control Equipment	$ 0.7	X	included	Continue with Design, Bid as Alternate
Eliminate Medium Voltage	$ 2.0	-	$ (2.0)	City is acceptable with Medium Voltage vs. 480V
Blower Replacement	$ 1.3	X	included	Consider including 2 or 3 blowers instead of 5 (cost modified for 3 blowers)
Generator Replacement	$ 1.3	-	$ (1.3)	Remove from Project, to be completed via CIP
Odor Control Building Footprint	$ 0.5	X	included	Include in Project
Biogas Storage	$ 1.2	-	$ (1.2)	Continue with Design, Bid as Alternate
HSW Load-Out and Storage System	$ 1.0	X	included	Include in Project
Second HSW Storage Tank	$ 0.1	-	$ (0.1)	Continue with Design, Bid second tank as Alternate
Redundant BFP (relocation of existing unit)	$ 0.5	-	$ (0.5)	Remove from Project
Change ML Recirc Piping from CLDI to 304 SST	$ 0.4	-	$ (0.4)	Proceed with pipe material change
Redundant Filter Prep. Chambers	$ 0.4	-	$ (0.4)	Remove redundant Filter Prep Chamber from Project
Additional Anaerobic & Anoxic Zone	$ 0.4	-	$ (0.4)	Remove additional zones from Project (Is there a cost savings by having the extra chambers)
Second Raw Influent Fine Screen	$ 0.3	X	included	Include in Project
W3 Water Expansion	$ 0.3	X	included	Include in Project
Administration / Lab Area Improvements	$ 0.3	-	$ (0.3)	Remove from Project, to be completed via CIP
Clarifier Launder Covers	$ 0.3	X	included	Include in Project
Paint Aeration Basins	$ 0.2	-	$ (0.2)	Continue with Design, Bid as Alternate
Clarifier RAS Pipe Segregation	$ 0.2	X	included	Include in Project as this is related to site safety
Use existing Ferric Tank for Filter Chemical Feed	$ 0.2	-	$ (0.2)	Modify design as City prefers a single location for ferric unloading and pumping
Boiler Redundancy	$ 0.2	-	$ (0.2)	Remove redundant boiler from Project but leave building footprint available
Change Air FCV from IRIS valves to Electric BFV	$ 0.2	-	$ (0.2)	Proceed with changing control valves to Butterfly Valves
Power Factor Correction	$ 0.2	X	included	Include in Project, determine the penalty for unbalanced power
Primary Clarifier 1, 2, & 3 Scum	$ 0.1	-	$ (0.1)	Remove from Project, to be completed via CIP (consider installing yard piping in project)
Replace Existing GBT Solids End	$ 0.1	-	$ (0.1)	Remove from Project, to be completed via CIP
Partial Aeration Pipe Replacement	$ 0.1	-	$ (0.1)	Include in Project
Eliminate Installed Redundant ML Recirc Pump/Piping	$ 0.1	-	$ (0.1)	Continue with Design - Redundant pumps to be bid as Alternate
VALUE ENGINEERING SUBTOTAL			**$ (7.8)**	**Project Cost Reduction from Preliminary Design Phave from Value Engineering**
TOTAL ANTICIPATED PROJECT COST			**$ 62.0**	**Total Project Cost with Removed Scope Items and Value Engineering**

Rate Impacts

After completion of the draft plan, the City hired a rate consultant. For the previously identified (TM7) project, estimated at $55.5 million, the rate study consultant identified a projected increase in the typical residential quarterly user bill of $11.85, from $33.90 to $45.75.

Given the identified larger cost to the project, the rates will need to be re-determined prior to adoption; however, a proportional increase results in a quarterly charge of $51.11; which is consistent with the rate estimate developed in TM7 of $17.24/month.

Schedule

The near-term implementation schedule is provided in Figure 2. The discharge permit has not changed, requiring initiation of construction in 2022, with ultimate compliance by January 1, 2025. The staff indicated preference to have a minimum of one year prior to this compliance deadline to run the new system allowing the operators to become familiar with the new technology. More recent operational struggles with the biosolids land application program have increased the importance of installing these improvements in an expedited manner.

Additionally, during this detailed design phase, it is recommended to conduct demonstration scale validation tests for the main treatment changes (phosphorus and biosolids) confirm performance, sizing, and operating costs prior to entering detailed design.

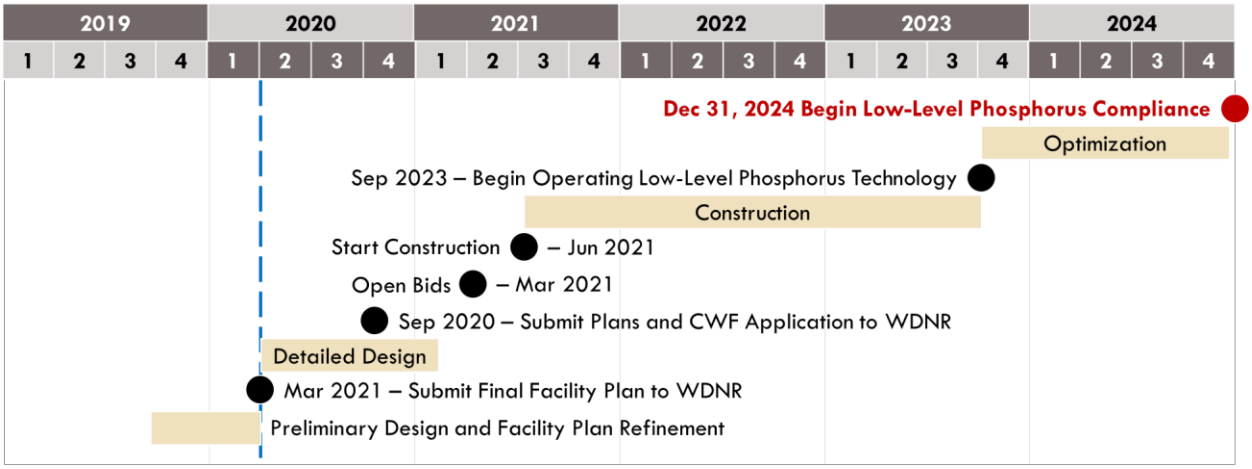


Figure 1 – Implementation Schedule

PROCESS DESIGN BASIS														
Owner:	City of La Crosse													
Project:	Wastewater Treament Facility Improvements Project													
	La Crosse, WI													
Donohue Project No.:	13655													
Revision Date:	01/29/20													
		Existing Conditions - Base Service Area						**Design Conditions (2040) - Base Service Area**						
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	
Key Parameter Results Summary														
Process Selections														
Bio-P? (0=No/1=Yes)	0 or 1	1												
Chemical Requirements														
Secondary Effluent Alkalinity	mg/L	300	365	308	291	321		308	370	304	299	343		
Ferric Chloride Solution to Primary Influent	GPD	0	0	0	0	0		0	0	0	0	0		
Ferric Chloride Solution to Aeration Effluent	GPD	0	0	0	0	0		0	0	0	0	0		
Ferric Chloride Solution to Tertiary Treatment	GPD	185	144	229	242	326		238	185	288	323	521		
Ferric Chloride Solution to DSD Filtrate	GPD	306	134	382	471	519		381	167	452	543	603		
Polymer for WAS Thickening (7 Day/Week Basis)	LB/D	55.8	21.7	70.6	99.7	99.7		67.9	26.2	88.5	125.4	125.4		
Polymer for DSD Thickening (7 Day/Week Basis)	LB/D	28.1	13.7	42.8	48.6	48.6		34.5	16.9	51.1	60.6	60.6		
Polymer for DSD Dewatering (7 Day/Week Basis)	LB/D	120.2	58.7	183.3	208.0	208.0		147.6	72.2	218.6	259.2	259.2		
Activated Sludge Process Aeration Requirements														
Summer Air - No Selector Denitrification Credit	scfm	8,076	2,942	9,591	11,792	19,436		9,508	3,551	12,335	15,009	27,294		
Winter Air - No Selector Denitrification Credit	scfm	7,887	2,873	9,368	11,517	19,445		9,508	3,468	12,048	14,660	27,306		
Minimum Air Requirement-Mixing	scfm	2,240	2,240	2,240	2,240	2,240		2,240	2,240	2,240	2,240	2,240		
General Secondary Treatment Inputs/Key Information														
Wastewater Temperature	deg C	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0		
Min Theor Aerobic SRT for Nitrification (from *Row 205*)	day	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	NA		
Target Aerobic SRT (from *Row 337)*	day	9.0	9.0	9.0	9.0	9.0		9.0	9.0	9.0	9.0	9.0		
Nitrification Safety Factor	---	1.81	1.80	1.79	1.72	1.72		1.76	1.80	1.79	1.54	1.54		
Desired Max Secondary Clarifier SLR	LB/D/SF	25.0	25.0	25.0	30.0	35.0		25.0	25.0	25.0	30.0	35.0		
Desired Min Residual Alkalinity @ Sec Eff	mg CaCO3/L	100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0		
Target Bulk Selector F:M Ratio @ Loading Condition	1/day	1.0	NA	1.2	1.4	NA		1.0	NA	1.2	1.4	NA		
Special Sampling Influent Characterization														
Influent Alkalinity as CaCO3	mg/L	425	425	425	425	425		425	425	425	425	425		
VSS as % of TSS	%	87.7%	87.7%	87.7%	87.7%	87.7%		87.7%	87.7%	87.7%	87.7%	87.7%		
TKN:BOD5 Ratio		0.112	0.112	0.112	0.112	0.112		0.112	0.112	0.112	0.112	0.112		
NH3-N:BOD5 Ratio		0.0621	0.0621	0.0621	0.0621	0.0621		0.0621	0.0621	0.0621	0.0621	0.0621		
Sol O-P:TP Ratio		0.5220	0.5220	0.5220	0.5220	0.5220		0.5220	0.5220	0.5220	0.5220	0.5220		

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Influent Parameters													
Flow	MGD	10.1	7.8	12.5	13.2	17.9	32.3	13.0	10.0	15.8	17.7	28.8	42.500
BOD5 Load	LB/D	26,000	9,300	30,800	35,200	64,300		31,300	11,196	39,700	45,000	91,000	
TSS Load	LB/D	29,400	16,100	49,800	60,900	77,000		36,600	20,043	56,700	70,000	126,000	
VSS Load	LB/D	25,784	14,120	43,675	53,409	67,529		32,098	17,578	49,726	61,390	110,502	
TKN Load	LB/D	2,912	1,042	3,450	3,942	7,202		3,506	1,254	4,446	5,040	10,192	
NH3-N Load	LB/D	1,615	578	1,913	2,186	3,993		1,944	695	2,465	2,795	5,651	
TP Load	LB/D	549	286	687	793	1,540		700	365	800	950	1,900	
Soluble O-P Load	LB/D	287	149	359	414	804		365	190	418	496	992	
Alkalinity Load as CaCO3	LB/D	35,799	27,647	44,306	46,787	63,447		46,043	35,558	56,003	62,738	102,082	
BOD5 Concentration	mg/L	309	143	295	320	431		289	134	301	305	379	
TSS Concentration	mg/L	349	247	478	553	516		338	240	430	474	525	
VSS Concentration	mg/L	306	217	419	485	452		296	210	377	416	460	
TKN Concentration	mg/L	34.6	16.0	33.1	35.8	48.2		32.4	15.0	33.7	34.1	42.4	
NH3-N Concentration	mg/L	19.2	8.9	18.3	19.9	26.7		17.9	8.3	18.7	18.9	23.5	
TP Concentration	mg/L	6.5	4.4	6.6	7.2	10.3		6.5	4.4	6.1	6.4	7.9	
Soluble O-P Concentration	mg/L	3.4	2.3	3.4	3.8	5.4		3.4	2.3	3.2	3.4	4.1	
Alkalinity Concentration as CaCO3	mg/L	425	425	425	425	425		425	425	425	425	425	
Combined WAS/DSD Sludge Thickening/Dewatering Sidestream Loadings													
Side Stream Flow	GPD	276,327	249,246	326,661	344,731	344,731		323,053	282,809	348,235	379,363	379,363	
Side Stream BOD	LB/D	205	105	310	343	343		252	128	363	412	412	
Side Stream TSS Solids	LB/D	2,491	1,102	3,326	4,117	3,380		2,942	1,302	3,844	4,791	9,978	
Side Stream VSS Solids	LB/D	959	416	1,333	1,566	993		1,176	509	1,651	2,028	5,347	
Side Stream TKN	LB/D	968	346	1,154	1,273	1,393		1,171	417	1,451	1,555	1,763	
Side Stream NH3-N	LB/D	879	314	1,048	1,146	1,261		1,063	379	1,313	1,382	1,581	
Side Stream TP	LB/D	237	106	295	363	396		295	133	350	423	464	
Side Stream Soluble O-P	LB/D	23	14	33	36	36		29	18	39	44	44	
Sidestream Alkalinity Load as CaCO3	LB/D	407	613	725	539	367		460	690	734	608	394	
Sidestream Flow Expressed as % of Influent Flow	%	3%	3%	3%	3%	2%		2%	3%	2%	2%	1%	
Primary Influent													
Primary Influent Flow	MGD	10.376	8.049	12.827	13.545	18.245	32.300	13.313	10.315	16.148	18.079	29.179	42.500
BOD5 Load	LB/D	26,205	9,405	31,110	35,543	64,643		31,552	11,324	40,063	45,412	91,412	
TSS Load	LB/D	31,891	17,202	53,126	65,017	80,380		39,542	21,345	60,544	74,791	135,978	
VSS Load	LB/D	26,743	14,536	45,008	54,976	68,522		33,274	18,087	51,377	63,418	115,849	
TKN Load	LB/D	3,880	1,388	4,604	5,216	8,595		4,676	1,671	5,898	6,595	11,955	
NH3-N Load	LB/D	2,493	892	2,961	3,332	5,254		3,006	1,074	3,778	4,177	7,232	
TP Load	LB/D	786	392	982	1,156	1,936		995	497	1,150	1,373	2,364	
Soluble O-P Load	LB/D	310	163	392	450	840		394	208	457	540	1,036	
Organic Particulate P Load (from Plant Influent Only)	LB/D	262	137	328	379	736		335	174	382	454	908	
Alkalinity Load as CaCO3	LB/D	36,206	28,260	45,031	47,327	63,814		46,504	36,248	56,737	63,345	102,476	
BOD5 Concentration	mg/L	303	140	291	315	425		284	132	297	301	376	
TSS Concentration	mg/L	369	256	497	576	528		356	248	450	496	559	
VSS Concentration	mg/L	309	217	421	487	450		300	210	381	421	476	
TKN Concentration	mg/L	44.8	20.7	43.0	46.2	56.5		42.1	19.4	43.8	43.7	49.1	
NH3-N Concentration	mg/L	28.8	13.3	27.7	29.5	34.5		27.1	12.5	28.1	27.7	29.7	
TP Concentration	mg/L	9.1	5.8	9.2	10.2	12.7		9.0	5.8	8.5	9.1	9.7	
Soluble O-P Concentration	mg/L	3.6	2.4	3.7	4.0	5.5		3.6	2.4	3.4	3.6	4.3	
Particulate P (PP) Load	mg/L	3.0	2.0	3.1	3.4	4.8		3.0	2.0	2.8	3.0	3.7	
Alkalinity Concentration as CaCO3	mg/L	418	421	421	419	419		419	421	421	420	421	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Ferric Chloride Addition to Primary Clarifier Influent													
Target Soluble O-P Percent Conversion	%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%	
Soluble O-P Converted to Chemical PP - Loading	LB/D	0	0	0	0	0		0	0	0	0	0	
Soluble O-P Converted to Chemical PP - Concentration	mg/L	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
P Atomic Weight	mg/mmole	30.97	30.97	30.97	30.97	30.97		30.97	30.97	30.97	30.97	30.97	
Fe Atomic Weight	mg/mmole	55.85	55.85	55.85	55.85	55.85		55.85	55.85	55.85	55.85	55.85	
Soluble O-P Converted	mmole/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
Fe to P Molar Ratio		1.6	1.6	1.6	1.6	1.6		1.6	1.6	1.6	1.6	1.6	
Fe Addition Required	mmole/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
Fe Dosage Required	mg Fe/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
FePO4 Produced	mmole/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
Fe(OH)3 Produced	mmole/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
FePO4 Molecular Weight	mg/mmole	150.82	150.82	150.82	150.82	150.82		150.82	150.82	150.82	150.82	150.82	
FeOH3 Molecular Weight	mg/mmole	106.87	106.87	106.87	106.87	106.87		106.87	106.87	106.87	106.87	106.87	
FePO4 Produced	mg/L	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Fe(OH)3 Produced	mg/L	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
FePO4 + FeOH3 Concentration	mg/l	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Increase for other Fe(OH)3 cation/anion complexes	%	10%	10%	10%	10%	10%		10%	10%	10%	10%	10%	
Chemical solids produced (FSS)	mg/l	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Chemical solids produced (FSS)	LB/D	0	0	0	0	0		0	0	0	0	0	
% Ferric Chloride in Ferric Chloride Solution	%	33%	33%	33%	33%	33%		33%	33%	33%	33%	33%	
Specific Gravity of Ferric Chloride Solution		1.40	1.40	1.40	1.40	1.40		1.40	1.40	1.40	1.40	1.40	
Fe Added	LB/D	0	0	0	0	0		0	0	0	0	0	
FeCl3 Added	LB/D	0	0	0	0	0		0	0	0	0	0	
Ferric Chloride Solution Required	LB/D	0	0	0	0	0		0	0	0	0	0	
Ferric Chloride Solution Required	GPD	0	0	0	0	0		0	0	0	0	0	
Alkalinity as CaCO3 Consumed by Ferric	mg/mg Fe	-2.68	-2.68	-2.68	-2.68	-2.68		-2.68	-2.68	-2.68	-2.68	-2.68	
Alkalinity Addition/Loss by Chemical Addition	LB/D	0	0	0	0	0		0	0	0	0	0	
Primary Influent Parameters - After Chemical P Removal													
Primary Influent Flow	MGD	10.376	8.049	12.827	13.545	18.245	32.300	13.313	10.315	16.148	18.079	29.179	42.500
BOD5 Load	LB/D	26,205	9,405	31,110	35,543	64,643		31,552	11,324	40,063	45,412	91,412	
TSS Load	LB/D	31,891	17,202	53,126	65,017	80,380		39,542	21,345	60,544	74,791	135,978	
VSS Load	LB/D	26,743	14,536	45,008	54,976	68,522		33,274	18,087	51,377	63,418	115,849	
TKN Load	LB/D	3,880	1,388	4,604	5,216	8,595		4,676	1,671	5,898	6,595	11,955	
NH3-N Load	LB/D	2,493	892	2,961	3,332	5,254		3,006	1,074	3,778	4,177	7,232	
TP Load	LB/D	786	392	982	1,156	1,936		995	497	1,150	1,373	2,364	
Soluble O-P Load	LB/D	310	163	392	450	840		394	208	457	540	1,036	
Organic Particulate P Load	LB/D	262	137	328	379	736		335	174	382	454	908	
Alkalinity Load as CaCO3	LB/D	36,206	28,260	45,031	47,327	63,814		46,504	36,248	56,737	63,345	102,476	
Primary Clarifier Loadings & Removal Efficencies													
Number Circular Primary Clarifiers in Service (1-3)		2	2	2	2	2	2	3	3	3	3	3	3
Number Rectangular Primary Clarifiers in Service (1-2)		0	0	0	0	0	0	0	0	0	0	0	0
PC Surface Area in Service	sf	12,723	12,723	12,723	12,723	12,723	12,723	19,085	19,085	19,085	19,085	19,085	19,085
PC Surface Overflow Rate	gpd/sf	804	624	995	1,049	1,418	2,539	690	534	837	937	1,518	2,227
BOD5 Removal	%	30.0	30.0	30.0	24.0	18.0		30.0	30.0	30.0	24.0	18.0	
TSS Removal	%	75.0	75.0	75.0	60.0	45.0		75.0	75.0	75.0	60.0	45.0	
Particulate TKN Removal	%	75.0	75.0	75.0	60.0	45.0		75.0	75.0	75.0	60.0	45.0	
Particulate TP Removal	%	75.0	75.0	75.0	60.0	45.0		75.0	75.0	75.0	60.0	45.0	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Primary Effluent Parameters													
Primary Effluent Flow	MGD	10.232	7.934	12.654	13.343	18.043	32.300	13.169	10.199	15.975	17.878	28.978	42.500
BOD5 Load	LB/D	18,344	6,583	21,777	27,013	53,007		22,086	7,927	28,044	34,513	74,957	
TSS Load	LB/D	7,973	4,300	13,282	26,007	44,209		9,885	5,336	15,136	29,916	74,788	
VSS Load	LB/D	6,686	3,634	11,252	21,990	37,687		8,318	4,522	12,844	25,367	63,717	
TKN Load	LB/D	2,805	1,003	3,332	4,036	7,034		3,391	1,211	4,268	5,097	9,780	
NH3-N Load	LB/D	2,459	879	2,921	3,282	5,196		2,974	1,062	3,738	4,130	7,182	
TP Load	LB/D	425	218	534	726	1,433		540	278	625	867	1,759	
Soluble O-P Load	LB/D	306	161	387	443	830		390	206	452	534	1,028	
Organic PP Load	LB/D	66	34	82	152	405		84	44	96	182	500	
Alkalinity Load as CaCO3	LB/D	35,704	27,856	44,424	46,622	63,109		46,001	35,843	56,130	62,639	101,768	
BOD5 Concentration	mg/L	215	99	206	243	352		201	93	210	231	310	
TSS Concentration	mg/L	93	65	126	234	294		90	63	114	201	309	
VSS Concentration	mg/L	78	55	107	198	250		76	53	96	170	264	
TKN Concentration	mg/L	33	15	32	36	47		31	14	32	34	40	
NH3-N Concentration	mg/L	29	13	28	29	35		27	12	28	28	30	
TP Concentration	mg/L	5.0	3.3	5.1	6.5	9.5		4.9	3.3	4.7	5.8	7.3	
Soluble O-P Concentration	mg/L	3.6	2.4	3.7	4.0	5.5		3.6	2.4	3.4	3.6	4.3	
Organic PP Load	mg/L	0.8	0.5	0.8	1.4	2.7		0.8	0.5	0.7	1.2	2.1	
Alkalinity Concentration as CaCO3	mg/L	418	421	421	419	419		419	421	421	420	421	
Primary Sludge													
PSD Flow	GPM	**100**	**80**	**120**	**140**	140		**100**	**80**	**120**	**140**	140	
PSD Flow	GPD	144,000	115,200	172,800	201,600	201,600		144,000	115,200	172,800	201,600	201,600	
PSD Concentratoin	%	1.99	1.34	2.76	2.32	2.15		2.47	1.67	3.15	2.67	3.64	
BOD5 Load	LB/D	7,862	2,821	9,333	8,530	11,636		9,466	3,397	12,019	10,899	16,454	
TSS Load	LB/D	23,918	12,901	39,845	39,010	36,171		29,656	16,009	45,408	44,875	61,190	
VSS Load	LB/D	20,057	10,902	33,756	32,985	30,835		24,955	13,565	38,532	38,051	52,132	
FSS Load	LB/D	3,861	2,000	6,089	6,025	5,336		4,701	2,444	6,875	6,824	9,058	
TKN Load	LB/D	1,075	385	1,272	1,180	1,561		1,285	460	1,630	1,497	2,175	
NH3-N Load	LB/D	35	13	40	50	58		33	12	40	47	50	
TP Load	LB/D	362	174	448	430	502		455	219	525	506	605	
Soluble O-P Load	LB/D	4.3	2.3	5.3	6.7	9.3		4.3	2.3	4.9	6.0	7.2	
Organic PP Load	LB/D	197	103	246	227	331		251	131	287	272	409	
Alkalinity Load as CaCO3	LB/D	502	404	607	704	705		503	405	607	706	708	
Gravity Thickener Overflow Sidestream into Primary Effluent													
Side Stream Flow	GPD	99,678	91,293	98,965	129,312	134,573		89,045	85,535	88,657	118,445	88,211	
Side Stream BOD	LB/D	357	152	341	524	791		299	133	311	457	456	
Side Stream TSS Solids	LB/D	3,588	1,935	5,977	5,852	5,426		4,448	2,401	6,811	6,731	9,179	
Side Stream VSS Solids	LB/D	3,009	1,635	5,063	4,948	4,625		3,743	2,035	5,780	5,708	7,820	
Side Stream TKN	LB/D	180	66	208	201	264		208	76	259	245	341	
Side Stream NH3-N	LB/D	24	10	23	32	39		20	9	21	27	22	
Side Stream TP	LB/D	57	28	69	68	80		70	34	81	79	93	
Side Stream Soluble O-P	LB/D	3	2	3	4	6		3	2	3	4	3	
Sidestream Alkalinity Load as CaCO3	LB/D	348	321	347	452	471		311	301	311	415	310	
Sidestream Flow Expressed as % of Influent Flow	%	1.0%	1.2%	0.8%	1.0%	0.7%		0.7%	0.8%	0.6%	0.7%	0.3%	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Aeration Basin Influent													
Total Aeration Influent Flow	MGD	10.332	8.025	12.753	13.472	18.178		13.258	10.285	16.064	17.996	29.066	
RAS Flow	MGD	8.27	6.42	10.09	10.09	10.09		10.09	8.23	10.09	10.09	10.09	
Mixed Liquor Flow to Selector/Aeration Basin Influent	MGD	18.60	14.45	22.84	23.56	28.26		23.34	18.51	26.15	28.08	39.15	
BOD5 Load	LB/D	18,344	6,583	21,777	27,013	53,007		22,086	7,927	28,044	34,513	74,957	
TSS Load	LB/D	7,973	4,300	13,282	26,007	44,209		9,885	5,336	15,136	29,916	74,788	
VSS Load	LB/D	6,686	3,634	11,252	21,990	37,687		8,318	4,522	12,844	25,367	63,717	
FSS Load	LB/D	1,287	667	2,030	4,016	6,522		1,567	815	2,292	4,549	11,071	
TKN Load	LB/D	2,805	1,003	3,332	4,036	7,034		3,391	1,211	4,268	5,097	9,780	
NH3-N Load	LB/D	2,459	879	2,921	3,282	5,196		2,974	1,062	3,738	4,130	7,182	
TP Load	LB/D	425	218	534	726	1,433		540	278	625	867	1,759	
Soluble O-P Load	LB/D	306	161	387	443	830		390	206	452	534	1,028	
Organic P Load	LB/D	66	34	82	152	405		84	44	96	182	500	
Alkalinity Load as CaCO3	LB/D	35,704	27,856	44,424	46,622	63,109		46,001	35,843	56,130	62,639	101,768	
3-Pass Aeration Basin Bioreactor Trains													
Number of Parallel Trains	2												
Number of Bioreactors (Aeration Basins) per Train	3												
Bioreactor Tank Unit Length (ft)	200												
Bioreactor Tank Unit Width (ft)	35												
Bioreactor Tank Unit Sidewater Depth (ft)	16												
Total Bioreactor Volume per Train (MG)	2.51												
Number of Parallel Bioreactor Trains in Service	(1 or 2)	**2**	2	2	2	2		**2**	2	2	2	2	
Number of Bioreactor Tanks as Selectors per Train	(0.5,1,1.5)	**1.0**	1.0	1.0	1.0	1.0		**1.0**	1.0	1.0	1.0	1.0	
Anaerobic/Anoxic Selector Volume In Service	MG	1.68	1.68	1.68	1.68	1.68		1.68	1.68	1.68	1.68	1.68	
Aerobic Bioreactor Volume in Service	MG	3.35	3.35	3.35	3.35	3.35		3.35	3.35	3.35	3.35	3.35	
Selector Loading Calculations													
Target Bulk Selector F:M at Loading Condition	***1/day***	***1.00***	***NA***	***1.20***	***1.40***	***NA***		***1.00***	***NA***	***1.20***	***1.40***	***NA***	
Selector Physical Features													
Number of Selector Compartments per Train		**4**	4	4	4	4		4	4	4	4	4	
Individual Selector Compartment Length	ft	50.0	50.0	50.0	50.0	50.0		50.0	50.0	50.0	50.0	50.0	
Individual Selector Compartment Volume	MG	0.209	0.209	0.209	0.209	0.209		0.209	0.209	0.209	0.209	0.209	
ML Recycle Flow as % Ave Day Design Flow	**100%**												
Selector ML Recycle Flow per Train	MGD	5.17	4.01	6.38	6.63	6.63		**6.63**	5.14	6.63	6.63	6.63	
ML Recycle Flow as % of Forward Flow	%	100%	100%	100%	98%	73%		100%	100%	83%	74%	46%	
Selector Organic Loadings													
Approximate Selector MLSS Concentration	mg/L	3,200	1,200	3,900	5,000	*5,000*		3,300	1,300	4,200	5,000	*5,000*	
PE BOD5 Load to First Pass Selector Zones	LB/D	18,344	6,583	21,777	27,013	*53,007*		22,086	7,927	28,044	34,513	*74,957*	
Bulk Selector (all Zones) F:M Ratio at Loading Condition	1/day	0.41	0.39	0.40	0.39	*NA*		0.48	0.44	0.48	0.49	*NA*	
Selector F:M Ratio in First Three (of Four) Selector Zones	1/day	0.55	0.52	0.53	0.52	*NA*		0.64	0.58	0.64	0.66	*NA*	
Selector F:M Ratio in First Two (of Four) Selector Zones	1/day	0.82	0.79	0.80	0.77	*NA*		0.96	0.87	0.96	0.99	*NA*	
Selector F:M Ratio in First (of Four) Selector Zone	1/day	1.64	1.57	1.60	1.55	*NA*		1.92	1.75	1.91	1.98	*NA*	
Selector Hydraulic Loadings													
Bulk Selector HRT (Forward Flow Basis)	hr	3.89	5.01	3.15	2.98			3.03	3.91	2.50	2.23		
Bulk SelectorTrue HRT (PE Q + RAS Q Basis)	hr	2.16	2.78	1.76	1.71			1.72	2.17	1.54	1.43		

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Selector Denitrification/Alkalinity/Oxygen Equivalent													
RAS Nitrate (lb NO3-N/day)	LB N/DAY	766	265	901	1,030	858		897	319	1,006	1,062	762	
Percent Denitrification in Selector	%	**90%**	90%	90%	90%	90%		90%	90%	90%	90%	90%	
RAS Nitrate Nitrogen Denitrified in Selector	LB N/DAY	689	238	811	927	773		807	287	905	956	685	
Unit Alkalinity From Denite (LB CaCO3/LB NO3-N)	LB/DAY	**3.56**	3.56	3.56	3.56	3.56		3.56	3.56	3.56	3.56	3.56	
Selector Alkalinity Production (as LB CaCO3/DAY)	LB/DAY	2,454	849	2,888	3,300	2,750		2,874	1,023	3,223	3,402	2,440	
Unit Oxygen Equivalent of Nitrate Dentrified	LB O2/LB N	**2.86**	2.86	2.86	2.86	2.86		2.86	2.86	2.86	2.86	2.86	
Oxygen Equivalent Supplied in Selector	LB O2/DAY	1,972	682	2,320	2,651	2,210		2,309	822	2,589	2,733	1,961	
Bioreactor Process Loadings													
Number of Bioreactor Trains in Service	#	2	2	2	2	2		2	2	2	2	2	
Aerobic Bioreactor Tanks per Train	#	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Length per Single Tank/Pass	ft	200	200	200	200	200		200	200	200	200	200	
Tank/Pass Width	ft	35	35	35	35	35		35	35	35	35	35	
Tank Side Water Depth	ft	16	16	16	16	16		16	16	16	16	16	
Aerobic Bioreactor Volume in Service	MG	3.35	3.35	3.35	3.35	3.35		3.35	3.35	3.35	3.35	3.35	
Aerobic Bioreactor Volume in Service	cf	448,000	448,000	448,000	448,000	448,000		448,000	448,000	448,000	448,000	448,000	
Aerated Bioreactor F:M Ratio	1/day	0.21	0.20	0.20	0.19	0.38		0.24	0.22	0.24	0.25	0.54	
Total Bioreactor F:M Ratio	1/day	0.14	0.13	0.13	0.13	0.25		0.16	0.15	0.16	0.16	0.36	
Aerated Bioreactor Volumetric Organic Loading	lb BOD/d/kcf	40.9	14.7	48.6	60.3	118.3		49.3	17.7	62.6	77.0	167.3	
Total Bioreactor Volumetric Organic Loading	lb BOD/d/kcf	27.3	9.8	32.4	40.2	78.9		32.9	11.8	41.7	51.4	111.5	
Activated Sludge Kinetic Parameters													
Design Wastewater Temperature (T)	deg C	10.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	
Target Effluent Ammonia	mg/L	**0.5**	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	
Max Nitrifier Specific Growth Rate at 15 deg C	#VSS/#VSS/d	**0.47**	0.47	0.47	0.47	0.47		0.47	0.47	0.47	0.47	0.47	
Max Nitrifier Specific Growth Rate at Design T	# VSS/#VSS/d	0.29	0.29	0.29	0.29	0.29		0.29	0.29	0.29	0.29	0.29	
Half Saturation Coefficient at Design T	mg/L	0.22	0.22	0.22	0.22	0.22		0.22	0.22	0.22	0.22	0.22	
Nitrifier Specific Growth Rate at Design T	#VSS/#VSS/d	0.20	0.20	0.20	0.20	0.20		0.20	0.20	0.20	0.20	0.20	
Minimum Aerobic SRT Required for Nitrification	d	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Nitrifier Yield Coefficient	#VSS/#NH3-N	**0.15**	0.15	0.15	0.15	0.15		0.15	0.15	0.15	0.15	0.15	
Biological Solids Yield Coefficient	#VSS/#BOD	**0.6**	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6	
Decay Coefficient at 20 deg C	#VSS/d	**0.04**	0.04	0.04	0.04	0.04		0.04	0.04	0.04	0.04	0.04	
Decay Coefficient at Design T	#VSS/d	0.03	0.03	0.03	0.03	0.03		0.03	0.03	0.03	0.03	0.03	
Percentage of VSS Non-Biodegradable	%	**10%**	10%	10%	10%	10%		10%	10%	10%	10%	10%	
VSS Content of New Cells	%	**90%**	90%	90%	90%	90%		90%	90%	90%	90%	90%	
Activated Sludge Biomass Production													
New Heterotrophic Biological Solids Produced	Lbs VSS/d	8,034	2,889	9,571	11,990	11,990		9,748	3,476	12,318	15,751	15,751	
New Heterotrophic Total Solids Produced	Lbs TSS/d	8,927	3,210	10,635	13,322	13,322		10,831	3,862	13,687	17,501	17,501	
New Nitrifier Biological Solids Produced	Lbs VSS/d	259	89	306	361	361		311	108	391	443	443	
New Nitrifier Total Solids Produced	Lbs TSS/d	287	99	340	401	401		346	120	435	493	493	
Non-Biodegradable VSS in PE	Lbs VSS/d	669	363	1,125	2,199	2,199		832	452	1,284	2,537	2,537	
Primary Effluent FSS	Lbs FSS/d	1,287	667	2,030	4,016	4,016		1,567	815	2,292	4,549	4,549	
Chemical Solids - Ferric Addition to Aeration Effluent	Lbs FSS/d	0	0	0	0	0		0	0	0	0	0	
Total VSS Produced	Lbs VSS/d	8,961	3,342	11,003	14,549	14,549		10,891	4,036	13,994	18,731	18,731	
Total TSS Produced	Lbs TSS/d	11,170	4,339	14,130	19,938	19,938		13,576	5,249	17,698	25,080	25,080	
Nitrogen Series Calculations													
Primary Effluent TKN to Aeration Basins	LB/D	2,805	1,003	3,332	4,036	4,036		3,391	1,211	4,268	5,097	5,097	
TKN in Non-Biodegradable VSS in PE	LB/D	35	12	41	75	75		42	15	53	97	97	
TKN in New VSS	LB/D	1,004	361	1,196	1,499	1,499		1,218	435	1,540	1,969	1,969	
TKN in TSS Produced	LB/D	1,039	373	1,237	1,574	1,574		1,260	449	1,593	2,066	2,066	
Organic N Content of TSS Produced	%	9.3%	8.6%	8.8%	7.9%	7.9%		9.3%	8.6%	9.0%	8.2%	8.2%	
Organic N in Effluent	LB/D	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	
NH3-N in Effluent	LB/D	43.1	33.5	53.2	56.2	56.2		55.3	42.9	67.0	75.0	75.0	
TKN Nitrified	LB/D	1,723	596	2,041	2,405	2,405		2,076	719	2,608	2,957	2,957	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Phosphorus Series Calculations													
Primary Effluent TP	LB/D	425	218	534	726	1,433		540	278	625	867	1,759	
Primary Effluent BOD Load	LB/D	18,344	6,583	21,777	27,013	53,007		22,086	7,927	28,044	34,513	74,957	
Primary Effluent Organic + Soluble P (Bioavailable)	LB/D	371	195	469	595	1,235		474	249	548	715	1,528	
BOD to Bioavailable P Ratio		49.4	33.7	46.5	45.4	42.9		46.6	31.8	51.2	48.3	49.1	
Primary Effluent Particulate P - Organic	LB/D	65.6	34.2	82.1	151.6	404.9		83.7	43.6	95.6	181.6	499.5	
Primary Effluent Particulate P - Chemical	LB/D	53.5	23.1	65.4	130.9	197.9		66.5	28.7	77.7	151.7	231.0	
Primary Effluent Soluble P	LB/D	305.6	161.1	386.5	443.1	830.4		390.2	205.7	452.0	533.6	1028.4	
Phosphorus Used in New Cell Production	LB/D	179.2	66.8	220.1	291.0	291.0		217.8	80.7	279.9	374.6	374.6	
Soluble P Residual With Bio-P	mg/L	**0.2**	0.2	0.2	0.2	0.2		**0.2**	0.2	0.2	0.2	0.2	
Soluble P Residual With Bio-P	LB/D	17.2	13.4	21.3	22.5	30.3		22.1	17.2	26.8	30.0	48.5	
Excess Phosphorus Taken Up Via Bio-P	LB/D	174.8	115.0	227.3	281.2	914.0		233.9	151.4	241.0	310.6	1104.8	
PO4 Weight of Excess Phosphorus	LB/D	536.0	352.7	697.0	862.3	2802.7		717.3	464.2	738.9	952.4	3387.7	
Total Organic P Content of ML Solids	%	3.2%	4.2%	3.2%	2.9%	6.0%		3.3%	4.4%	2.9%	2.7%	5.9%	
Soluble P In Mixed Liquor Before Chemical Precip	LB/D	17.2	13.4	21.3	22.5	30.3		22.1	17.2	26.8	30.0	48.5	
Activated Sludge SRT/Nitrification													
MLSS	mg/L	**3,200**	**1,200**	**3,900**	**5,000**	5,000		**3,300**	**1,300**	**4,200**	**5,000**	5,000	
Mass under Aeration	LBS	89,433	33,537	108,996	139,738	139,738		92,227	36,332	117,380	139,738	139,738	
WAS Manual	LB/D	**9,800**	**3,700**	**12,100**	**16,100**	16,100		**10,400**	**4,000**	**13,000**	**18,000**	18,000	
WAS Produced	LB/D	10,214	3,876	12,664	17,338	17,338		12,398	4,677	15,979	22,050	22,050	
SRT	D	9.1	9.1	9.0	8.7	8.7		8.9	9.1	9.0	7.8	7.8	
Manual Aerobic SRT	D	**9.0**	**9.0**	**9.0**	**9.0**	9.0		**9.0**	**9.0**	**9.0**	**9.0**	9.0	
Nitrification Safety Factor		1.81	1.80	1.79	1.72	1.72		1.76	1.80	1.79	1.54	1.54	
Total Bioreactor SRT (Selector + Aeration Basins)	D	13.7	13.6	13.5	13.0	13.0		13.3	13.6	13.5	11.6	11.6	
Alkalinity Analysis													
Aeration Basin Influent Alkalinity as CaCO3	LB/D	35,704	27,856	44,424	46,622	63,109		46,001	35,843	56,130	62,639	101,768	
Alkalinity Producted by Selector Denitrification	LB/D	2,454	849	2,888	3,300	2,750		2,874	1,023	3,223	3,402	2,440	
Nitrification Unit Alkalinity as CaCO3 Consumed	mg/mg N	**-7.14**	-7.14	-7.14	-7.14	-7.14		-7.14	-7.14	-7.14	-7.14	-7.14	
TKN Nitrified	LB/D	1,723	596	2,041	2,405	2,405		2,076	719	2,608	2,957	2,957	
Alkalinity as CaCO3 Consumed in Nitrification	LB/D	-12,305	-4,257	-14,572	-17,174	-17,174		-14,822	-5,132	-18,620	-21,109	-21,109	
AB Effluent (Before P Removal) Alkalinity as CaCO3	LB/D	25,853	24,448	32,740	32,748	48,685		34,052	31,735	40,733	44,932	83,099	
Minimum Target Alkalinity at AB Effluent as CaCO3	mg/l	100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0	
Minimum Target Alkalinity at AB Effluent as CaCO3	LB/D	15,510	12,048	19,048	19,648	23,572		19,469	15,440	21,810	23,421	32,653	
Alkalinity excess (+)/deficit (-) as CaCO3	LB/D	10,343	12,400	13,692	13,099	25,112		14,583	16,295	18,923	21,511	50,446	
Supplemental Alkalinity Requied?	YES/NO	NO	NO	NO	NO	NO		NO	NO	NO	NO	NO	
Air Requirements													
Mixing Requirement	scfm/sf	**0.08**											
Unit O2 Requirement for BOD Treatment	LB O2/LB BOD	**1.1**	1.1	1.1	1.1	1.1		1.1	1.1	1.1	1.1	1.1	
Unit O2 Requirement for Nitrification	LB O2/LB N	**4.6**	4.6	4.6	4.6	4.6		4.6	4.6	4.6	4.6	4.6	
Unit O2 credit per lb NO3 reduced	LB O2/LB N	**2.9**	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	2.9	
PE BOD	LB/DAY	18,344	6,583	21,777	27,013	53,007		22,086	7,927	28,044	34,513	74,957	
Carbonaceous O2 Demand From PE BOD	LB O2/DAY	20,178	7,242	23,954	29,714	58,308		24,295	8,719	30,848	37,964	82,453	
TKN Nitrified	LB N/DAY	1,723	596	2,041	2,405	2,405		2,076	719	2,608	2,957	2,957	
NO3 Denitrified (effluent of 7.2 mg/L NO3)	LB N/DAY	1,586	490	1,871	2,226	2,162		1,899	582	2,393	2,716	2,565	
Nitrogenous O2 Demand From Aer Tk Inf BOD	LB O2/DAY	7,928	2,743	9,388	11,065	11,065		9,549	3,306	11,996	13,600	13,600	
Denitrification Credit	LB O2/DAY	4,600	1,422	5,426	6,456	6,270		5,508	1,689	6,940	7,877	7,439	
Total AOR - without Selector Denitrification credit	LB O2/DAY	28,106	9,984	33,343	40,779	69,373		33,844	12,026	42,844	51,564	96,053	
Total AOR - with Selector Denitrification credit	LB O2/DAY	23,506	8,563	27,917	34,323	63,102		28,336	10,337	35,904	43,687	88,614	
Process Air Reg'd From Est Air Worksheets													
Summer Air - With Denitrification Credit	scfm	8,076	2,942	9,591	11,792	19,436		9,508	3,551	12,335	15,009	27,294	
Winter Air - With Denitrification Credit	scfm	7,887	2,873	9,368	11,517	19,445		9,508	3,468	12,048	14,660	27,306	
Minimum Air Requirement-Mixing	scfm	2,240	2,240	2,240	2,240	2,240		2,240	2,240	2,240	2,240	2,240	

Description	Units	Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
		Average Day	Min Week	Max Month	Max Week	Max Day	Pk Hour Flow	Average Day Design	Min Week	Max Month	Max Week	Max Day	Pk Hour Flow
Mixed Liquor Effluent Chemical Phosphorus Removal - Ferric Chloride													
Target Soluble O-P Percent Conversion	%	50%	50%	50%	50%	50%		50%	50%	50%	50%	50%	
Soluble O-P Converted to Chemical PP - Loading	LB/D	0	0	0	0	0		0	0	0	0	0	
Soluble O-P Converted to Chemical PP - Concentration	mg/L	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
P Atomic Weight	mg/mmole	30.97	30.97	30.97	30.97	30.97		30.97	30.97	30.97	30.97	30.97	
Fe Atomic Weight	mg/mmole	55.85	55.85	55.85	55.85	55.85		55.85	55.85	55.85	55.85	55.85	
Soluble O-P Converted	mmole/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
Fe to P Molar Ratio		1.6	1.6	1.6	1.6	1.6		1.6	1.6	1.6	1.6	1.6	
Fe Addition Required	mmole/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
Fe Dosage Required	mg Fe/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
FePO4 Produced	mmole/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
Fe(OH)3 Produced	mmole/L	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	
FePO4 Molecular Weight	mg/mmole	150.82	150.82	150.82	150.82	150.82		150.82	150.82	150.82	150.82	150.82	
FeOH3 Molecular Weight	mg/mmole	106.87	106.87	106.87	106.87	106.87		106.87	106.87	106.87	106.87	106.87	
FePO4 Produced	mg/L	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Fe(OH)3 Produced	mg/L	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
FePO4 + FeOH3 Concentration	mg/l	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Increase for other Fe(OH)3 cation/anion complexes	%	10%	10%	10%	10%	10%		10%	10%	10%	10%	10%	
Chemical solids produced (FSS)	mg/l	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Chemical solids produced (FSS)	LB/D	0	0	0	0	0		0	0	0	0	0	
% Ferric Chloride in Ferric Chloride Solution	%	33%	33%	33%	33%	33%		33%	33%	33%	33%	33%	
Specific Gravity of Ferric Chloride Solution		1.40	1.40	1.40	1.40	1.40		1.40	1.40	1.40	1.40	1.40	
Fe Added	LB/D	0	0	0	0	0		0	0	0	0	0	
FeCl3 Added	LB/D	0	0	0	0	0		0	0	0	0	0	
Ferric Chloride Solution Required	LB/D	0	0	0	0	0		0	0	0	0	0	
Ferric Chloride Solution Required	GPD	0	0	0	0	0		0	0	0	0	0	
Alkalinity as CaCO3 Consumed by Ferric	mg/mg Fe	-2.68	-2.68	-2.68	-2.68	-2.68		-2.68	-2.68	-2.68	-2.68	-2.68	
Alkalinity Addition/Loss by Chemical Addition	LB/D	0	0	0	0	0		0	0	0	0	0	
Net Alkalinity as CaCO3 in ML to Sec Clarifiers	LB/D	25,853	24,448	32,740	32,748	48,685		34,052	31,735	40,733	44,932	83,099	
Net Alkalinity as CaCO3 in ML to Sec Clarifiers	mg/L	300.0	365.3	307.8	291.5	321.1		308.0	370.0	304.0	299.4	342.8	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Secondary Clarifiers													
Final Clarifiers (1-4)	Number	4	4	4	4	4		4	4	4	4	4	
Unit Diameter	ft	120	120	120	120	120		120	120	120	120	120	
Unit Side Water Depth	ft	12	12	12	12	12		12	12	12	12	12	
Unit Surface Area	sf	11,310	11,310	11,310	11,310	11,310		11,310	11,310	11,310	11,310	11,310	
Secondary Clarification													
Forward Flow to Secondary Clarifiers	MGD	10.332	8.025	12.753	13.472	18.178		13.258	10.285	16.064	17.996	29.066	
MLSS Concentration in AE Channel	mg/L	3,200	1,200	3,900	5,000	5,000		3,300	1,300	4,200	5,000	5,000	
Number of Final Clarifiers in Service	(1-4)	4	4	4	4	4		4	4	4	4	4	
Total Secondary Clarifier Surface Area in Service	sf	45,239	45,239	45,239	45,239	45,239		45,239	45,239	45,239	45,239	45,239	
Maximum Firm RAS Pumping Capacity	MGD	10.086	10.086	10.086	10.086	10.086		10.086	10.086	10.086	10.086	10.086	
Firm Max RAS Pump Capacity as % of Forward Flow	%	98%	126%	79%	75%	55%		76%	98%	63%	56%	35%	
Design Max ML Flow to Secondary Clarifiers	MGD	20.418	18.112	22.839	23.559	28.264		23.345	20.371	26.151	28.083	39.152	
Target Operating RAS Pump Rate (% of Forward Flow)	%	80%	80%	80%	80%	80%		80%	80%	80%	80%	80%	
Operating RAS Pumping Rate	MGD	8.266	6.420	10.086	10.086	10.086		10.086	8.228	10.086	10.086	10.086	
Actual RAS Pump Rate (% of Forward Flow)	%	80.0%	80.0%	79.1%	74.9%	55.5%		76.1%	80.0%	62.8%	56.0%	34.7%	
Operating Mixed Liquor Flow to Secondary Clarifiers	MGD	18.598	14.446	22.839	23.559	28.264		23.345	18.513	26.151	28.083	39.152	
Secondary Clarifier SOR	GPD/sf	228	177	282	298	402		293	227	355	398	642	
Design Max Secondary Clarifier SLR	LB/D/SF	12.0	4.0	16.4	21.7	26.1		14.2	4.9	20.2	25.9	36.1	
Operational Secondary Clarifier SLR	LB/D/SF	11.0	3.2	16.4	21.7	26.1		14.2	4.4	20.2	25.9	36.1	
"Design" RAS/WAS Solids Concentration	mg/L	6,478	2,155	8,831	11,678	14,011		7,638	2,626	10,889	13,921	19,408	
Operational RAS/WAS Solids Concentration	mg/L	7,200	2,700	8,831	11,678	14,011		7,638	2,925	10,889	13,921	19,408	
WAS													
WAS Flow	GPD	186,014	192,691	191,850	204,707	204,707		213,127	215,171	194,875	216,018	216,018	
WAS Solids Concentration	mg/L	7,200	2,700	8,831	11,678	14,011		7,638	2,925	10,889	13,921	19,408	
TSS	LB/D	11,170	4,339	14,130	19,938	19,938		13,576	5,249	17,698	25,080	25,080	
VSS	LB/D	8,961	3,342	11,003	14,549	14,549		10,891	4,036	13,994	18,731	18,731	
FSS	LB/D	2,208	997	3,127	5,389	5,389		2,685	1,213	3,704	6,348	6,348	
VSS/TSS	%	80.2%	77.0%	77.9%	73.0%	73.0%		80.2%	76.9%	79.1%	74.7%	74.7%	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Tertiary Treatment: Disc Filter & Chemical Phosphorus Removal - Ferric													
Tertiary Filter Flow	MGD	10.146	7.833	12.561	13.268	17.973		13.045	10.070	15.869	17.780	28.850	
Estimated Backwash Flow % of Influent Flow	%	**5.0%**	5.0%	5.0%	5.0%	5.0%		5.0%	5.0%	5.0%	5.0%	5.0%	
Estimated Backwash Flow	MGD	0.507	0.392	0.628	0.663	0.899		0.652	0.503	0.793	0.889	1.442	
Target Soluble O-P Percent Conversion	%	**99%**	99%	99%	99%	99%		99%	99%	99%	99%	99%	
Soluble O-P to be Converted to PP - Loading	LB/D	17	13	21	22	30		22	17	27	30	48	
Soluble O-P to be Converted to PP - Concentration	mg/L	0.20	0.20	0.20	0.20	0.20		0.20	0.20	0.20	0.20	0.20	
P Atomic Weight	mg/mmole	30.97	30.97	30.97	30.97	30.97		30.97	30.97	30.97	30.97	30.97	
Fe Atomic Weight	mg/mmole	55.85	55.85	55.85	55.85	55.85		55.85	55.85	55.85	55.85	55.85	
Soluble O-P Converted	mmole/L	0.007	0.007	0.006	0.006	0.006		0.006	0.007	0.006	0.006	0.006	
Fe to P Molar Ratio		**8.0**	8.0	8.0	8.0	8.0		8.0	8.0	8.0	8.0	8.0	
Fe Addition Required	mmole/L	0.052	0.052	0.052	0.052	0.052		0.052	0.052	0.052	0.052	0.052	
Fe Dosage Required	mg Fe/L	2.909	2.927	2.900	2.901	2.889		2.903	2.918	2.892	2.891	2.878	
FePO4 Produced	mmole/L	0.007	0.007	0.006	0.006	0.006		0.006	0.007	0.006	0.006	0.006	
Fe(OH)3 Produced	mmole/L	0.046	0.046	0.045	0.045	0.045		0.045	0.046	0.045	0.045	0.045	
FePO4 Molecular Weight	mg/mmole	150.82	150.82	150.82	150.82	150.82		150.82	150.82	150.82	150.82	150.82	
FeOH3 Molecular Weight	mg/mmole	106.87	106.87	106.87	106.87	106.87		106.87	106.87	106.87	106.87	106.87	
FePO4 Produced	mg/L	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Fe(OH)3 Produced	mg/L	4.9	4.9	4.9	4.9	4.8		4.9	4.9	4.8	4.8	4.8	
FePO4 + FeOH3 Concentration	mg/l	5.9	5.9	5.8	5.8	5.8		5.8	5.9	5.8	5.8	5.8	
Increase for other Fe(OH)3 cation/anion complexes	%	**10%**	10%	10%	10%	10%		10%	10%	10%	10%	10%	
Chemical solids produced (FSS)	mg/l	6.4	6.5	6.4	6.4	6.4		6.4	6.5	6.4	6.4	6.4	
Chemical solids produced (FSS)	LB/D	32	32	32	32	32		32	32	32	32	32	
% Ferric Chloride in Ferric Chloride Solution	%	**33%**	33%	33%	33%	33%		33%	33%	33%	33%	33%	
Specific Gravity of Ferric Chloride Solution		**1.40**	1.40	1.40	1.40	1.40		1.40	1.40	1.40	1.40	1.40	
Fe Added	LB/D	246	191	304	321	433		316	245	383	429	692	
FeCl3 Added	LB/D	714	555	882	931	1,257		916	711	1,110	1,244	2,009	
Ferric Chloride Solution Required	LB/D	2,164	1,681	2,671	2,822	3,808		2,777	2,154	3,365	3,770	6,088	
Ferric Chloride Solution Required	GPD	185	144	229	242	326		238	185	288	323	521	
Alkalinity as CaCO3 Consumed by Ferric	mg/mg Fe	**-2.68**	-2.68	-2.68	-2.68	-2.68		-2.68	-2.68	-2.68	-2.68	-2.68	
Alkalinity Addition/Loss by Chemical Addition	LB/D	-660	-512	-814	-860	-1,161		-846	-657	-1,026	-1,149	-1,856	
Alkalinity in Final Effluent	LB/D	23,459	22,155	29,821	29,777	44,569		30,983	28,861	37,201	41,024	76,501	
Alkalinity in Final Effluent	mg/L	277	339	285	269	297		285	344	281	277	318	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Gravity Thickening of Primary Sludge													
Primary Sludge Production													
PSD Flow	GPD	144,000	115,200	172,800	201,600	201,600		144,000	115,200	172,800	201,600	201,600	
PSD Concentratoin	%	1.99	1.34	2.76	2.32	2.15		2.47	1.67	3.15	2.67	3.64	
TSS Load	LB/D	23,918	12,901	39,845	39,010	36,171		29,656	16,009	45,408	44,875	61,190	
VSS Load	LB/D	20,057	10,902	33,756	32,985	30,835		24,955	13,565	38,532	38,051	52,132	
FSS Load	LB/D	3,861	2,000	6,089	6,025	5,336		4,701	2,444	6,875	6,824	9,058	
TKN Load	LB/D	1,075	385	1,272	1,180	1,561		1,285	460	1,630	1,497	2,175	
NH3-N Load	LB/D	35	13	40	50	58		33	12	40	47	50	
TP Load	LB/D	362	174	448	430	502		455	219	525	506	605	
Soluble O-P Load	LB/D	4	2	5	7	9		4	2	5	6	7	
Alkalinity Load as CaCO3	LB/D	502	404	607	704	705		503	405	607	706	708	
New Primary Sludge Screen													
Number of Screens in Service	#	1	1	1	1	1		1	1	1	1	1	
Primary Sludge Production	LB/D	23,918	12,901	39,845	39,010	36,171		29,656	16,009	45,408	44,875	61,190	
Primary Sludge Concentration	%	1.99	1.34	2.76	2.32	2.15		2.47	1.67	3.15	2.67	3.64	
Primary Sludge Flow	GPM	100.0	80.0	120.0	140.0	140.0		100.0	80.0	120.0	140.0	140.0	
Screening Unit Hydraulic Loading Rate	GPM	100.0	80.0	120.0	140.0	140.0		100.0	80.0	120.0	140.0	140.0	
Screening Unit Solids Loading Rate	LB/HR	997	538	1,660	1,625	1,507		1,236	667	1,892	1,870	2,550	
Gravity Thickening of Primary Sludge													
Number of Gravity Thickeners		1	1	1	1	1		1	1	1	1	1	
Gravity Thickener Diameter	ft	50	50	50	50	50		50	50	50	50	50	
Gravity Thickener Side Water Depth	ft	10	10	10	10	10		10	10	10	10	10	
Gravity Thickener Surface Area in Service	ft^2	1,963	1,963	1,963	1,963	1,963		1,963	1,963	1,963	1,963	1,963	
Primary Sludge Production	LB/D	23,918	12,901	39,845	39,010	36,171		29,656	16,009	45,408	44,875	61,190	
Primary Sludge Concentration	%	1.99	1.34	2.76	2.32	2.15		2.47	1.67	3.15	2.67	3.64	
Primary Sludge Flow to Thickening	GPD	144,000	115,200	172,800	201,600	201,600		144,000	115,200	172,800	201,600	201,600	
Design solids loading rate	lb/ft^2-day	25	25	25	25	25		25	25	25	25	25	
Operating solids loading rate	lb/ft^2-day	12.18	6.57	20.29	19.87	18.42		15.10	8.15	23.13	22.85	31.16	
Design hydraulic loading rate	gal/ft^2-day	500	500	500	500	500		500	500	500	500	500	
Operating hydraulic loading rate	gal/ft^2-day	73	59	88	103	103		73	59	88	103	103	
Solids Capture	%	85%	85%	85%	85%	85%		85%	85%	85%	85%	85%	
TPSD Concentration	%	5.5%	5.5%	5.5%	5.5%	5.5%		5.5%	5.5%	5.5%	5.5%	5.5%	
TPSD Flow Rate	GPD	44,322	23,907	73,835	72,288	67,027		54,955	29,665	84,143	83,155	113,389	
TPSD TSS	LB/D	20,330	10,966	33,868	33,159	30,745		25,208	13,607	38,597	38,143	52,012	
TPSD VSS	LB/D	17,049	9,266	28,692	28,038	26,210		21,212	11,530	32,753	32,343	44,312	
TPSD FSS	LB/D	3,282	1,700	5,176	5,121	4,535		3,996	2,077	5,844	5,800	7,699	
TPSD TKN	LB/D	895	319	1,065	979	1,297		1,077	384	1,371	1,252	1,834	
TPSD NH3-N	LB/D	11	3	17	18	19		12	3	20	19	28	
TPSD Total P	LB/D	305	146	378	363	422		385	185	444	427	512	
TPSD Soluble O-P Load	LB/D	1	0	2	2	3		2	1	2	2	4	
TPSD Total Alkalinity as CaCO3	LB/D	155	84	259	253	234		192	104	296	291	398	
GT Overflow Volume	GPD	99,678	91,293	98,965	129,312	134,573		89,045	85,535	88,657	118,445	88,211	
GT Overflow BOD5	LB/D	357	152	341	524	791		299	133	311	457	456	
GT Overflow TSS	LB/D	3,588	1,935	5,977	5,852	5,426		4,448	2,401	6,811	6,731	9,179	
GT Overflow VSS	LB/D	3,009	1,635	5,063	4,948	4,625		3,743	2,035	5,780	5,708	7,820	
GT Overflow FSS	LB/D	579	300	913	904	800		705	367	1,031	1,024	1,359	
GT Overflow TKN	LB/D	180	66	208	201	264		208	76	259	245	341	
GT Overflow NH3-N	LB/D	24	10	23	32	39		20	9	21	27	22	
GT Overflow TP	LB/D	57	28	69	68	80		70	34	81	79	93	
GT Overflow Soluble O-P Load	LB/D	3	2	3	4	6		3	2	3	4	3	
GT Overflow Total Alkalinity as CaCO3	LB/D	348	321	347	452	471		311	301	311	415	310	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
New Gravity Belt Thickening of WAS													
Number of New 2-m WAS Thickening GBTs	#	1	1	1	1	1		1	1	1	1	1	
WAS Production													
WAS Flow	GPD	186,014	192,691	191,850	204,707	204,707		213,127	215,171	194,875	216,018	216,018	
WAS Concentration	mg/L	7,200	2,700	8,831	11,678	11,678		7,638	2,925	10,889	13,921	13,921	
TSS Load	LB/D	11,170	4,339	14,130	19,938	19,938		13,576	5,249	17,698	25,080	25,080	
VSS Load	LB/D	8,961	3,342	11,003	14,549	14,549		10,891	4,036	13,994	18,731	18,731	
FSS Load	LB/D	2,208	997	3,127	5,389	5,389		2,685	1,213	3,704	6,348	6,348	
TKN Load	LB/D	1,039	373	1,237	1,574	1,574		1,260	449	1,593	2,066	2,066	
NH3-N Load	LB/D	0.8	0.8	0.8	0.9	1		0.9	0.9	0.8	0.9	1	
TP Load	LB/D	233	90	285	422	422		284	109	358	526	526	
Soluble O-P Load	LB/D	9	7	11	11	11		11	9	13	15	15	
Alkalinity Load as CaCO3	LB/D	465	587	493	498	498		547	664	494	539	539	
WAS Thickening @ Wasting Operational Schedule													
Numbers of Days Wasting Each Week	5-7 Days	7	7	7	7	7		7	7	7	7	7	
WAS Wasted at Wasting Schedule Above	LB/D	11,170	4,339	14,130	19,938	19,938		13,576	5,249	17,698	25,080	25,080	
WAS Concentration	mg/L	7,200	2,700	8,831	11,678	11,678		7,638	2,925	10,889	13,921	13,921	
Daily WAS Thickening Volume at Wasting Schedule	GPD	186,014	192,691	191,850	204,707	204,707		213,127	215,171	194,875	216,018	216,018	
Hydraulic Capacity per GBT - WAS Thickening	GPM/meter	200	200	200	200	200		200	200	200	200	200	
No of 2-meter GBTs Operating	#	1	1	1	1	1		1	1	1	1	1	
Daily WAS Thickening Operating Time	hr	7.8	8.0	8.0	8.5	9		8.9	9.0	8.1	9.0	9	
Maximum WAS Thickening Capacity	GPM	400	400	400	400	400		400	400	400	400	400	
Minimum Daily WAS Thickening Time	hr	7.8	8.0	8.0	8.5	9		8.9	9.0	8.1	9.0	9	
GBT Solids Capture	%	95	95	95	95	95		95	95	95	95	95	
TWAS Concentration	%	5.5	5.5	5.5	5.5	6		5.5	5.5	5.5	5.5	6	
TWAS TSS at Wasting Schedule	LB/D	10,611	4,122	13,423	18,941	18,941		12,897	4,987	16,813	23,826	23,826	
TWAS Volume per Wasting Run	GPD	23,133	8,986	29,264	41,293	41,293		28,116	10,871	36,653	51,942	51,942	
TWAS Flow during Wasting Run	GPM	49.7	18.7	61.0	80.7	81		52.8	20.2	75.2	96.2	96	
WAS Thickening GBT Filtrate Flow Rate	GPD	162,881	183,705	162,586	163,413	163,413		185,011	204,300	158,222	164,076	164,076	
WAS Thickening GBT Washwater Flow Rate	GPM	40	40	40	40	40		40	40	40	40	40	
Total Filtrate/Washwater Flow - GBT Thickening of WAS	GPD	181,482	202,974	181,771	183,884	183,884		206,324	225,817	177,710	185,678	185,678	
TWAS Flowrate @ Wasting Schedule	GPD	23,133	8,986	29,264	41,293	41,293		28,116	10,871	36,653	51,942	51,942	
TWAS TSS @ Wasting Schedule	LB/D	10,611	4,122	13,423	18,941	18,941		12,897	4,987	16,813	23,826	23,826	
TWAS VSS @ Wasting Schedule	LB/D	8,513	3,174	10,453	13,822	13,822		10,347	3,834	13,294	17,795	17,795	
TWAS FSS @ Wasting Schedule	LB/D	2,098	948	2,971	5,119	5,119		2,550	1,152	3,519	6,031	6,031	
TWAS TKN @ Wasting Schedule	LB/D	986	354	1,175	1,495	1,495		1,196	426	1,512	1,962	1,962	
TWAS NH3-N @ Wasting Schedule	LB/D	0.1	0.0	0.1	0.2	0.2		0.1	0.0	0.2	0.2	0.2	
TWAS Total P @ Wasting Schedule	LB/D	214	79	263	392	392		261	96	330	489	489	
TWAS Soluble O-P Load @ Wasting Schedule	LB/D	1.1	0.3	1.6	2.3	2.3		1.5	0.4	2.5	3.6	3.6	
TWAS Alkalinity as CaCO3 @ Wasting Schedule	LB/D	57.9	27.4	75.1	100.4	100.4		72.2	33.5	92.9	129.7	129.7	
GBT Filtrate Volume w/Washwater	GPD	181,482	202,974	181,771	183,884	183,884		206,324	225,817	177,710	185,678	185,678	
Assumed Effluent CBOD5 Concentration	mg/L	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	
GBT Filtrate BOD5	LB/D	7.6	8.5	7.6	7.7	7.7		8.6	9.4	7.4	7.7	7.7	
GBT Filtrate TSS	LB/D	558	217	706	997	997		679	262	885	1,254	1,254	
GBT Filtrate VSS	LB/D	448	167	550	727	727		545	202	700	937	937	
GBT Filtrate FSS	LB/D	110	50	156	269	269		134	61	185	317	317	
GBT Filtrate TKN	LB/D	52.5	19.4	62.4	79.2	79		63.6	23.2	80.1	103.7	104	
GBT Filtrate NH3-N	LB/D	0.7	0.8	0.7	0.7	1		0.8	0.9	0.7	0.7	1	
GBT Filtrate TP	LB/D	18	10	21	27	27		22	13	26	33	33	
GBT Filtrate Soluble O-P Load	LB/D	7.5	6.4	9.0	9.0	9		9.6	8.1	10.9	11.4	11	
GBT Filtrate Total Alkalinity as CaCO3	LB/D	408	560	417	397	397		475	630	401	410	410	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
WAS Thickening Polymer (Not Based on Wasting Schedule - Assumes 7 Day/Week Operation)													
Number of Polymer Feed Units	#	**2**	2	2	2	2		2	2	2	2	2	
Active Polymer Thickening Dose LBS Per Ton Dry Solids	LBS/Ton	**10.0**	10	10	10	10		10	10	10	10	10	
Active Polymer Required	LB/D	55.8	21.7	70.6	99.7	99.7		67.9	26.2	88.5	125.4	125.4	
Emulsion Polymer Required @ 35% Active	LB/D	159.6	62.0	201.9	284.8	284.8		193.9	75.0	252.8	358.3	358.3	
Emulsion Polymer Flow Rate	GPD	51.6	20.0	65.2	92.1	92.1		62.7	24.2	81.7	115.8	115.8	
Dilution Water Required at 0.1% by Weight per Unit	GPD	19,133	7,432	24,203	34,152	34,152		23,254	8,991	30,314	42,960	42,960	
Raw Sludge Feed to Anaerobic Digestion													
Thickened Primary Sludge													
Flow	GPD	44,322	23,907	73,835	72,288	67,027		54,955	29,665	84,143	83,155	113,389	
PSD Concentratoin	%	5.5%	5.5%	5.5%	5.5%	5.5%		5.5%	5.5%	5.5%	5.5%	5.5%	
TSS Load	LB/D	20,330	10,966	33,868	33,159	30,745		25,208	13,607	38,597	38,143	52,012	
VSS Load	LB/D	17,049	9,266	28,692	28,038	26,210		21,212	11,530	32,753	32,343	44,312	
FSS Load	LB/D	3,282	1,700	5,176	5,121	4,535		3,996	2,077	5,844	5,800	7,699	
TKN Load	LB/D	895	319	1,065	979	1,297		1,077	384	1,371	1,252	1,834	
NH3-N Load	LB/D	10.7	2.6	17.0	17.8	19.3		12.4	3.1	19.7	19.2	28.1	
TP Load	LB/D	305	146	378	363	422		385	185	444	427	512	
Chemical PP Load	LB/D	136	59	167	167	138		170	73	198	193	161	
Soluble O-P Load	LB/D	1.3	0.5	2.3	2.4	3.1		1.6	0.6	2.4	2.5	4.0	
Alkalinity Load as CaCO3	LB/D	154.7	83.9	259.2	252.6	234.4		192.0	104.2	295.6	291.4	398.2	
Thickened WAS (Ignores Wasting Schedule - Equalizes to 7 Days/Week)													
Flow	GPD	23,133	8,986	29,264	41,293	41,293		28,116	10,871	36,653	51,942	51,942	
Concentratoin	%	5.5	5.5	5.5	5.5	5.5		5.5	5.5	5.5	5.5	5.5	
TSS Load	LB/D	10,611	4,122	13,423	18,941	18,941		12,897	4,987	16,813	23,826	23,826	
VSS Load	LB/D	8,513	3,174	10,453	13,822	13,822		10,347	3,834	13,294	17,795	17,795	
FSS Load	LB/D	2,098	948	2,971	5,119	5,119		2,550	1,152	3,519	6,031	6,031	
TKN Load	LB/D	986	354	1,175	1,495	1,495		1,196	426	1,512	1,962	1,962	
NH3-N Load	LB/D	0.1	0.0	0.1	0.2	0.2		0.1	0.0	0.2	0.2	0.2	
TP Load	LB/D	214	79	263	392	392		261	96	330	489	489	
Chemical PP Load	LB/D	0	0	0	0	0		0	0	0	0	0	
Soluble O-P Load	LB/D	1.1	0.3	1.6	2.3	2.3		1.5	0.4	2.5	3.6	3.6	
Alkalinity Load as CaCO3	LB/D	57.9	27.4	75.1	100.4	100.4		72.2	33.5	92.9	129.7	129.7	
Total Raw Sludge Feed to Digesters													
Flow	GPD	67,455	32,893	103,098	113,581	108,320		83,072	40,536	120,796	135,098	165,331	
TSS Load	LB/D	30,942	15,088	47,291	52,100	49,686		38,105	18,594	55,409	61,969	75,837	
VSS Load	LB/D	25,562	12,441	39,145	41,859	40,032		31,559	15,365	46,047	50,138	62,107	
FSS Load	LB/D	5,380	2,647	8,146	10,240	9,655		6,546	3,229	9,363	11,831	13,730	
TKN Load	LB/D	1,881	673	2,239	2,473	2,792		2,273	810	2,883	3,214	3,796	
NH3-N Load	LB/D	11	3	17	18	19		13	3	20	19	28	
TP Load	LB/D	519	226	641	755	815		646	281	774	917	1,001	
Chemical PP Load	LB/D	136	59	167	167	138		170	73	198	193	161	
Soluble O-P Load	LB/D	2	1	4	5	5		3	1	5	6	8	
Alkalinity Load as CaCO3	LB/D	213	111	334	353	335		264	138	389	421	528	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Anaerobic Digestion													
Number of Large Primary Digesters		2											
Large Digesters Diameter	ft	74.5											
Large Digesters Liquid Depth	ft	20.0											
Large Digesters Volume Including Cone	gal	760,700											
Large Primary Digester Effective Volume	%	90%	90%	90%	90%	90%		90%	90%	90%	90%	90%	
Large Primary Digester Effective Volume	gal	684,630	684,630	684,630	684,630	684,630		684,630	684,630	684,630	684,630	684,630	
Large Primary Digester Effective Volume	cf	91,528	91,528	91,528	91,528	91,528		91,528	91,528	91,528	91,528	91,528	
Number of Small Primary Digesters		2											
Small Digesters Diameter	ft	65.0											
Small Digesters Liquid Depth	ft	18.0											
Small Digesters Volume Including Cone	gal	501,900											
Small Primary Digester Effective Volume	%	90%	90%	90%	90%	90%		90%	90%	90%	90%	90%	
Small Primary Digester Effective Volume	gal	451,710	451,710	451,710	451,710	451,710		451,710	451,710	451,710	451,710	451,710	
Small Primary Digester Effective Volume	cf	60,389	60,389	60,389	60,389	60,389		60,389	60,389	60,389	60,389	60,389	
Total Primary Digester Effective Volume	gal	2,272,700	2,272,700	2,272,700	2,272,700	2,272,700		2,272,700	2,272,700	2,272,700	2,272,700	2,272,700	
Total Primary Digester Effective Volume	cf	303,800	303,800	303,800	303,800	303,800		303,800	303,800	303,800	303,800	303,800	
Raw Sludge Flow to Digestion	GPD	67,455	32,893	103,098	113,581	108,320		83,072	40,536	120,796	135,098	165,331	
TS Load to Digestion	LB/D	30,942	15,088	47,291	52,100	49,686		38,105	18,594	55,409	61,969	75,837	
VS Load to Digestion	LB/D	25,562	12,441	39,145	41,859	40,032		31,559	15,365	46,047	50,138	62,107	
FS Load to Digestion	LB/D	5,380	2,647	8,146	10,240	9,655		6,546	3,229	9,363	11,831	13,730	
Anaerobic Digester Loading Criteria													
Minimum Digester HRT/SRT	DAY	20	NA	15	12	NA		20	NA	15	12	NA	
Maximum Volatile Solids Volumetric Loading	LB VS/D/CF	0.150	NA	0.175	0.175	NA		0.150	NA	0.175	0.175	NA	
Maximum COD Volumetric Loading	LB COD/D/CF	0.200	NA	0.240	0.240	NA		0.200	NA	0.240	0.240	NA	
Raw Sludge Loading/Capacity Utilization													
Primary Digestion Effective HRT/SRT	DAY	33.7	69.1	22.0	20.0	21.0		27.4	56.1	18.8	16.8	13.7	
Capacity Utilization - HRT Basis	%	59.4%	NA	68.0%	60.0%	NA		73.1%	NA	79.7%	71.3%	NA	
Primary Digestion VS Loading	LB VS/D/CF	0.084	0.041	0.129	0.138	0.132		0.104	0.051	0.152	0.165	0.204	
Capacity Utilization - Organic Loading Basis	%	56.1%	NA	73.6%	78.7%	NA		69.3%	NA	86.6%	94.3%	NA	
Estimated Capacity for HSW													
Daily Additional Digester Feed Volume Allowable	GPD	46,180	NA	48,415	75,810	NA		30,563	NA	30,717	54,294	NA	
Daily Additional Digester Feed VS Load Allowable	LB VS/D	20,008	NA	14,020	11,306	NA		14,011	NA	7,118	3,027	NA	
Daily Additional Digester Feed COD Load Allowable	LB COD/D	26,677	NA	19,228	15,505	NA		18,682	NA	9,762	4,151	NA	
HSW COD Limit at Hydraulic Capacity Limit	*mg COD/L*	*69,266*	*NA*	*47,619*	*24,523*	*NA*		*73,291*	*NA*	*38,107*	*9,168*	*NA*	
HSW Unit Biogas Production	CF/LB COD	9.33	9.33	9.33	9.33	9.33		9.33	9.33	9.33	9.33	9.33	
HSW Digestion Efficiency	%	85%	85%	85%	85%	85%		85%	85%	85%	85%	85%	
Potential Added Biogas From Max Allowable HSW Load	CF/DAY	211,600	211,600	152,500	123,000	123,000		148,200	148,200	77,400	32,900	32,900	
HSW Storage Assessment													
HSW Assumed COD Concentration	mg COD/L	100,000	100,000	100,000	100,000	100,000		100,000	100,000	100,000	100,000	100,000	
HSW Allowable Daily Feed Volume	GPD	32,000	32,000	23,100	18,600	18,600		22,400	22,400	11,700	5,000	5,000	
HSW Storage Volume	GAL	20,000	20,000	20,000	20,000	20,000		20,000	20,000	20,000	20,000	20,000	
HSW Storage Capacity	DAY	0.63	0.63	0.87	1.08	1.08		0.89	0.89	1.71	4.00	4.00	
HSW Biogas Production Estimate													
Maximum HSW Daily Feed Volume to Digestion	GPD	32,000	32,000	23,100	18,600	18,600		22,400	22,400	11,700	5,000	5,000	
Actual HSW Daily Feed Volume to Digestion	GPD	30,000	30,000	20,000	15,000	15,000		20,000	20,000	10,000	2,500	2,500	
HSW COD Loading to Digestion	LB COD/D	25,000	25,000	16,700	12,500	12,500		16,700	16,700	8,300	2,100	2,100	
HSW Digestion Efficiency	%	85%	85%	85%	85%	85%		85%	85%	85%	85%	85%	
HSW Unit Biogas Production	CF/LB COD	9.33	9.33	9.33	9.33	9.33		9.33	9.33	9.33	9.33	9.33	
Estimated Biogas From HSW Digestion	CF/DAY	198,300	198,300	132,500	99,200	99,200		132,500	132,500	65,800	16,700	16,700	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Raw Sludge Digestion													
Total Primary Digester VS Loading Rate from Raw Sludge	LB/DAY/CF	0.084	0.041	0.129	0.138	0.132		0.104	0.051	0.152	0.165	0.204	
Total Primary Digester HRT	DAY	33.7	69.1	22.0	20.0	21.0		27.4	56.1	18.8	16.8	13.7	
Maximum Anaaerobic Digestion VSR	%	**60%**	60%	60%	60%	60%		60%	60%	60%	60%	60%	
Raw Sludge Volatile Solids Destruction (VSR)	%	60.0%	60.0%	60.0%	59.9%	59.9%		60.0%	60.0%	58.7%	56.5%	56.5%	
Raw Sludge Volatile Solids Destroyed	LB/D	15,337	7,465	23,487	25,084	23,989		18,935	9,219	27,026	28,305	35,062	
Digested Sludge	LB/D	15,604	7,624	23,804	27,016	25,698		19,170	9,375	28,383	33,664	40,775	
Digested Sludge (no decant)	GPD	67,455	32,893	103,098	113,581	108,320		83,072	40,536	120,796	135,098	165,331	
% Digested Sludge (no decant)	%	2.77	2.78	2.77	2.85	2.84		2.77	2.77	2.82	2.99	2.96	
Biogas Production - Raw Sludge Digestion													
Biogas Production per lb Raw Sludge VSR	CF/LB VSR	**15.0**	15.0	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	
Biogas Production - Raw Sludge Digestion	CF/DAY	230,100	112,000	352,300	376,300	376,300		284,000	138,300	405,400	424,600	424,600	
Biogas Production - Raw Sludge Digestion	CFM	159.8	77.8	244.7	261.3	261.3		197.2	96.0	281.5	294.9	294.9	
Biogas Production Estimates													
Biogas Production - Plant Raw Sludge Digestion	CF/DAY	230,100	112,000	352,300	376,300	376,300		284,000	138,300	405,400	424,600	424,600	
(Maximum Potential Biogas Production - HSW)	CF/DAY	211,600	211,600	152,500	123,000	123,000		148,200	148,200	77,400	32,900	32,900	
(Estimated Maximum Potential Biogas Production)	CF/DAY	441,700	323,600	504,800	499,300	499,300		432,200	286,500	482,800	457,500	457,500	
(Estimated Maximum Potential Biogas Production)	CFM	306.7	224.7	350.6	346.7	346.7		300.1	199.0	335.3	317.7	317.7	
Estimated Actual Biogas Production - HSW	CF/DAY	198,300	198,300	132,500	99,200	99,200		132,500	132,500	65,800	16,700	16,700	
Estimated Actual Biogas Production	CF/DAY	428,400	310,300	484,800	475,500	475,500		416,500	270,800	471,200	441,300	441,300	
Estimated Actual Biogas Production	CFM	297.5	215.5	336.7	330.2	330.2		289.2	188.1	327.2	306.5	306.5	
Anaerobically Digested Sludge													
DSD Flow	GPD	67,455	32,893	103,098	113,581	108,320		83,072	40,536	120,796	135,098	165,331	
DSD CBOD Concentration	mg/L	**250**	250.0	250.0	250.0	250.0		250.0	250.0	250.0	250.0	250.0	
DSD CBOD	LB/D	140.6	68.6	215.0	236.8	225.8		173.2	84.5	251.9	281.7	344.7	
DSD TSS	LB/D	15,604	7,624	23,804	27,016	25,698		19,170	9,375	28,383	33,664	40,775	
DSD VSS	LB/D	10,225	4,976	15,658	16,776	16,043		12,623	6,146	19,021	21,833	27,045	
DSD FSS	LB/D	5,380	2,647	8,146	10,240	9,655		6,546	3,229	9,363	11,831	13,730	
DSD TKN	LB/D	1881.0	673.0	2239.5	2473.4	2791.8		2273.5	810.0	2883.4	3214.1	3796.1	
DSD NH3-N	LB/D	1132.9	404.9	1350.6	1489.4	1680.8		1369.1	487.2	1700.6	1823.0	2155.4	
DSD TP	LB/D	518.9	225.8	640.9	754.9	814.6		645.7	281.3	773.9	916.8	1001.4	
DSD Chemical PP	LB/D	136.4	58.8	166.7	166.8	137.6		169.7	73.3	198.2	193.4	160.6	
DSD Soluble O-P	LB/D	230.5	100.5	286.1	354.3	407.8		286.9	125.2	339.9	411.1	478.0	
DSD Alkalinity as CaCO3 Concentration	mg/L	**2,500**	2,500	2,500	2,500	2,500		2,500	2,500	2,500	2,500	2,500	
DSD Alkalinity as CaCO3	LB/D	1,406	686	2,150	2,368	2,258		1,732	845	2,519	2,817	3,447	
Digested Sludge Thickening/Dewatering Split													
Percent Digested Sludge to Gravity Belt Thickening	%	**30%**	**30%**	**30%**	**30%**	30%		**30%**	**30%**	**30%**	**30%**	30%	
Digested Sludge Flow to GBT	GPD	20,237	9,868	30,929	34,074	34,074		24,922	12,161	36,239	40,529	40,529	
Dogested Sludge Solids to GBT	LB/D	4,681	2,287	7,141	8,105	8,105		5,751	2,813	8,515	10,099	10,099	
Percent Digested Sludge to New Belt Filter Press	%	70%	70%	70%	70%	70%		70%	70%	70%	70%	70%	
Digested Sludge Flow to BFP	GPD	47,219	23,025	72,169	79,507	79,507		58,150	28,375	84,557	94,568	94,568	
Dogested Sludge Solids to BFP	LB/D	10,923	5,337	16,663	18,911	18,911		13,419	6,563	19,868	23,565	23,565	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Digested Sludge GBT Thickening - Daily Basis													
DSD Flow to GBT Thickening	GPD	20,237	9,868	30,929	34,074	34,074		24,922	12,161	36,239	40,529	40,529	
DSD Mass to GBT Thickening	LB/D	4,681	2,287	7,141	8,105	8,105		5,751	2,813	8,515	10,099	10,099	
Hydraulic Capacity per GBT - DSD Thickening	GPM/meter	125	125	125	125	125		125	125	125	125	125	
No of 2-meter GBTs Operating	#	1	1	1	1	1		1	1	1	1	1	
Daily DSD Thickening Operating Time	hr	1.35	0.66	2.06	2.27	2.27		1.66	0.81	2.42	2.70	2.70	
GBT Solids Capture	%	95	95	95	95	95		95	95	95	95	95	
TDSD Concentration	%	6.0	6.0	6.0	6.0	6		6.0	6.0	6.0	6.0	6	
TDSD TS	LB/D	4,447	2,173	6,784	7,700	7,700		5,463	2,672	8,089	9,594	9,594	
TDSD Flow	GPD	8,887	4,342	13,558	15,387	15,387		10,918	5,340	16,166	19,173	19,173	
DSD Thickening GBT Filtrate Flow	GPD	11,349	5,526	17,372	18,688	18,688		14,003	6,821	20,073	21,356	21,356	
DSD Thickening GBT Washwater Flow	GPM	40	40	40	40	40		40	40	40	40	40	
Total Filtrate/Washwater Flow - GBT Thickening of DSD	GPD	14,587	7,105	22,321	24,140	24,140		17,991	8,767	25,872	27,841	27,841	
TDSD Flowrate	GPD	8,887	4,342	13,558	15,387	15,387		10,918	5,340	16,166	19,173	19,173	
TDSD TS	LB/D	4,447	2,173	6,784	7,700	7,700		5,463	2,672	8,089	9,594	9,594	
TDSD VS	LB/D	2,914	1,418	4,463	4,781	4,781		3,598	1,752	5,421	6,222	6,222	
TDSD FS	LB/D	1,533	754	2,322	2,918	2,918		1,866	920	2,668	3,372	3,372	
TDSD TKN	LB/D	362	130	431	482	482		438	156	565	655	655	
TDSD NH3-N	LB/D	149	53	178	202	201.8		180	64	228	259	258.7	
TDSD Total P	LB/D	86	37	105	119	119		107	46	128	150	150	
TDSD Soluble O-P	LB/D	3.9	1.2	3.7	4.6	4.6		4.7	1.5	4.8	5.5	5.5	
TDSD Alkalinity as CaCO3	LB/D	185	5,015	14,769	16,254	16,253.9		9,458	6,328	16,101	18,787	18,787.2	
GBT Filtrate Volume w/Washwater	GPD	14,587	7,105	22,321	24,140	24,140		17,991	8,767	25,872	27,841	27,841	
Assumed DSD Soluble CBOD Concentration	mg/L	250	250	250	250	250		250	250	250	250	250	
GBT Filtrate BOD5	LB/D	30.4	14.8	46.5	50.3	50.3		37.5	18.3	53.9	58.0	58.0	
GBT Filtrate TSS	LB/D	234	114	357	405	405		288	141	426	505	505	
GBT Filtrate VSS	LB/D	153	75	235	252	252		189	92	285	327	327	
GBT Filtrate FSS	LB/D	81	40	122	154	154		98	48	140	177	177	
GBT Filtrate TKN	LB/D	202	72	241	260	260		244	87	300	309	309	
GBT Filtrate NH3-N	LB/D	191	68	228	245	245		231	82	283	288	288	
GBT Filtrate TP	LB/D	70	31	87	108	108		87	38	104	125	125	
GBT Filtrate Soluble O-P Load	LB/D	65	29	82	102	102		81	36	97	118	118	
GBT Filtrate Total Alkalinity as CaCO3	LB/D	237	115	362	390	390		292	142	419	445	445	
Digested Sludge Thickening Polymer													
Number of Polymer Feed Units	#	2	2	2	2	2		2	2	2	2	2	
Active Polymer Thickening Dose LBS Per Ton Dry Solids	LBS/Ton	12.0	12	12	12	12		12	12	12	12	12	
Active Polymer Required	LB/D	28.1	13.7	42.8	48.6	48.6		34.5	16.9	51.1	60.6	60.6	
Emulsion Polymer Required @ 35% Active	LB/D	80.3	39.2	122.4	138.9	138.9		98.6	48.2	146.0	173.1	173.1	
Emulsion Polymer Flow Rate	GPD	25.9	12.7	39.6	44.9	44.9		31.9	15.6	47.2	56.0	56.0	
Dilution Water Required at 0.1% by Weight per Unit	GPD	9,622	4,701	14,679	16,659	16,659		11,821	5,781	17,503	20,759	20,759	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Digested Sludge Dewatering - New BFP													
Number of New 2-m BFPs for DSD Dewatering	#	1	1	1	1	1		1	1	1	1	1	
Digested Sludge Flow to Dewatering	GPD	47,219	23,025	72,169	79,507	79,507		58,150	28,375	84,557	94,568	94,568	
Digested Sludge TS to Dewatering	LB/D	10,923	5,337	16,663	18,911	18,911		13,419	6,563	19,868	23,565	23,565	
BFP Loading Rate	LB/HR	1,000	1,000	1,000	1,000	1,000		1,000	1,000	1,000	1,000	1,000	
BFP Daily Operating Hours	hr	10.9	5.3	16.7	18.9	18.9		13.4	6.6	19.9	23.6	23.6	
BFP Solids Capture	%	95.0	95.0	95.0	95.0	95.0		95.0	95.0	95.0	95.0	95.0	
Dewatered Cake Concentration	% TS	18.0	18.0	18.0	18.0	18.0		18.0	18.0	18.0	18.0	18.0	
Dewatered Sludge Cake	LB/D	10,377	5,070	15,830	17,966	17,966		12,748	6,234	18,875	22,387	22,387	
Dewatered Sludge Cake	GPD	6,284	3,070	9,586	10,880	10,880		7,720	3,775	11,430	13,557	13,557	
Dewatered Sludge Cake	CF/DAY	840	410	1,282	1,454	1,454		1,032	505	1,528	1,812	1,812	
Dewatered Sludge Cake	CY/DAY	31.1	15.2	47.5	53.9	53.9		38.2	18.7	56.6	67.1	67.1	
Filtrate TSS	LB/D	546	267	833	946	946		671	328	993	1,178	1,178	
BFP Filitrate Flow	GPD	40,935	19,955	62,583	68,627	68,627		50,430	24,600	73,127	81,012	81,012	
BFP Unit Washwater	GPM	60	60	60	60	60		60	60	60	60	60	
BFP Daily Washwater	GPD	39,323	19,212	59,987	68,080	68,080		48,308	23,625	71,526	84,833	84,833	
Total Dewatering Filtrate/Washwater Flow	GPD	80,258	39,167	122,569	136,707	136,707		98,738	48,225	144,653	165,845	165,845	
DSD Cake Daily Volume	GPD	6,284	3,070	9,586	10,880	10,880		7,720	3,775	11,430	13,557	13,557	
DSD Cake TS	LB/D	10,377	5,070	15,830	17,966	17,966		12,748	6,234	18,875	22,387	22,387	
DSD Cake VS	LB/D	6,800	3,309	10,413	11,156	11,216		8,395	4,087	12,649	14,519	14,848	
DSD Cake FS	LB/D	3,577	1,760	5,417	6,810	6,750		4,353	2,147	6,226	7,868	7,538	
DSD Cake TKN	LB/D	603	216	717	797	900		729	260	948	1,108	1,307	
DSD Cake NH3-N	LB/D	106	38	126	143	161		127	45	161	183	216	
DSD Cake Total P	LB/D	213	93	263	300	310		265	115	321	378	396	
DSD Cake Soluble O-P	LB/D	21.5	9.4	26.6	33.9	39.1		26.7	11.7	32.2	41.2	48.0	
DSD Cake Alkalinity as CaCO3	LB/D	131	64	200	227	227		161	79	238	283	283	
BFP Filtrate Volume w/Washwater	GPD	80,258	39,167	122,569	136,707	136,707		98,738	48,225	144,653	165,845	165,845	
Assumed DSD Soluble CBOD Concentration	mg/L	250	250	250	250	250		250	250	250	250	250	
BFP Filtrate BOD5	LB/D	167.3	81.7	255.6	285.0	285.0		205.9	100.5	301.6	345.8	345.8	
BFP Filtrate TSS	LB/D	546	267	833	946	23		671	328	993	1,178	6,156	
BFP Filtrate VSS	LB/D	358	174	548	587	14		442	215	666	764	4,083	
BFP Filtrate FSS	LB/D	188	93	285	358	9		229	113	328	414	2,073	
BFP Filtrate TKN	LB/D	714	255	851	934	1,054		863	307	1,071	1,142	1,350	
BFP Filtrate NH3-N	LB/D	687	246	820	900	1,016		831	296	1,029	1,093	1,292	
BFP Filtrate TP	LB/D	150	65	186	228	261		187	81	221	264	305	
BFP Filtrate Soluble O-P Load	LB/D	140	61	174	214	246		174	76	206	246	287	
BFP Filtrate Total Alkalinity as CaCO3	LB/D	853	416	1,305	1,431	1,431		1,051	513	1,525	1,689	1,689	
DSD Dewatering Polymer													
Number of Polymer Feed Units	#	2	2	2	2	2		2	2	2	2	2	
Active Polymer Thickening Dosage/Ton Dry Solids	LBS/Ton	22.0	22	22	22	22		22	22	22	22	22	
Active Polymer Required	LB/D	120.2	58.7	183.3	208.0	208.0		147.6	72.2	218.6	259.2	259.2	
Emulsion Polymer Required @ 35% Active	LB/D	343.3	167.7	523.7	594.3	594.3		421.7	206.3	624.4	740.6	740.6	
Emulsion Polymer Flow Rate	GPD	111.0	54.2	169.3	192.1	192.1		136.3	66.7	201.8	239.4	239.4	
Dilution Water Required at 0.1% by Weight per Unit	GPD	41,163	20,110	62,793	71,265	71,265		50,568	24,730	74,872	88,802	88,802	
DSD GBT & BFP Filtrate Before Chem P													
Filtrate Flow (With Washwater)	GPD	94,845	46,272	144,890	160,847	160,847		116,729	56,992	170,525	193,686	193,686	
Pre-Ferric Filtrate Alkalinity Load as CaCO3	LB/D	1,090	531	1,667	1,821	1,821		1,343	655	1,943	2,134	2,134	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Digested Sludge Thickening/Dewatering Filtrate Chemical Phosphorus Removal - Ferric Chloride													
DSD Filtrate Flow (With Washwater)	MGD	0.095	0.046	0.145	0.161	0.161		0.117	0.057	0.171	0.194	0.194	
Total DSD Filtrate Soluble O-P	LB/D	205	90	256	316	348		255	112	303	364	404	
Final DSD Soluble O-P Concentration	mg/l	259	233	212	235	259		262	236	213	225	250	
Target Residual Filtrate Ortho-P Concentration	mg/l	**20**	20	20	20	20		20	20	20	20	20	
Ortho-P conc to be removed	mg/l	239	213	192	215	239		242	216	193	205	230	
Ortho-P load to be removed	LB/D	189	82	232	289	321		236	103	275	332	372	
P Atomic Weight	mg/mmole	30.97	30.97	30.97	30.97	30.97		30.97	30.97	30.97	30.97	30.97	
Fe Atomic Weight	mg/mmole	55.85	55.85	55.85	55.85	55.85		55.85	55.85	55.85	55.85	55.85	
Fe to P Molar Ratio		**1.1**	1.1	1.1	1.1	1.1		1.1	1.1	1.1	1.1	1.1	
Fe Applied	mmole/L	9.21	8.27	7.52	8.36	9.22		9.32	8.37	7.57	8.01	8.89	
FePO4 Formed	mmole/L	7.73	6.88	6.19	6.95	7.73		7.83	6.97	6.23	6.64	7.44	
FeOH3 Formed	mmole/L	1.48	1.40	1.33	1.41	1.48		1.49	1.41	1.33	1.37	1.45	
FePO4 Molecular Weight	mg/mmole	150.82	150.82	150.82	150.82	150.82		150.82	150.82	150.82	150.82	150.82	
FeOH3 Molecular Weight	mg/mmole	106.87	106.87	106.87	106.87	106.87		106.87	106.87	106.87	106.87	106.87	
FePO4 Formed	LB/D	922.0	400.2	1127.8	1406.7	1564.3		1149.3	499.3	1336.8	1616.6	1812.0	
FeOH3 Formed	LB/D	125.4	57.7	171.7	201.5	212.7		155.3	71.5	202.7	237.2	251.0	
FePO4 + FeOH3 Formed	LB/D	1047.4	457.9	1299.5	1608.2	1777.0		1304.6	570.8	1539.5	1853.7	2063.0	
Increase For Other FeOH3 Cat/An Complexes	%	**10%**	10%	10%	10%	10%		0%	0%	0%	0%	0%	
Chemical Solids Formed (all FSS)	LB/D	1152.2	503.7	1429.4	1769.0	1954.7		1304.6	570.8	1539.5	1853.7	2063.0	
Soluble P Converted to Particulate (Chemical) P	LB/D	189.3	82.2	231.6	288.9	321.2		236.0	102.5	274.5	332.0	372.1	
Fe Added	LB Fe/D	407.0	178.3	507.3	626.2	690.4		506.8	222.3	601.0	722.6	802.2	
FeCl3 Added	LB FeCl3/D	1180.8	517.4	1472.1	1817.0	2003.3		1470.4	644.9	1743.7	2096.6	2327.5	
Specific Gravity of Ferric Chloride Solution		**1.40**	1.40	1.40	1.40	1.40		1.40	1.40	1.40	1.40	1.40	
% Ferric Chloride in Ferric Chloride Solution	%	**33.0%**	33.0%	33.0%	33.0%	33.0%		33.0%	33.0%	33.0%	33.0%	33.0%	
FeCl3 Solution Usage	GPD	306.0	134.1	381.5	470.9	519.2		381.1	167.1	451.9	543.4	603.2	
Unit Alkalinity Consumed by Ferric, lb CaCO3/lb Fe	LB/LB	**-2.68**	-2.68	-2.68	-2.68	-2.68		-2.68	-2.68	-2.68	-2.68	-2.68	
Alkalinity Consumption by Ferric, lb CaCO3/day	LB/D	-1,091	-478	-1,360	-1,678	-1,850		-1,358	-596	-1,611	-1,936	-2,150	
Net Remaining Alkalinity in DSD Filtrate Return	LB/D	-1	53	307	142	-30		-15	59	333	198	-15	

		Existing Conditions - Base Service Area						Design Conditions (2040) - Base Service Area					
Description	**Units**	**Average Day**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**	**Average Day Design**	**Min Week**	**Max Month**	**Max Week**	**Max Day**	**Pk Hour Flow**
Side Streams													
Tertiary Filter Backwash Flow	GPD	507,300	391,632	628,049	663,387	898,650		652,249	503,493	793,461	889,009	1,442,498	
Tertiary Filter TSS	LB/D	32	32	32	32	32		32	32	32	32	32	
Tertiary Filter Backwash Alkalinity Load as CaCO3	LB/D	1,173	1,108	1,491	1,489	2,228		1,549	1,443	1,860	2,051	3,825	
Primary Sludge Gravity Thickening Overflow to Primary Effluent													
Gravity Thickener Overflow Flow	GPD	99,678	91,293	98,965	129,312	134,573		89,045	85,535	88,657	118,445	88,211	
Gravity Thickener Overflow CBOD	LB/D	357	152	341	524	791		299	133	311	457	456	
Gravity Thickener Overflow TSS	LB/D	3,588	1,935	5,977	5,852	5,426		4,448	2,401	6,811	6,731	9,179	
Gravity Thickener Overflow VSS	LB/D	3,009	1,635	5,063	4,948	4,625		3,743	2,035	5,780	5,708	7,820	
Gravity Thickener Overflow TKN	LB/D	180	66	208	201	264		208	76	259	245	341	
Gravity Thickener Overflow NH3-N	LB/D	24	10	23	32	39		20	9	21	27	22	
Gravity Thickener Overflow TP	LB/D	57	28	69	68	80		70	34	81	79	93	
Gravity Thickener Overflow Soluble O-P	LB/D	3	2	3	4	6		3	2	3	4	3	
Gravity Thickener Overflow Alkalinity Load as CaCO3	LB/D	348	321	347	452	471		311	301	311	415	310	
Waste Activated Sludge Gravity Belt Thickening Overflow Recycled													
WAS GBT Filtrate Flow	GPD	181,482	202,974	181,771	183,884	183,884		206,324	225,817	177,710	185,678	185,678	
WAS GBT Filtrate CBOD	LB/D	8	8	8	8	8		9	9	7	8	8	
WAS GBT Filtrate TSS	LB/D	558	217	706	997	997		679	262	885	1,254	1,254	
WAS GBT Filtrate VSS	LB/D	448	167	550	727	727		545	202	700	937	937	
WAS GBT Filtrate TKN	LB/D	52	19	62	79	79		64	23	80	104	104	
WAS GBT Filtrate NH3-N	LB/D	1	1	1	1	1		1	1	1	1	1	
WAS GBT Filtrate TP	LB/D	18	10	21	27	27		22	13	26	33	33	
WAS GBT Filtrate Soluble O-P	LB/D	8	6	9	9	9		10	8	11	11	11	
WAS GBT Filtrate Alkalinity Load as CaCO3	LB/D	408	560	417	397	397		475	630	401	410	410	
Combined Digested Sludge Thickening/Dewatering Sidestreams Recycled to Headworks													
DSD Filtrate + Washwater Flow	GPD	94,845	46,272	144,890	160,847	160,847		116,729	56,992	170,525	193,686	193,686	
DSD Filtrate CBOD	LB/D	198	96	302	335	335		243	119	356	404	404	
DSD Filtrate TSS	LB/D	1,932	885	2,620	3,120	2,383		2,263	1,040	2,959	3,537	8,724	
DSD Filtrate VSS	LB/D	511	249	783	839	266		631	307	951	1,092	4,411	
DSD Filtrate TKN	LB/D	915	327	1,092	1,194	1,314		1,107	394	1,371	1,451	1,659	
DSD Filtrate NH3-N	LB/D	878	314	1,047	1,145	1,261		1,062	378	1,312	1,381	1,581	
DSD Filtrate TP	LB/D	220	96	274	336	368		273	120	325	390	430	
DSD Filtrate Soluble O-P	LB/D	16	8	24	27	27		19	10	28	32	32	
DSD Filtrate Alkalinity Load as CaCO3	LB/D	-1	53	307	142	-30		-15	59	333	198	-15	
Combined WAS & DSD Sidestreams Recycled to Headworks													
Side Stream Flow	GPD	276,327	249,246	326,661	344,731	344,731		323,053	282,809	348,235	379,363	379,363	
Side Stream BOD	LB/D	205	105	310	343	343		252	128	363	412	412	
Side Stream TSS Solids	LB/D	2,491	1,102	3,326	4,117	3,380		2,942	1,302	3,844	4,791	9,978	
Side Stream VSS Solids	LB/D	959	416	1,333	1,566	993		1,176	509	1,651	2,028	5,347	
Side Stream TKN	LB/D	968	346	1,154	1,273	1,393		1,171	417	1,451	1,555	1,763	
Side Stream NH3-N	LB/D	879	314	1,048	1,146	1,261		1,063	379	1,313	1,382	1,581	
Side Stream TP	LB/D	237	106	295	363	396		295	133	350	423	464	
Side Stream Soluble O-P	LB/D	23	14	33	36	36		29	18	39	44	44	
Sidestream Alkalinity Load as CaCO3	LB/D	407	613	725	539	367		460	690	734	608	394	

STRUCTURE LIST

00 ADMINISTRATION
- 001 LAB
- 002 MAINTENANCE BUILDING

10 PLANT 1
- 100 PLANT 1 BUILDING
- 101 INFLUENT SCREEN AND NEW INFLUENT SCREEN
- 102 RAW SEWAGE PUMPING
- 103 GRIT REMOVAL
- 104 PRIMARY SLUDGE THICKENING
- 105 WAS THICKENING

13 PRIMARY CLARIFICATION
- 131 PRIMARY CLARIFIER 1
- 132 PRIMARY CLARIFIER 2
- 133 PRIMARY CLARIFIER 3
- 134 PRIMARY CLARIFIER 4
- 135 PRIMARY CLARIFIER 5
- 136 NEW PRIMARY SCUM PUMPING

16 PLANT 2
- 160 PLANT 2 BUILDING
- 161 SETTLED SEWAGE PUMPING
- 162 SLUDGE PUMPING
- 163 BLOWERS
- 164 PRIMARY SLUDGE SCREENING

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- 191 AERATION TANK 1
  - 191A AERATION TANK 1, TRAIN 1
  - 191B AERATION TANK 1, TRAIN 2
  - 191C AERATION TANK 1, TRAIN 3
- 192 AERATION TANK 2
  - 192A AERATION TANK 2, TRAIN 1
  - 192B AERATION TANK 2, TRAIN 2
  - 192C AERATION TANK 2, TRAIN 3

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- 212 SECONDARY CLARIFIER 2
- 213 SECONDARY CLARIFIER 3
- 214 SECONDARY CLARIFIER 4

24 FILTRATION
- 240 NEW FILTRATION BUILDING
- 241 NEW RAPID, COAGULATION, AND FLOCCULATION TANKS
- 242 NEW FILTER UNITS
- 243 REUSE WATER SYSTEM

27 DISINFECTION
- 270 DISINFECTION BUILDING
- 271 UV DISINFECTION UNITS

30 GRAVITY THICKENING
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- 302 GRAVITY THICKENER 2

33 HIGH STRENGTH WASTE BUILDING
- 330 HIGH STRENGTH WASTE BUILDING
- 331 HIGH STRENGTH WASTE PUMPING
- 332 BELT FILTER PRESS (TO BE RELOCATED)
- 333 HIGH STRENGTH WASTE AND SLUDGE TRANSFER

36 ANAEROBIC DIGESTION
- 361 ANAEROBIC DIGESTER 1
- 362 ANAEROBIC DIGESTER 2
- 363 ANAEROBIC DIGESTER 3
- 364 ANAEROBIC DIGESTER 4
- 365 ANAEROBIC DIGESTER SYSTEM
- 366 NEW ANAEROBIC DIGESTER MIXING & HEATING

39 NEW DIGESTER BUILDING
- 390 NEW ANAEROBIC DIGESTER BUILDING
- 391 NEW ANAEROBIC DIGESTER HEATING SYSTEM
- 392 NEW ANAEROBIC DIGESTER MIXING & HEATING

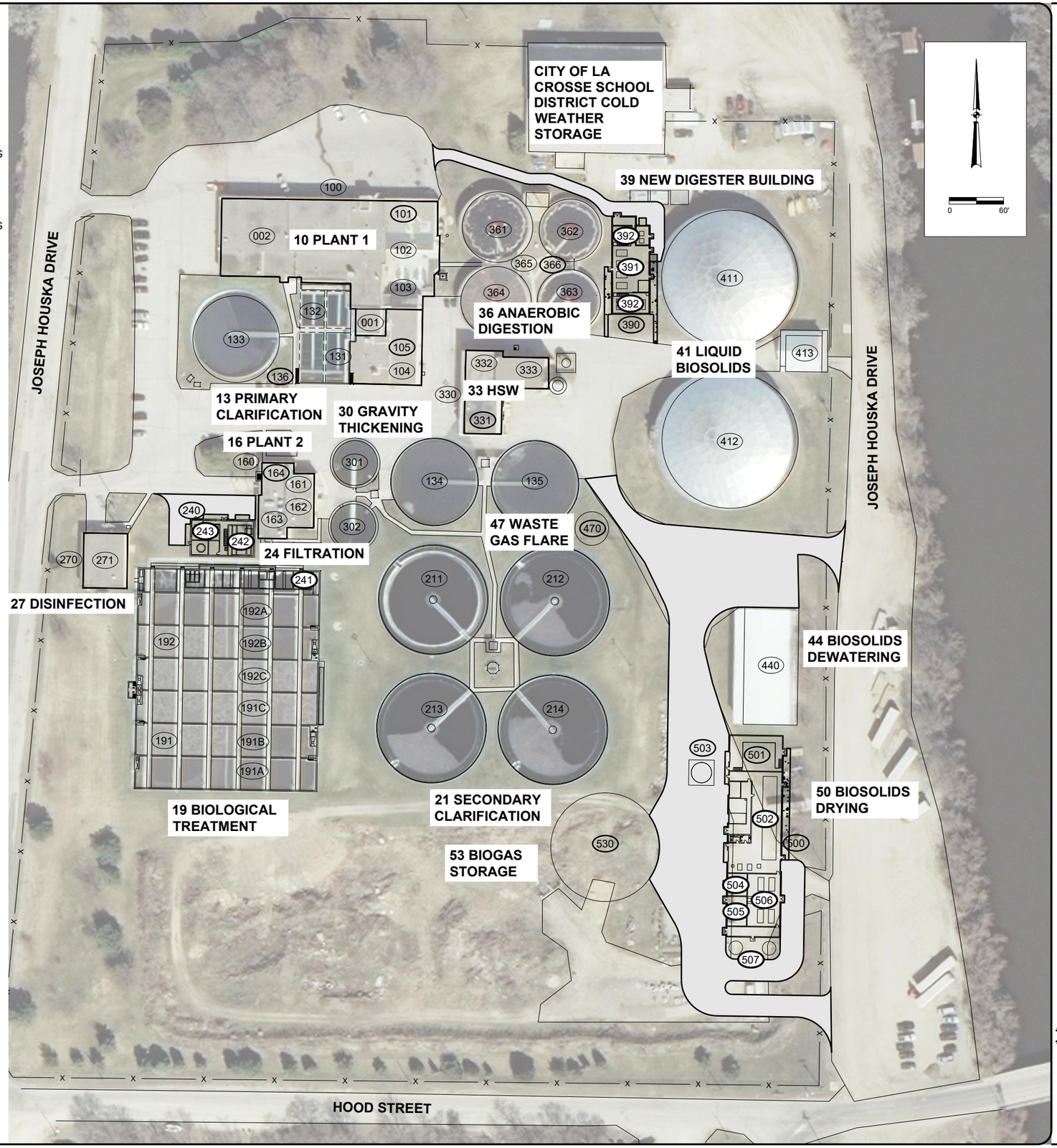
41 LIQUID BIOSOLIDS
- 411 LIQUID BIOSOLIDS STORAGE TANK 1
- 412 LIQUID BIOSOLIDS STORAGE TANK 2
- 413 LIQUID BIOSOLIDS PUMPING

44 BIOSOLIDS DEWATERING
- 440 DEWATERED BIOSOLIDS STORAGE BUILDING

47 WASTE GAS FLARE
- 470 NEW WASTE GAS FLARE STRUCTURE

50 BIOSOLIDS DRYING
- 500 NEW BIOSOLIDS DRYING BUILDING
- 501 SOLIDS DEWATERING
- 502 BIOSOLIDS DRYING
- 503 NEW BIOSOLIDS STORAGE SILO
- 504 BIOGAS CONDITIONING
- 505 ENGINE GENERATOR
- 506 BOILER SYSTEM
- 507 BIOGAS CLEANING TANKS

53 BIOGAS STORAGE
- 530 NEW BIOGAS STORAGE STRUCTURE



Revision Number	Revision Description	Date

Designed By	BEG
Drawn By	BEG
Checked By	JCH
Approved By	XXX
Filename	002CF1.DWG
Project No.	13655
Project Date	12/31/2019

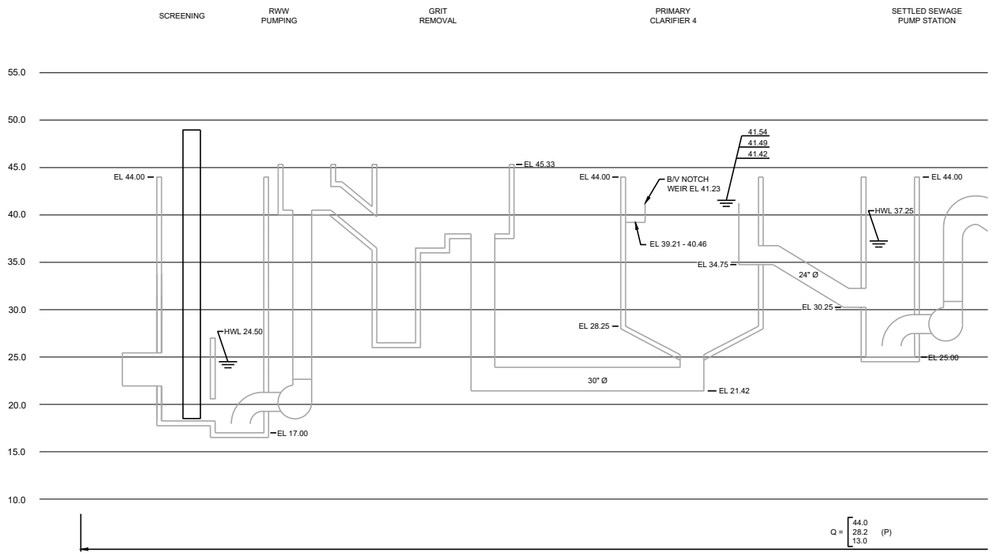
CITY OF LA CROSSE
WASTEWATER TREATMENT FACILITY
IMPROVEMENTS
LA CROSSE WISCONSIN

SITE DEVELOPMENT
FACILITIES KEY PLAN

DONOHUE

Sheet No. 1

Drawing No. 002-CFK-1



GENERAL NOTES:

1. FEMA 100 YEAR FLOOD EL 41.30
2. RIVER FLOOD STAGE EL 36.84** (HYDRAULICS CURRENTLY BASED ON)
3. WATER SURFACE ELEVATIONS BASED ON FLOWS LISTED BELOW (MGD)

LEGEND:

X.XX WATER LEVEL AT
X.XX WATER LEVEL AT
X.XX WATER LEVEL AT

P	M	F	RAS
44.0	57.0	16.0	13.0
28.2	41.8	16.0	13.0
13.0	26.0	13.0	13.0

FLOW BREAKDOWN

P = TOTAL PLANT INFLUENT FLOW
M = MIXED LIQUOR FLOW
F = DISC FILTERS FLOW
RAS = RETURN ACTIVATED SLUDGE FLOW

Revision Number	Revision Description	Drawn By	Checked By	Date

Designed By	WJR
Drawn By	WJR
Checked By	----
Approved By	----
Filename	004M1.DWG
Project No.	13655
Project Date	12/31/2019

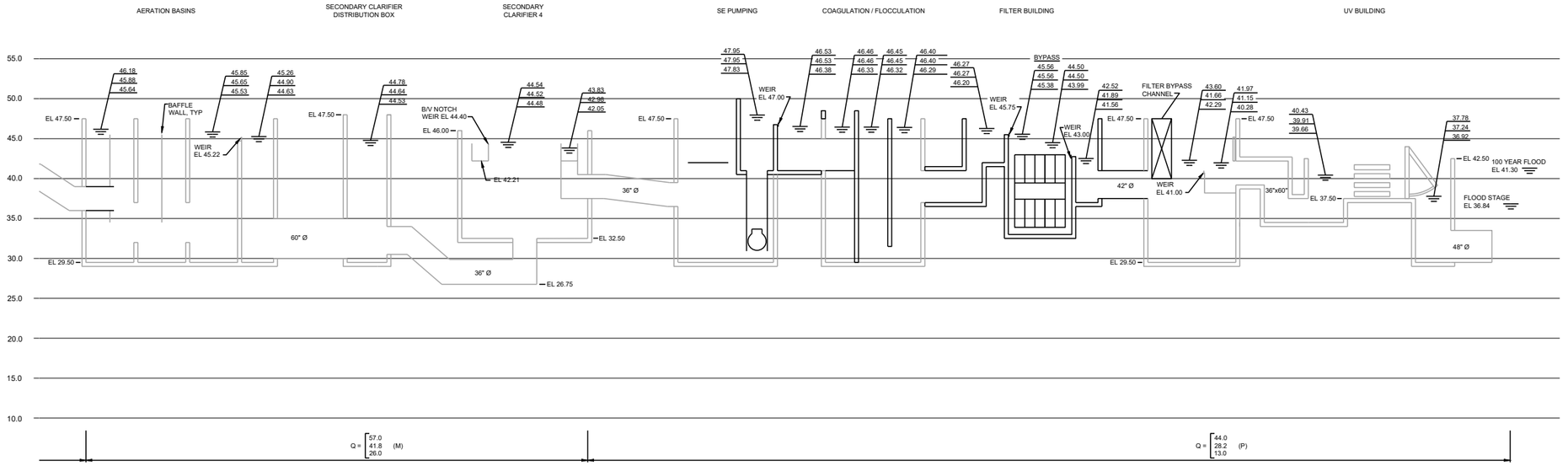
CITY OF LA CROSSE
WASTEWATER TREATMENT FACILITY
IMPROVEMENTS
LA CROSSE WISCONSIN

HYDRAULIC PROFILE

DONOHUE

Sheet No. 2--

Drawing No. 004-M-1



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Designed By	WJR
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CITY OF LA CROSSE
WASTEWATER TREATMENT FACILITY IMPROVEMENTS
LA CROSSE WISCONSIN

HYDRAULIC PROFILE

DONOHUE

Sheet No. 3

Drawing No. 004-M-2

NFPA 820 UPDATES THROUGHOUT TREATMENT SYSTEM UPGRADES

BREWERY WASTE

BREWERY HSW HOLDING TANKS (2)

HOLDING TANK / SEPTAGE / GREASE TRAP HAULING

NEW HOLDING TANK / SEPTAGE RECEIVING UPGRADES

NEW FINE SCREEN

COMMINUTORS (2) REMOVED (2)

GRIT REMOVAL PROGRAM MODIFICATIONS

PRIMARY CLARIFIER SCUM PIT

SCUM

INFLUENT SAMPLER

RAW WASTEWATER

RAW WASTEWATER WET WELL

VORTEX GRIT REMOVAL (2)

PRIMARY CLARIFIERS (5)

AERATION BASIN SPLITTER BOX

PE SAMPLER

PO4 ANALYZER

PO4, NO3-N, TSS ANALYZERS

SETTLED SEWAGE WET WELL

SETTLED SEWAGE PUMPS (4)

AERATION BASINS (2)

DO ANALYZERS

ANAEROBIC

ANOXIC

AEROBIC

AEROBIC

MUCT PROCESS

FINAL CLARIFIER SPLITTER BOX

NEW CLARIFIER LAUNDER COVERS AND CURRENT BAFFLES (4)

FINAL CLARIFIERS (4)

TSS NH3-N OP ANALYZERS & FE SAMPLER

COAG

FLOC

NEW SUBMERGED CLOTH DISC FILTERS

NEW RAPID MIX TANK COAGULATION TANK FLOCCULATION TANK

CHLORINE CONTACT TANK

UV DISINFECTION

EFFLUENT TO MISSISSIPPI RIVER

NEW TURBO AERATION BLOWERS (4)

EXISTING AERATION BLOWERS (3)

HIGH STRENGTH WASTEWATER

HSW HOLDING TANK

HSW PUMP

SCREENINGS LOADOUT TO LANDFILL

FINE SCREEN (1)

SCREENINGS WASH PRESS

RAW WASTEWATER PUMPS (5)

GRIT WASHING (2)

GRIT LOADOUT TO LANDFILL

GRIT BOX

GRIT BOX

NEW PLUG VALVES (4)

RAS PUMP (3)

RAS WET WELL

WAS WET WELL

TSS ANALYZER

WAS PUMP (2)

BELT FILTER PRESS (RELOCATED)

NEW BELT FILTER PRESS

CAKE BIOSOLIDS STORAGE

CAKE BIOSOLIDS LOADOUT TO AGRICULTURAL LAND

THICKENER SCUM BOX

SCUM

THICKENER SPLITTER BOX

PRIMARY

WAS

WAS GRAVITY THICKENER

PRIMARY GRAVITY THICKENER

NEW SCREENINGS LOADOUT TO LANDFILL

NEW PRIMARY SLUDGE SCREEN

BIOGAS

PRIMARY ANAEROBIC DIGESTERS (4)

NEW JET MIXING SYSTEMS (4)

DIGESTER DISCHARGE PUMP (2)

POLYMER

PRIMARY GBT

BIOSOLIDS STORAGE TANKS (2)

POLYMER

FERRIC

NEW WAS GBT

POLYMER

FERRIC

NEW WASTE GAS BURNER

LIQUID BIOSOLIDS LOADOUT TO AGRICULTURAL LAND

NEW BIOSOLIDS BELT DRYER

NEW DRIED BIOSOLIDS STORAGE SILO

DRY BIOSOLIDS CONVEYOR

NEW DRY BIOSOLIDS TO DISPOSAL / INCINERATION

HOT WATER

COOL WATER

NEW HEAT EXCHANGERS (4)

NEW BIOGAS CONDITIONING

NEW COGENERATION UNIT

NEW HEAT EXCHANGERS (2)

NEW BOILERS (4)

NEW DUAL MEMBRANE BIOGAS STORAGE

BIOGAS

Revision Number	Revision Description	Drawn By	Checked By	Date

Designed By	###
Drawn By	###
Checked By	####
Approved By	####
Filename	N2 SCHEMATIC.DWG
Project No.	13655
Project Date	12/31/2019

CITY OF LA CROSSE
WASTEWATER TREATMENT FACILITY
IMPROVEMENTS
LA CROSSE WISCONSIN

PROPOSED FLOW SCHEMATIC

DONOHUE

Sheet No. 4

Drawing No. 004-M-3

CLIENT CITY OF LA CROSSE | **OPINION OF PROBABLE CONST COST** | **DONOHUE & ASSOCIATES, INC.**

PROJECT WASTEWATER TREATMENT FACILITY IMP | PRELIMINARY DESIGN PHASE

PROJECT NO. 13655

MANAGER: LOCKETT 03/16/20

DIVISION SUMMARY

DIV NO.	DIVISION NAME	M, E, L O & P	V O & P	CONSTRUCTION MATERIAL	CONSTRUCTION EQUIPMENT	LABOR	VENDOR	TOTAL	Part of Total
1	GENERAL REQUIREMENTS	15.0%	4.0%	56,199	34,543	239,975	8,694	339,411	1.5%
2	EXISTING CONDITIONS	15.0%	4.0%	0	0	0	0	0	0.0%
3	CONCRETE	15.0%	4.0%	686,450	96,764	792,045	0	1,575,260	7.0%
4	MASONRY	15.0%	4.0%	75,787	21,100	132,492	0	229,379	1.0%
5	METALS	15.0%	4.0%	381,601	11,854	88,629	0	482,084	2.1%
6	WOOD, PLASTICS, AND COMPOSITES	15.0%	4.0%	0	0	0	0	0	0.0%
7	THERMAL AND MOISTURE PROTECTION	15.0%	4.0%	29,210	2,243	12,018	0	43,470	0.2%
8	OPENINGS	15.0%	4.0%	40,549	0	0	0	40,549	0.2%
9	FINISHES	15.0%	4.0%	26,734	0	43,072	0	69,806	0.3%
10	SPECIALTIES	15.0%	4.0%	2,616	0	598	0	3,214	0.0%
11	EQUIPMENT	15.0%	4.0%	0	0	0	0	0	0.0%
12	FURNISHINGS	15.0%	4.0%	110,356	0	87,543	39,474	237,374	1.1%
13	SPECIAL CONSTRUCTION	15.0%	4.0%	0	0	0	0	0	0.0%
14	CONVEYING EQUIPMENT	15.0%	4.0%	0	0	0	0	0	0.0%
21	FIRE SUPRESSION	15.0%	4.0%	0	0	0	0	0	0.0%
22	PLUMBING	15.0%	7.5%	74,750	0	60,950	0	135,700	0.6%
23	HVAC	15.0%	7.5%	264,615	0	142,773	0	407,388	1.8%
25	INTEGRATED AUTOMATION	15.0%	4.0%	0	0	0	0	0	0.0%
26	ELECTRICAL	15.0%	15.0%	3,626,734	0	481,324	391,000	4,499,059	20.0%
27	COMMUNICATIONS	15.0%	4.0%	0	0	0	0	0	0.0%
28	ELECTRONIC SAFETY AND SECURITY	15.0%	4.0%	0	0	0	0	0	0.0%
31	EARTHWORK	15.0%	4.0%	455,228	407,110	365,010	0	1,227,347	5.5%
32	EXTERIOR IMPROVEMENTS	15.0%	4.0%	809,642	78,263	98,170	0	986,074	4.4%
33	UTILIITES	15.0%	4.0%	1,371,726	228,850	228,850	0	1,829,426	8.1%
34	TRANSPORTATION	15.0%	4.0%	0	0	0	0	0	0.0%
35	NFPA 820 COMPLIANCE	15.0%	7.5%	374,696	7,229	168,583	0	550,508	2.4%
40M	PROCESS INTERCONNECTIONS: PROCESS	15.0%	6.0%	2,170,429	4,676	568,232	0	2,743,338	12.2%
40IC	PROCESS INTERCONNECTIONS: I&C	15.0%	4.0%	458,034	0	288,144	0	746,178	3.3%
41	MATERIAL PROCESSING AND HANDLING	15.0%	7.5%	0	0	0	0	0	0.0%
42	PROCESS HEATING, COOLING, AND DRYIN	15.0%	7.5%	0	0	0	0	0	0.0%
43	PROCESS GAS AND LIQUID HANDLING	15.0%	7.5%	152,260	115	240,605	2,107,070	2,500,050	11.1%
44	POLLUTION AND WASTE CONTROL EQUIPM	15.0%	7.5%	0	0	0	0	0	0.0%
45	INDUSTRY SPECIFIC MANUFACTURING EQ	15.0%	7.5%	0	0	0	0	0	0.0%
46	WATER AND WASTEWATER EQUIPMENT	15.0%	7.5%	218,500	2,300	715,933	2,909,853	3,846,586	17.1%
48	ELECTRICAL POWER GENERATION	15.0%	15.0%	0	0	0	0	0	0.0%
	Subtotal Without Global Markups			11,386,117	895,047	4,754,943	5,456,092	22,492,199	100%
	Global Markups	M, E, L O & P	V O & P						
	General Conditions	6.0%	0.0%	683,167	53,703	285,297	0	1,022,166	4.1%
	Prime Markup	5.0%	0.0%	569,306	44,752	237,747	0	851,805	3.4%
	Bonds & Insurance	4.0%	2.0%	455,445	35,802	190,198	109,122	790,566	3.1%
	Subtotal Without Contingency			13,094,034	1,029,304	5,468,184	5,565,213	25,156,737	100%
	Contingency	20.0%	10.0%	2,618,807	205,861	1,093,637	556,521	4,474,826	
	TOTAL			**15,712,841**	**1,235,165**	**6,561,821**	**6,121,735**	**29,631,563**	
	Part of Total			53.0%	4.2%	22.1%	20.7%	100%	

CLIENT	**CITY OF LA CROSSE**	**OPINION OF PROBABLE CONST COST**	**DONOHUE & ASSOCIATES, INC.**
PROJECT	**WASTEWATER TREATMENT FACILITY IMI**	**PRELIMINARY DESIGN PHASE**	
PROJECT NO.	**13655**		
		MANAGER: LOCKETT	**03/16/20**

STRUCTURE SUMMARY

		CONSTRUCTION MATERIAL	EQUIPMENT	LABOR	VENDOR	TOTAL	Part of Total
2	**SITE WORK**	2,376,005	622,374	686,716	345,000	4,030,095	18%
100	**PLANT 1**	2,166,698	10,957	742,097	622,329	3,542,082	16%
130	**PRIMARY CLARIFICATION**	32,940	119	3,786	0	36,845	0%
160	**PLANT 2**	2,433,853	8,681	537,619	1,482,262	4,462,415	20%
191/192	**AERATION TANKS**	1,857,610	34,008	831,467	541,237	3,264,322	15%
193	**TERTIARY TREATMENT TANK**	551,169	83,877	508,191	420,786	1,564,023	7%
210	**SECONDARY CLARIFICATION**	23,000	2,300	105,570	442,728	573,598	3%
240	**FILTRATION BUILDING**	1,883,892	132,731	1,319,946	1,601,750	4,938,319	22%
270	**DISINFECTION BUILDING**	60,950	0	19,550	0	80,500	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
	Subtotal Without Global Markups	11,386,117	895,047	4,754,943	5,456,092	22,492,199	100%
	Global Markups						
	General Conditions **6.0%** **0.0%**	683,167	53,703	285,297	0	1,022,166	4.1%
	Prime Markup **5.0%** **0.0%**	569,306	44,752	237,747	0	851,805	3.4%
	Bonds and Insurance **4.0%** **2.0%**	455,445	35,802	190,198	109,122	790,566	3.1%
	Subtotal Without Contingency	13,094,034	1,029,304	5,468,184	5,565,213	25,156,737	100.0%
	Contingency **20.0%** **10.0%**	2,618,807	205,861	1,093,637	556,521	4,474,826	
	TOTAL	**15,712,841**	**1,235,165**	**6,561,821**	**6,121,735**	**29,631,563**	
	Part of Total	53%	4%	22%	21%	100%	

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 2
STRUCTURE NAME: SITE WORK

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		MANHOLES	EA	5.0	5,000.00	25,000		0	400.00	2,000		0	**27,000**
26	2													
26	3		UTILITY	LS	1.0		0		0		0	100,000.00	100,000	**100,000**
26	4													
26	5		POWER SYSTEM STUDY	EA	1.0		0		0		0	75,000.00	75,000	**75,000**
26	6													
26	7		TESTING AND COMMISSIONING	EA	1.0		0		0		0	125,000.00	125,000	**125,000**
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26	DIV	26	ELECTRICAL (continued next page)											

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	2
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	SITE WORK
PROJECT NO.	13655	03/16/20	

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
26													
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26		SUBTOTAL				25,000		0		2,000		300,000	**327,000**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			3,750		0		300			**4,050**
26		Major Vendor O&P	15.0%									45,000	**45,000**
26		Global Markups	15.0%	2.0%		4,313		0		345		6,900	**11,558**
26	DIV 26	**TOTAL w/o Global Markups**				**28,750**		**0**		**2,300**		**345,000**	**376,050**
		TOTAL w/ Global Markups				**33,063**		**0**		**2,645**		**351,900**	**387,608**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**39,675**		**0**		**3,174**		**387,090**	**429,939**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 2
STRUCTURE NAME: SITE WORK

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	31	EARTHWORK											
31	1	31.10.00	Remove Existing Asphalt	SY	7,181.7	0.00	0	2.67	19,175	4.42	31,743		0	**50,918**
31	2	31.10.00	Strip Topsoil	SY	20,000.0	0.00	0	0.97	19,400	0.46	9,200		0	**28,600**
31	3	31.10.00	Clearing	EA	12.0	0.00	0	168.00	2,016	210.00	2,520		0	**4,536**
31	4	31.10.00	Grubbing	EA	12.0	0.00	0	81.50	978	47.50	570		0	**1,548**
31	5	31.22.00	Grading	SY	16,111.1	0.00	0	0.82	13,211	0.60	9,667		0	**22,878**
31	6					0.00		3.05		1.01				
31	7					0.00		0.30		0.32				
31	8					0.00		0.95		0.70				
31	9					0.00		5.60		2.98				
31	10					0.00		5.60		2.98				
31	11	31.23.33	Trench Excavation	BCY	5,500.0	0.00	0	25.00	137,500	25.00	137,500		0	**275,000**
31	12	31.23.33	Pipe Bedding & Cover	LCY	1,900.0	27.50	52,250	9.40	17,860	9.40	17,860		0	**87,970**
31	13	31.23.33	Trench Backfill - Granular	LCY	2,880.0	20.00	57,600	20.00	57,600	20.00	57,600		0	**172,800**
31	14	31.23.33	Trench Backfill - Native	LCY	320.0	0.00	0	20.00	6,400	20.00	6,400		0	**12,800**
31	15	31.25.00	Erosion Control	LS	1.0	5,000.00	5,000	0.00	0	0.00	0		0	**5,000**
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31			SUBTOTAL				114,850		274,140		273,060		0	**662,050**
31														
31			Material, Construction Equipment, Labor O&P	15.0%			17,228		41,121		40,959			**99,307**
31			Major Vendor O&P	4.0%									0	**0**
31			Global Markups	15.0%	2.0%		19,812		47,289		47,103		0	**114,204**
31	DIV	31	**TOTAL w/o Global Markups**				**132,078**		**315,261**		**314,019**		**0**	**761,357**
			TOTAL w/ Global Markups				**151,889**		**362,550**		**361,121**		**0**	**875,561**
31			**TOTAL w/ Contingency**	20.0%	10.0%		**182,267**		**435,060**		**433,346**		**0**	**1,050,673**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 2
STRUCTURE NAME: SITE WORK

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	32	EXTERIOR IMPROVEMENTS											
32	1	32.11.23	1 1/4" Base Aggregate Dense	SY	13,126.0	21.50	282,209	1.19	15,620	0.83	10,895		0	**308,724**
32	2	32.12.16	Asphalt Pavement	TON	4,620.0	80.00	369,600	4.17	19,265	6.40	29,568		0	**418,433**
32	3	32.16.23	Concrete Sidewalk	SF	2,630.0	3.50	9,205	0.00	0	4.00	10,520		0	**19,725**
32	4	32.31.13	Manual Slide Gates	LF	72.0	150.00	10,800	13.15	947	30.00	2,160		0	**13,907**
32	5	32.92.00	Site Restoration	SY	16,111.1	2.00	32,222	2.00	32,222	2.00	32,222		0	**96,667**
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32			SUBTOTAL				704,036		68,054		85,365		0	**857,455**
32														
32			Material, Construction Equipment, Labor O&P	15.0%			105,605		10,208		12,805			**128,618**
32			Major Vendor O&P	4.0%									0	**0**
32			Global Markups	15.0%	2.0%		121,446		11,739		14,725		0	**147,911**
32	DIV	32	**TOTAL w/o Global Markups**				**809,642**		**78,263**		**98,170**		**0**	**986,074**
			TOTAL w/ Global Markups				**931,088**		**90,002**		**112,895**		**0**	**1,133,985**
32			**TOTAL w/ Contingency**	20.0%	10.0%		**1,117,305**		**108,002**		**135,474**		**0**	**1,360,782**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 2
STRUCTURE NAME: SITE WORK
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	33	UTILITIES											
33	1	33.05.05	4-inch Scum GLDI (Buried)	LF	240.0	35.00	8,400	25.00	6,000	25.00	6,000		0	**20,400**
33	2	33.05.05	6-inch DS 316SS (Buried)	LF	50.0	20.00	1,000	25.00	1,250	25.00	1,250		0	**3,500**
33	3	33.05.05	10-inch DS 304SS (Buried)	LF	82.0	50.00	4,100	25.00	2,050	25.00	2,050		0	**8,200**
33	4	33.05.05	12-inch DS 304SS (Buried)	LF	75.0	55.00	4,125	25.00	1,875	25.00	1,875		0	**7,875**
33	5	33.05.05	8-Inch DS 304SS (Outside Exposed)	LF	225.0	40.00	9,000	25.00	5,625	25.00	5,625		0	**20,250**
33	6	33.05.05	8-Inch DS 304SS (Buried)	LF	75.0	40.00	3,000	25.00	1,875	25.00	1,875		0	**6,750**
33	7	33.05.05	6-Inch DS 304SS (Outside Exposed)	LF	38.0	20.00	760	25.00	950	25.00	950		0	**2,660**
33	8	33.05.05	6-Inch DS 304SS (Utility Corridor)	LF	700.0	20.00	14,000	25.00	17,500	25.00	17,500		0	**49,000**
33	9	33.05.05	6-inch DS 304SS (Buried)	LF	395.0	20.00	7,900	25.00	9,875	25.00	9,875		0	**27,650**
33	10	33.05.05	14-Inch BG HDPE (Utility Corridor)	LF	580.0	20.00	11,600	25.00	14,500	25.00	14,500		0	**40,600**
33	11	33.05.05	14-Inch BG HDPE (Buried)	LF	272.0	20.00	5,440	25.00	6,800	25.00	6,800		0	**19,040**
33	12	33.05.05	10-Inch BG HDPE (Utility Corridor)	LF	120.0	18.00	2,160	25.00	3,000	25.00	3,000		0	**8,160**
33	13	33.05.05	20-Inch RAS DIP (Buried)	LF	132.0	85.00	11,220	25.00	3,300	25.00	3,300		0	**17,820**
33	14	33.05.05	8-inch HWS DIP (Utility Corridor)	LF	700.0	35.00	24,500	25.00	17,500	25.00	17,500		0	**59,500**
33	15	33.05.05	8-Inch HWR DIP (Utility Corridor)	LF	700.0	35.00	24,500	25.00	17,500	25.00	17,500		0	**59,500**
33	16	33.05.05	8-Inch W3 DIP (Utility Corridor)	LF	700.0	35.00	24,500	25.00	17,500	25.00	17,500		0	**59,500**
33	17	33.05.05	8-Inch W1 DIP (Utility Corridor)	LF	700.0	35.00	24,500	25.00	17,500	25.00	17,500		0	**59,500**
33	18	33.05.05	8-Inch D PVC (Buried)	LF	270.0	10.00	2,700	25.00	6,750	25.00	6,750		0	**16,200**
33	19	33.05.05	Concrete Utility Corridor	LF	700.0	1,200.00	840,000	25.00	17,500	25.00	17,500		0	**875,000**
33	20	33.05.05	24-Inch RAS	LF	70.0	100.00	7,000	25.00	1,750	25.00	1,750		0	**10,500**
33	21	33.05.05	4- to 8-Inch DI Fittings	EA	12.0	300.00	3,600	100.00	1,200	100.00	1,200		0	**6,000**
33	22	33.05.05	20-Inch DI Fittings	EA	8.0	3,100.00	24,800	400.00	3,200	400.00	3,200		0	**31,200**
33	23		4-Ft Diamater Manhole	VF	16.0	250.00	4,000	250.00	4,000	250.00	4,000		0	**12,000**
33	24													
33	25	33.05.05	Primary Sludge Pipeline Replacement	LS	1.0	10,000.00	10,000	0.00	0	0.00	0		0	**10,000**
33	26													
33	27		20-Inch RAS Insertion Valves	EA	4.0	30,000.00	120,000	5,000.00	20,000	5,000.00	20,000		0	**160,000**
33	28													
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33			SUBTOTAL				1,192,805		199,000		199,000		0	**1,590,805**
33														
33			Material, Construction Equipment, Labor O&P	15.0%			178,921		29,850		29,850			**238,621**
33			Major Vendor O&P	4.0%									0	**0**
33			Global Markups	15.0%	2.0%		205,759		34,328		34,328		0	**274,414**
33	DIV	33	**TOTAL w/o Global Markups**				**1,371,726**		**228,850**		**228,850**		**0**	1,829,426
			TOTAL w/ Global Markups				**1,577,485**		**263,178**		**263,178**		**0**	**2,103,840**
33			**TOTAL w/ Contingency**	20.0%	10.0%		**1,892,982**		**315,813**		**315,813**		**0**	**2,524,608**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 2
STRUCTURE NAME: SITE WORK

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40IC	**PROCESS INTERCONNECTIONS: IC**											
40IC	1													
40IC	2		Fiber Loop (entire site) (12-strand)	FT	4,000.0	6.00	24,000		0	7.00	28,000		0	**52,000**
40IC	3		Fiber Termination (24) at each node (9)	Ea.	216.0	25.00	5,400		0	30.00	6,480		0	**11,880**
40IC	4		Fiber Testing (9 legs x 12 strands)	Ea.	108.0		0		0	30.00	3,240		0	**3,240**
40IC	5													
40IC	6													
40IC	7													
40IC	8													
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40IC	43													
40IC	44													
40IC														
40IC														
40IC			SUBTOTAL				29,400		0		37,720		0	**67,120**
40IC														
40IC			Material, Construction Equipment, Labor O&P	15.0%			4,410		0		5,658			**10,068**
40IC			Major Vendor O&P	4.0%									0	**0**
40IC			Global Markups	15.0%	2.0%		5,072		0		6,507		0	**11,578**
40IC	DIV	40IC	**TOTAL w/o Global Markups**				**33,810**		**0**		**43,378**		**0**	**77,188**
			TOTAL w/ Global Markups				**38,882**		**0**		**49,885**		**0**	**88,766**
40IC			**TOTAL w/ Contingency**	20.0%	10.0%		**46,658**		**0**		**59,862**		**0**	**106,519**

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	1	**GENERAL REQUIREMENTS**											
1	1		Concrete removal	CF	130.0		0	5.00	650	31.00	4,030		0	**4,680**
1	2													
1	3		GBT Piping Removals	LS	1.0		0		0	1,000.00	1,000		0	**1,000**
1	4													
1	5		Gate Removals	Ea	4.0		0		0	450.00	1,800		0	**1,800**
1	6													
1	7		Comminutor Removal	Ea	2.0		0		0	500.00	1,000		0	**1,000**
1	8													
1	9		Headworks Gas Unit Heater Removal	Ea	1.0		0		0	500.00	500		0	**500**
1	10													
1	11		Misc HVAC Removals	LS	1.0		0		0	5,500.00	5,500		0	**5,500**
1	12													
1	13													
1	14													
1	15													
1	16													
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1	35													
1														
1			SUBTOTAL				0		650		13,830		0	**14,480**
1														
1			Material, Construction Equipment, Labor O&P	15.0%			0		98		2,075			**2,172**
1			Major Vendor O&P	4.0%									0	**0**
1			Global Markups	15.0%	2.0%		0		112		2,386		0	**2,498**
1	DIV	1	**TOTAL w/o Global Markups**				**0**		**748**		**15,905**		**0**	**16,652**
			TOTAL w/ Global Markups				**0**		**860**		**18,290**		**0**	**19,150**
1			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**1,032**		**21,948**		**0**	**22,980**

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DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		New concrete slab over screen chamber	CY	6.0	490.00	2,940	40.00	240	450.00	2,700		0	**5,880**
3	2		Concrete equipment pads	CY	5.0	725.00	3,625	93.00	465	645.00	3,225		0	**7,315**
3	3		containment curb	LF	55.0	7.00	385	2.00	110	15.00	825		0	**1,320**
3	4		Drill and grout dowels	EA	160.0	11.40	1,824	11.40	1,824	63.00	10,080		0	**13,728**
3	5		slab over stair opening in electr. Room	CY	2.0	490.00	980	40.00	80	450.00	900		0	**1,960**
3	6													
3	7													
3	8													
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3														
3			SUBTOTAL				9,754		2,719		17,730		0	**30,203**
3														
3			Material, Construction Equipment, Labor O&P	15.0%			1,463		408		2,660			**4,530**
3			Major Vendor O&P	4.0%									0	**0**
3			Global Markups	15.0%	2.0%		1,683		469		3,058		0	**5,210**
3	DIV	3	**TOTAL w/o Global Markups**				**11,217**		**3,127**		**20,390**		**0**	**34,733**
			TOTAL w/ Global Markups				**12,900**		**3,596**		**23,448**		**0**	**39,943**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**15,480**		**4,315**		**28,138**		**0**	**47,932**

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PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	4	MASONRY											
4	1		Miscellaneous wall patches	LS	1.0	2,000.00	2,000		0	5,000.00	5,000		0	**7,000**
4	2													
4	3													
4	4													
4	5													
4	6													
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4	35													
4														
4			SUBTOTAL				2,000		0		5,000		0	**7,000**
4														
4			Material, Construction Equipment, Labor O&P	15.0%			300		0		750			**1,050**
4			Major Vendor O&P	4.0%									0	**0**
4			Global Markups	15.0%	2.0%		345		0		863		0	**1,208**
4	DIV	4	**TOTAL w/o Global Markups**				**2,300**		**0**		**5,750**		**0**	**8,050**
			TOTAL w/ Global Markups				**2,645**		**0**		**6,613**		**0**	**9,258**
4			**TOTAL w/ Contingency**	20.0%	10.0%		**3,174**		**0**		**7,935**		**0**	**11,109**

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DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	5	METALS											
5	1		platform at GBT	LS	1.0	5,000.00	5,000		0	5,000.00	5,000		0	**10,000**
5	2		aluminum grating	SF	100.0	31.40	3,140	2.00	200	3.25	325		0	**3,665**
5	3													
5	4													
5	5		GBT 1 Hopper	Ea.	1.0	500.00	500		0	500.00	500		0	**1,000**
5	6													
5	7													
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5	9													
5	10													
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5														
5			SUBTOTAL				8,640		200		5,825		0	**14,665**
5														
5			Material, Construction Equipment, Labor O&P	15.0%			1,296		30		874			**2,200**
5			Major Vendor O&P	4.0%									0	**0**
5			Global Markups	15.0%	2.0%		1,490		35		1,005		0	**2,530**
5	DIV	5	**TOTAL w/o Global Markups**				**9,936**		**230**		**6,699**		**0**	**16,865**
			TOTAL w/ Global Markups				**11,426**		**265**		**7,704**		**0**	**19,394**
5			**TOTAL w/ Contingency**	20.0%	10.0%		**13,712**		**317**		**9,244**		**0**	**23,273**

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LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
DIV	10	SPECIALTIES											
10	1	fire extinguisher	EA	6.0	175.00	1,050		0	40.00	240		0	**1,290**
10	2												
10	3												
10	4												
10	5												
10	6												
10	7												
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10													
10		SUBTOTAL				1,050		0		240		0	**1,290**
10													
10		Material, Construction Equipment, Labor O&P	15.0%			158		0		36			**194**
10		Major Vendor O&P	4.0%									0	**0**
10		Global Markups	15.0%	2.0%		181		0		41		0	**223**
10	DIV 10	**TOTAL w/o Global Markups**				**1,208**		**0**		**276**		**0**	**1,484**
		TOTAL w/ Global Markups				**1,389**		**0**		**317**		**0**	**1,706**
10		**TOTAL w/ Contingency**	20.0%	10.0%		**1,666**		**0**		**381**		**0**	**2,047**

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DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	12	FURNISHINGS											
12	1	12345	High Density Plastic Laminate Base Cabinets	LF	114.0	300.00	34,200		0	200.00	22,800		0	**57,000**
12	2	12345	High Density Plastic Laminate Wall Cabinets	LF	45.0	156.00	7,020		0	104.00	4,680		0	**11,700**
12	3	12345	Epoxy Countertop	SF	300.0	50.00	15,000		0	10.75	3,225		0	**18,225**
12	4	12345	Fume Hood	EA	1.0	4,700.00	4,700		0	7,100.00	7,100		0	**11,800**
12	5	12345	Desks	EA	3.0		0		0		0	4,062.00	12,186	**12,186**
12	6	12345	Desk Chair	EA	3.0		0		0		0	466.00	1,398	**1,398**
12	7	12345	Removal of lab cabinet	LF	114.0		0		0	20.50	2,337		0	**2,337**
12	8	12345	Removal of countertop	LF	114.0		0		0	8.25	941		0	**941**
12	9	12345	Removal of fume hood	EA	1.0		0		0	300.00	300		0	**300**
12	10	12345	Epoxy Resin Sink	EA	2.0	241.00	482		0	91.00	182		0	**664**
12	11													
12	12	12345	Office Spaces in Electrical Room	SF	864.0	40.00	34,560		0	40.00	34,560		0	**69,120**
12	13	12345	Desks	EA	6.0		0		0		0	4,062.00	24,372	**24,372**
12	14													
12	15													
12	16													
12	17													
12	18													
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12	35													
12														
12			SUBTOTAL				95,962		0		76,125		37,956	**210,043**
12														
12			Material, Construction Equipment, Labor O&P	15.0%			14,394		0		11,419			**25,813**
12			Major Vendor O&P	4.0%									1,518	**1,518**
12			Global Markups	15.0%	2.0%		16,553		0		13,131		789	**30,474**
12	DIV	12	**TOTAL w/o Global Markups**				**110,356**		**0**		**87,543**		**39,474**	**237,374**
			TOTAL w/ Global Markups				**126,910**		**0**		**100,675**		**40,264**	**267,848**
12			**TOTAL w/ Contingency**	20.0%	10.0%		**152,292**		**0**		**120,810**		**44,290**	**317,391**

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	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	22	PLUMBING											
22	1		Fixture	Ea	4.0	2,500.00	10,000		0	1,000.00	4,000		0	**14,000**
22	2													
22	3													
22	4													
22	5													
22	6													
22	7													
22	8													
22	9													
22	10													
22	11													
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22	35													
22														
22			SUBTOTAL				10,000		0		4,000		0	**14,000**
22														
22			Material, Construction Equipment, Labor O&P	15.0%			1,500		0		600			**2,100**
22			Major Vendor O&P	7.5%									0	**0**
22			Global Markups	15.0%	2.0%		1,725		0		690		0	**2,415**
22	DIV	22	**TOTAL w/o Global Markups**				**11,500**		**0**		**4,600**		**0**	**16,100**
			TOTAL w/ Global Markups				**13,225**		**0**		**5,290**		**0**	**18,515**
22			**TOTAL w/ Contingency**	20.0%	10.0%		**15,870**		**0**		**6,348**		**0**	**22,218**

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LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	23 HVAC											
23	1	Headworks MAU	CFM	5,000.0	10.00	50,000		0	5.00	25,000		0	**75,000**
23	2	Headworks Exhaust	CFM	5,000.0	0.75	3,750		0	0.50	2,500		0	**6,250**
23	3												
23	4	Admin HVAC Improvements	Tons	15.0	2,500.00	37,500		0	1,500.00	22,500		0	**60,000**
23	5	Lab HVAC Improvements	Tons	7.5	2,500.00	18,750		0	1,500.00	11,250		0	**30,000**
23	6												
23	7	Conversion to Central Heating Plant	LS	1.0	20,000.00	20,000		0	12,000.00	12,000		0	**32,000**
23	8	Misc Heater Replacemenst	LS	1.0	20,000.00	20,000		0	10,000.00	10,000		0	**30,000**
23	9												
23	10												
23	11												
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23													
23		SUBTOTAL				150,000		0		83,250		0	**233,250**
23													
23		Material, Construction Equipment, Labor O&P	15.0%			22,500		0		12,488			**34,988**
23		Major Vendor O&P	7.5%									0	**0**
23		Global Markups	15.0%	2.0%		25,875		0		14,361		0	**40,236**
23	DIV	23 **TOTAL w/o Global Markups**				**172,500**		**0**		**95,738**		**0**	**268,238**
		TOTAL w/ Global Markups				**198,375**		**0**		**110,098**		**0**	**308,473**
23		**TOTAL w/ Contingency**	20.0%	10.0%		**238,050**		**0**		**132,118**		**0**	**370,168**

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	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		MCC	EA	1.0	2,250.00	2,250		0	505.00	505		0	2,755
26	2		480V SPD	EA	2.0	13,900.00	27,800		0	1,050.00	2,100		0	29,900
26	3		SIZE 1 STARTER	EA	30.0	1,700.00	51,000		0	149.00	4,470		0	55,470
26	4		100A CB	EA	30.0	950.00	28,500		0	101.00	3,030		0	31,530
26	5		SIZE 2 STARTER	EA	5.0	1,950.00	9,750		0	201.00	1,005		0	10,755
26	6		CONDUIT AND CONDUCTORS	LS	1.0	900,000.00	900,000		0	100,000.00	100,000		0	1,000,000
26	7		MOTOR CONNECTIONS	EA	20.0		0		0	200.00	4,000		0	4,000
26	8		1200A MAIN BREAKER	EA	4.0	16,200.00	64,800		0	995.00	3,980		0	68,780
26	9		FIRE ALARM SYSTEM	LS	1.0		0		0	10,000.00	10,000	40,000.00	40,000	50,000
26	10		DUCT BANK AND SITE WORK	LS	1.0	70,000.00	70,000		0	60,000.00	60,000		0	130,000
26	11		100HP VFD	EA	4.0	13,300.00	53,200		0	2,850.00	11,400		0	64,600
26	12													
26	13		100HP HARMONIC FILTERS	EA	5.0	5,468.00	27,340		0	712.00	3,560		0	30,900
26	14													
26	15													
26	16													
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26	43													
26	44													
26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 100
STRUCTURE NAME: PLANT 1

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
26													
26	45												
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26	72												
26	73												
26	74												
26	75	I&C Wiring & Conduit	LS	1.0	10,000.00	10,000		0	5,500.00	5,500		0	**15,500**
26	76												
26	77												
26	78												
26	79												
26													
26		SUBTOTAL				1,244,640		0		209,550		40,000	**1,494,190**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			186,696		0		31,433			**218,129**
26		Major Vendor O&P	15.0%									6,000	**6,000**
26		Global Markups	15.0%	2.0%		214,700		0		36,147		920	**251,768**
26	DIV 26	**TOTAL w/o Global Markups**				**1,431,336**		**0**		**240,983**		**46,000**	1,718,319
		TOTAL w/ Global Markups				**1,646,036**		**0**		**277,130**		**46,920**	**1,970,086**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**1,975,244**		**0**		**332,556**		**51,612**	**2,359,412**

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	35	WATERWAY AND MARINE CONSTRUCTION											
35	1		Step Screen Pit Low Temp Alarm Switch	Ea.	1.0	750.00	750		0	120.00	120		0	870
35	2		Washer/Compactor Water Solenoids	Ea.	2.0		0		0		0		0	0
35	3		Washer/Compactor Water Pressure Switch	Ea.	2.0	750.00	1,500		0	120.00	240		0	1,740
35	4		Step Screen/ Wash Press Controls	Ea.	1.0	2,500.00	2,500		0	300.00	300		0	2,800
35	5		Hopper Level Alarm Controls	Ea.	1.0	750.00	750		0	240.00	240		0	990
35	6		Grit Classifier Operator Controls	Ea.	2.0	750.00	1,500		0	240.00	480		0	1,980
35	7													
35	8		block up wall openings	LS	1.0	2,000.00	2,000		0	3,000.00	3,000		0	5,000
35	9		patch floor openings	LS	1.0	4,000.00	4,000	2,000.00	2,000	4,000.00	4,000		0	10,000
35	10		add door and landing in motor room	LS	1.0	3,000.00	3,000		0	2,000.00	2,000		0	5,000
35	11		wall around stair in garage, door to exterior	LS	1.0	7,500.00	7,500		0	7,500.00	7,500		0	15,000
35	12		18" tall concrete wall next to clarifier	LF	100.0	13.00	1,300	3.00	300	25.00	2,500		0	4,100
35	13		drill and grout dowels for 18" wall	EA	140.0	11.40	1,596	11.40	1,596	63.00	8,820		0	12,012
35	14													
35	15													
35	16													
35	17													
35	18		Replace 120Vac outlets	Ea.	10.0	509.50	5,095		0	134.50	1,345		0	6,440
35	19		EXTERIOR 120Vac outlet	Ea.	1.0	600.00	600		0	135.00	135		0	735
35	20		Lighting	Ea.	30.0	2,950.00	88,500		0	175.00	5,250		0	93,750
35	21		relocating transformer and lighitng panel	LS	1.0		0		0	5,000.00	5,000		0	5,000
35	22		Junction Boxes nema 7	ea	2.0	1,500.00	3,000		0	200.00	400		0	3,400
35	23		explosion proof seal offs	EA	30.0	50.00	1,500		0	50.00	1,500		0	3,000
35	24		Rollup Door Opener and controls	Ea.	2.0		0		0		0		0	0
35	25													
35	26													
35	27													
35	28													
35	29													
35	30													
35	31													
35	32		Motor Room / Drywell Ventilation Improvements	CFM	3,150.0	10.75	33,863		0	5.50	17,325		0	51,188
35	33		GBT Ventilation Improvements	CFM	3,000.0	10.75	32,250		0	5.50	16,500		0	48,750
35	34		Primary Sludge Pumping Ventilation Improvements	CFM	2,500.0	10.75	26,875		0	5.50	13,750		0	40,625
35	35													
35	36													
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35														
35			SUBTOTAL				218,079		3,896		90,405		0	312,380
35														
35			Material, Construction Equipment, Labor O&P	15.0%			32,712		584		13,561			46,857
35			Major Vendor O&P	7.5%									0	0
35			Global Markups	15.0%	2.0%		37,619		672		15,595		0	53,885
35	DIV	35	**TOTAL w/o Global Markups**				**250,790**		**4,480**		**103,966**		**0**	**359,236**
			TOTAL w/ Global Markups				**288,409**		**5,152**		**119,561**		**0**	**413,122**
35			**TOTAL w/ Contingency**	20.0%	10.0%		**346,091**		**6,183**		**143,473**		**0**	**495,746**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

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STRUCTURE NAME: PLANT 1

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		1.50" W3 wash press ball valves	Ea.	4.0	220.00	880		0	88.00	352		0	**1,232**
40M	2		1.50" W3 solenoid valves	Ea.	2.0	1,500.00	3,000		0	600.00	1,200		0	**4,200**
40M	3		Pressure relief valve (4")	Ea.	1.0	3,500.00	3,500		0	200.00	200		0	**3,700**
40M	4		1.50" W3 SS piping	ft	20.0	25.00	500		0	10.00	200		0	**700**
40M	5		1.50" SS Flanges	Ea.	8.0	50.00	400	5.00	40	80.00	640		0	**1,080**
40M	6		1.50" W3 SS 90 deg elbow	Ea.	1.0	80.00	80		0	32.00	32		0	**112**
40M	7		1.50" W3 SS 90 deg Tee	Ea.	3.0	50.00	150		0	50.00	150		0	**300**
40M	8													
40M	9													
40M	10													
40M	11													
40M	12													
40M	13													
40M	14													
40M	15		Sludge Piping (TWAS/DS)											
40M	16		6" DI Pipe on GBT Discharge	ft	95.5	141.20	13,485		0	56.48	5,394		0	**18,878**
40M	17		6" DI 90deg on GBT Discharge	Ea.	8.0	283.00	2,264		0	113.20	906		0	**3,170**
40M	18		6" DI GBT Discharge Plug Valves w/ Actuators	Ea.	2.0	5,392.00	10,784		0	2,156.80	4,314		0	**15,098**
40M	19													
40M	20		6" DI Pipe on GBT Feed	ft	60.0	141.20	8,472		0	56.48	3,389		0	**11,861**
40M	21		6" DI 90deg on GBT Suction (allow for snaking)	Ea.	8.0	283.00	2,264		0	113.20	906		0	**3,170**
40M	22		6" DI GBT Discharge Plug Valves w/ Actuators	Ea.	2.0	5,392.00	10,784		0	2,156.80	4,314		0	**15,098**
40M	23													
40M	24		Polymer PVC Piping											
40M	25		1.5" PO to GBT	ft	36.0	9.85	355		0	14.05	506		0	**860**
40M	26		1.5" PO 90deg	Ea.	3.0	1.97	6		0	25.50	77		0	**82**
40M	27		1.5" PO Tee	Ea.	4.0	2.61	10		0	38.00	152		0	**162**
40M	28		1.5" PO Ball Valve	Ea.	14.0	84.50	1,183		0	25.50	357		0	**1,540**
40M	29													
40M	30		W3 Piping 304 SS Sch 10											
40M	31		1.5" W3 Pipe	ft	34.0	21.00	714	0.68	23	10.95	372		0	**1,109**
40M	32		1.5" W3 90deg	Ea.	10.0	83.50	835		0	57.00	570		0	**1,405**
40M	33		1.5" W3 Ball Valve	Ea.	6.0	220.00	1,320		0	88.00	528		0	**1,848**
40M	34		1.5" W3 Pressure Reducing Valve	Ea.	4.0	1,925.00	7,700		0	39.00	156		0	**7,856**
40M	35		1.5" W3 Iron Body Wye Strainer	Ea.	2.0	51.50	103		0	42.50	85		0	**188**
40M	36													
40M	37		FECL PVC											
40M	38		2" PVC	ft	30.0	11.35	341		0	15.40	462		0	**803**
40M	39		2" 90deg	Ea.	4.0	133.00	532		0	29.50	118		0	**650**
40M	40													
40M	41													
40M	42													
40M	43													
40M	44													
40M														
40M														
40M			SUBTOTAL				69,661		63		25,378		0	**95,102**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			10,449		9		3,807			**14,265**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		12,017		11		4,378		0	**16,405**
40M	DIV	40M	**TOTAL w/o Global Markups**				**80,110**		**73**		**29,184**		**0**	**109,367**
			TOTAL w/ Global Markups				**92,127**		**83**		**33,562**		**0**	**125,772**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**110,552**		**100**		**40,274**		**0**	**150,927**

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40IC	**PROCESS INTERCONNECTIONS: IC**											
40IC	1													
40IC	2		Ball Float Switch (Diversion Manhole)	Ea.	2.0	300.00	600		0	60.00	120		0	**720**
40IC	3		Hydrostatic Level Element (Diversion Manhole)	Ea.	1.0	1,500.00	1,500		0	240.00	240		0	**1,740**
40IC	4		Ball Float Switch (Upstream Bar Screen 2)	Ea.	1.0	300.00	300		0	60.00	60		0	**360**
40IC	5		Pressure Indicating Switch (W3 Barscreen Wash)	Ea.	2.0	600.00	1,200		0	120.00	240		0	**1,440**
40IC	6		Comb, H2S, O2 sensors/transmitters	Ea.	3.0	5,000.00	15,000		0	320.00	960		0	**15,960**
40IC	7		Alarm annunciators	Ea.	5.0	300.00	1,500		0	120.00	600		0	**2,100**
40IC	8		Alarm Silence C/S	Ea.	1.0	350.00	350		0	60.00	60		0	**410**
40IC	9													
40IC	10		Pressure Indicating Switch (GBT Polymer System)	Ea.	1.0	600.00	600		0	120.00	120		0	**720**
40IC	11		Pressure Gauge (GBT Polymer System)	Ea.	1.0	250.00	250		0	60.00	60		0	**310**
40IC	12													
40IC	13													
40IC	14													
40IC	15													
40IC	16													
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40IC	18													
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40IC	24													
40IC	25													
40IC	26													
40IC	27													
40IC	28													
40IC	29													
40IC	30		Plant 1 PLC Panel	Ea.	1.0	50,000.00	50,000		0	20,000.00	20,000		0	**70,000**
40IC	31		Network Equipment	Ea.	1.0	3,000.00	3,000		0	1,000.00	1,000		0	**4,000**
40IC	32													
40IC	33		PLC Programming	LS	1.0		0		0	10,000.00	10,000		0	**10,000**
40IC	34		SCADA HMI Programming	LS	1.0		0		0	10,000.00	10,000		0	**10,000**
40IC	35													
40IC	36													
40IC	37													
40IC	38													
40IC	39													
40IC	40													
40IC	41													
40IC	42													
40IC	43													
40IC	44													
40IC														
40IC														
40IC			SUBTOTAL				74,300		0		43,460		0	**117,760**
40IC														
40IC			Material, Construction Equipment, Labor O&P	15.0%			11,145		0		6,519			**17,664**
40IC			Major Vendor O&P	4.0%									0	**0**
40IC			Global Markups	15.0%	2.0%		12,817		0		7,497		0	**20,314**
40IC	DIV	40IC	**TOTAL w/o Global Markups**				**85,445**		**0**		**49,979**		**0**	**135,424**
			TOTAL w/ Global Markups				**98,262**		**0**		**57,476**		**0**	**155,738**
40IC			**TOTAL w/ Contingency**	20.0%	10.0%		**117,914**		**0**		**68,971**		**0**	**186,885**

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03/16/20
DONOHUE & ASSOCIATES, INC.

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	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		Seepex Pumps, GBT Thickened Sludge	Ea.	2.0		0		0	3,880.00	7,760	9,700.00	19,400	**27,160**
43	2													
43	3													
43	4													
43	5													
43	6													
43	7													
43	8													
43	9													
43	10													
43	11													
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43														
43			SUBTOTAL				0		0		7,760		19,400	**27,160**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			0		0		1,164			**1,164**
43			Major Vendor O&P	7.5%									1,455	**1,455**
43			Global Markups	15.0%	2.0%		0		0		1,339		417	**1,756**
43	DIV	43	**TOTAL w/o Global Markups**				**0**		**0**		**8,924**		**20,855**	**29,779**
			TOTAL w/ Global Markups				**0**		**0**		**10,263**		**21,272**	**31,535**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**12,315**		**23,399**	**35,714**

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	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	46	WATER AND WASTEWATER EQUIPMENT											
46	1		Multi-Rake Bar Screen	LS	1.0		0	2,000.00	2,000	20,000.00	20,000	177,000.00	177,000	**199,000**
46	2		Screenings Wash Press Sluice	LS	1.0		0	0.00	0	500.00	500	8,000.00	8,000	**8,500**
46	3													
46	4													
46	5													
46	6													
46	7													
46	8													
46	9													
46	10		Gravity Belt Thickener	LS	1.0		0		0	38,250.00	38,250	255,000.00	255,000	**293,250**
46	11		Polymer System	LS	1.0		0		0	4,000.00	4,000	40,000.00	40,000	**44,000**
46	12													
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46			SUBTOTAL				0		2,000		62,750		480,000	**544,750**
46														
46			Material, Construction Equipment, Labor O&P	15.0%			0		300		9,413			**9,713**
46			Major Vendor O&P	7.5%									36,000	**36,000**
46			Global Markups	15.0%	2.0%		0		345		10,824		10,320	**21,489**
46	DIV	46	**TOTAL w/o Global Markups**				**0**		**2,300**		**72,163**		**516,000**	**590,463**
			TOTAL w/ Global Markups				**0**		**2,645**		**82,987**		**526,320**	**611,952**
46			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**3,174**		**99,584**		**578,952**	**681,710**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 130
STRUCTURE NAME: PRIMARY CLARIFICATION

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		4" GLDI pipe	ft	20.0	157.30	3,146		0	62.92	1,258		0	**4,404**
40M	2		4" GLDI 90° Short Bend	Ea.	4.0	378.09	1,512		0	151.24	605		0	**2,117**
40M	3		1.5" SST pipe (recirculation line)	ft	5.0	21.00	105	0.68	3	8.40	42		0	**150**
40M	4		1.5" ball valve	Ea.	1.0	220.00	220		0	88.00	88		0	**308**
40M	5		1.5" SST 90° elbow	Ea.	2.0	83.50	167		0	33.40	67		0	**234**
40M	6													
40M	7		6" Wall penetration	Ea.	2.0	500.00	1,000		0	500.00	1,000		0	**2,000**
40M	8		Link Seal	Ea.	1.0	93.03	93		0	82.43	82		0	**175**
40M	9													
40M	10													
40M	11													
40M	12													
40M	13													
40M	14													
40M	15													
40M	16													
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40M	37													
40M	38													
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40M	41													
40M	42													
40M	43													
40M	44													
40M														
40M														
40M			SUBTOTAL				6,243		3		3,143		0	**9,389**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			937		1		471			**1,408**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		1,077		1		542		0	**1,620**
40M	DIV	40M	**TOTAL w/o Global Markups**				**7,180**		**4**		**3,614**		**0**	**10,798**
			TOTAL w/ Global Markups				**8,257**		**4**		**4,156**		**0**	**12,417**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**9,908**		**5**		**4,987**		**0**	**14,901**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 130
STRUCTURE NAME: PRIMARY CLARIFICATION

03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		Primary Submersible Scum Pump	LS	1.0	22,400.00	22,400	100.00	100	150.00	150		0	**22,650**
43	2													
43	3													
43	4													
43	5													
43	6													
43	7													
43	8													
43	9													
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43	44													
43														
43			SUBTOTAL				22,400		100		150		0	**22,650**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			3,360		15		23			**3,398**
43			Major Vendor O&P	7.5%									0	**0**
43			Global Markups	15.0%	2.0%		3,864		17		26		0	**3,907**
43	DIV	43	**TOTAL w/o Global Markups**				**25,760**		**115**		**173**		**0**	**26,048**
			TOTAL w/ Global Markups				**29,624**		**132**		**198**		**0**	**29,955**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**35,549**		**159**		**238**		**0**	**35,946**

CLIENT CITY OF LA CROSSE
PROJECT WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO. 13655

STRUCTURE NO. 160
STRUCTURE NAME PLANT 2

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20 DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV 1	GENERAL REQUIREMENTS											
1	1	miscellaneous wall removals	LS	1.0		0	1,000.00	1,000	4,000.00	4,000		0	**5,000**
1	2												
1	3	Remove Blower	EA	4.0		0	500.00	2,000	2,720.00	10,880		0	**12,880**
1	4												
1	5	Remove ALP Piping 16" through 20"	LF	100.0		0	0.80	80	20.50	2,050		0	**2,130**
1	6	Remove ALP Piping 30" through 36"	LF	35.0		0	1.40	49	36.00	1,260		0	**1,309**
1	7	Remove ALP Valves 16" through 20"	EA	20.0		0		0	705.00	14,100		0	**14,100**
1	8												
1	9												
1	10												
1	11	Remove/Relocate Existing PVC Piping (Per Pump)	EA	2.0	500.00	1,000		0	700.00	1,400		0	**2,400**
1	12												
1	13												
1	14												
1	15												
1	16												
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1	35												
1													
1		SUBTOTAL				1,000		3,129		33,690		0	**37,819**
1													
1		Material, Construction Equipment, Labor O&P	15.0%			150		469		5,054			**5,673**
1		Major Vendor O&P	4.0%									0	**0**
1		Global Markups	15.0%	2.0%		173		540		5,812		0	**6,524**
1	DIV 1	**TOTAL w/o Global Markups**				**1,150**		**3,598**		**38,744**		**0**	**43,492**
		TOTAL w/ Global Markups				**1,323**		**4,138**		**44,555**		**0**	**50,016**
1		**TOTAL w/ Contingency**	20.0%	10.0%		**1,587**		**4,966**		**53,466**		**0**	**60,019**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 160
STRUCTURE NAME: PLANT 2

03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		concrete patches	CY	3.0	490.00	1,470	40.00	120	450.00	1,350		0	**2,940**
3	2		equipment pads	CY	10.0	725.00	7,250	93.00	930	645.00	6,450		0	**14,630**
3	3		door stoop	SF	30.0	33.00	990	6.00	180	35.00	1,050		0	**2,220**
3	4		approach slab	SF	50.0	9.00	450	2.00	100	4.00	200		0	**750**
3	5													
3	6													
3	7													
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3														
3														
3			SUBTOTAL				10,160		1,330		9,050		0	**20,540**
3														
3			Material, Construction Equipment, Labor O&P	15.0%			1,524		200		1,358			**3,081**
3			Major Vendor O&P	4.0%									0	**0**
3			Global Markups	15.0%	2.0%		1,753		229		1,561		0	**3,543**
3	DIV	3	**TOTAL w/o Global Markups**				**11,684**		**1,530**		**10,408**		**0**	**23,621**
			TOTAL w/ Global Markups				**13,437**		**1,759**		**11,969**		**0**	**27,164**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**16,124**		**2,111**		**14,362**		**0**	**32,597**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 160
STRUCTURE NAME: PLANT 2

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	4	MASONRY											
4	1		miscellaneous wall patches	LS	1.0	2,000.00	2,000		0	8,000.00	8,000		0	**10,000**
4	2													
4	3													
4	4													
4	5													
4	6													
4	7													
4	8													
4	9													
4	10													
4	11													
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4	35													
4														
4			SUBTOTAL				2,000		0		8,000		0	**10,000**
4														
4			Material, Construction Equipment, Labor O&P	15.0%			300		0		1,200			**1,500**
4			Major Vendor O&P	4.0%									0	**0**
4			Global Markups	15.0%	2.0%		345		0		1,380		0	**1,725**
4	DIV	4	**TOTAL w/o Global Markups**				**2,300**		**0**		**9,200**		**0**	**11,500**
			TOTAL w/ Global Markups				**2,645**		**0**		**10,580**		**0**	**13,225**
4			**TOTAL w/ Contingency**	20.0%	10.0%		**3,174**		**0**		**12,696**		**0**	**15,870**

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STRUCTURE NAME: PLANT 2

03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	5	METALS											
5	1		platform in sludge screening room	LS	1.0	10,000.00	10,000		0	5,000.00	5,000		0	**15,000**
5	2													
5	3		misc metal fabrications	LBS	700.0	1.75	1,225	1.00	700	1.75	1,225		0	**3,150**
5	4													
5	5													
5	6													
5	7													
5	8													
5	9													
5	10													
5	11													
5	12													
5	13													
5	14													
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5	34													
5	35													
5														
5			SUBTOTAL				11,225		700		6,225		0	**18,150**
5														
5			Material, Construction Equipment, Labor O&P	15.0%			1,684		105		934			**2,723**
5			Major Vendor O&P	4.0%									0	**0**
5			Global Markups	15.0%	2.0%		1,936		121		1,074		0	**3,131**
5	DIV	5	**TOTAL w/o Global Markups**				**12,909**		**805**		**7,159**		**0**	**20,873**
			TOTAL w/ Global Markups				**14,845**		**926**		**8,233**		**0**	**24,003**
5			**TOTAL w/ Contingency**	20.0%	10.0%		**17,814**		**1,111**		**9,879**		**0**	**28,804**

CLIENT: CITY OF LA CROSSE
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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	8	OPENINGS											
8	1		single GHM door/frame/hardware	EA	1.0	1,740.00	1,740		0		0		0	**1,740**
8	2		overhead coiling door	SF	120.0	70.00	8,400		0		0		0	**8,400**
8	3													
8	4													
8	5													
8	6													
8	7													
8	8													
8	9													
8	10													
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8	35													
8														
8			SUBTOTAL				10,140		0		0		0	**10,140**
8														
8			Material, Construction Equipment, Labor O&P	15.0%			1,521		0		0			**1,521**
8			Major Vendor O&P	4.0%									0	**0**
8			Global Markups	15.0%	2.0%		1,749		0		0		0	**1,749**
8	DIV	8	**TOTAL w/o Global Markups**				**11,661**		**0**		**0**		**0**	**11,661**
			TOTAL w/ Global Markups				**13,410**		**0**		**0**		**0**	**13,410**
8			**TOTAL w/ Contingency**	20.0%	10.0%		**16,092**		**0**		**0**		**0**	**16,092**

CLIENT: CITY OF LA CROSSE
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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	10	SPECIALTIES											
10	1		fire extinguisher	EA	3.0	175.00	525		0	40.00	120		0	**645**
10	2													
10	3													
10	4													
10	5													
10	6													
10	7													
10	8													
10	9													
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10	11													
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10	34													
10	35													
10														
10			SUBTOTAL				525		0		120		0	**645**
10														
10			Material, Construction Equipment, Labor O&P	15.0%			79		0		18			**97**
10			Major Vendor O&P	4.0%									0	**0**
10			Global Markups	15.0%	2.0%		91		0		21		0	**111**
10	DIV	10	**TOTAL w/o Global Markups**				**604**		**0**		**138**		**0**	**742**
			TOTAL w/ Global Markups				**694**		**0**		**159**		**0**	**853**
10			**TOTAL w/ Contingency**	20.0%	10.0%		**833**		**0**		**190**		**0**	**1,024**

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	22	PLUMBING											
22	1		Fixture	Ea	4.0	2,500.00	10,000		0	1,000.00	4,000		0	**14,000**
22	2													
22	3													
22	4													
22	5													
22	6													
22	7													
22	8													
22	9													
22	10													
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22	32													
22	33													
22	34													
22	35													
22														
22			SUBTOTAL				10,000		0		4,000		0	**14,000**
22														
22			Material, Construction Equipment, Labor O&P	15.0%			1,500		0		600			**2,100**
22			Major Vendor O&P	7.5%									0	**0**
22			Global Markups	15.0%	2.0%		1,725		0		690		0	**2,415**
22	DIV	22	**TOTAL w/o Global Markups**				**11,500**		**0**		**4,600**		**0**	**16,100**
			TOTAL w/ Global Markups				**13,225**		**0**		**5,290**		**0**	**18,515**
22			**TOTAL w/ Contingency**	20.0%	10.0%		**15,870**		**0**		**6,348**		**0**	**22,218**

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	23	HVAC											
23	1		Sludge Screen Room Ventilation	CFM	800.0	10.75	8,600		0	5.50	4,400		0	13,000
23	2													
23	3		Blower Room Expansion HVAC	LS	1.0	5,000.00	5,000		0	5,000.00	5,000		0	10,000
23	4													
23	5													
23	6													
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23	35													
23														
23			SUBTOTAL				13,600		0		9,400		0	23,000
23														
23			Material, Construction Equipment, Labor O&P	15.0%			2,040		0		1,410			3,450
23			Major Vendor O&P	7.5%									0	0
23			Global Markups	15.0%	2.0%		2,346		0		1,622		0	3,968
23	DIV	23	**TOTAL w/o Global Markups**				**15,640**		**0**		**10,810**		**0**	**26,450**
			TOTAL w/ Global Markups				**17,986**		**0**		**12,432**		**0**	**30,418**
23			**TOTAL w/ Contingency**	20.0%	10.0%		**21,583**		**0**		**14,918**		**0**	**36,501**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 160
STRUCTURE NAME: PLANT 2

03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		MCC SECTIONS	EA	12.0	2,200.00	26,400		0	505.00	6,060		0	32,460
26	2		FVNR SZ 1	EA	30.0	1,700.00	51,000		0	149.00	4,470		0	55,470
26	3		100A CB	EA	30.0	950.00	28,500		0	101.00	3,030		0	31,530
26	4		480V SPD	EA	2.0	13,900.00	27,800		0	1,050.00	2,100		0	29,900
26	5		120/208V SPD	EA	2.0	3,890.00	7,780		0	1,050.00	2,100		0	9,880
26	6		CONDUIT AND CONDUCTORS	LS	1.0	##########	1,200,000		0	44,000.00	44,000		0	1,244,000
26	7		MOTOR CONNECTIONS	EA	20.0		0		0	200.00	4,000		0	4,000
26	8		LED LIGHITNG	LS	1.0	7,000.00	7,000		0	3,000.00	3,000		0	10,000
26	9		SWITCHBOARD SECTION	EA	1.0	20,000.00	20,000		0	5,000.00	5,000		0	25,000
26	10		FVNR SZ 2	EA	5.0	1,950.00	9,750		0	201.00	1,005		0	10,755
26	11		2000 MAIN BREAKER	EA	4.0	24,100.00	96,400		0	1,725.00	6,900		0	103,300
26	12		100HP VFDS	EA	3.0	13,300.00	39,900		0	2,850.00	8,550		0	48,450
26	13		100HP HARMONIC FILTERS	EA	4.0	5,468.00	21,872		0	712.00	2,848		0	24,720
26	14		GROUNDING	LS	1.0	1,000.00	1,000		0	335.00	335		0	1,335
26	15		DUCT BANK AND SITE WORK	LS	1.0	100,000.00	100,000		0	30,000.00	30,000		0	130,000
26	16													
26	17		500HP VFD											
26	18		500HP HARMONIC FILTER											
26	19		250HP VFD											
26	20		250 HP HARMONIC											
26	21													
26	22													
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26	44													
26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
26													
26	45												
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26	73												
26	74												
26	75	I&C Wiring & Conduit	LS	1.0	10,000.00	10,000		0	6,000.00	6,000		0	**16,000**
26	76												
26	77												
26	78												
26	79												
26													
26		SUBTOTAL				1,647,402		0		129,398		0	**1,776,800**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			247,110		0		19,410			**266,520**
26		Major Vendor O&P	15.0%									0	**0**
26		Global Markups	15.0%	2.0%		284,177		0		22,321		0	**306,498**
26	DIV 26	**TOTAL w/o Global Markups**				**1,894,512**		**0**		**148,808**		**0**	**2,043,320**
		TOTAL w/ Global Markups				**2,178,689**		**0**		**171,129**		**0**	**2,349,818**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**2,614,427**		**0**		**205,355**		**0**	**2,819,782**

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	35	**WATERWAY AND MARINE CONSTRUCTION**											
35	1		Patch hatch openings over wet well	LS	1.0	3,000.00	3,000		0	3,000.00	3,000		0	**6,000**
35	2		patch door opening between blower and RAS room	LS	1.0	1,000.00	1,000		0	1,000.00	1,000		0	**2,000**
35	3													
35	4		earth work for exterior wet well access (incl piles)	LS	1.0	12,000.00	12,000		0	5,000.00	5,000		0	**17,000**
35	5		concrete walls	CY	12.0	490.00	5,880	56.00	672	680.00	8,160		0	**14,712**
35	6		concrete base mat	CY	4.0	290.00	1,160	39.00	156	91.00	364		0	**1,680**
35	7		concrete top slab	CY	2.0	490.00	980	40.00	80	450.00	900		0	**1,960**
35	8		hatches	SF	18.0	160.00	2,880		0		0		0	**2,880**
35	9		drill and grout dowels	EA	130.0	11.40	1,482	11.40	1,482	63.00	8,190		0	**11,154**
35	10		EXPLOSION PROOF LIGHTING	LS	1.0	30,000.00	30,000		0	5,000.00	5,000		0	**35,000**
35	11		EXPLOSIONPROOF WIRING DEVICES	LS	1.0	4,000.00	4,000		0	1,000.00	1,000		0	**5,000**
35	12		EXPLOSIONPROOF SEAL OFFS	EA	15.0	50.00	750		0	50.00	750		0	**1,500**
35	13													
35	14													
35	15		B102, B103, 101, 106 Vent Improvements	CFM	4,150.0	10.75	44,613		0	5.50	22,825		0	**67,438**
35	16													
35	17													
35	18													
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35														
35			SUBTOTAL				107,745		2,390		56,189		0	**166,324**
35														
35			Material, Construction Equipment, Labor O&P	15.0%			16,162		359		8,428			**24,949**
35			Major Vendor O&P	7.5%									0	**0**
35			Global Markups	15.0%	2.0%		18,586		412		9,693		0	**28,691**
35	DIV	35	**TOTAL w/o Global Markups**				**123,906**		**2,749**		**64,617**		**0**	**191,272**
			TOTAL w/ Global Markups				**142,492**		**3,161**		**74,310**		**0**	**219,963**
35			**TOTAL w/ Contingency**	20.0%	10.0%		**170,991**		**3,793**		**89,172**		**0**	**263,955**

CLIENT: CITY OF LA CROSSE
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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		ALP - 304 SST											
40M	2		14" BW Pipe	LF	30.0	91.00	2,730		0	22.75	683		0	**3,413**
40M	3		20" BW Pipe	LF	89.0	123.00	10,947		0	30.75	2,737		0	**13,684**
40M	4		26" BW Pipe	LF	66.0	155.00	10,230		0	38.75	2,558		0	**12,788**
40M	5		30" BW Pipe	LF	80.0	175.00	14,000		0	43.75	3,500		0	**17,500**
40M	6													
40M	7		14" 90 Deg Elbow	EA	2.0	2,115.00	4,230		0	528.75	1,058		0	**5,288**
40M	8		14" Weldneck Flange	EA	12.0	600.00	7,200		0	150.00	1,800		0	**9,000**
40M	9		20" 90 Deg Elbow	EA	5.0	3,100.00	15,500		0	775.00	3,875		0	**19,375**
40M	10		20" Weldneck Flange	EA	24.0	1,400.00	33,600		0	350.00	8,400		0	**42,000**
40M	11		26" 90 Deg Elbow	EA	3.0	3,682.00	11,046		0	920.50	2,762		0	**13,808**
40M	12		26" Weldneck Flange	EA	6.0	2,000.00	12,000		0	500.00	3,000		0	**15,000**
40M	13		30" x 20" Red Wye	EA	3.0	2,800.00	8,400		0	700.00	2,100		0	**10,500**
40M	14		30" x 14" Red Wye	EA	2.0	2,800.00	5,600		0	700.00	1,400		0	**7,000**
40M	15		30" Pipe Cap	EA	1.0	400.00	400		0	100.00	100		0	**500**
40M	16		30" SST Exp Jt	EA	1.0	2,000.00	2,000		0	500.00	500		0	**2,500**
40M	17		30" Weldneck Flange	EA	2.0	2,500.00	5,000		0	625.00	1,250		0	**6,250**
40M	18													
40M	19													
40M	20		Sludge Piping GLDI											
40M	21		4" Pipe GLDI	ft	93.0	157.30	14,629		0	62.92	5,852		0	**20,480**
40M	22		6"x4" GLDI Reducing Elbow	EA	1.0	560.00	560		0	224.00	224		0	**784**
40M	23		6" Pipe DI	ft	1.0	386.00	386		0	154.40	154		0	**540**
40M	24		4" 90deg	EA	14.0	378.09	5,293		0	151.24	2,117		0	**7,411**
40M	25		4" 45deg	EA	1.0	335.74	336		0	134.30	134		0	**470**
40M	26		4" Tee	EA	2.0	454.85	910		0	181.94	364		0	**1,274**
40M	27		Wall Penetrations	EA	2.0	500.00	1,000		0	500.00	1,000		0	**2,000**
40M	28		Floor Penetrations	EA	1.0	500.00	500		0	500.00	500		0	**1,000**
40M	29													
40M	30		Sludge Valves											
40M	31		4" Plug Valves	EA	6.0	583.00	3,498		0	233.20	1,399		0	**4,897**
40M	32		4" Swing Check	EA	1.0	1,616.00	1,616		0	646.40	646		0	**2,262**
40M	33		4" Ball Check	EA	2.0	1,369.00	2,738		0	547.60	1,095		0	**3,833**
40M	34		4" Electrically Actuated Plug Valves	EA	1.0	5,000.00	5,000		0	2,000.00	2,000		0	**7,000**
40M	35													
40M	36		PVC Sludge Piping											
40M	37		4" Pipe	ft	28.0	32.50	910		0	19.75	553		0	**1,463**
40M	38		6" Pipe	ft	4.5	35.00	158		0	24.00	108		0	**266**
40M	39		6"x4" Tee	EA	1.0	253.40	253		0	190.40	190		0	**444**
40M	40		4" 90deg	EA	2.0	37.50	75		0	55.00	110		0	**185**
40M	41		6" 90deg	EA	2.0	107.00	214		0	90.00	180		0	**394**
40M	42		GTE CLDI											
40M	43		4" Pipe	ft	21.0	114.00	2,394		0	45.60	958		0	**3,352**
40M	44		4" 90deg	EA	5.0	171.00	855		0	68.40	342		0	**1,197**
40M														
40M														
40M			SUBTOTAL				184,208		0		53,648		0	**237,855**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			27,631		0		8,047			**35,678**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		31,776		0		9,254		0	**41,030**
40M	DIV	40M	**TOTAL w/o Global Markups**				**211,839**		**0**		**61,695**		**0**	**273,534**
			TOTAL w/ Global Markups				**243,614**		**0**		**70,949**		**0**	**314,564**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**292,337**		**0**		**85,139**		**0**	**377,477**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
DIV	40IC	PROCESS INTERCONNECTIONS: IC											
1													
2		Radar Level Element (Scum Pumping)	Ea.	1.0	3,500.00	3,500		0	360.00	360		0	3,860
3		Ball Float Switch (Scum Pumping)	Ea.	1.0	300.00	300		0	60.00	60		0	360
4		Control Station (Scum Pumping)	Ea.	1.0	500.00	500		0	120.00	120		0	620
5													
6		Annular Seal (Pri Sludge Pumps)	Ea.	4.0	4,000.00	16,000		0	480.00	1,920		0	17,920
7		Pressure Transmitter (Pri Sludge Pumps)	Ea.	4.0	2,200.00	8,800		0	180.00	720		0	9,520
8		Pressure Gauge (Pri Sludge Pumps)	Ea.	2.0	250.00	500		0	60.00	120		0	620
9													
10		GBT 2 Electromagnetic Flow Meter (6")	Ea.	1.0	5,000.00	5,000		0	480.00	480		0	5,480
11		GBT 2 CCTV	Ea.	1.0	1,200.00	1,200		0	360.00	360		0	1,560
12													
13		Pressure Gauge (RAS Pumps)	Ea.	3.0	250.00	750		0	60.00	180		0	930
14		Wetwell Instrumentation (unk).	LS	1.0	2,200.00	2,200		0	240.00	240		0	2,440
15													
16		Relocate Electromagnetic Flow Meter (TSLDG)	LS	1.0		0		0	600.00	600		0	600
17		Relocate TSS meter (TSLDG)	LS	1.0		0		0	200.00	200		0	200
18		TSLDG Electromagnetic Flow Meter	LS	1.0	5,000.00	5,000		0	480.00	480		0	5,480
19		New TSS Sensor/Transmitter	Ea.	1.0	2,000.00	2,000		0	360.00	360		0	2,360
20													
21		Relocate Electromagnetic Flow Meter (GBT1)	LS	1.0		0		0	600.00	600		0	600
22		Relocate Annular Seal/PIT	LS	1.0		0		0	300.00	300		0	300
23		GBT2 Electromagnetic Flow Meter 6"	LS	1.0	5,000.00	5,000		0	480.00	480		0	5,480
24		GBT2 Annular Seal	LS	1.0	3,000.00	3,000		0	480.00	480		0	3,480
25		GBT2 Pressure Transmitter	LS	1.0	2,200.00	2,200		0	180.00	180		0	2,380
26		GBT1&2 Pump Temperature Transmitter	LS	2.0	770.00	1,540		0	180.00	360		0	1,900
27		TWAS Hopper 1&2 Level Transmitter	LS	2.0	3,200.00	6,400		0	600.00	1,200		0	7,600
28		TWAS Pumps 1&2 Control Station	LS	2.0	750.00	1,500		0	120.00	240		0	1,740
29													
30		Plant 2 PLC Panel (unk.)	LS	1.0	50,000.00	50,000		0	20,000.00	20,000		0	70,000
31		Network Equipment	Ea.	1.0	3,000.00	3,000		0	1,000.00	1,000		0	4,000
32													
33		PLC Programming	LS	1.0		0		0	20,000.00	20,000		0	20,000
34		SCADA HMI Programming	LS	1.0		0		0	20,000.00	20,000		0	20,000
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
		SUBTOTAL				118,390		0		71,040		0	189,430
		Material, Construction Equipment, Labor O&P	15.0%			17,759		0		10,656			28,415
		Major Vendor O&P	4.0%									0	0
		Global Markups	15.0%	2.0%		20,422		0		12,254		0	32,677
DIV	40IC	**TOTAL w/o Global Markups**				**136,149**		**0**		**81,696**		**0**	**217,845**
		TOTAL w/ Global Markups				**156,571**		**0**		**93,950**		**0**	**250,521**
		TOTAL w/ Contingency	20.0%	10.0%		**187,885**		**0**		**112,740**		**0**	**300,625**

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03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		Large Activated Sludge Blowers	EA	3.0		0		0	6,120.00	18,360	250,000.00	750,000	**768,360**
43	2		Small Activated Sludge Blowers	EA	2.0		0		0	6,120.00	12,240	180,000.00	360,000	**372,240**
43	3		Master Control Panel	EA	1.0		0		0	1,360.00	1,360	49,750.00	49,750	**51,110**
43	4													
43	5													
43	6		Sludge Screen Feed Pumps	EA	2.0		0		0	6,385.13	12,770	25,540.50	51,081	**63,851**
43	7		Gravity Thickened Sludge Pump	EA	1.0		0		0	5,504.25	5,504	22,017.00	22,017	**27,521**
43	8													
43	9													
43	10													
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43														
43			SUBTOTAL				0		0		50,235		1,232,848	**1,283,083**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			0		0		7,535			**7,535**
43			Major Vendor O&P	7.5%									92,464	**92,464**
43			Global Markups	15.0%	2.0%		0		0		8,665		26,506	**35,172**
43	DIV	43	**TOTAL w/o Global Markups**				**0**		**0**		**57,770**		**1,325,312**	**1,383,081**
			TOTAL w/ Global Markups				**0**		**0**		**66,435**		**1,351,818**	**1,418,253**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**79,722**		**1,487,000**	**1,566,722**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 160
STRUCTURE NAME: PLANT 2

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	46	WATER AND WASTEWATER EQUIPMENT											
46	1		Primary Sludge Screen	Ea.	1.0		0		0	36,500.00	36,500	146,000.00	146,000	**182,500**
46	2													
46	3													
46	4													
46	5													
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46														
46			SUBTOTAL				0		0		36,500		146,000	**182,500**
46														
46			Material, Construction Equipment, Labor O&P	15.0%			0		0		5,475			**5,475**
46			Major Vendor O&P	7.5%									10,950	**10,950**
46			Global Markups	15.0%	2.0%		0		0		6,296		3,139	**9,435**
46	DIV	46	**TOTAL w/o Global Markups**				**0**		**0**		**41,975**		**156,950**	**198,925**
			TOTAL w/ Global Markups				**0**		**0**		**48,271**		**160,089**	**208,360**
46			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**57,926**		**176,098**	**234,023**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 191/192
STRUCTURE NAME: AERATION TANKS
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	1	**GENERAL REQUIREMENTS**											
1	1		Remove Mixer	EA	12.0	5.75	69	24.00	288	1,360.00	16,320		0	**16,677**
1	2		Remove Pump	EA	4.0		0		0	1,360.00	5,440		0	**5,440**
1	3		Remove & Replace Diffuser Membranes	LS	1.0	43,200.00	43,200		0	73,440.00	73,440		0	**116,640**
1	4													
1	5		Remove ALP Piping 4" through 6"	LF	0.0					10.10				
1	6		Remove ALP Piping 8" through 14"	LF	350.0		0		0	16.85	5,898		0	**5,898**
1	7		Remove ALP/PE/RAS Piping 16" through 20"	LF	512.0		0	0.80	410	20.50	10,496		0	**10,906**
1	8		Remove ALP/PE/RAS Piping 30" through 36"	LF	436.0		0	1.40	610	36.00	15,696		0	**16,306**
1	9		Remove ALP Valves 4" through 6"	EA	0.0					114.00				
1	10		Remove ALP Valves 8" through 14"	EA	12.0		0		0	177.00	2,124		0	**2,124**
1	11		Remove ALP Valves 16" through 20"	EA	0.0					705.00				
1	12		Remove PE Valves 30" through 36"	EA	4.0		0		0	1,175.00	4,700		0	**4,700**
1	13													
1	14													
1	15		sawcut and remove concrete	CF	1,000.0		0	5.75	5,750	24.00	24,000		0	**29,750**
1	16													
1	17		remove painted handrail	LF	3,800.0		0		0	0.80	3,040	2.20	8,360	**11,400**
1	18													
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1			SUBTOTAL				43,269		7,058		161,154		8,360	**219,841**
1														
1			Material, Construction Equipment, Labor O&P	15.0%			6,490		1,059		24,173			**31,722**
1			Major Vendor O&P	4.0%									334	**334**
1			Global Markups	15.0%	2.0%		7,464		1,218		27,799		174	**36,654**
1	DIV	1	**TOTAL w/o Global Markups**				**49,759**		**8,117**		**185,327**		**8,694**	**251,897**
			TOTAL w/ Global Markups				**57,223**		**9,334**		**213,126**		**8,868**	**288,551**
1			**TOTAL w/ Contingency**	20.0%	10.0%		**68,668**		**11,201**		**255,751**		**9,755**	**345,375**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 191/192
STRUCTURE NAME: AERATION TANKS
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		12" wall	CY	94.0	490.00	46,060	56.00	5,264	680.00	63,920		0	**115,244**
3	2		drill and grout dowels	EA	600.0	11.40	6,840	11.40	6,840	63.00	37,800		0	**51,480**
3	3													
3	4		concrete walkway	CY	20.0	490.00	9,800	40.00	800	450.00	9,000		0	**19,600**
3	5		drill and grout dowels	EA	150.0	11.40	1,710	11.40	1,710	63.00	9,450		0	**12,870**
3	6													
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3			SUBTOTAL				64,410		14,614		120,170		0	**199,194**
3														
3			Material, Construction Equipment, Labor O&P	15.0%			9,662		2,192		18,026			**29,879**
3			Major Vendor O&P	4.0%									0	**0**
3			Global Markups	15.0%	2.0%		11,111		2,521		20,729		0	**34,361**
3	DIV	3	**TOTAL w/o Global Markups**				**74,072**		**16,806**		**138,196**		**0**	**229,073**
			TOTAL w/ Global Markups				**85,182**		**19,327**		**158,925**		**0**	**263,434**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**102,219**		**23,192**		**190,710**		**0**	**316,121**

CLIENT: CITY OF LA CROSSE
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STRUCTURE NO.: 191/192
STRUCTURE NAME: AERATION TANKS
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	5	METALS											
5	1		al railing to replace existing painted railing	LF	3,800.0	53.00	201,400	1.00	3,800	12.50	47,500		0	**252,700**
5	2													
5	3		al railing at new walkway/platforms	LF	100.0	53.00	5,300	1.00	100	12.50	1,250		0	**6,650**
5	4													
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5			SUBTOTAL				206,700		3,900		48,750		0	**259,350**
5														
5			Material, Construction Equipment, Labor O&P	15.0%			31,005		585		7,313			**38,903**
5			Major Vendor O&P	4.0%									0	**0**
5			Global Markups	15.0%	2.0%		35,656		673		8,409		0	**44,738**
5	DIV	5	**TOTAL w/o Global Markups**				**237,705**		**4,485**		**56,063**		**0**	**298,253**
			TOTAL w/ Global Markups				**273,361**		**5,158**		**64,472**		**0**	**342,990**
5			**TOTAL w/ Contingency**	20.0%	10.0%		**328,033**		**6,189**		**77,366**		**0**	**411,588**

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	9	FINISHES											
9	1		coat top 4' of all tanks	SF	11,280.0	1.80	20,304		0	2.90	32,712		0	**53,016**
9	2													
9	3													
9	4													
9	5													
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9	33													
9	34													
9	35													
9														
9			SUBTOTAL				20,304		0		32,712		0	**53,016**
9														
9			Material, Construction Equipment, Labor O&P	15.0%			3,046		0		4,907			**7,952**
9			Major Vendor O&P	4.0%									0	**0**
9			Global Markups	15.0%	2.0%		3,502		0		5,643		0	**9,145**
9	DIV	9	**TOTAL w/o Global Markups**				**23,350**		**0**		**37,619**		**0**	**60,968**
			TOTAL w/ Global Markups				**26,852**		**0**		**43,262**		**0**	**70,114**
9			**TOTAL w/ Contingency**	20.0%	10.0%		**32,222**		**0**		**51,914**		**0**	**84,136**

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OPINION OF PROBABLE CONST COST
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DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		WIRING DEVICES	LS	1.0	3,000.00	3,000		0	1,500.00	1,500		0	**4,500**
26	2		CONDUITS AND CONDUCTORS	LS	1.0	4,000.00	4,000		0	2,000.00	2,000		0	**6,000**
26	3													
26	4		SITE LIGHTING	LS	1.0	12,000.00	12,000		0	6,000.00	6,000		0	**18,000**
26	5													
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26	7													
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26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
26													
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26	74												
26	75	I&C Wiring & Conduit	LS	1.0	4,000.00	4,000		0	4,000.00	4,000		0	**8,000**
26	76												
26	77												
26	78												
26	79												
26													
26		SUBTOTAL				23,000		0		13,500		0	**36,500**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			3,450		0		2,025			**5,475**
26		Major Vendor O&P	15.0%									0	**0**
26		Global Markups	15.0%	2.0%		3,968		0		2,329		0	**6,296**
26	DIV 26	**TOTAL w/o Global Markups**				**26,450**		**0**		**15,525**		**0**	**41,975**
		TOTAL w/ Global Markups				**30,418**		**0**		**17,854**		**0**	**48,271**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**36,501**		**0**		**21,425**		**0**	**57,926**

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	PROCESS INTERCONNECTIONS: PROCESS											
40M	1		ML - CLDI											
40M	2		20" FL Pipe	LS	1.0	303,768.00	303,768		0	75,942.00	75,942		0	379,710
40M	3		20" 90 Deg Elbow	EA	4.0	7,520.00	30,080		0	1,880.00	7,520		0	37,600
40M	4		20" Tideflex Check Valve	EA	4.0	4,500.00	18,000		0	1,125.00	4,500		0	22,500
40M	5													
40M	6		RAS - CLDI											
40M	7		20" FL Pipe	LS	1.0	257,359.00	257,359		0	64,339.75	64,340		0	321,699
40M	8		20" 90 Deg Eblow	EA	8.0	7,520.00	60,160		0	1,880.00	15,040		0	75,200
40M	9		20" Tee	EA	2.0	8,607.00	17,214		0	2,151.75	4,304		0	21,518
40M	10		20" Plug Valve	EA	4.0	14,956.00	59,824		0	3,739.00	14,956		0	74,780
40M	11													
40M	12		PE - CLDI											
40M	13		30" Gate Valve	EA	2.0	36,816.00	73,632	2,000.00	4,000	1,020.00	2,040		0	79,672
40M	14													
40M	15		ALP - 304 SST											
40M	16		30" Pipe	LF	118.0	175.00	20,650		0	43.75	5,163		0	25,813
40M	17		24" Pipe	LF	65.0	155.00	10,075		0	38.75	2,519		0	12,594
40M	18		18" Pipe	LF	80.0	123.00	9,840		0	30.75	2,460		0	12,300
40M	19		16" Pipe	LF	172.0	112.00	19,264		0	28.00	4,816		0	24,080
40M	20		14" Pipe	LF	320.0	91.00	29,120		0	22.75	7,280		0	36,400
40M	21		30" Weldneck Flange	EA	2.0	2,500.00	5,000		0	625.00	1,250		0	6,250
40M	22		30" SST Exp Jt	EA	1.0	2,000.00	2,000		0	500.00	500		0	2,500
40M	23		30" x 18" Red Tee	EA	1.0	2,800.00	2,800		0	700.00	700		0	3,500
40M	24		30" x 24" Ecc Red	EA	1.0	2,600.00	2,600		0	650.00	650		0	3,250
40M	25		24" Weldneck Flange	EA	2.0	2,000.00	4,000		0	500.00	1,000		0	5,000
40M	26		24" SST Exp Jt	EA	1.0	1,800.00	1,800		0	450.00	450		0	2,250
40M	27		24" x 18" Red Tee	EA	2.0	1,600.00	3,200		0	400.00	800		0	4,000
40M	28		24" x 18" Ecc Red	EA	1.0	1,600.00	1,600		0	400.00	400		0	2,000
40M	29		18" 90 Deg Elbow	EA	1.0	900.00	900		0	225.00	225		0	1,125
40M	30		18" Weldneck Flange	EA	24.0	1,000.00	24,000		0	250.00	6,000		0	30,000
40M	31		18" Butterfly Valve	EA	4.0	5,474.00	21,896		0	1,368.50	5,474		0	27,370
40M	32		18" Flow Control Iris Valve	EA	4.0	38,700.00	154,800		0	2,040.00	8,160		0	162,960
40M	33		18" x 16" Ecc Red	EA	4.0	600.00	2,400		0	150.00	600		0	3,000
40M	34		18" x 14" Red Tee	EA	4.0	600.00	2,400		0	150.00	600		0	3,000
40M	35		16" x 14" Ecc Red	EA	4.0	500.00	2,000		0	125.00	500		0	2,500
40M	36		16" x 14" Red Tee	EA	4.0	500.00	2,000		0	125.00	500		0	2,500
40M	37		14" 90 Deg Elbow	EA	4.0	2,115.00	8,460		0	528.75	2,115		0	10,575
40M	38		14" Weldneck Flange	EA	24.0	600.00	14,400		0	150.00	3,600		0	18,000
40M	39		14" Butterfly Valve	EA	12.0	4,149.00	49,788		0	1,037.25	12,447		0	62,235
40M	40													
40M	41													
40M	42													
40M	43													
40M	44													
40M														
40M														
40M			SUBTOTAL				1,215,030		4,000		256,850		0	1,475,880
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			182,255		600		38,527			221,382
40M			Major Vendor O&P	6.0%									0	0
40M			Global Markups	15.0%	2.0%		209,593		690		44,307		0	254,589
40M	DIV	40M	**TOTAL w/o Global Markups**				**1,397,285**		**4,600**		**295,377**		**0**	1,697,261
			TOTAL w/ Global Markups				**1,606,877**		**5,290**		**339,683**		**0**	1,951,851
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**1,928,253**		**6,348**		**407,620**		**0**	2,342,221

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 191/192
STRUCTURE NAME: AERATION TANKS

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

							CONSTRUCTION EQUIPMENT						
					MATERIAL				LABOR		VENDOR		
LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	TOTAL COST
	DIV	40IC	PROCESS INTERCONNECTIONS: IC										
40IC	1												
40IC	2		Relocate existing DO Probes (Biological Treatment)	LS	1.0		0		0	1,000.00	1,000		0	1,000
40IC	3		ORP Probes (Biological Treatment)	Ea.	8.0	2,000.00	16,000		0	480.00	3,840		0	19,840
40IC	4		Relocate Existing Thermal Dispersion Flow Meter	LS	1.0		0		0	480.00	480		0	480
40IC	5		Thermal Dispersion Flow Meter (Biological Treatment	Ea.	4.0	4,400.00	17,600		0	600.00	2,400		0	20,000
40IC	6		Mixer Control Station (Biological Treatment)	Ea.	8.0	750.00	6,000		0	120.00	960		0	6,960
40IC	7		ML Pump Control Station (Biological Treatment)	Ea.	4.0	750.00	3,000		0	120.00	480		0	3,480
40IC	8													
40IC	9													
40IC	10													
40IC	11													
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40IC	38													
40IC	39													
40IC	40		PLC Programming	LS	1.0		0		0	5,000.00	5,000		0	5,000
40IC	41		SCADA HMI Programming	LS	1.0		0		0	5,000.00	5,000		0	5,000
40IC	42													
40IC	43													
40IC	44													
40IC														
40IC														
40IC			SUBTOTAL				42,600		0		19,160		0	61,760
40IC														
40IC			Material, Construction Equipment, Labor O&P	15.0%			6,390		0		2,874			9,264
40IC			Major Vendor O&P	4.0%									0	0
40IC			Global Markups	15.0%	2.0%		7,349		0		3,305		0	10,654
40IC	DIV	40IC	**TOTAL w/o Global Markups**				**48,990**		**0**		**22,034**		**0**	**71,024**
			TOTAL w/ Global Markups				**56,339**		**0**		**25,339**		**0**	**81,678**
40IC			**TOTAL w/ Contingency**	20.0%	10.0%		**67,606**		**0**		**30,407**		**0**	**98,013**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 191/192
STRUCTURE NAME: AERATION TANKS
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		Selector Zone Mixers	EA	8.0		0		0	3,060.00	24,480	20,000.00	160,000	**184,480**
43	2		ML Recycle Pumps	EA	4.0		0		0	3,060.00	12,240	39,097.00	156,388	**168,628**
43	3													
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43														
43			SUBTOTAL				0		0		36,720		316,388	**353,108**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			0		0		5,508			**5,508**
43			Major Vendor O&P	7.5%									23,729	**23,729**
43			Global Markups	15.0%	2.0%		0		0		6,334		6,802	**13,137**
43	DIV	43	**TOTAL w/o Global Markups**				**0**		**0**		**42,228**		**340,117**	**382,345**
			TOTAL w/ Global Markups				**0**		**0**		**48,562**		**346,919**	**395,482**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**58,275**		**381,611**	**439,886**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 191/192
STRUCTURE NAME: AERATION TANKS
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	46	**WATER AND WASTEWATER EQUIPMENT**											
46	1		Fine Bubble Aeration System	LS	1.0		0		0	34,000.00	34,000	179,000.00	179,000	**213,000**
46	2													
46	3													
46	4													
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46														
46			SUBTOTAL				0		0		34,000		179,000	**213,000**
46														
46			Material, Construction Equipment, Labor O&P	15.0%			0		0		5,100			**5,100**
46			Major Vendor O&P	7.5%									13,425	**13,425**
46			Global Markups	15.0%	2.0%		0		0		5,865		3,849	**9,714**
46	DIV	46	**TOTAL w/o Global Markups**				**0**		**0**		**39,100**		**192,425**	**231,525**
			TOTAL w/ Global Markups				**0**		**0**		**44,965**		**196,274**	**241,239**
46			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**53,958**		**215,901**	**269,859**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 193
STRUCTURE NAME: TERTIARY TREATMENT TANK

03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	1	**GENERAL REQUIREMENTS**											
1	1		sawcut and remove concrete	CF	800.0	5.75	4,600	24.00	19,200		0		0	**23,800**
1	2													
1	3													
1	4													
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1														
1			SUBTOTAL				4,600		19,200		0		0	**23,800**
1														
1			Material, Construction Equipment, Labor O&P	15.0%			690		2,880		0			**3,570**
1			Major Vendor O&P	4.0%									0	**0**
1			Global Markups	15.0%	2.0%		794		3,312		0		0	**4,106**
1	DIV	1	**TOTAL w/o Global Markups**				**5,290**		**22,080**		**0**		**0**	**27,370**
			TOTAL w/ Global Markups				**6,084**		**25,392**		**0**		**0**	**31,476**
1			**TOTAL w/ Contingency**	20.0%	10.0%		**7,300**		**30,470**		**0**		**0**	**37,771**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 193
STRUCTURE NAME: TERTIARY TREATMENT TANK

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		12" walls	CY	157.0	490.00	76,930	56.00	8,792	680.00	106,760		0	**192,482**
3	2		drill and grout dowels	EA	550.0	11.40	6,270	11.40	6,270	63.00	34,650		0	**47,190**
3	3		structural slab	CY	30.0	490.00	14,700	40.00	1,200	450.00	13,500		0	**29,400**
3	4													
3	5		10" channel walls	CY	84.0	540.00	45,360	60.00	5,040	790.00	66,360		0	**116,760**
3	6		channel base mat	CY	92.0	290.00	26,680	39.00	3,588	91.00	8,372		0	**38,640**
3	7		drill and grout dowels	EA	350.0	11.40	3,990	11.40	3,990	63.00	22,050		0	**30,030**
3	8													
3	9													
3	10		Junction structure 1 (east of tank):											
3	11		18" base mat	CY	10.0	290.00	2,900	39.00	390	91.00	910		0	**4,200**
3	12		16" wall	CY	36.0	430.00	15,480	55.00	1,980	535.00	19,260		0	**36,720**
3	13													
3	14													
3	15		Junction structure 2 (NW corner of tank):											
3	16		18" base mat	CY	8.0	290.00	2,320	39.00	312	91.00	728		0	**3,360**
3	17		16" wall	CY	27.0	430.00	11,610	39.00	1,053	535.00	14,445		0	**27,108**
3	18													
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3			SUBTOTAL				206,240		32,615		287,035		0	**525,890**
3														
3			Material, Construction Equipment, Labor O&P	15.0%			30,936		4,892		43,055			**78,884**
3			Major Vendor O&P	4.0%									0	**0**
3			Global Markups	15.0%	2.0%		35,576		5,626		49,514		0	**90,716**
3	DIV	3	**TOTAL w/o Global Markups**				**237,176**		**37,507**		**330,090**		**0**	**604,774**
			TOTAL w/ Global Markups				**272,752**		**43,133**		**379,604**		**0**	**695,490**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**327,303**		**51,760**		**455,525**		**0**	**834,587**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 193
STRUCTURE NAME: TERTIARY TREATMENT TANK

03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	5	METALS											
5	1		al hatch	SF	18.0	165.00	2,970		0		0		0	**2,970**
5	2		al grating-floc/coagg tanks	SF	1,144.0	32.00	36,608	1.75	2,002	2.90	3,318		0	**41,928**
5	3		al grating-channel	SF	392.0	32.00	12,544	1.75	686	2.90	1,137		0	**14,367**
5	4		al railing	LF	140.0	53.00	7,420	1.00	140	12.50	1,750		0	**9,310**
5	5													
5	6													
5	7		grating over junction str 1	SF	100.0	31.40	3,140	2.00	200	3.25	325		0	**3,665**
5	8		grating over junction str 2	SF	75.0	31.40	2,355	2.00	150	3.25	244		0	**2,749**
5	9													
5	10													
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5	35													
5														
5			SUBTOTAL				65,037		3,178		6,773		0	**74,988**
5														
5			Material, Construction Equipment, Labor O&P	15.0%			9,756		477		1,016			**11,248**
5			Major Vendor O&P	4.0%									0	**0**
5			Global Markups	15.0%	2.0%		11,219		548		1,168		0	**12,935**
5	DIV	5	**TOTAL w/o Global Markups**				**74,793**		**3,655**		**7,789**		**0**	**86,236**
			TOTAL w/ Global Markups				**86,011**		**4,203**		**8,957**		**0**	**99,172**
5			**TOTAL w/ Contingency**	20.0%	10.0%		**103,214**		**5,043**		**10,749**		**0**	**119,006**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	193
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	TERTIARY TREATMENT TANK
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV 26	ELECTRICAL											
26	1	LED LIGHTING	LS	1.0	5,000.00	5,000		0	2,200.00	2,200		0	**7,200**
26	2	CONDUITS AND CONDUCTORS	LS	1.0	5,000.00	5,000		0	1,000.00	1,000		0	**6,000**
26	3	SITE WORK	LS	1.0	4,000.00	4,000		0	3,000.00	3,000		0	**7,000**
26	4												
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26													
26	DIV 26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 193
STRUCTURE NAME: TERTIARY TREATMENT TANK

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	31	EARTHWORK											
31	1		excavation for channel	LS	1.0		0	2,000.00	2,000	2,000.00	2,000		0	**4,000**
31	2		piles below channel	LS	1.0	40,000.00	40,000		0		0		0	**40,000**
31	3													
31	4		Junction Str 1 (east of tank):											
31	5		excavation	CY	200.0		0	15.00	3,000	15.00	3,000		0	**6,000**
31	6		haul excess	CY	75.0		0	2.75	206	2.50	188		0	**394**
31	7		earth backfill	CY	125.0		0	1.50	188	3.50	438		0	**625**
31	8		piles	LS	1.0	20,000.00	20,000		0		0		0	**20,000**
31	9													
31	10		Junction Str 2 (NW corner of tank):											
31	11		excavation	CY	150.0		0	15.00	2,250	15.00	2,250		0	**4,500**
31	12		haul excess	CY	60.0		0	2.75	165	2.50	150		0	**315**
31	13		earth backfill	CY	90.0		0	1.50	135	3.50	315		0	**450**
31	14		piles	LS	1.0	15,000.00	15,000		0		0		0	**15,000**
31	15													
31	16		dewatering	LS	1.0		0	10,000.00	10,000		0		0	**10,000**
31	17													
31	18													
31	19													
31	20													
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31														
31			SUBTOTAL				75,000		17,944		8,340		0	**101,284**
31														
31			Material, Construction Equipment, Labor O&P	15.0%			11,250		2,692		1,251			**15,193**
31			Major Vendor O&P	4.0%									0	**0**
31			Global Markups	15.0%	2.0%		12,938		3,095		1,439		0	**17,471**
31	DIV	31	**TOTAL w/o Global Markups**				**86,250**		**20,635**		**9,591**		**0**	**116,476**
			TOTAL w/ Global Markups				**99,188**		**23,731**		**11,030**		**0**	**133,948**
31			**TOTAL w/ Contingency**	20.0%	10.0%		**119,025**		**28,477**		**13,236**		**0**	**160,737**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 193
STRUCTURE NAME: TERTIARY TREATMENT TANK

03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		Stainless Steel Gates (48"x48")	EA	6.0	10,000.00	60,000		0	2,500.00	15,000		0	**75,000**
40M	2		Stainless Steel Gates (96"x48")	EA	3.0	12,000.00	36,000		0	3,000.00	9,000		0	**45,000**
40M	3													
40M	4		TFI - CLDI											
40M	5		48" Pipe	LF	40.0	460.00	18,400		0	460.00	18,400		0	**36,800**
40M	6													
40M	7													
40M	8													
40M	9													
40M	10													
40M	11													
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40M														
40M			SUBTOTAL				114,400		0		42,400		0	**156,800**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			17,160		0		6,360			**23,520**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		19,734		0		7,314		0	**27,048**
40M	DIV	40M	**TOTAL w/o Global Markups**				**131,560**		**0**		**48,760**		**0**	**180,320**
			TOTAL w/ Global Markups				**151,294**		**0**		**56,074**		**0**	**207,368**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**181,553**		**0**		**67,289**		**0**	**248,842**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 193
STRUCTURE NAME: TERTIARY TREATMENT TANK

03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		Secondary Effluent Axial Flow Propeller Pumps	LS	1.0		0		0	64,357.25	64,357	257,429.00	257,429	**321,786**
43	2													
43	3		Rapid Mix Mixer	EA	2.0		0		0	5,000.00	10,000	25,000.00	50,000	**60,000**
43	4		Coagulation Mixer	EA	2.0		0		0	4,200.00	8,400	21,000.00	42,000	**50,400**
43	5		Flocculation Mixer	EA	2.0		0		0	4,200.00	8,400	21,000.00	42,000	**50,400**
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43														
43			SUBTOTAL				0		0		91,157		391,429	**482,586**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			0		0		13,674			**13,674**
43			Major Vendor O&P	7.5%									29,357	**29,357**
43			Global Markups	15.0%	2.0%		0		0		15,725		8,416	**24,140**
43	DIV	43	**TOTAL w/o Global Markups**				**0**		**0**		**104,831**		**420,786**	**525,617**
			TOTAL w/ Global Markups				**0**		**0**		**120,555**		**429,202**	**549,757**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**144,667**		**472,122**	**616,789**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 210
STRUCTURE NAME: SECONDARY CLARIFICATION
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		CONDUITS AND CONUDCTORS	LS	1.0	5,000.00	5,000		0	2,000.00	2,000		0	7,000
26	2		SITE WORK AND DUCT BANK	LS	1.0	9,000.00	9,000		0	9,000.00	9,000		0	18,000
26	3													
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26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 210
STRUCTURE NAME: SECONDARY CLARIFICATION

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
DIV	31	EARTHWORK											
1		sheeting/shoring/bracing	LS	1.0	6,000.00	6,000	2,000.00	2,000	2,000.00	2,000		0	**10,000**
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		SUBTOTAL				6,000		2,000		2,000		0	**10,000**
		Material, Construction Equipment, Labor O&P	15.0%			900		300		300			**1,500**
		Major Vendor O&P	4.0%									0	**0**
		Global Markups	15.0%	2.0%		1,035		345		345		0	**1,725**
DIV	31	**TOTAL w/o Global Markups**				**6,900**		**2,300**		**2,300**		**0**	**11,500**
		TOTAL w/ Global Markups				**7,935**		**2,645**		**2,645**		**0**	**13,225**
		TOTAL w/ Contingency	20.0%	10.0%		**9,522**		**3,174**		**3,174**		**0**	**15,870**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 210
STRUCTURE NAME: SECONDARY CLARIFICATION

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	46	WATER AND WASTEWATER EQUIPMENT											
46	1		Current Density Baffle System	EA	4.0		0		0	9,500.00	38,000	36,030.00	144,120	**182,120**
46	2		Launder Cover System	EA	4.0		0		0	10,200.00	40,800	66,930.00	267,720	**308,520**
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46			SUBTOTAL				0		0		78,800		411,840	**490,640**
46														
46			Material, Construction Equipment, Labor O&P	15.0%			0		0		11,820			**11,820**
46			Major Vendor O&P	7.5%									30,888	**30,888**
46			Global Markups	15.0%	2.0%		0		0		13,593		8,855	**22,448**
46	DIV	46	**TOTAL w/o Global Markups**				**0**		**0**		**90,620**		**442,728**	**533,348**
			TOTAL w/ Global Markups				**0**		**0**		**104,213**		**451,583**	**555,796**
46			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**125,056**		**496,741**	**621,796**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		18" conc walls	CY	186.0	420.00	78,120	50.00	9,300	490.00	91,140		0	**178,560**
3	2		base mat	CY	275.0	290.00	79,750	39.00	10,725	91.00	25,025		0	**115,500**
3	3		12" walls	CY	126.0	490.00	61,740	56.00	7,056	680.00	85,680		0	**154,476**
3	4		equipment pads	CY	10.0	725.00	7,250	93.00	930	645.00	6,450		0	**14,630**
3	5		structural slab	CY	92.0	490.00	45,080	40.00	3,680	450.00	41,400		0	**90,160**
3	6		approach slab	SF	250.0	9.00	2,250	2.00	500	4.00	1,000		0	**3,750**
3	7		door stoop	SF	100.0	33.00	3,300	6.00	600	35.00	3,500		0	**7,400**
3	8													
3	9		precast plank roof	SF	2,600.0	11.00	28,600		0		0		0	**28,600**
3	10													
3	11		containment curb	LF	37.0	7.00	259	2.00	74	15.00	555		0	**888**
3	12													
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3			SUBTOTAL				306,349		32,865		254,750		0	**593,964**
3														
3			Material, Construction Equipment, Labor O&P	15.0%			45,952		4,930		38,213			**89,095**
3			Major Vendor O&P	4.0%									0	**0**
3			Global Markups	15.0%	2.0%		52,845		5,669		43,944		0	**102,459**
3	DIV	3	**TOTAL w/o Global Markups**				**352,301**		**37,795**		**292,963**		**0**	**683,059**
			TOTAL w/ Global Markups				**405,147**		**43,464**		**336,907**		**0**	**785,517**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**486,176**		**52,157**		**404,288**		**0**	**942,621**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	4	MASONRY											
4	1		12" block	SF	3,600.0	7.60	27,360	2.20	7,920	13.90	50,040		0	**85,320**
4	2		8" block	SF	1,140.0	6.30	7,182	2.20	2,508	8.50	9,690		0	**19,380**
4	3		facebrick	SF	3,600.0	7.60	27,360	2.20	7,920	11.80	42,480		0	**77,760**
4	4													
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4			SUBTOTAL				61,902		18,348		102,210		0	**182,460**
4														
4			Material, Construction Equipment, Labor O&P	15.0%			9,285		2,752		15,332			**27,369**
4			Major Vendor O&P	4.0%									0	**0**
4			Global Markups	15.0%	2.0%		10,678		3,165		17,631		0	**31,474**
4	DIV	4	**TOTAL w/o Global Markups**				**71,187**		**21,100**		**117,542**		**0**	**209,829**
			TOTAL w/ Global Markups				**81,865**		**24,265**		**135,173**		**0**	**241,303**
4			**TOTAL w/ Contingency**	20.0%	10.0%		**98,238**		**29,118**		**162,207**		**0**	**289,564**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	5	METALS											
5	1		al grating	SF	300.0	31.40	9,420	2.00	600	3.25	975		0	10,995
5	2		al stair	TREADS	25.0	450.00	11,250	15.65	391	60.00	1,500		0	13,141
5	3		al platform (lower level)	LS	1.0	5,000.00	5,000		0	3,000.00	3,000		0	8,000
5	4		SS weir	LF	30.0	77.00	2,310	5.00	150	6.25	188		0	2,648
5	5		misc metal fabrications	LBS	1,000.0	1.75	1,750	1.00	1,000	1.75	1,750		0	4,500
5	6		al railing	LF	150.0	53.00	7,950	1.00	150	12.50	1,875		0	9,975
5	7													
5	8		ladder to roof	VLF	13.0	85.00	1,105	3.00	39	16.00	208		0	1,352
5	9													
5	10		al access hatch	SF	9.0	160.00	1,440		0		0		0	1,440
5	11													
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5														
5			SUBTOTAL				40,225		2,330		9,496		0	52,051
5														
5			Material, Construction Equipment, Labor O&P	15.0%			6,034		350		1,424			7,808
5			Major Vendor O&P	4.0%									0	0
5			Global Markups	15.0%	2.0%		6,939		402		1,638		0	8,979
5	DIV	5	**TOTAL w/o Global Markups**				**46,259**		**2,680**		**10,920**		**0**	**59,858**
			TOTAL w/ Global Markups				**53,198**		**3,082**		**12,558**		**0**	**68,837**
5			**TOTAL w/ Contingency**	20.0%	10.0%		**63,837**		**3,698**		**15,069**		**0**	**82,605**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	7	THERMAL AND MOISTURE PROTECTION											
7	1		perimeter insulation	SF	900.0	1.60	1,440		0	1.60	1,440		0	**2,880**
7	2		cavity wall insulation	SF	3,600.0	1.60	5,760		0	1.60	5,760		0	**11,520**
7	3		Fully adhered EPDM roofing	SF	2,600.0	7.00	18,200	0.75	1,950	1.25	3,250		0	**23,400**
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7	34													
7	35													
7														
7			SUBTOTAL				25,400		1,950		10,450		0	**37,800**
7														
7			Material, Construction Equipment, Labor O&P	15.0%			3,810		293		1,568			**5,670**
7			Major Vendor O&P	4.0%									0	**0**
7			Global Markups	15.0%	2.0%		4,382		336		1,803		0	**6,521**
7	DIV	7	**TOTAL w/o Global Markups**				**29,210**		**2,243**		**12,018**		**0**	**43,470**
			TOTAL w/ Global Markups				**33,592**		**2,579**		**13,820**		**0**	**49,991**
7			**TOTAL w/ Contingency**	20.0%	10.0%		**40,310**		**3,095**		**16,584**		**0**	**59,989**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	8	OPENINGS											
8	1		single GHM door/frame/hardware	EA	3.0	1,740.00	5,220		0		0		0	**5,220**
8	2		double GHM door/frame/hardware	EA	1.0	3,100.00	3,100		0		0		0	**3,100**
8	3		Overhead coiling door	SF	240.0	70.00	16,800		0		0		0	**16,800**
8	4													
8	5													
8	6													
8	7													
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8														
8			SUBTOTAL				25,120		0		0		0	**25,120**
8														
8			Material, Construction Equipment, Labor O&P	15.0%			3,768		0		0			**3,768**
8			Major Vendor O&P	4.0%									0	**0**
8			Global Markups	15.0%	2.0%		4,333		0		0		0	**4,333**
8	DIV	8	**TOTAL w/o Global Markups**				**28,888**		**0**		**0**		**0**	**28,888**
			TOTAL w/ Global Markups				**33,221**		**0**		**0**		**0**	**33,221**
8			**TOTAL w/ Contingency**	20.0%	10.0%		**39,865**		**0**		**0**		**0**	**39,865**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	9	FINISHES											
9	1		coat ferric chloride tank	SF	1,635.0	1.80	2,943		0	2.90	4,742		0	**7,685**
9	2													
9	3													
9	4													
9	5													
9	6													
9	7													
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9														
9			SUBTOTAL				2,943		0		4,742		0	**7,685**
9														
9			Material, Construction Equipment, Labor O&P	15.0%			441		0		711			**1,153**
9			Major Vendor O&P	4.0%									0	**0**
9			Global Markups	15.0%	2.0%		508		0		818		0	**1,326**
9	DIV	9	**TOTAL w/o Global Markups**				**3,384**		**0**		**5,453**		**0**	**8,837**
			TOTAL w/ Global Markups				**3,892**		**0**		**6,271**		**0**	**10,163**
9			**TOTAL w/ Contingency**	20.0%	10.0%		**4,671**		**0**		**7,525**		**0**	**12,195**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV 10	SPECIALTIES											
10 1		fire extinguisher	EA	4.0	175.00	700		0	40.00	160		0	**860**
10 2													
10 3													
10 4													
10 5													
10 6													
10 7													
10 8													
10 9													
10 10													
10 11													
10 12													
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10 32													
10 33													
10 34													
10 35													
10													
10		SUBTOTAL				700		0		160		0	**860**
10													
10		Material, Construction Equipment, Labor O&P	15.0%			105		0		24			**129**
10		Major Vendor O&P	4.0%									0	**0**
10		Global Markups	15.0%	2.0%		121		0		28		0	**148**
10 DIV	10	**TOTAL w/o Global Markups**				**805**		**0**		**184**		**0**	**989**
		TOTAL w/ Global Markups				**926**		**0**		**212**		**0**	**1,137**
10		**TOTAL w/ Contingency**	20.0%	10.0%		**1,111**		**0**		**254**		**0**	**1,365**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	22	PLUMBING											
22	1		Fixture	Ea	30.0	1,500.00	45,000		0	1,500.00	45,000		0	**90,000**
22	2													
22	3													
22	4													
22	5													
22	6													
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22	35													
22														
22			SUBTOTAL				45,000		0		45,000		0	**90,000**
22														
22			Material, Construction Equipment, Labor O&P	15.0%			6,750		0		6,750			**13,500**
22			Major Vendor O&P	7.5%									0	**0**
22			Global Markups	15.0%	2.0%		7,763		0		7,763		0	**15,525**
22	DIV	22	**TOTAL w/o Global Markups**				**51,750**		**0**		**51,750**		**0**	**103,500**
			TOTAL w/ Global Markups				**59,513**		**0**		**59,513**		**0**	**119,025**
22			**TOTAL w/ Contingency**	20.0%	10.0%		**71,415**		**0**		**71,415**		**0**	**142,830**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	23	HVAC											
23	1		Checmical Room Ventilation	CFM	600.0	25.00	15,000		0	10.00	6,000		0	**21,000**
23	2													
23	3		Thermostatic Vent System	Ea	3.0	7,500.00	22,500		0	2,500.00	7,500		0	**30,000**
23	4													
23	5		Gas Unit Heater	Ea	5.0	4,500.00	22,500		0	3,000.00	15,000		0	**37,500**
23	6													
23	7		Corrosion Resistant Electric Unit Heater	Ea	2.0	2,500.00	5,000		0	750.00	1,500		0	**6,500**
23	8													
23	9		Gas Piping	LS	1.0	1,500.00	1,500		0	1,500.00	1,500		0	**3,000**
23	10													
23	11													
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23	35													
23														
23			SUBTOTAL				66,500		0		31,500		0	**98,000**
23														
23			Material, Construction Equipment, Labor O&P	15.0%			9,975		0		4,725			**14,700**
23			Major Vendor O&P	7.5%									0	**0**
23			Global Markups	15.0%	2.0%		11,471		0		5,434		0	**16,905**
23	DIV	23	**TOTAL w/o Global Markups**				**76,475**		**0**		**36,225**		**0**	**112,700**
			TOTAL w/ Global Markups				**87,946**		**0**		**41,659**		**0**	**129,605**
23			**TOTAL w/ Contingency**	20.0%	10.0%		**105,536**		**0**		**49,991**		**0**	**155,526**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	240
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	FILTRATION BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

		SPEC		UNIT OF		MATERIAL		CONSTRUCTION EQUIPMENT		LABOR		VENDOR		
	LINE	SECTION	DESCRIPTION	MEASURE	QUANTITY	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		MCC SECTIONS	EA	3.0	2,200.00	6,600		0	505.00	1,515		0	8,115
26	2		480V SPD	EA	1.0	13,900.00	13,900		0	1,050.00	1,050		0	14,950
26	3		100A CB	EA	10.0	950.00	9,500		0	101.00	1,010		0	10,510
26	4		FVNR SZ1	EA	10.0	2,250.00	22,500		0	150.00	1,500		0	24,000
26	5		LIGHTING PANEL	EA	1.0	2,250.00	2,250		0	1,425.00	1,425		0	3,675
26	6		30KVA TRANSFORMER	EA	1.0	2,225.00	2,225		0	895.00	895		0	3,120
26	7		POWER PANEL	EA	1.0	4,775.00	4,775		0	1,750.00	1,750		0	6,525
26	8		120/208V SPD	EA	1.0	3,890.00	3,890		0	1,050.00	1,050		0	4,940
26	9		CONDUITS AND CONDUCTORS	LS	1.0	31,000.00	31,000		0	5,000.00	5,000		0	36,000
26	10		LIGHITNG LED	LS	1.0	20,000.00	20,000		0	2,000.00	2,000		0	22,000
26	11		WIRING DEVICES	LS	1.0	4,000.00	4,000		0	1,500.00	1,500		0	5,500
26	12		MOTOR CONNECTIONS	EA	20.0		0		0	200.00	4,000		0	4,000
26	13		GROUNDING	LS	1.0		0		0	700.00	700		0	700
26	14		DUCT BANK AND SITE WORK	LS	1.0	5,000.00	5,000		0	3,000.00	3,000		0	8,000
26	15													
26	16													
26	17													
26	18													
26	19													
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26	44													
26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV	26	**ELECTRICAL (concluded)**											
26														
26	45													
26	46													
26	47													
26	48													
26	49													
26	50													
26	51													
26	52													
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26	66													
26	67													
26	68													
26	69													
26	70													
26	71													
26	72													
26	73													
26	74													
26	75		I&C Wiring & Conduit	LS	1.0	7,000.00	7,000		0	3,500.00	3,500		0	**10,500**
26	76													
26	77													
26	78													
26	79													
26														
26			SUBTOTAL				132,640		0		29,895		0	**162,535**
26														
26			Material, Construction Equipment, Labor O&P	15.0%			19,896		0		4,484			**24,380**
26			Major Vendor O&P	15.0%									0	**0**
26			Global Markups	15.0%	2.0%		22,880		0		5,157		0	**28,037**
26	DIV	26	**TOTAL w/o Global Markups**				**152,536**		**0**		**34,379**		**0**	**186,915**
			TOTAL w/ Global Markups				**175,416**		**0**		**39,536**		**0**	**214,953**
26			**TOTAL w/ Contingency**	20.0%	10.0%		**210,500**		**0**		**47,443**		**0**	**257,943**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	31	EARTHWORK											
31	1		structure excavation	CY	3,800.0		0	7.00	26,600	6.00	22,800		0	**49,400**
31	2		haul excess excavation off site	CY	2,100.0		0	2.75	5,775	2.50	5,250		0	**11,025**
31	3		earth backfill	CY	1,700.0		0	1.50	2,550	3.50	5,950		0	**8,500**
31	4													
31	5		piles	LS	1.0	200,000.00	200,000		0		0		0	**200,000**
31	6													
31	7		dewatering	LS	1.0		0	25,000.00	25,000		0		0	**25,000**
31	8													
31	9													
31	10													
31	11													
31	12													
31	13													
31	14													
31	15													
31	16													
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31														
31			SUBTOTAL				200,000		59,925		34,000		0	**293,925**
31														
31			Material, Construction Equipment, Labor O&P	15.0%			30,000		8,989		5,100			**44,089**
31			Major Vendor O&P	4.0%									0	**0**
31			Global Markups	15.0%	2.0%		34,500		10,337		5,865		0	**50,702**
31	DIV	31	**TOTAL w/o Global Markups**				**230,000**		**68,914**		**39,100**		**0**	**338,014**
			TOTAL w/ Global Markups				**264,500**		**79,251**		**44,965**		**0**	**388,716**
31			**TOTAL w/ Contingency**	20.0%	10.0%		**317,400**		**95,101**		**53,958**		**0**	**466,459**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		RAS - CLDI											
40M	2		20" FL Pipe	LS	1.0	16,926.00	16,926		0	4,231.50	4,232		0	**21,158**
40M	3		20" RAS Flow Control Valves	EA	2.0	19,975.00	39,950		0	4,993.75	9,988		0	**49,938**
40M	4		20" Plug Valve	EA	2.0	14,956.00	29,912		0	3,739.00	7,478		0	**37,390**
40M	5													
40M	6		Stainless Steel Gates (48"x48")	EA	2.0	10,000.00	20,000		0	2,500.00	5,000		0	**25,000**
40M	7		Stainless Steel Gates (96"x48")	EA	3.0	12,000.00	36,000		0	3,000.00	9,000		0	**45,000**
40M	8													
40M	9		Process-Mechanical Piping Systems	LS	1.0	150,000.00	150,000		0	75,000.00	75,000		0	**225,000**
40M	10													
40M	11		PM Piping Insulation	LS	1.0	5,000.00	5,000		0	2,000.00	2,000		0	**7,000**
40M	12													
40M	13													
40M	14													
40M	15													
40M	16													
40M	17													
40M	18													
40M	19													
40M	20													
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40M	40													
40M	41													
40M	42													
40M	43													
40M	44													
40M														
40M														
40M			SUBTOTAL				297,788		0		112,697		0	**410,485**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			44,668		0		16,905			**61,573**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		51,368		0		19,440		0	**70,809**
40M	DIV	40M	**TOTAL w/o Global Markups**				**342,456**		**0**		**129,602**		**0**	**472,058**
			TOTAL w/ Global Markups				**393,825**		**0**		**149,042**		**0**	**542,866**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**472,590**		**0**		**178,850**		**0**	**651,440**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
DIV	40IC	PROCESS INTERCONNECTIONS: IC											
1													
2													
3		Hydrostatic Level Element (SE Pumping)	Ea.	2.0	1,500.00	3,000		0	240.00	480		0	3,480
4		Ball Float Switch (SE Pumping)	Ea.	7.0	300.00	2,100		0	60.00	420		0	2,520
5													
6		Eyewash Flow Switch (FeCl Feed System)	Ea.	1.0	600.00	600		0	180.00	180		0	780
7		Radar Level Instrument (FeCl Feed System)	Ea.	1.0	3,500.00	3,500		0	360.00	360		0	3,860
8		Optical Switch (FeCl Feed System)	Ea.	1.0	300.00	300		0	60.00	60		0	360
9		Pressure Indicating Switch (FeCl Feed System)	Ea.	2.0	600.00	1,200		0	120.00	240		0	1,440
10		Pressure Gauge (FeCl Feed System)	Ea.	1.0	250.00	250		0	60.00	60		0	310
11													
12		Pressure Transmitter (Polymer System)	Ea.	1.0	2,200.00	2,200		0	180.00	180		0	2,380
13		Ball Float Switch (Polymer System)	Ea.	1.0	300.00	300		0	60.00	60		0	360
14		Eyewash Flow Switch (Polymer System)	Ea.	1.0	600.00	600		0	180.00	180		0	780
15		Optical Switch (Polymer System)	Ea.	1.0	300.00	300		0	60.00	60		0	360
16													
17		Pressure Gauge (W3 System)	Ea.	8.0	250.00	2,000		0	60.00	480		0	2,480
18		Electromagnetic Flowmeter (~6" W3 System)	Ea.	1.0	4,500.00	4,500		0	600.00	600		0	5,100
19													
20		Eyewash Flow Switch (SHC Feed System)	Ea.	1.0	600.00	600		0	180.00	180		0	780
21		Optical Switch (SHC Feed System)	Ea.	1.0	300.00	300		0	60.00	60		0	360
22		Pressure Indicating Switch (SHC Feed System)	Ea.	1.0	600.00	600		0	120.00	120		0	720
23		Pressure Gauge (SHC Feed System)	Ea.	1.0	250.00	250		0	60.00	60		0	310
24													
25		Electromagnetic Flowmeter (~20" RAS)	Ea.	2.0	16,000.00	32,000		0	1,200.00	2,400		0	34,400
26													
27		Ortho-P Analyzer	Ea.	1.0	25,000.00	25,000		0	2,000.00	2,000		0	27,000
28													
29													
30		Filtration Building PLC Panel	Ea.	1.0	50,000.00	50,000		0	20,000.00	20,000		0	70,000
31		Network Equipment	Ea.	1.0	4,000.00	4,000		0	1,000.00	1,000		0	5,000
32													
33		PLC Programming	LS	1.0		0		0	25,000.00	25,000		0	25,000
34		SCADA HMI Programming	LS	1.0		0		0	25,000.00	25,000		0	25,000
35													
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37													
38													
39													
40													
41													
42													
43													
44													
		SUBTOTAL				133,600		0		79,180		0	212,780
		Material, Construction Equipment, Labor O&P	15.0%			20,040		0		11,877			31,917
		Major Vendor O&P	4.0%									0	0
		Global Markups	15.0%	2.0%		23,046		0		13,659		0	36,705
DIV	40IC	**TOTAL w/o Global Markups**				**153,640**		**0**		**91,057**		**0**	**244,697**
		TOTAL w/ Global Markups				**176,686**		**0**		**104,716**		**0**	**281,402**
		TOTAL w/ Contingency	20.0%	10.0%		**212,023**		**0**		**125,659**		**0**	**337,682**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		W3 Pumps	EA	4.0	15,000.00	60,000		0	3,000.00	12,000		0	**72,000**
43	2		Automatic W3 Strainer	EA	2.0	12,000.00	24,000		0	3,000.00	6,000		0	**30,000**
43	3													
43	4		Chemical Storage Tank	EA	1.0	20,000.00	20,000		0	4,000.00	4,000		0	**24,000**
43	5		Polymer Aging Tank	EA	1.0	6,000.00	6,000		0	1,200.00	1,200		0	**7,200**
43	6													
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43														
43			SUBTOTAL				110,000		0		23,200		0	**133,200**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			16,500		0		3,480			**19,980**
43			Major Vendor O&P	7.5%									0	**0**
43			Global Markups	15.0%	2.0%		18,975		0		4,002		0	**22,977**
43	DIV	43	**TOTAL w/o Global Markups**				**126,500**		**0**		**26,680**		**0**	**153,180**
			TOTAL w/ Global Markups				**145,475**		**0**		**30,682**		**0**	**176,157**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**174,570**		**0**		**36,818**		**0**	**211,388**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 240
STRUCTURE NAME: FILTRATION BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	46	**WATER AND WASTEWATER EQUIPMENT**											
46	1		Disk Filtration System (includes chemical feed)	LS	1.0		0		0	372,500.00	372,500	##########	1,490,000	**1,862,500**
46	2													
46	3		Filter Polymer Mixing and Feed Systems	Ea	2.0	80,000.00	160,000		0	16,000.00	32,000		0	**192,000**
46	4													
46	5		Polymer Tote Rack	Ea	1.0	2,500.00	2,500		0	500.00	500		0	**3,000**
46	6													
46	7		SHC Feed System	LS	1.0	25,000.00	25,000		0	5,000.00	5,000		0	**30,000**
46	8		SHC Polymer Rack	Ea	1.0	2,500.00	2,500		0	500.00	500		0	**3,000**
46	9													
46	10													
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46			SUBTOTAL				190,000		0		410,500		1,490,000	**2,090,500**
46														
46			Material, Construction Equipment, Labor O&P	15.0%			28,500		0		61,575			**90,075**
46			Major Vendor O&P	7.5%									111,750	**111,750**
46			Global Markups	15.0%	2.0%		32,775		0		70,811		32,035	**135,621**
46	DIV	46	**TOTAL w/o Global Markups**				**218,500**		**0**		**472,075**		**1,601,750**	**2,292,325**
			TOTAL w/ Global Markups				**251,275**		**0**		**542,886**		**1,633,785**	**2,427,946**
46			**TOTAL w/ Contingency**	20.0%	10.0%		**301,530**		**0**		**651,464**		**1,797,164**	**2,750,157**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	270
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	DISINFECTION BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

		SPEC		UNIT OF		MATERIAL		CONSTRUCTION EQUIPMENT		LABOR		VENDOR		
	LINE	SECTION	DESCRIPTION	MEASURE	QUANTITY	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		CONDUITS AND CONDUCTORS	LS	1.0	44,000.00	44,000		0	10,000.00	10,000		0	54,000
26	2		DUCT BANK AND SITE WORK	LS	1.0	9,000.00	9,000		0	7,000.00	7,000		0	16,000
26	3													
26	4													
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26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 270
STRUCTURE NAME: DISINFECTION BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
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26		SUBTOTAL				53,000		0		17,000		0	**70,000**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			7,950		0		2,550			**10,500**
26		Major Vendor O&P	15.0%									0	**0**
26		Global Markups	15.0%	2.0%		9,143		0		2,933		0	**12,075**
26	DIV 26	**TOTAL w/o Global Markups**				**60,950**		**0**		**19,550**		**0**	**80,500**
		TOTAL w/ Global Markups				**70,093**		**0**		**22,483**		**0**	**92,575**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**84,111**		**0**		**26,979**		**0**	**111,090**

CLIENT CITY OF LA CROSSE — **OPINION OF PROBABLE CONST COST** — **DONOHUE & ASSOCIATES, INC.**

PROJECT WASTEWATER TREATMENT FACILITY IMI — PRELIMINARY DESIGN PHASE

PROJECT NO. 13655

MANAGER: LOCKETT — 03/16/20

DIVISION SUMMARY

DIV NO.	DIVISION NAME	M, E, L O & P	V O & P	CONSTRUCTION MATERIAL	CONSTRUCTION EQUIPMENT	CONSTRUCTION LABOR	CONSTRUCTION VENDOR	TOTAL	Part of Total
1	GENERAL REQUIREMENTS	15.0%	4.0%	0	11,270	38,985	0	50,255	0.2%
2	EXISTING CONDITIONS	15.0%	4.0%	0	0	0	0	0	0.0%
3	CONCRETE	15.0%	4.0%	1,818,076	83,282	431,036	0	2,332,394	8.5%
4	MASONRY	15.0%	4.0%	164,223	49,932	263,428	0	477,583	1.7%
5	METALS	15.0%	4.0%	84,344	4,440	19,019	0	107,802	0.4%
6	WOOD, PLASTICS, AND COMPOSITES	15.0%	4.0%	9,200	0	2,300	0	11,500	0.0%
7	THERMAL AND MOISTURE PROTECTION	15.0%	4.0%	152,052	14,283	42,549	0	208,884	0.8%
8	OPENINGS	15.0%	4.0%	110,941	0	0	0	110,941	0.4%
9	FINISHES	15.0%	4.0%	0	0	0	0	0	0.0%
10	SPECIALTIES	15.0%	4.0%	3,910	0	943	0	4,853	0.0%
11	EQUIPMENT	15.0%	4.0%	0	0	0	0	0	0.0%
12	FURNISHINGS	15.0%	4.0%	0	0	0	0	0	0.0%
13	SPECIAL CONSTRUCTION	15.0%	4.0%	57,500	0	0	0	57,500	0.2%
14	CONVEYING EQUIPMENT	15.0%	4.0%	6,900	0	0	0	6,900	0.0%
21	FIRE SUPRESSION	15.0%	4.0%	33,638	0	41,113	0	74,750	0.3%
22	PLUMBING	15.0%	7.5%	207,000	0	141,450	0	348,450	1.3%
23	HVAC	15.0%	7.5%	814,007	2,208	415,610	0	1,231,825	4.5%
25	INTEGRATED AUTOMATION	15.0%	4.0%	0	0	0	0	0	0.0%
26	ELECTRICAL	15.0%	15.0%	1,871,780	0	615,342	1,242,000	3,729,122	13.6%
27	COMMUNICATIONS	15.0%	4.0%	0	0	0	0	0	0.0%
28	ELECTRONIC SAFETY AND SECURITY	15.0%	4.0%	0	0	0	0	0	0.0%
31	EARTHWORK	15.0%	4.0%	488,750	72,910	53,533	0	615,193	2.3%
32	EXTERIOR IMPROVEMENTS	15.0%	4.0%	0	0	0	0	0	0.0%
33	UTILIITES	15.0%	4.0%	0	0	0	0	0	0.0%
34	TRANSPORTATION	15.0%	4.0%	0	0	0	0	0	0.0%
35	NFPA 820 COMPLIANCE	15.0%	7.5%	242,478	0	97,060	0	339,538	1.2%
40M	PROCESS INTERCONNECTIONS: PROCESS	15.0%	6.0%	2,092,797	66,288	928,548	0	3,087,633	11.3%
40IC	PROCESS INTERCONNECTIONS: I&C	15.0%	4.0%	515,327	0	282,020	0	797,347	2.9%
41	MATERIAL PROCESSING AND HANDLING	15.0%	7.5%	132,893	6,325	420,807	2,128,500	2,688,525	9.8%
42	PROCESS HEATING, COOLING, AND DRYIN	15.0%	7.5%	23,000	0	105,340	1,199,700	1,328,040	4.9%
43	PROCESS GAS AND LIQUID HANDLING	15.0%	7.5%	129,740	0	147,912	1,113,910	1,391,562	5.1%
44	POLLUTION AND WASTE CONTROL EQUIPM	15.0%	7.5%	0	0	0	0	0	0.0%
45	INDUSTRY SPECIFIC MANUFACTURING EQ	15.0%	7.5%	0	0	0	0	0	0.0%
46	WATER AND WASTEWATER EQUIPMENT	15.0%	7.5%	212,175	0	1,165,640	6,180,175	7,557,990	27.7%
48	ELECTRICAL POWER GENERATION	15.0%	15.0%	0	0	70,150	701,500	771,650	2.8%
	Subtotal Without Global Markups			9,170,730	310,937	5,282,784	12,565,785	27,330,236	100%
	Global Markups	M, E, L O & P	V O & P						
	General Conditions	6.0%	0.0%	550,244	18,656	316,967	0	885,867	3.0%
	Prime Markup	5.0%	0.0%	458,536	15,547	264,139	0	738,223	2.5%
	Bonds & Insurance	4.0%	2.0%	366,829	12,437	211,311	251,316	841,894	2.8%
	Subtotal Without Contingency			10,546,339	357,578	6,075,201	12,817,101	29,796,219	100%
	Contingency	20.0%	10.0%	2,109,268	71,516	1,215,040	1,281,710	4,677,534	
	TOTAL			**12,655,607**	**429,094**	**7,290,242**	**14,098,811**	**34,473,753**	
	Part of Total			36.7%	1.2%	21.1%	40.9%	100%	

CLIENT	**CITY OF LA CROSSE**	**OPINION OF PROBABLE CONST COST**	**DONOHUE & ASSOCIATES, INC.**
PROJECT	**WASTEWATER TREATMENT FACILITY IMI**	**PRELIMINARY DESIGN PHASE**	
PROJECT NO.	**13655**		
		MANAGER: LOCKETT	**03/16/20**

STRUCTURE SUMMARY

		CONSTRUCTION MATERIAL	EQUIPMENT	LABOR	VENDOR	TOTAL	Part of Total
300	**GRAVITY THICKENING**	12,786	0	7,543	0	20,329	0%
330	**HIGH STENGTH WASTE BUILDING**	1,038,939	14,699	370,196	247,250	1,671,084	6%
360	**WEST DIGESTER BUILDING**	1,198,657	58,316	510,039	297,020	2,064,031	8%
390	**EAST DIGESTER BUILDING**	1,519,162	111,250	780,019	869,565	3,279,996	12%
410	**LIQUID BIOSOLIDS STORAGE**	117,933	0	49,105	0	167,038	1%
440	**DEWATERED BIOSOLIDS STORAGE BUILDING**	11,500	0	5,750	0	17,250	0%
470	**WASTE GAS BURNER**	142,888	3,450	30,084	0	176,422	1%
500	**BIOSOLIDS DRYING BUILDING**	4,823,542	87,299	3,292,285	10,551,025	18,754,151	69%
530	**BIOGAS STORAGE MEMBRANE**	305,325	35,923	237,763	600,925	1,179,936	4%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
		0	0	0	0	0	0%
Subtotal Without Global Markups		9,170,730	310,937	5,282,784	12,565,785	27,330,236	100%
Global Markups							
General Conditions	**6.0%** **0.0%**	550,244	18,656	316,967	0	885,867	3.0%
Prime Markup	**5.0%** **0.0%**	458,536	15,547	264,139	0	738,223	2.5%
Bonds and Insurance	**4.0%** **2.0%**	366,829	12,437	211,311	251,316	841,894	2.8%
Subtotal Without Contingency		10,546,339	357,578	6,075,201	12,817,101	29,796,219	100.0%
Contingency	**20.0%** **10.0%**	2,109,268	71,516	1,215,040	1,281,710	4,677,534	
TOTAL		**12,655,607**	**429,094**	**7,290,242**	**14,098,811**	**34,473,753**	
Part of Total		37%	1%	21%	41%	100%	

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 300
STRUCTURE NAME: GRAVITY THICKENING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		GTE DI Pipe											
40M	2		4" Pipe	ft	5.0	114.00	570		0		0		0	**570**
40M	3		4" 90deg	EA	1.0	171.00	171		0		0		0	**171**
40M	4													
40M	5													
40M	6													
40M	7													
40M	8													
40M	9													
40M	10													
40M	11													
40M	12													
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40M	16													
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40M	36													
40M	37													
40M	38													
40M	39													
40M	40													
40M	41													
40M	42													
40M	43													
40M	44													
40M														
40M														
40M			SUBTOTAL				741		0		0		0	**741**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			111		0		0			**111**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		128		0		0		0	**128**
40M	DIV	40M	**TOTAL w/o Global Markups**				**852**		**0**		**0**		**0**	**852**
			TOTAL w/ Global Markups				**980**		**0**		**0**		**0**	**980**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**1,176**		**0**		**0**		**0**	**1,176**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 300
STRUCTURE NAME: GRAVITY THICKENING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40IC	PROCESS INTERCONNECTIONS: IC											
40IC	1													
40IC	2		Ball Float Switch (GTE Pumping)	Ea.	2.0	300.00	600		0	60.00	120		0	**720**
40IC	3		GTE Control Station	Ea.	1.0	500.00	500		0	120.00	120		0	**620**
40IC	4													
40IC	5													
40IC	6													
40IC	7													
40IC	8													
40IC	9													
40IC	10													
40IC	11													
40IC	12													
40IC	13													
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40IC	28													
40IC	29													
40IC	30		PLC Programming	LS	1.0		0		0	2,000.00	2,000		0	**2,000**
40IC	31		SCADA HMI Programming	LS	1.0		0		0	2,000.00	2,000		0	**2,000**
40IC	32													
40IC	33													
40IC	34													
40IC	35													
40IC	36													
40IC	37													
40IC	38													
40IC	39													
40IC	40													
40IC	41													
40IC	42													
40IC	43													
40IC	44													
40IC														
40IC														
40IC			SUBTOTAL				1,100		0		4,240		0	**5,340**
40IC														
40IC			Material, Construction Equipment, Labor O&P	15.0%			165		0		636			**801**
40IC			Major Vendor O&P	4.0%									0	**0**
40IC			Global Markups	15.0%	2.0%		190		0		731		0	**921**
40IC	DIV	40IC	**TOTAL w/o Global Markups**				**1,265**		**0**		**4,876**		**0**	**6,141**
			TOTAL w/ Global Markups				**1,455**		**0**		**5,607**		**0**	**7,062**
40IC			**TOTAL w/ Contingency**	20.0%	10.0%		**1,746**		**0**		**6,729**		**0**	**8,475**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 300
STRUCTURE NAME: GRAVITY THICKENING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		GTE Pump	EA	1.0	9,277.00	9,277		0	2,319.25	2,319		0	**11,596**
43	2													
43	3													
43	4													
43	5													
43	6													
43	7													
43	8													
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43	43													
43	44													
43														
43			SUBTOTAL				9,277		0		2,319		0	**11,596**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			1,392		0		348			**1,739**
43			Major Vendor O&P	7.5%									0	**0**
43			Global Markups	15.0%	2.0%		1,600		0		400		0	**2,000**
43	DIV	43	**TOTAL w/o Global Markups**				**10,669**		**0**		**2,667**		**0**	**13,336**
			TOTAL w/ Global Markups				**12,269**		**0**		**3,067**		**0**	**15,336**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**14,723**		**0**		**3,681**		**0**	**18,403**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	1	**GENERAL REQUIREMENTS**											
1	1		Remove bridge crane	LS	1.0		0		0	5,000.00	5,000		0	**5,000**
1	2		sawcut and remove concrete floor for new tanks	LS	1.0		0	4,000.00	4,000	4,000.00	4,000		0	**8,000**
1	3		Remove metal control building, platforms and stairs	LS	1.0		0		0	5,000.00	5,000		0	**5,000**
1	4		Remove existing HSW tanks, pumpings, and piping	LS	1.0		0	800.00	800	2,400.00	2,400		0	**3,200**
1	5													
1	6		HVAC Removals	LS	1.0		0		0	7,500.00	7,500		0	**7,500**
1	7													
1	8													
1	9													
1	10													
1	11													
1	12													
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1	14													
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1	35													
1														
1			SUBTOTAL				0		4,800		23,900		0	**28,700**
1														
1			Material, Construction Equipment, Labor O&P	15.0%			0		720		3,585			**4,305**
1			Major Vendor O&P	4.0%									0	**0**
1			Global Markups	15.0%	2.0%		0		828		4,123		0	**4,951**
1	DIV	1	**TOTAL w/o Global Markups**				**0**		**5,520**		**27,485**		**0**	**33,005**
			TOTAL w/ Global Markups				**0**		**6,348**		**31,608**		**0**	**37,956**
1			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**7,618**		**37,929**		**0**	**45,547**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		tank foundations	CY	25.0	290.00	7,250	40.00	1,000	90.00	2,250		0	**10,500**
3	2													
3	3													
3	4													
3	5													
3	6													
3	7													
3	8													
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3														
3			SUBTOTAL				7,250		1,000		2,250		0	**10,500**
3														
3			Material, Construction Equipment, Labor O&P	15.0%			1,088		150		338			**1,575**
3			Major Vendor O&P	4.0%									0	**0**
3			Global Markups	15.0%	2.0%		1,251		173		388		0	**1,811**
3	DIV	3	**TOTAL w/o Global Markups**				**8,338**		**1,150**		**2,588**		**0**	**12,075**
			TOTAL w/ Global Markups				**9,588**		**1,323**		**2,976**		**0**	**13,886**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**11,506**		**1,587**		**3,571**		**0**	**16,664**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	4	MASONRY											
4	1		Miscellaneous wall patches	LS	1.0	2,000.00	2,000		0	1,000.00	1,000		0	**3,000**
4	2													
4	3													
4	4													
4	5													
4	6													
4	7													
4	8													
4	9													
4	10													
4	11													
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4	35													
4														
4			SUBTOTAL				2,000		0		1,000		0	**3,000**
4														
4			Material, Construction Equipment, Labor O&P	15.0%			300		0		150			**450**
4			Major Vendor O&P	4.0%									0	**0**
4			Global Markups	15.0%	2.0%		345		0		173		0	**518**
4	DIV	4	**TOTAL w/o Global Markups**				**2,300**		**0**		**1,150**		**0**	**3,450**
			TOTAL w/ Global Markups				**2,645**		**0**		**1,323**		**0**	**3,968**
4			**TOTAL w/ Contingency**	20.0%	10.0%		**3,174**		**0**		**1,587**		**0**	**4,761**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	330
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	HIGH STENGTH WASTE BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	5	METALS											
5	1		platform up to tanks	LS	1.0	10,000.00	10,000		0	5,000.00	5,000		0	**15,000**
5	2		miscellaneous metal fabrications	LBS	500.0	1.75	875	1.00	500	1.75	875		0	**2,250**
5	3													
5	4													
5	5													
5	6													
5	7													
5	8													
5	9													
5	10													
5	11													
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5	31													
5	32													
5	33													
5	34													
5	35													
5														
5			SUBTOTAL				10,875		500		5,875		0	**17,250**
5														
5			Material, Construction Equipment, Labor O&P	15.0%			1,631		75		881			**2,588**
5			Major Vendor O&P	4.0%									0	**0**
5			Global Markups	15.0%	2.0%		1,876		86		1,013		0	**2,976**
5	DIV	5	**TOTAL w/o Global Markups**				**12,506**		**575**		**6,756**		**0**	**19,838**
			TOTAL w/ Global Markups				**14,382**		**661**		**7,770**		**0**	**22,813**
5			**TOTAL w/ Contingency**	20.0%	10.0%		**17,259**		**794**		**9,324**		**0**	**27,376**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	330
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	HIGH STENGTH WASTE BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	22	PLUMBING											
22	1		Fixture	Ea	8.0	2,500.00	20,000		0	1,500.00	12,000		0	**32,000**
22	2													
22	3													
22	4													
22	5													
22	6													
22	7													
22	8													
22	9													
22	10													
22	11													
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22	35													
22														
22			SUBTOTAL				20,000		0		12,000		0	**32,000**
22														
22			Material, Construction Equipment, Labor O&P	15.0%			3,000		0		1,800			**4,800**
22			Major Vendor O&P	7.5%									0	**0**
22			Global Markups	15.0%	2.0%		3,450		0		2,070		0	**5,520**
22	DIV	22	**TOTAL w/o Global Markups**				**23,000**		**0**		**13,800**		**0**	**36,800**
			TOTAL w/ Global Markups				**26,450**		**0**		**15,870**		**0**	**42,320**
22			**TOTAL w/ Contingency**	20.0%	10.0%		**31,740**		**0**		**19,044**		**0**	**50,784**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	330
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	HIGH STENGTH WASTE BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	23	HVAC											
23	1		HSW Receiving Ventilation	CFM	4,800.0	10.75	51,600		0	5.50	26,400		0	78,000
23	2													
23	3		Misc Heater Replacements	LS	1.0	15,000.00	15,000		0	7,500.00	7,500		0	22,500
23	4		Connect to Central Heating	LS	1.0	10,000.00	10,000		0	7,500.00	7,500		0	17,500
23	5													
23	6													
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23	34													
23	35													
23														
23			SUBTOTAL				76,600		0		41,400		0	118,000
23														
23			Material, Construction Equipment, Labor O&P	15.0%			11,490		0		6,210			17,700
23			Major Vendor O&P	7.5%									0	0
23			Global Markups	15.0%	2.0%		13,214		0		7,142		0	20,355
23	DIV	23	**TOTAL w/o Global Markups**				**88,090**		**0**		**47,610**		**0**	**135,700**
			TOTAL w/ Global Markups				**101,304**		**0**		**54,752**		**0**	**156,055**
23			**TOTAL w/ Contingency**	20.0%	10.0%		**121,564**		**0**		**65,702**		**0**	**187,266**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		MCC SECTIONS	EA	8.0	2,200.00	17,600		0	505.00	4,040		0	21,640
26	2		FVNR SZ 1	EA	20.0	2,250.00	45,000		0	150.00	3,000		0	48,000
26	3		100A CB	EA	10.0	1,725.00	17,250		0	101.00	1,010		0	18,260
26	4		LIGHTING PANEL	EA	1.0	2,250.00	2,250		0	1,425.00	1,425		0	3,675
26	5		30KVA TRANSFORMER	EA	1.0	2,225.00	2,225		0	895.00	895		0	3,120
26	6		POWER PANEL	EA	1.0	4,775.00	4,775		0	1,750.00	1,750		0	6,525
26	7		480V SOD	EA	2.0	13,900.00	27,800		0	1,050.00	2,100		0	29,900
26	8		120/208V SPD	EA	1.0	3,890.00	3,890		0	1,050.00	1,050		0	4,940
26	9		CONDUITS AND CONDUCTORS	LS	1.0	205,000.00	205,000		0	47,000.00	47,000		0	252,000
26	10		FVNR SZ 2	EA	5.0	1,950.00	9,750		0	201.00	1,005		0	10,755
26	11		600A MAIN CB	EA	4.0	3,850.00	15,400		0	730.00	2,920		0	18,320
26	12		WIRING DEVICES	LS	1.0	1,000.00	1,000		0	500.00	500		0	1,500
26	13		GROUNDING	LS	1.0	1,000.00	1,000		0	500.00	500		0	1,500
26	14		LIGHTING	LS	1.0	6,500.00	6,500		0	1,000.00	1,000		0	7,500
26	15		DUCT BANK AND SITE	LS	1.0	34,000.00	34,000		0	30,000.00	30,000		0	64,000
26	16													
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26	44													
26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
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26	72												
26	73												
26	74												
26	75	I&C Wiring & Conduit	LS	1.0	4,000.00	4,000		0	2,500.00	2,500		0	**6,500**
26	76												
26	77												
26	78												
26	79												
26													
26		SUBTOTAL				397,440		0		100,695		0	**498,135**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			59,616		0		15,104			**74,720**
26		Major Vendor O&P	15.0%									0	**0**
26		Global Markups	15.0%	2.0%		68,558		0		17,370		0	**85,928**
26	DIV 26	**TOTAL w/o Global Markups**				**457,056**		**0**		**115,799**		**0**	**572,855**
		TOTAL w/ Global Markups				**525,614**		**0**		**133,169**		**0**	**658,784**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**630,737**		**0**		**159,803**		**0**	**790,540**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	31	EARTHWORK											
31	1		pile supports for HSW tanks	LS	1.0	25,000.00	25,000		0		0		0	**25,000**
31	2													
31	3													
31	4													
31	5													
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31														
31			SUBTOTAL				25,000		0		0		0	**25,000**
31														
31			Material, Construction Equipment, Labor O&P	15.0%			3,750		0		0			**3,750**
31			Major Vendor O&P	4.0%									0	**0**
31			Global Markups	15.0%	2.0%		4,313		0		0		0	**4,313**
31	DIV	31	**TOTAL w/o Global Markups**				**28,750**		**0**		**0**		**0**	**28,750**
			TOTAL w/ Global Markups				**33,063**		**0**		**0**		**0**	**33,063**
31			**TOTAL w/ Contingency**	20.0%	10.0%		**39,675**		**0**		**0**		**0**	**39,675**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	35	**WATERWAY AND MARINE CONSTRUCTION**											
35	1		block up miscellaneous openings	LS	1.0	4,000.00	4,000		0	4,000.00	4,000		0	**8,000**
35	2		outside access to SST	LS	1.0	3,000.00	3,000		0	3,000.00	3,000		0	**6,000**
35	3													
35	4		Ventilate East Side of Building	CFM	6,400.0	10.75	68,800		0	5.50	35,200		0	**104,000**
35	5													
35	6													
35	7													
35	8													
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35														
35			SUBTOTAL				75,800		0		42,200		0	**118,000**
35														
35			Material, Construction Equipment, Labor O&P	15.0%			11,370		0		6,330			**17,700**
35			Major Vendor O&P	7.5%									0	**0**
35			Global Markups	15.0%	2.0%		13,076		0		7,280		0	**20,355**
35	DIV	35	**TOTAL w/o Global Markups**				**87,170**		**0**		**48,530**		**0**	**135,700**
			TOTAL w/ Global Markups				**100,246**		**0**		**55,810**		**0**	**156,055**
35			**TOTAL w/ Contingency**	20.0%	10.0%		**120,295**		**0**		**66,971**		**0**	**187,266**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		6" Plug valves	Ea	13.0	4,000.00	52,000		0	1,600.00	20,800		0	**72,800**
40M	2		6" actuated valves (Auma)	Ea	2.0	5,000.00	10,000		0	2,000.00	4,000		0	**14,000**
40M	3		6" check valves	Ea	2.0	2,300.00	4,600		0	920.00	1,840		0	**6,440**
40M	4		1.5" W3 SST piping	ft	100.0	21.00	2,100	0.68	68	8.40	840		0	**3,008**
40M	5		1.5" W3 SST Tee	Ea	1.0	150.00	150		0	60.00	60		0	**210**
40M	6		1.5" W3 90 SST deg elbow	Ea	2.0	83.57	167		0	33.43	67		0	**234**
40M	7		1.5" W3 ball valves	Ea	3.0	220.00	660		0	88.00	264		0	**924**
40M	8		1.5" W3 pressure relief valve	Ea	1.0	2,000.00	2,000		0	800.00	800		0	**2,800**
40M	9		6" SST piping	ft	275.0	72.00	19,800	1.50	413	28.80	7,920		0	**28,133**
40M	10		6" 90 deg SST elbows	Ea	18.0	540.00	9,720	16.44	296	216.00	3,888		0	**13,904**
40M	11		6" SST flanges	Ea	10.0	187.00	1,870	10.70	107	74.80	748		0	**2,725**
40M	12		6" SST Tee	Ea	4.0	371.00	1,484	24.68	99	148.40	594		0	**2,176**
40M	13		Wall penetration	Ea	4.0		0		0	500.00	2,000		0	**2,000**
40M	14													
40M	15													
40M	16													
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40M			SUBTOTAL				104,551		982		43,820		0	**149,354**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			15,683		147		6,573			**22,403**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		18,035		169		7,559		0	**25,764**
40M	DIV	40M	**TOTAL w/o Global Markups**				**120,234**		**1,129**		**50,394**		**0**	**171,757**
			TOTAL w/ Global Markups				**138,269**		**1,299**		**57,953**		**0**	**197,520**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**165,923**		**1,559**		**69,543**		**0**	**237,024**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40IC	PROCESS INTERCONNECTIONS: IC											
40IC	1													
40IC	2		HSW/SCS Tanks Ultrasonic Level Instrumentation	Ea.	7.0	2,200.00	15,400		0	240.00	1,680		0	**17,080**
40IC	3		HSW/SCS Tanks Ball Float Switch	Ea.	7.0	300.00	2,100		0	60.00	420		0	**2,520**
40IC	4		HSW Tank Mixer Control Station	Ea.	3.0	750.00	2,250		0	120.00	360		0	**2,610**
40IC	5		Pressure Transmitter (Unloading & Transfer Pumps)	Ea.	4.0	2,200.00	8,800		0	180.00	720		0	**9,520**
40IC	6		Differential Pressure Gauge (HSW)	Ea.	2.0	350.00	700		0	60.00	120		0	**820**
40IC	7		Unloading & Transfer Pumps C/S	Ea.	2.0	750.00	1,500		0	120.00	240		0	**1,740**
40IC	8		Eyewash Flow Switch (HSW)	Ea.	1.0	600.00	600		0	180.00	180		0	**780**
40IC	9		Electromagnetic Flow Meter (6")	Ea.	2.0	5,000.00	10,000		0	480.00	960		0	**10,960**
40IC	10		HSW Truck Fill Control Panel	Ea.	1.0	2,000.00	2,000		0	180.00	180		0	**2,180**
40IC	11		SCS Pump Misc. Controls (upgrade)	Ea.	1.0	2,000.00	2,000		0	240.00	240		0	**2,240**
40IC	12		Demo portions of Building I&C	LS	1.0		0		0	3,000.00	3,000		0	**3,000**
40IC	13													
40IC	14													
40IC	15													
40IC	16													
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40IC	24													
40IC	25													
40IC	26													
40IC	27		HSW Building PLC Upgrades (unk.)	LS	1.0	20,000.00	20,000		0	5,000.00	5,000		0	**25,000**
40IC	28		Network Eq. upgrades(unk.)	LS	1.0	3,000.00	3,000		0	1,000.00	1,000		0	**4,000**
40IC	29													
40IC	30													
40IC	31													
40IC	32													
40IC	33													
40IC	34													
40IC	35													
40IC	36													
40IC	37													
40IC	38													
40IC	39		PLC Programming	LS	1.0		0		0	6,000.00	6,000		0	**6,000**
40IC	40		SCADA HMI Programming	LS	1.0		0		0	6,000.00	6,000		0	**6,000**
40IC	41													
40IC	42													
40IC	43													
40IC	44													
40IC														
40IC														
40IC			SUBTOTAL				68,350		0		26,100		0	**94,450**
40IC														
40IC			Material, Construction Equipment, Labor O&P	15.0%			10,253		0		3,915			**14,168**
40IC			Major Vendor O&P	4.0%									0	**0**
40IC			Global Markups	15.0%	2.0%		11,790		0		4,502		0	**16,293**
40IC	DIV	40IC	**TOTAL w/o Global Markups**				**78,603**		**0**		**30,015**		**0**	**108,618**
			TOTAL w/ Global Markups				**90,393**		**0**		**34,517**		**0**	**124,910**
40IC			**TOTAL w/ Contingency**	20.0%	10.0%		**108,471**		**0**		**41,421**		**0**	**149,892**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 330
STRUCTURE NAME: HIGH STENGTH WASTE BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
DIV	41	**MATERIAL PROCESSING AND HANDLING**											
41	1	HSW 316 SST tank 1	Ea	1.0		0	1,500.00	1,500	6,000.00	6,000	115,000.00	115,000	**122,500**
41	2	HSW 316 SST tank 2	Ea	1.0		0	1,500.00	1,500	6,000.00	6,000	115,000.00	115,000	**122,500**
41	3	HSW unloading rotary lobe pump	Ea	1.0	44,988.00	44,988	1,000.00	1,000	4,498.80	4,499		0	**50,487**
41	4	HSW transfer rotary lobe pump	Ea	1.0	27,164.00	27,164	1,000.00	1,000	2,716.40	2,716		0	**30,880**
41	5	Eaton basket strainers - SST - 6" flange	Ea	2.0	8,654.00	17,308		0	500.00	1,000		0	**18,308**
41	6	Basket Strainer - replacement baskets	Ea	2.0	780.00	1,560		0		0		0	**1,560**
41	7	HSW side entry mixers	LS	1.0	24,539.00	24,539	500.00	500	2,453.90	2,454		0	**27,493**
41	8												
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41													
41		SUBTOTAL				115,559		5,500		22,669		230,000	**373,728**
41													
41		Material, Construction Equipment, Labor O&P	15.0%			17,334		825		3,400			**21,559**
41		Major Vendor O&P	7.5%									17,250	**17,250**
41		Global Markups	15.0%	2.0%		19,934		949		3,910		4,945	**29,738**
41	DIV 41	**TOTAL w/o Global Markups**				**132,893**		**6,325**		**26,069**		**247,250**	**412,537**
		TOTAL w/ Global Markups				**152,827**		**7,274**		**29,980**		**252,195**	**442,275**
41		**TOTAL w/ Contingency**	20.0%	10.0%		**183,392**		**8,729**		**35,976**		**277,415**	**505,511**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 360
STRUCTURE NAME: WEST DIGESTER BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	1	**GENERAL REQUIREMENTS**											
1	1		Process Removals	LS	1.0		0	5,000.00	5,000	10,000.00	10,000		0	**15,000**
1	2													
1	3													
1	4													
1	5													
1	6													
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1			SUBTOTAL				0		5,000		10,000		0	**15,000**
1														
1			Material, Construction Equipment, Labor O&P	15.0%			0		750		1,500			**2,250**
1			Major Vendor O&P	4.0%									0	**0**
1			Global Markups	15.0%	2.0%		0		863		1,725		0	**2,588**
1	DIV	1	**TOTAL w/o Global Markups**				**0**		**5,750**		**11,500**		**0**	**17,250**
			TOTAL w/ Global Markups				**0**		**6,613**		**13,225**		**0**	**19,838**
1			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**7,935**		**15,870**		**0**	**23,805**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 360
STRUCTURE NAME: WEST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	5	METALS											
5	1		add beam for removal of interior wall	LS	1.0	1,500.00	1,500		0	500.00	500		0	**2,000**
5	2													
5	3													
5	4													
5	5													
5	6													
5	7													
5	8													
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5	29													
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5	31													
5	32													
5	33													
5	34													
5	35													
5														
5			SUBTOTAL				1,500		0		500		0	**2,000**
5														
5			Material, Construction Equipment, Labor O&P	15.0%			225		0		75			**300**
5			Major Vendor O&P	4.0%									0	**0**
5			Global Markups	15.0%	2.0%		259		0		86		0	**345**
5	DIV	5	**TOTAL w/o Global Markups**				**1,725**		**0**		**575**		**0**	**2,300**
			TOTAL w/ Global Markups				**1,984**		**0**		**661**		**0**	**2,645**
5			**TOTAL w/ Contingency**	20.0%	10.0%		**2,381**		**0**		**794**		**0**	**3,174**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 360
STRUCTURE NAME: WEST DIGESTER BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	7	**THERMAL AND MOISTURE PROTECTION**											
7	1		miscellaneous roof patches/modifications	LS	1.0	5,000.00	5,000		0	5,000.00	5,000		0	**10,000**
7	2													
7	3													
7	4													
7	5													
7	6													
7	7													
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7	30													
7	31													
7	32													
7	33													
7	34													
7	35													
7														
7			SUBTOTAL				5,000		0		5,000		0	**10,000**
7														
7			Material, Construction Equipment, Labor O&P	15.0%			750		0		750			**1,500**
7			Major Vendor O&P	4.0%									0	**0**
7			Global Markups	15.0%	2.0%		863		0		863		0	**1,725**
7	DIV	7	**TOTAL w/o Global Markups**				**5,750**		**0**		**5,750**		**0**	**11,500**
			TOTAL w/ Global Markups				**6,613**		**0**		**6,613**		**0**	**13,225**
7			**TOTAL w/ Contingency**	20.0%	10.0%		**7,935**		**0**		**7,935**		**0**	**15,870**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 360
STRUCTURE NAME: WEST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	22	PLUMBING											
22	1		Fixture	Ea	4.0	2,500.00	10,000		0	1,500.00	6,000		0	**16,000**
22	2													
22	3													
22	4													
22	5													
22	6													
22	7													
22	8													
22	9													
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22	34													
22	35													
22														
22			SUBTOTAL				10,000		0		6,000		0	**16,000**
22														
22			Material, Construction Equipment, Labor O&P	15.0%			1,500		0		900			**2,400**
22			Major Vendor O&P	7.5%									0	**0**
22			Global Markups	15.0%	2.0%		1,725		0		1,035		0	**2,760**
22	DIV	22	**TOTAL w/o Global Markups**				**11,500**		**0**		**6,900**		**0**	**18,400**
			TOTAL w/ Global Markups				**13,225**		**0**		**7,935**		**0**	**21,160**
22			**TOTAL w/ Contingency**	20.0%	10.0%		**15,870**		**0**		**9,522**		**0**	**25,392**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 360
STRUCTURE NAME: WEST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	23	HVAC											
23	1		Ventilation Imrprovements	CFM	6,800.0	10.75	73,100		0	5.50	37,400		0	**110,500**
23	2													
23	3													
23	4													
23	5													
23	6													
23	7													
23	8													
23	9													
23	10													
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23	35													
23														
23			SUBTOTAL				73,100		0		37,400		0	**110,500**
23														
23			Material, Construction Equipment, Labor O&P	15.0%			10,965		0		5,610			**16,575**
23			Major Vendor O&P	7.5%									0	**0**
23			Global Markups	15.0%	2.0%		12,610		0		6,452		0	**19,061**
23	DIV	23	**TOTAL w/o Global Markups**				**84,065**		**0**		**43,010**		**0**	**127,075**
			TOTAL w/ Global Markups				**96,675**		**0**		**49,462**		**0**	**146,136**
23			**TOTAL w/ Contingency**	20.0%	10.0%		**116,010**		**0**		**59,354**		**0**	**175,364**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	360
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PROJECT NO.	13655	03/16/20	

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	26	ELECTRICAL										
26	1		CONDUITS AND CONDUCTORS	LS	1.0	3,000.00	3,000		0	1,000.00	1,000		0	4,000
26	2		DUCT BANK AND SITE WORK	LS	1.0	3,000.00	3,000		0	1,000.00	1,000		0	4,000
26	3													
26	4													
26	5													
26	6													
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26	43													
26	44													
26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 360
STRUCTURE NAME: WEST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV	26	**ELECTRICAL (concluded)**											
26														
26	45													
26	46													
26	47													
26	48													
26	49													
26	50													
26	51													
26	52													
26	53													
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26	67													
26	68													
26	69													
26	70													
26	71													
26	72													
26	73													
26	74													
26	75		I&C Wiring & Conduit	LS	1.0	4,000.00	4,000		0	20,000.00	20,000		0	**24,000**
26	76													
26	77													
26	78													
26	79													
26														
26			SUBTOTAL				10,000		0		22,000		0	**32,000**
26														
26			Material, Construction Equipment, Labor O&P	15.0%			1,500		0		3,300			**4,800**
26			Major Vendor O&P	15.0%									0	**0**
26			Global Markups	15.0%	2.0%		1,725		0		3,795		0	**5,520**
26	DIV	26	**TOTAL w/o Global Markups**				**11,500**		**0**		**25,300**		**0**	**36,800**
			TOTAL w/ Global Markups				**13,225**		**0**		**29,095**		**0**	**42,320**
26			**TOTAL w/ Contingency**	20.0%	10.0%		**15,870**		**0**		**34,914**		**0**	**50,784**

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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
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DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	35	WATERWAY AND MARINE CONSTRUCTION											
35	1													
35	2		Move PLC functionality to Str. 390	LS	1.0	8,000.00	8,000		0	1,000.00	1,000		0	**9,000**
35	3		Gas Detection and Alarming	LS	1.0	10,000.00	10,000		0	2,000.00	2,000		0	**12,000**
35	4		MOTOR CONNECTIONS	EA	10.0		0		0	200.00	2,000		0	**2,000**
35	5		EXPLOSION PROOF SEAL OFFS	EA	10.0	50.00	500		0	50.00	500		0	**1,000**
35	6		CONDUITS AND CONDUCTORS	LS	1.0	6,000.00	6,000		0	3,000.00	3,000		0	**9,000**
35	7		EXPLOSION PROOF WIRING DEVICES	LS	1.0	10,000.00	10,000		0	5,000.00	5,000		0	**15,000**
35	8		EXPLOSION PROOF LIGHTING	LS	1.0	60,000.00	60,000		0	7,000.00	7,000		0	**67,000**
35	9		DUCT BANK AND SITE WORK	LS	1.0	4,000.00	4,000		0	3,000.00	3,000		0	**7,000**
35	10													
35	11													
35	12													
35	13													
35	14													
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35	16													
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35	18													
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35	44													
35														
35														
35			SUBTOTAL				98,500		0		23,500		0	**122,000**
35														
35			Material, Construction Equipment, Labor O&P	15.0%			14,775		0		3,525			**18,300**
35			Major Vendor O&P	7.5%									0	**0**
35			Global Markups	15.0%	2.0%		16,991		0		4,054		0	**21,045**
35	DIV	35	**TOTAL w/o Global Markups**				**113,275**		**0**		**27,025**		**0**	**140,300**
			TOTAL w/ Global Markups				**130,266**		**0**		**31,079**		**0**	**161,345**
35			**TOTAL w/ Contingency**	20.0%	10.0%		**156,320**		**0**		**37,295**		**0**	**193,614**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 360
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03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M 1		304 SS Sch 10 DS											
40M 2		Pipe	LS	1.0	125,800.00	125,800	12,580.00	12,580	50,320.00	50,320		0	**188,700**
40M 3		Valves and Fittings	LS	1.0	155,600.00	155,600	15,560.00	15,560	62,240.00	62,240		0	**233,400**
40M 4													
40M 5		316 SS Sch 10 DG											
40M 6		8" Pipe	ft	140.0	199.79	27,971	19.98	2,797	79.92	11,188		0	**41,956**
40M 7		6" Pipe	ft	116.0	131.32	15,233	13.13	1,523	52.53	6,093		0	**22,849**
40M 8		12" Pipe	ft	57.0	351.79	20,052	35.18	2,005	140.71	8,021		0	**30,078**
40M 9		14" Pipe	ft	10.0	462.36	4,624	46.24	462	184.94	1,849		0	**6,935**
40M 10		8" Plug Valve	EA	6.0	2,549.25	15,296	254.93	1,530	1,019.70	6,118		0	**22,943**
40M 11		6" Plug Valve	EA	8.0	1,663.75	13,310	166.38	1,331	665.50	5,324		0	**19,965**
40M 12		8" 90deg	EA	10.0	1,356.29	13,563	135.63	1,356	542.51	5,425		0	**20,344**
40M 13		6" 90deg	EA	10.0	1,070.86	10,709	107.09	1,071	428.34	4,283		0	**16,063**
40M 14		8" Tee	EA	4.0	2,141.71	8,567	214.17	857	856.68	3,427		0	**12,850**
40M 15		6" Tee	EA	4.0	1,005.90	4,024	100.59	402	402.36	1,609		0	**6,035**
40M 16		12" Tee	EA	1.0	4,807.04	4,807	480.70	481	1,922.82	1,923		0	**7,211**
40M 17		14" Cross	EA	1.0	5,262.08	5,262	526.21	526	2,104.83	2,105		0	**7,893**
40M 18		12" 90deg	EA	2.0	4,720.42	9,441	472.04	944	1,888.17	3,776		0	**14,161**
40M 19		Wall Penetration	EA	6.0	500.00	3,000		0	500.00	3,000		0	**6,000**
40M 20		Misc CND Piping/Valves	LS	1.0	10,000.00	10,000	1,000.00	1,000	4,000.00	4,000		0	**15,000**
40M 21		12"x8" Red	EA	2.0	2,204.70	4,409	220.47	441	881.88	1,764		0	**6,614**
40M 22		14"x6" Red	EA	2.0	3,159.91	6,320	315.99	632	1,263.96	2,528		0	**9,480**
40M 23		14"x12" Red	EA	1.0	2,106.61	2,107	210.66	211	842.64	843		0	**3,160**
40M 24													
40M 25		CLDI DS											
40M 26		8" Pipe	ft	644.0	169.25	108,997		0	67.70	43,599		0	**152,596**
40M 27		8" 90deg	EA	24.0	464.00	11,136		0	185.60	4,454		0	**15,590**
40M 28		8" 45deg	EA	7.0	383.00	2,681		0	153.20	1,072		0	**3,753**
40M 29		8" Tee	EA	1.0	692.00	692		0	276.80	277		0	**969**
40M 30		8" Ball Check Valve	EA	2.0	4,905.00	9,810		0	1,962.00	3,924		0	**13,734**
40M 31		8" Plug Valve	EA	4.0	1,216.00	4,864		0	486.40	1,946		0	**6,810**
40M 32		8" Plug Valve Electric Actuator C1D1	EA	8.0	10,000.00	80,000		0	2,500.00	20,000		0	**100,000**
40M 33													
40M 34													
40M 35		GLDI DS											
40M 36		4" Pipe	ft	96.0	157.30	15,101		0	62.92	6,040		0	**21,141**
40M 37		8"x4" Ecc Red	EA	2.0	668.00	1,336		0	267.20	534		0	**1,870**
40M 38		4" Ball Check	EA	2.0	1,369.00	2,738		0	547.60	1,095		0	**3,833**
40M 39		4" Plug Valve	EA	2.0	583.00	1,166		0	233.20	466		0	**1,632**
40M 40		4" 90deg	EA	4.0	378.09	1,512		0	151.24	605		0	**2,117**
40M 41		4" Tee	EA	1.0	454.85	455		0	181.94	182		0	**637**
40M 42													
40M 43		Wall Penetrations	EA	8.0	500.00	4,000		0	500.00	4,000		0	**8,000**
40M 44		Roof Penetrations	EA	7.0	500.00	3,500		0	500.00	3,500		0	**7,000**
40M													
40M													
40M		SUBTOTAL				708,080		45,709		277,532		0	**1,031,321**
40M													
40M		Material, Construction Equipment, Labor O&P	15.0%			106,212		6,856		41,630			**154,698**
40M		Major Vendor O&P	6.0%									0	**0**
40M		Global Markups	15.0%	2.0%		122,144		7,885		47,874		0	**177,903**
40M DIV	40M	**TOTAL w/o Global Markups**				**814,292**		**52,566**		**319,162**		**0**	**1,186,020**
		TOTAL w/ Global Markups				**936,436**		**60,450**		**367,036**		**0**	**1,363,923**
40M		**TOTAL w/ Contingency**	20.0%	10.0%		**1,123,723**		**72,541**		**440,443**		**0**	**1,636,707**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	360
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	WEST DIGESTER BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40IC	PROCESS INTERCONNECTIONS: IC											
40IC	1													
40IC	2		DS Mixing Pumps Pressure Transmitter	Ea.	2.0	2,200.00	4,400		0	180.00	360		0	**4,760**
40IC	3		DS Mixing Pumps Control Station	Ea.	2.0	1,000.00	2,000		0	180.00	360		0	**2,360**
40IC	4													
40IC	5													
40IC	6													
40IC	7													
40IC	8													
40IC	9													
40IC	10		DS Heating Pump Pressure Transmitter	Ea.	2.0	2,200.00	4,400		0	180.00	360		0	**4,760**
40IC	11		DS Heating Pump Annular Seal 8"	Ea.	2.0	4,000.00	8,000		0	460.00	920		0	**8,920**
40IC	12		DS Heating Pump Electromagnetic FM 8"	Ea.	2.0	6,000.00	12,000		0	480.00	960		0	**12,960**
40IC	13		DS Heating Pump Control Station	Ea.	2.0	1,000.00	2,000		0	180.00	360		0	**2,360**
40IC	14		DS Heating Pump Temperature Transmitter	Ea.	2.0	770.00	1,540		0	180.00	360		0	**1,900**
40IC	15													
40IC	16		Wet Gas Thermal Disp. Flowmeter (Gas Production)	Ea.	4.0	6,500.00	26,000		0	600.00	2,400		0	**28,400**
40IC	17		Condensate/Accum. Level Ind. & Switch	Ea.	1.0	750.00	750		0	400.00	400		0	**1,150**
40IC	18		Radar for Digester cover Position.	Ea.	1.0	3,500.00	3,500		0	600.00	600		0	**4,100**
40IC	19													
40IC	20													
40IC	21													
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40IC	35													
40IC	36													
40IC	37													
40IC	38													
40IC	39													
40IC	40		PLC Panel additions.	LS	1.0	5,000.00	5,000		0	2,000.00	2,000		0	**7,000**
40IC	41													
40IC	42		PLC Programming	LS	1.0		0		0	5,000.00	5,000		0	**5,000**
40IC	43		SCADA HMI Programming	LS	1.0		0		0	5,000.00	5,000		0	**5,000**
40IC	44													
40IC														
40IC			SUBTOTAL				69,590		0		19,080		0	**88,670**
40IC														
40IC			Material, Construction Equipment, Labor O&P	15.0%			10,439		0		2,862			**13,301**
40IC			Major Vendor O&P	4.0%									0	**0**
40IC			Global Markups	15.0%	2.0%		12,004		0		3,291		0	**15,296**
40IC	DIV	40IC	**TOTAL w/o Global Markups**				**80,029**		**0**		**21,942**		**0**	**101,971**
			TOTAL w/ Global Markups				**92,033**		**0**		**25,233**		**0**	**117,266**
40IC			**TOTAL w/ Contingency**	20.0%	10.0%		**110,439**		**0**		**30,280**		**0**	**140,719**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 360
STRUCTURE NAME: WEST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		Digesters 1 and 4 Heat Exchanger Pumps	EA	2.0		0		0	4,000.00	8,000	27,948.80	55,898	**63,898**
43	2													
43	3		Digesters 1 and 4 Mixing System	EA	2.0		0		0	10,000.00	20,000	99,500.00	199,000	**219,000**
43	4													
43	5		Digester Withdrawal Pumps	EA	2.0		0		0	3,000.00	6,000	10,700.00	21,400	**27,400**
43	6													
43	7		8" Sediment Trap	EA	2.0	13,770.00	27,540		0	1,500.00	3,000		0	**30,540**
43	8		6" Sediment Trap	EA	2.0	12,000.00	24,000		0	1,500.00	3,000		0	**27,000**
43	9													
43	10		Condensate Accumulator	EA	1.0	15,000.00	15,000		0	2,500.00	2,500		0	**17,500**
43	11													
43	12													
43	13													
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43														
43			SUBTOTAL				66,540		0		42,500		276,298	**385,338**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			9,981		0		6,375			**16,356**
43			Major Vendor O&P	7.5%									20,722	**20,722**
43			Global Markups	15.0%	2.0%		11,478		0		7,331		5,940	**24,750**
43	DIV	43	**TOTAL w/o Global Markups**				**76,521**		**0**		**48,875**		**297,020**	**422,416**
			TOTAL w/ Global Markups				**87,999**		**0**		**56,206**		**302,960**	**447,166**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**105,599**		**0**		**67,448**		**333,256**	**506,303**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		12" wall	CY	112.0	490.00	54,880	56.00	6,272	680.00	76,160		0	137,312
3	2		base mat	CY	315.0	290.00	91,350	39.00	12,285	91.00	28,665		0	132,300
3	3		equipment pads	CY	7.0	725.00	5,075	93.00	651	645.00	4,515		0	10,241
3	4		structural slab	CY	117.0	490.00	57,330	40.00	4,680	450.00	52,650		0	114,660
3	5		columns	CY	3.0	400.00	1,200	90.00	270	1,180.00	3,540		0	5,010
3	6		beams	CY	12.0	490.00	5,880	80.00	960	670.00	8,040		0	14,880
3	7													
3	8		precast roof	SF	3,000.0	12.00	36,000		0		0		0	36,000
3	9													
3	10		approach slab	SF	100.0	9.00	900	2.00	200	4.00	400		0	1,500
3	11		door stoop	SF	120.0	33.00	3,960	6.00	720	35.00	4,200		0	8,880
3	12													
3	13		containment curb	LF	20.0	7.00	140	2.00	40	15.00	300		0	480
3	14													
3	15													
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3														
3			SUBTOTAL				256,715		26,078		178,470		0	461,263
3														
3			Material, Construction Equipment, Labor O&P	15.0%			38,507		3,912		26,771			69,189
3			Major Vendor O&P	4.0%									0	0
3			Global Markups	15.0%	2.0%		44,283		4,498		30,786		0	79,568
3	DIV	3	**TOTAL w/o Global Markups**				**295,222**		**29,990**		**205,241**		**0**	**530,452**
			TOTAL w/ Global Markups				**339,506**		**34,488**		**236,027**		**0**	**610,020**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**407,407**		**41,386**		**283,232**		**0**	**732,024**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	4	MASONRY											
4	1		8" cmu	SF	4,500.0	6.30	28,350	2.20	9,900	8.50	38,250		0	**76,500**
4	2		face brick	SF	3,850.0	7.60	29,260	2.20	8,470	11.80	45,430		0	**83,160**
4	3													
4	4													
4	5													
4	6													
4	7													
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4	10													
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4														
4			SUBTOTAL				57,610		18,370		83,680		0	**159,660**
4														
4			Material, Construction Equipment, Labor O&P	15.0%			8,642		2,756		12,552			**23,949**
4			Major Vendor O&P	4.0%									0	**0**
4			Global Markups	15.0%	2.0%		9,938		3,169		14,435		0	**27,541**
4	DIV	4	**TOTAL w/o Global Markups**				**66,252**		**21,126**		**96,232**		**0**	**183,609**
			TOTAL w/ Global Markups				**76,189**		**24,294**		**110,667**		**0**	**211,150**
4			**TOTAL w/ Contingency**	20.0%	10.0%		**91,427**		**29,153**		**132,800**		**0**	**253,380**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	5	METALS											
5	1		al stairs	TREADS	38.0	450.00	17,100	15.65	595	60.00	2,280		0	**19,975**
5	2		misc metal fabrications	LBS	1,000.0	1.75	1,750	1.00	1,000	1.75	1,750		0	**4,500**
5	3		ladder to roof	VLF	13.0	85.00	1,105	3.00	39	16.00	208		0	**1,352**
5	4													
5	5		al access hatch	SF	100.0	64.00	6,400		0		0		0	**6,400**
5	6													
5	7		al railing	LF	25.0	53.00	1,325	1.00	25	12.50	313		0	**1,663**
5	8													
5	9													
5	10													
5	11													
5	12													
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5	34													
5	35													
5														
5			SUBTOTAL				27,680		1,659		4,551		0	**33,889**
5														
5			Material, Construction Equipment, Labor O&P	15.0%			4,152		249		683			**5,083**
5			Major Vendor O&P	4.0%									0	**0**
5			Global Markups	15.0%	2.0%		4,775		286		785		0	**5,846**
5	DIV	5	**TOTAL w/o Global Markups**				**31,832**		**1,908**		**5,233**		**0**	**38,973**
			TOTAL w/ Global Markups				**36,607**		**2,194**		**6,018**		**0**	**44,818**
5			**TOTAL w/ Contingency**	20.0%	10.0%		**43,928**		**2,632**		**7,222**		**0**	**53,782**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	7	THERMAL AND MOISTURE PROTECTION											
7	1		perimeter insulation	SF	932.0	1.60	1,491		0	1.60	1,491		0	2,982
7	2		cavity wall insulation	SF	3,850.0	1.60	6,160		0	1.60	6,160		0	12,320
7	3		fully adhered EPDM roofing	SF	3,000.0	7.00	21,000	0.75	2,250	1.25	3,750		0	27,000
7	4													
7	5													
7	6													
7	7													
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7	9													
7	10													
7	11													
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7														
7			SUBTOTAL				28,651		2,250		11,401		0	42,302
7														
7			Material, Construction Equipment, Labor O&P	15.0%			4,298		338		1,710			6,345
7			Major Vendor O&P	4.0%									0	0
7			Global Markups	15.0%	2.0%		4,942		388		1,967		0	7,297
7	DIV	7	**TOTAL w/o Global Markups**				**32,949**		**2,588**		**13,111**		**0**	**48,648**
			TOTAL w/ Global Markups				**37,891**		**2,976**		**15,078**		**0**	**55,945**
7			**TOTAL w/ Contingency**	20.0%	10.0%		**45,469**		**3,571**		**18,094**		**0**	**67,134**

CLIENT CITY OF LA CROSSE
PROJECT WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO. 13655

STRUCTURE NO. 390
STRUCTURE NAME EAST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20 DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	8	OPENINGS											
8	1		single GHM door/frame/hardware	EA	4.0	1,740.00	6,960		0		0		0	**6,960**
8	2		double GHM door/frame/hardware	EA	1.0	3,100.00	3,100		0		0		0	**3,100**
8	3		overhead coiling door	SF	200.0	70.00	14,000		0		0		0	**14,000**
8	4													
8	5													
8	6													
8	7													
8	8													
8	9													
8	10													
8	11													
8	12													
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8	35													
8														
8			SUBTOTAL				24,060		0		0		0	**24,060**
8														
8			Material, Construction Equipment, Labor O&P	15.0%			3,609		0		0			**3,609**
8			Major Vendor O&P	4.0%									0	**0**
8			Global Markups	15.0%	2.0%		4,150		0		0		0	**4,150**
8	DIV	8	**TOTAL w/o Global Markups**				**27,669**		**0**		**0**		**0**	**27,669**
			TOTAL w/ Global Markups				**31,819**		**0**		**0**		**0**	**31,819**
8			**TOTAL w/ Contingency**	20.0%	10.0%		**38,183**		**0**		**0**		**0**	**38,183**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV 10	SPECIALTIES											
10 1		fire extinguisher	EA	3.0	175.00	525		0	40.00	120		0	**645**
10 2													
10 3													
10 4													
10 5													
10 6													
10 7													
10 8													
10 9													
10 10													
10 11													
10 12													
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10 35													
10													
10		SUBTOTAL				525		0		120		0	**645**
10													
10		Material, Construction Equipment, Labor O&P	15.0%			79		0		18			**97**
10		Major Vendor O&P	4.0%									0	**0**
10		Global Markups	15.0%	2.0%		91		0		21		0	**111**
10	DIV 10	**TOTAL w/o Global Markups**				**604**		**0**		**138**		**0**	**742**
		TOTAL w/ Global Markups				**694**		**0**		**159**		**0**	**853**
10		**TOTAL w/ Contingency**	20.0%	10.0%		**833**		**0**		**190**		**0**	**1,024**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV 13	SPECIAL CONSTRUCTION											
13 1		enclosure over walkway between digester bldgs	LS	1.0	50,000.00	50,000		0		0		0	**50,000**
13 2													
13 3													
13 4													
13 5													
13 6													
13 7													
13 8													
13 9													
13 10													
13 11													
13 12													
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13 35													
13													
13		SUBTOTAL				50,000		0		0		0	**50,000**
13													
13		Material, Construction Equipment, Labor O&P	15.0%			7,500		0		0			**7,500**
13		Major Vendor O&P	4.0%									0	**0**
13		Global Markups	15.0%	2.0%		8,625		0		0		0	**8,625**
13 DIV	13	**TOTAL w/o Global Markups**				**57,500**		**0**		**0**		**0**	**57,500**
		TOTAL w/ Global Markups				**66,125**		**0**		**0**		**0**	**66,125**
13		**TOTAL w/ Contingency**	20.0%	10.0%		**79,350**		**0**		**0**		**0**	**79,350**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	14	CONVEYING SYSTEMS										
14	1		Hoist	EA	1.0	6,000.00	6,000		0		0	0	**6,000**
14	2												
14	3												
14	4												
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14	34												
14	35												
14													
14			SUBTOTAL			6,000		0		0	0		**6,000**
14													
14			Material, Construction Equipment, Labor O&P	15.0%		900		0		0			**900**
14			Major Vendor O&P	4.0%							0		**0**
14			Global Markups	15.0%	2.0%	1,035		0		0	0		**1,035**
14	DIV	14	**TOTAL w/o Global Markups**			**6,900**		**0**		**0**	**0**		**6,900**
			TOTAL w/ Global Markups			**7,935**		**0**		**0**	**0**		**7,935**
14			**TOTAL w/ Contingency**	20.0%	10.0%	**9,522**		**0**		**0**	**0**		**9,522**

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PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	22	PLUMBING											
22	1		Fixture	Ea	20.0	2,500.00	50,000		0	1,500.00	30,000		0	**80,000**
22	2													
22	3													
22	4													
22	5													
22	6													
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22	35													
22														
22			SUBTOTAL				50,000		0		30,000		0	**80,000**
22														
22			Material, Construction Equipment, Labor O&P	15.0%			7,500		0		4,500			**12,000**
22			Major Vendor O&P	7.5%									0	**0**
22			Global Markups	15.0%	2.0%		8,625		0		5,175		0	**13,800**
22	DIV	22	**TOTAL w/o Global Markups**				**57,500**		**0**		**34,500**		**0**	**92,000**
			TOTAL w/ Global Markups				**66,125**		**0**		**39,675**		**0**	**105,800**
22			**TOTAL w/ Contingency**	20.0%	10.0%		**79,350**		**0**		**47,610**		**0**	**126,960**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 390
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03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	23	HVAC											
23	1		Sludge Portion Ventilation	CFM	4,900.0	10.75	52,675		0	5.50	26,950		0	**79,625**
23	2		Gas Handling Ventilation	LS	1.0	7,500.00	7,500		0	5,000.00	5,000		0	**12,500**
23	3		Gas Handling Unit Heaters	Ea	2.0	5,000.00	10,000		0	2,500.00	5,000		0	**15,000**
23	4													
23	5		Elec Room AC	LS	1.0	8,000.00	8,000		0	2,500.00	2,500		0	**10,500**
23	6													
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23	25		Sludge Hex HW Pump	Ea	4.0	5,000.00	20,000		0	2,500.00	10,000		0	**30,000**
23	26		Sludge Hex HW Valve	Ea	4.0	6,500.00	26,000		0	2,500.00	10,000		0	**36,000**
23	27		4" HW Piping	LF	300.0	55.00	16,500	2.00	600	29.00	8,700		0	**25,800**
23	28		4" HW Fittings	Ea	60.0	70.00	4,200	12.00	720	180.00	10,800		0	**15,720**
23	29		HW Valves	Ea	20.0	800.00	16,000		0	200.00	4,000		0	**20,000**
23	30		HW Insulation	LF	675.0	7.50	5,063		0	12.00	8,100		0	**13,163**
23	31		8" HW Pipe	LF	150.0	103.50	15,525	2.00	300	49.00	7,350		0	**23,175**
23	32		8" HW Fitting	Ea	20.0	351.00	7,020	15.00	300	375.00	7,500		0	**14,820**
23	33													
23	34													
23	35													
23														
23			SUBTOTAL				188,483		1,920		105,900		0	**296,303**
23														
23			Material, Construction Equipment, Labor O&P	15.0%			28,272		288		15,885			**44,445**
23			Major Vendor O&P	7.5%									0	**0**
23			Global Markups	15.0%	2.0%		32,513		331		18,268		0	**51,112**
23	DIV	23	**TOTAL w/o Global Markups**				**216,755**		**2,208**		**121,785**		**0**	**340,748**
			TOTAL w/ Global Markups				**249,268**		**2,539**		**140,053**		**0**	**391,860**
23			**TOTAL w/ Contingency**	20.0%	10.0%		**299,122**		**3,047**		**168,063**		**0**	**470,232**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	390
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	EAST DIGESTER BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

		SPEC		UNIT OF		MATERIAL		CONSTRUCTION EQUIPMENT		LABOR		VENDOR		
	LINE	SECTION	DESCRIPTION	MEASURE	QUANTITY	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		MCC SECTIONS	EA	3.0	2,200.00	6,600		0	505.00	1,515		0	8,115
26	2		100A CIRCUIT BREAKERS	EA	10.0	950.00	9,500		0	101.00	1,010		0	10,510
26	3		FVNR SZ1	EA	5.0	2,250.00	11,250		0	150.00	750		0	12,000
26	4		LIGHTING PANEL	EA	1.0	2,250.00	2,250		0	1,500.00	1,500		0	3,750
26	5		30KVA TRANSFORMER	EA	1.0	2,225.00	2,225		0	450.00	450		0	2,675
26	6		SPD 480V	EA	1.0	13,900.00	13,900		0	1,050.00	1,050		0	14,950
26	7		120/208SPD	EA	1.0	3,890.00	3,890		0	1,050.00	1,050		0	4,940
26	8		POWER PANEL	EA	1.0	4,950.00	4,950		0	1,750.00	1,750		0	6,700
26	9		LIGHTING	LS	1.0	40,000.00	40,000		0	9,000.00	9,000		0	49,000
26	10		CONDUIT AND CONDUCTORS	LS	1.0	65,000.00	65,000		0	7,000.00	7,000		0	72,000
26	11		WIRING DEVICES	LS	1.0	5,000.00	5,000		0	1,500.00	1,500		0	6,500
26	12		MOTOR CONNECTIONS	EA	10.0		0		0	200.00	2,000		0	2,000
26	13		LIGHITNG	LS	1.0	3,000.00	3,000		0	1,000.00	1,000		0	4,000
26	14		400A MAIN CB	EA	1.0	3,300.00	3,300		0	670.00	670		0	3,970
26	15		DUCT BANK AND SITE WORK	LS	1.0	15,000.00	15,000		0	10,000.00	10,000		0	25,000
26	16													
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26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
26													
26	45												
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26	71												
26	72												
26	73												
26	74												
26	75	I&C Wiring & Conduit	LS	1.0	8,000.00	8,000		0	4,000.00	4,000		0	**12,000**
26	76												
26	77												
26	78												
26	79												
26													
26		SUBTOTAL				193,865		0		44,245		0	**238,110**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			29,080		0		6,637			**35,717**
26		Major Vendor O&P	15.0%									0	**0**
26		Global Markups	15.0%	2.0%		33,442		0		7,632		0	**41,074**
26	DIV 26	**TOTAL w/o Global Markups**				**222,945**		**0**		**50,882**		**0**	**273,827**
		TOTAL w/ Global Markups				**256,386**		**0**		**58,514**		**0**	**314,900**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**307,664**		**0**		**70,217**		**0**	**377,881**

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PROJECT NO.: 13655

STRUCTURE NO.: 390
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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	31	EARTHWORK											
31	1		Structure excavation	CY	2,200.0		0	7.00	15,400	6.00	13,200		0	**28,600**
31	2		haul excess excavation off site	CY	1,450.0		0	2.75	3,988	2.50	3,625		0	**7,613**
31	3		earth backfill	CY	750.0		0	1.50	1,125	3.50	2,625		0	**3,750**
31	4													
31	5		piles	LS	1.0	150,000.00	150,000		0		0		0	**150,000**
31	6													
31	7		dewatering	LS	1.0		0	15,000.00	15,000		0		0	**15,000**
31	8													
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31														
31			SUBTOTAL				150,000		35,513		19,450		0	**204,963**
31														
31			Material, Construction Equipment, Labor O&P	15.0%			22,500		5,327		2,918			**30,744**
31			Major Vendor O&P	4.0%									0	**0**
31			Global Markups	15.0%	2.0%		25,875		6,126		3,355		0	**35,356**
31	DIV	31	**TOTAL w/o Global Markups**				**172,500**		**40,839**		**22,368**		**0**	**235,707**
			TOTAL w/ Global Markups				**198,375**		**46,965**		**25,723**		**0**	**271,063**
31			**TOTAL w/ Contingency**	20.0%	10.0%		**238,050**		**56,358**		**30,867**		**0**	**325,275**

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PROJECT NO.: 13655

STRUCTURE NO.: 390
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03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
1		304 SS Sch 10 DS											
2		12" Pipe	ft	20.0	272.28	5,446	27.23	545	108.91	2,178		0	**8,168**
3		10" Pipe	ft	20.0	210.31	4,206	21.03	421	84.12	1,682		0	**6,309**
4		10" Plug Valve	EA	2.0	3,773.00	7,546	377.30	755	1,509.20	3,018		0	**11,319**
5		12" Plug Valve	EA	2.0	4,963.75	9,928	496.38	993	1,985.50	3,971		0	**14,891**
6		10" 90deg	EA	2.0	1,212.01	2,424	121.20	242	484.80	970		0	**3,636**
7													
8		CLDI DS											
9		8" Pipe	ft	150.0	169.25	25,388		0	67.70	10,155		0	**35,543**
10		8" Plug Valve	EA	2.0	1,216.00	2,432		0	486.40	973		0	**3,405**
11		8" 90deg	EA	12.0	464.00	5,568		0	185.60	2,227		0	**7,795**
12		8"x6" Red	EA	8.0	383.00	3,064		0	153.20	1,226		0	**4,290**
13													
14		GLDI DS											
15		4" Pipe	ft	75.0	157.30	11,798		0	62.92	4,719		0	**16,517**
16		4" Electrically Actuated Plug Valve	EA	2.0	5,110.00	10,220		0	2,044.00	4,088		0	**14,308**
17		4" Tee	EA	1.0	454.85	455		0	181.94	182		0	**637**
18		4" 90deg	EA	8.0	378.09	3,025		0	151.24	1,210		0	**4,235**
19													
20		316 SS Sch 10 DG											
21		14" Pipe	ft	10.0	462.36	4,624	46.24	462	184.94	1,849		0	**6,935**
22		14" Tee	EA	3.0	4,209.66	12,629	420.97	1,263	1,683.86	5,052		0	**18,943**
23		14" Plug Valve	EA	2.0	9,314.25	18,629	931.43	1,863	3,725.70	7,451		0	**27,943**
24		14" Digester Auto Wasting Valve	EA	1.0	9,427.44	9,427	942.74	943	3,770.98	3,771		0	**14,141**
25		12" Pressure Relief Valve	EA	1.0	10,000.00	10,000	1,000.00	1,000	4,000.00	4,000		0	**15,000**
26		14" 90deg	EA	4.0	3,857.97	15,432	385.80	1,543	1,543.19	6,173		0	**23,148**
27		14"x12" Red	EA	2.0	2,106.61	4,213	210.66	421	842.64	1,685		0	**6,320**
28													
29		Misc CND Piping	LS	1.0	5,000.00	5,000	500.00	500	2,000.00	2,000		0	**7,500**
30													
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44													
		SUBTOTAL				171,451		10,950		68,581		0	**250,982**
		Material, Construction Equipment, Labor O&P	15.0%			25,718		1,643		10,287			**37,647**
		Major Vendor O&P	6.0%									0	**0**
		Global Markups	15.0%	2.0%		29,575		1,889		11,830		0	**43,294**
DIV	40M	**TOTAL w/o Global Markups**				**197,169**		**12,593**		**78,868**		**0**	**288,630**
		TOTAL w/ Global Markups				**226,744**		**14,482**		**90,698**		**0**	**331,924**
		TOTAL w/ Contingency	20.0%	10.0%		**272,093**		**17,378**		**108,837**		**0**	**398,309**

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PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
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PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
40IC DIV	40IC	PROCESS INTERCONNECTIONS: IC											
1													
2		DS Pump Pressure Transmitter	Ea.	2.0	2,200.00	4,400		0	180.00	360		0	**4,760**
3		DS Pump Annular Seal 4"	Ea.	2.0	3,000.00	6,000		0	330.00	660		0	**6,660**
4		DS Pump Electromagnetic FM 4"	Ea.	1.0	3,200.00	3,200		0	400.00	400		0	**3,600**
5		DS Pump Control Station	Ea.	2.0	700.00	1,400		0	120.00	240		0	**1,640**
6													
7		HEX Loop Temperature Gauge	Ea.	8.0	150.00	1,200		0	60.00	480		0	**1,680**
8		HEX Loop Temperature Transmitter	Ea.	16.0	770.00	12,320		0	180.00	2,880		0	**15,200**
9		HEX Loop Pressure Gauge	Ea.	20.0	250.00	5,000		0	60.00	1,200		0	**6,200**
10		Hot Water Pump Control Station	Ea.	4.0	750.00	3,000		0	120.00	480		0	**3,480**
11													
12		Condensate/Accum. Level Ind. & Switch	Ea.	1.0	750.00	750		0	400.00	400		0	**1,150**
13		Wet Gas Thermal Disp. Flowmeter (Gas Production)	Ea.	1.0	6,500.00	6,500		0	600.00	600		0	**7,100**
14		Waste Gas Pressure Transmitter	Ea.	1.0	2,200.00	2,200		0	180.00	180		0	**2,380**
15													
16													
17													
18													
19													
20													
21													
22		East Digester Building PLC Panel	Ea.	1.0	50,000.00	50,000		0	20,000.00	20,000		0	**70,000**
23		Network Equipment	Ea.	1.0	5,000.00	5,000		0	1,500.00	1,500		0	**6,500**
24													
25		PLC Programming	LS	1.0		0		0	20,000.00	20,000		0	**20,000**
26		SCADA HMI Programming	LS	1.0		0		0	20,000.00	20,000		0	**20,000**
27													
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44													
		SUBTOTAL				100,970		0		69,380		0	**170,350**
		Material, Construction Equipment, Labor O&P	15.0%			15,146		0		10,407			**25,553**
		Major Vendor O&P	4.0%									0	**0**
		Global Markups	15.0%	2.0%		17,417		0		11,968		0	**29,385**
DIV	40IC	**TOTAL w/o Global Markups**				**116,116**		**0**		**79,787**		**0**	**195,903**
		TOTAL w/ Global Markups				**133,533**		**0**		**91,755**		**0**	**225,288**
		TOTAL w/ Contingency	20.0%	10.0%		**160,239**		**0**		**110,106**		**0**	**270,345**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

						MATERIAL		CONSTRUCTION EQUIPMENT		LABOR		VENDOR		
	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	Unit Cost	Total	TOTAL COST
	DIV	42	PROCESS HEATING, COOLING, AND DRYING											
42	1		Digester 1-4 HEX	EA	4.0		0		0	8,000.00	32,000	140,000.00	560,000	**592,000**
42	2													
42	3													
42	4													
42	5													
42	6													
42	7													
42	8													
42	9													
42	10													
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42	42													
42	43													
42	44													
42														
42														
42			SUBTOTAL				0		0		32,000		560,000	**592,000**
42														
42			Material, Construction Equipment, Labor O&P	15.0%			0		0		4,800			**4,800**
42			Major Vendor O&P	7.5%									42,000	**42,000**
42			Global Markups	15.0%	2.0%		0		0		5,520		12,040	**17,560**
42	DIV	42	**TOTAL w/o Global Markups**				**0**		**0**		**36,800**		**602,000**	**638,800**
			TOTAL w/ Global Markups				**0**		**0**		**42,320**		**614,040**	**656,360**
42			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**50,784**		**675,444**	**726,228**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 390
STRUCTURE NAME: EAST DIGESTER BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		Digesters 1 and 4 Heat Exchanger Pumps	EA	2.0		0		0	4,000.00	8,000	27,948.80	55,898	**63,898**
43	2													
43	3		Digesters 1 and 4 Mixing System	EA	2.0		0		0	10,000.00	20,000	96,500.00	193,000	**213,000**
43	4													
43	5		Condensate Accumulator	EA	1.0	15,000.00	15,000		0	2,500.00	2,500		0	**17,500**
43	6													
43	7													
43	8													
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43														
43			SUBTOTAL				15,000		0		30,500		248,898	**294,398**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			2,250		0		4,575			**6,825**
43			Major Vendor O&P	7.5%									18,667	**18,667**
43			Global Markups	15.0%	2.0%		2,588		0		5,261		5,351	**13,200**
43	DIV	43	**TOTAL w/o Global Markups**				**17,250**		**0**		**35,075**		**267,565**	**319,890**
			TOTAL w/ Global Markups				**19,838**		**0**		**40,336**		**272,916**	**333,090**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**23,805**		**0**		**48,404**		**300,208**	**372,416**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	410
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	LIQUID BIOSOLIDS STORAGE
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	26	ELECTRICAL											
26	1		CONDUITS AND CONDUCTORS	LS	1.0	52,000.00	52,000		0	14,000.00	14,000		0	**66,000**
26	2		DUCT BANK AND SITE WORK	LS	1.0	14,000.00	14,000		0	10,000.00	10,000		0	**24,000**
26	3													
26	4													
26	5													
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26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 410
STRUCTURE NAME: LIQUID BIOSOLIDS STORAGE

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	35	**WATERWAY AND MARINE CONSTRUCTION**											
35	1		Ventilation Improvements	CFM	3,400.0	10.75	36,550		0	5.50	18,700		0	**55,250**
35	2													
35	3													
35	4													
35	5													
35	6													
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35														
35			SUBTOTAL				36,550		0		18,700		0	**55,250**
35														
35			Material, Construction Equipment, Labor O&P	15.0%			5,483		0		2,805			**8,288**
35			Major Vendor O&P	7.5%									0	**0**
35			Global Markups	15.0%	2.0%		6,305		0		3,226		0	**9,531**
35	DIV	35	**TOTAL w/o Global Markups**				**42,033**		**0**		**21,505**		**0**	**63,538**
			TOTAL w/ Global Markups				**48,337**		**0**		**24,731**		**0**	**73,068**
35			**TOTAL w/ Contingency**	20.0%	10.0%		**58,005**		**0**		**29,677**		**0**	**87,682**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	440
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	DEWATERED BIOSOLIDS STORAGE BUIL
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	26	ELECTRICAL										
26	1		CONDUITS AND CONDUCTORS	LS	1.0	7,000.00	7,000		0	3,000.00	3,000		0	**10,000**
26	2		DUCT BANK AND SITE WORK	LS	1.0	3,000.00	3,000		0	2,000.00	2,000		0	**5,000**
26	3													
26	4													
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26														
26	DIV	26	ELECTRICAL (continued next page)											

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	440
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	DEWATERED BIOSOLIDS STORAGE BUIL
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
26													
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26	50												
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26	79												
26													
26		SUBTOTAL				10,000		0		5,000		0	**15,000**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			1,500		0		750			**2,250**
26		Major Vendor O&P	15.0%									0	**0**
26		Global Markups	15.0%	2.0%		1,725		0		863		0	**2,588**
26	DIV 26	**TOTAL w/o Global Markups**				**11,500**		**0**		**5,750**		**0**	**17,250**
		TOTAL w/ Global Markups				**13,225**		**0**		**6,613**		**0**	**19,838**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**15,870**		**0**		**7,935**		**0**	**23,805**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 470
STRUCTURE NAME: WASTE GAS BURNER
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		Concrete walls/slab	LS	1.0	7,000.00	7,000		0	3,000.00	3,000		0	**10,000**
3	2													
3	3													
3	4													
3	5													
3	6													
3	7													
3	8													
3	9													
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3														
3			SUBTOTAL				7,000		0		3,000		0	**10,000**
3														
3			Material, Construction Equipment, Labor O&P	15.0%			1,050		0		450			**1,500**
3			Major Vendor O&P	4.0%									0	**0**
3			Global Markups	15.0%	2.0%		1,208		0		518		0	**1,725**
3	DIV	3	**TOTAL w/o Global Markups**				**8,050**		**0**		**3,450**		**0**	**11,500**
			TOTAL w/ Global Markups				**9,258**		**0**		**3,968**		**0**	**13,225**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**11,109**		**0**		**4,761**		**0**	**15,870**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	470
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	WASTE GAS BURNER
PROJECT NO.	13655	03/16/20	

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
DIV	26	ELECTRICAL											
26	1	CONDUITS AND CONDUCTORS	LS	1.0	2,000.00	2,000		0	1,000.00	1,000		0	3,000
26	2	DUCT BANK AND SITE WORK	LS	1.0	4,000.00	4,000		0	4,000.00	4,000		0	8,000
26	3												
26	4												
26	5												
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26													
26	DIV	26	ELECTRICAL (continued next page)										

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 470
STRUCTURE NAME: WASTE GAS BURNER
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
26													
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26													
26		SUBTOTAL				6,000		0		5,000		0	**11,000**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			900		0		750			**1,650**
26		Major Vendor O&P	15.0%									0	**0**
26		Global Markups	15.0%	2.0%		1,035		0		863		0	**1,898**
26	DIV 26	**TOTAL w/o Global Markups**				**6,900**		**0**		**5,750**		**0**	**12,650**
		TOTAL w/ Global Markups				**7,935**		**0**		**6,613**		**0**	**14,548**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**9,522**		**0**		**7,935**		**0**	**17,457**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 470
STRUCTURE NAME: WASTE GAS BURNER
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	31	EARTHWORK											
31	1		Excavation/fill	LS	1.0		0	3,000.00	3,000	3,000.00	3,000		0	6,000
31	2													
31	3													
31	4													
31	5													
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31														
31			SUBTOTAL				0		3,000		3,000		0	6,000
31														
31			Material, Construction Equipment, Labor O&P	15.0%			0		450		450			900
31			Major Vendor O&P	4.0%									0	0
31			Global Markups	15.0%	2.0%		0		518		518		0	1,035
31	DIV	31	**TOTAL w/o Global Markups**				**0**		**3,450**		**3,450**		**0**	**6,900**
			TOTAL w/ Global Markups				**0**		**3,968**		**3,968**		**0**	**7,935**
31			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**4,761**		**4,761**		**0**	**9,522**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 470
STRUCTURE NAME: WASTE GAS BURNER
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		Piping	LS	1.0	10,000.00	10,000		0	5,000.00	5,000		0	**15,000**
40M	2													
40M	3													
40M	4													
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40M	43													
40M	44													
40M														
40M														
40M			SUBTOTAL				10,000		0		5,000		0	**15,000**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			1,500		0		750			**2,250**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		1,725		0		863		0	**2,588**
40M	DIV	40M	**TOTAL w/o Global Markups**				**11,500**		**0**		**5,750**		**0**	**17,250**
			TOTAL w/ Global Markups				**13,225**		**0**		**6,613**		**0**	**19,838**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**15,870**		**0**		**7,935**		**0**	**23,805**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 470
STRUCTURE NAME: WASTE GAS BURNER
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40IC	PROCESS INTERCONNECTIONS: IC											
40IC	1													
40IC	2		Waste Gas Pressure Gauge	Ea.	1.0	250.00	250		0	60.00	60		0	**310**
40IC	3													
40IC	4													
40IC	5													
40IC	6													
40IC	7													
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40IC	44													
40IC														
40IC														
40IC			SUBTOTAL				250		0		60		0	**310**
40IC														
40IC			Material, Construction Equipment, Labor O&P	15.0%			38		0		9			**47**
40IC			Major Vendor O&P	4.0%									0	**0**
40IC			Global Markups	15.0%	2.0%		43		0		10		0	**53**
40IC	DIV	40IC	**TOTAL w/o Global Markups**				**288**		**0**		**69**		**0**	**357**
			TOTAL w/ Global Markups				**331**		**0**		**79**		**0**	**410**
40IC			**TOTAL w/ Contingency**	20.0%	10.0%		**397**		**0**		**95**		**0**	**492**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 470
STRUCTURE NAME: WASTE GAS BURNER
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	46	WATER AND WASTEWATER EQUIPMENT											
46	1		Waste Gas Burner	Ea	1.0	86,000.00	86,000		0	8,600.00	8,600		0	**94,600**
46	2		Flame Trap Assembly	Ea	1.0	15,000.00	15,000		0	1,500.00	1,500		0	**16,500**
46	3													
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46														
46			SUBTOTAL				101,000		0		10,100		0	**111,100**
46														
46			Material, Construction Equipment, Labor O&P	15.0%			15,150		0		1,515			**16,665**
46			Major Vendor O&P	7.5%									0	**0**
46			Global Markups	15.0%	2.0%		17,423		0		1,742		0	**19,165**
46	DIV	46	**TOTAL w/o Global Markups**				**116,150**		**0**		**11,615**		**0**	**127,765**
			TOTAL w/ Global Markups				**133,573**		**0**		**13,357**		**0**	**146,930**
46			**TOTAL w/ Contingency**	20.0%	10.0%		**160,287**		**0**		**16,029**		**0**	**176,316**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		18" foundation wall	CY	127.0	420.00	53,340	50.00	6,350	490.00	62,230		0	**121,920**
3	2		strip footing	CY	130.0	290.00	37,700	39.00	5,070	91.00	11,830		0	**54,600**
3	3		8" slab on grade	CY	315.0	260.00	81,900	22.00	6,930	104.00	32,760		0	**121,590**
3	4		approach slab	SF	250.0	9.00	2,250	2.00	500	4.00	1,000		0	**3,750**
3	5		door stoop	SF	575.0	33.00	18,975	6.00	3,450	35.00	20,125		0	**42,550**
3	6		conc curb	LF	80.0	7.00	560	2.00	160	15.00	1,200		0	**1,920**
3	7		equipment pad	CY	20.0	725.00	14,500	93.00	1,860	645.00	12,900		0	**29,260**
3	8													
3	9													
3	10		precast wall panels	SF	17,732.0	33.00	585,156		0		0		0	**585,156**
3	11		precast double tees	SF	13,560.0	23.00	311,880		0		0		0	**311,880**
3	12		precast plank	SF	3,950.0	12.00	47,400		0		0		0	**47,400**
3	13													
3	14													
3	15		biosolids storage silo foundation	CY	58.0	290.00	16,820	39.00	2,262	91.00	5,278		0	**24,360**
3	16													
3	17		siloxane scrubber pad	CY	23.0	290.00	6,670	39.00	897	91.00	2,093		0	**9,660**
3	18													
3	19		nitrogen equipment pad	CY	8.0	290.00	2,320	39.00	312	91.00	728		0	**3,360**
3	20													
3	21													
3	22													
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3			SUBTOTAL				1,179,471		27,791		150,144		0	**1,357,406**
3														
3			Material, Construction Equipment, Labor O&P	15.0%			176,921		4,169		22,522			**203,611**
3			Major Vendor O&P	4.0%									0	**0**
3			Global Markups	15.0%	2.0%		203,459		4,794		25,900		0	**234,153**
3	DIV	3	**TOTAL w/o Global Markups**				**1,356,392**		**31,960**		**172,666**		**0**	1,561,017
			TOTAL w/ Global Markups				**1,559,850**		**36,754**		**198,565**		**0**	**1,795,169**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**1,871,820**		**44,104**		**238,279**		**0**	**2,154,203**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	4	MASONRY											
4	1		12" cmu	SF	8,816.0	7.60	67,002	2.20	19,395	13.90	122,542		0	**208,939**
4	2		8" cmu	SF	2,570.0	6.30	16,191	2.20	5,654	8.50	21,845		0	**43,690**
4	3													
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4														
4			SUBTOTAL				83,193		25,049		144,387		0	**252,629**
4														
4			Material, Construction Equipment, Labor O&P	15.0%			12,479		3,757		21,658			**37,894**
4			Major Vendor O&P	4.0%									0	**0**
4			Global Markups	15.0%	2.0%		14,351		4,321		24,907		0	**43,579**
4	DIV	4	**TOTAL w/o Global Markups**				**95,671**		**28,807**		**166,046**		**0**	**290,524**
			TOTAL w/ Global Markups				**110,022**		**33,128**		**190,952**		**0**	**334,102**
4			**TOTAL w/ Contingency**	20.0%	10.0%		**132,027**		**39,753**		**229,143**		**0**	**400,923**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
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STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	5	METALS											
5	1		al stair	TREADS	26.0	450.00	11,700	15.65	407	60.00	1,560		0	**13,667**
5	2		misc metal fabrications	LBS	750.0	1.75	1,313	1.00	750	1.75	1,313		0	**3,375**
5	3													
5	4		stair to roof	LS	1.0	12,000.00	12,000	500.00	500	2,500.00	2,500		0	**15,000**
5	5													
5	6		al ladder	VLF	15.0	85.00	1,275	3.00	45	16.00	240		0	**1,560**
5	7													
5	8		roof hatch	SF	40.0	175.00	7,000		0		0		0	**7,000**
5	9													
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5														
5			SUBTOTAL				33,288		1,702		5,613		0	**40,602**
5														
5			Material, Construction Equipment, Labor O&P	15.0%			4,993		255		842			**6,090**
5			Major Vendor O&P	4.0%									0	**0**
5			Global Markups	15.0%	2.0%		5,742		294		968		0	**7,004**
5	DIV	5	**TOTAL w/o Global Markups**				**38,281**		**1,957**		**6,454**		**0**	**46,692**
			TOTAL w/ Global Markups				**44,023**		**2,251**		**7,423**		**0**	**53,696**
5			**TOTAL w/ Contingency**	20.0%	10.0%		**52,827**		**2,701**		**8,907**		**0**	**64,435**

CLIENT: CITY OF LA CROSSE
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STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	6	WOOD, PLASTICS, AND COMPOSITES											
6	1		Control room cabinets/countertops/etc	LS	1.0	8,000.00	8,000		0	2,000.00	2,000		0	**10,000**
6	2													
6	3													
6	4													
6	5													
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6														
6			SUBTOTAL				8,000		0		2,000		0	**10,000**
6														
6			Material, Construction Equipment, Labor O&P	15.0%			1,200		0		300			**1,500**
6			Major Vendor O&P	4.0%									0	**0**
6			Global Markups	15.0%	2.0%		1,380		0		345		0	**1,725**
6	DIV	6	**TOTAL w/o Global Markups**				**9,200**		**0**		**2,300**		**0**	**11,500**
			TOTAL w/ Global Markups				**10,580**		**0**		**2,645**		**0**	**13,225**
6			**TOTAL w/ Contingency**	20.0%	10.0%		**12,696**		**0**		**3,174**		**0**	**15,870**

CLIENT: CITY OF LA CROSSE
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STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	7	THERMAL AND MOISTURE PROTECTION											
7	1		Perimeter insulation	SF	2,280.0	1.60	3,648		0	1.60	3,648		0	**7,296**
7	2		Fully adhered EPDM insulation	SF	13,560.0	7.00	94,920	0.75	10,170	1.25	16,950		0	**122,040**
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7														
7			SUBTOTAL				98,568		10,170		20,598		0	**129,336**
7														
7			Material, Construction Equipment, Labor O&P	15.0%			14,785		1,526		3,090			**19,400**
7			Major Vendor O&P	4.0%									0	**0**
7			Global Markups	15.0%	2.0%		17,003		1,754		3,553		0	**22,310**
7	DIV	7	**TOTAL w/o Global Markups**				**113,353**		**11,696**		**23,688**		**0**	**148,736**
			TOTAL w/ Global Markups				**130,356**		**13,450**		**27,241**		**0**	**171,047**
7			**TOTAL w/ Contingency**	20.0%	10.0%		**156,427**		**16,140**		**32,689**		**0**	**205,256**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	8	OPENINGS											
8	1		single GHM door/frame/hardware	EA	14.0	1,740.00	24,360		0		0		0	**24,360**
8	2		double GHM door/frame/hardware	EA	5.0	3,100.00	15,500		0		0		0	**15,500**
8	3		Overhead coiling door	SF	465.0	70.00	32,550		0		0		0	**32,550**
8	4													
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8	35													
8														
8			SUBTOTAL				72,410		0		0		0	**72,410**
8														
8			Material, Construction Equipment, Labor O&P	15.0%			10,862		0		0			**10,862**
8			Major Vendor O&P	4.0%									0	**0**
8			Global Markups	15.0%	2.0%		12,491		0		0		0	**12,491**
8	DIV	8	**TOTAL w/o Global Markups**				**83,272**		**0**		**0**		**0**	**83,272**
			TOTAL w/ Global Markups				**95,762**		**0**		**0**		**0**	**95,762**
8			**TOTAL w/ Contingency**	20.0%	10.0%		**114,915**		**0**		**0**		**0**	**114,915**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	500
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	BIOSOLIDS DRYING BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV 10	SPECIALTIES											
10	1	fire extinguisher	EA	5.0	175.00	875		0	40.00	200		0	**1,075**
10	2	toilet room acessories	LS	1.0	2,000.00	2,000		0	500.00	500		0	**2,500**
10	3												
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10													
10		SUBTOTAL				2,875		0		700		0	**3,575**
10													
10		Material, Construction Equipment, Labor O&P	15.0%			431		0		105			**536**
10		Major Vendor O&P	4.0%									0	**0**
10		Global Markups	15.0%	2.0%		496		0		121		0	**617**
10	DIV 10	**TOTAL w/o Global Markups**				**3,306**		**0**		**805**		**0**	**4,111**
		TOTAL w/ Global Markups				**3,802**		**0**		**926**		**0**	**4,728**
10		**TOTAL w/ Contingency**	20.0%	10.0%		**4,563**		**0**		**1,111**		**0**	**5,674**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	21	FIRE SUPRESSION											
21	1		Fire Suppresion	SF	6,500.0	4.50	29,250		0	5.50	35,750		0	**65,000**
21	2													
21	3													
21	4													
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21														
21			SUBTOTAL				29,250		0		35,750		0	**65,000**
21														
21			Material, Construction Equipment, Labor O&P	15.0%			4,388		0		5,363			**9,750**
21			Major Vendor O&P	4.0%									0	**0**
21			Global Markups	15.0%	2.0%		5,046		0		6,167		0	**11,213**
21	DIV	21	**TOTAL w/o Global Markups**				**33,638**		**0**		**41,113**		**0**	**74,750**
			TOTAL w/ Global Markups				**38,683**		**0**		**47,279**		**0**	**85,963**
21			**TOTAL w/ Contingency**	20.0%	10.0%		**46,420**		**0**		**56,735**		**0**	**103,155**

CLIENT: CITY OF LA CROSSE
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OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	22	PLUMBING											
22	1		Fixture	Ea	50.0	2,000.00	100,000		0	1,500.00	75,000		0	**175,000**
22	2													
22	3													
22	4													
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22														
22			SUBTOTAL				100,000		0		75,000		0	**175,000**
22														
22			Material, Construction Equipment, Labor O&P	15.0%			15,000		0		11,250			**26,250**
22			Major Vendor O&P	7.5%									0	**0**
22			Global Markups	15.0%	2.0%		17,250		0		12,938		0	**30,188**
22	DIV	22	**TOTAL w/o Global Markups**				**115,000**		**0**		**86,250**		**0**	**201,250**
			TOTAL w/ Global Markups				**132,250**		**0**		**99,188**		**0**	**231,438**
22			**TOTAL w/ Contingency**	20.0%	10.0%		**158,700**		**0**		**119,025**		**0**	**277,725**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	23	HVAC											
23	1		Heating Water Main Pumps	EA	4.0	10,000.00	40,000		0	2,000.00	8,000		0	**48,000**
23	2		Boiler Pumps	EA	4.0	7,500.00	30,000		0	1,500.00	6,000		0	**36,000**
23	3		Expansion Tanks	EA	2.0	6,000.00	12,000		0	1,200.00	2,400		0	**14,400**
23	4		Air Seperator	EA	2.0	3,000.00	6,000		0	600.00	1,200		0	**7,200**
23	5		Chemical Feeder	EA	2.0	2,000.00	4,000		0	400.00	800		0	**4,800**
23	6		Heat Recovery Pumps	EA	2.0	10,000.00	20,000		0	2,000.00	4,000		0	**24,000**
23	7													
23	8													
23	9													
23	10													
23	11													
23	12		Dewatering Ventilation	CFM	4,050.0	10.75	43,538		0	5.50	22,275		0	**65,813**
23	13		Gas Utilization Ventilation	CFM	4,400.0	10.75	47,300		0	5.50	24,200		0	**71,500**
23	14		Gas Handling Ventilation	CFM	1,550.0	10.75	16,663		0	5.50	8,525		0	**25,188**
23	15		Chemical Ventilation	CFM	1,400.0	10.75	15,050		0	5.50	7,700		0	**22,750**
23	16		Drier Ventilation	LS	1.0	50,500.00	50,500		0	12,500.00	12,500		0	**63,000**
23	17		Cogen Cooling Vent	LS	1.0	20,000.00	20,000		0	10,000.00	10,000		0	**30,000**
23	18		Electrical Room AC	LS	1.0	16,000.00	16,000		0	5,000.00	5,000		0	**21,000**
23	19		Control Room AC	LS	1.0	5,000.00	5,000		0	2,500.00	2,500		0	**7,500**
23	20		HW Unit Heat	Ea	30.0	800.00	24,000		0	1,200.00	36,000		0	**60,000**
23	21		HW Piping	LF	800.0	20.00	16,000		0	20.00	16,000		0	**32,000**
23	22		HW Pipe Insulation	LF	1,200.0	3.00	3,600		0	8.00	9,600		0	**13,200**
23	23													
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23														
23			SUBTOTAL				369,650		0		176,700		0	**546,350**
23														
23			Material, Construction Equipment, Labor O&P	15.0%			55,448		0		26,505			**81,953**
23			Major Vendor O&P	7.5%									0	**0**
23			Global Markups	15.0%	2.0%		63,765		0		30,481		0	**94,245**
23	DIV	23	**TOTAL w/o Global Markups**				**425,098**		**0**		**203,205**		**0**	**628,303**
			TOTAL w/ Global Markups				**488,862**		**0**		**233,686**		**0**	**722,548**
23			**TOTAL w/ Contingency**	20.0%	10.0%		**586,635**		**0**		**280,423**		**0**	**867,057**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV 26	ELECTRICAL											
26	1	500KW DIESEL GENERATORS	EA	2.0		0		0	25,000.00	50,000	150,000.00	300,000	**350,000**
26	2	480V MAIN FIXED SWITCHBOARD	EA	1.0	30,000.00	30,000		0	10,000.00	10,000		0	**40,000**
26	3	480V DRAW OUT SWITCHGEAR	EA	1.0		0		0	50,000.00	50,000	600,000.00	600,000	**650,000**
26	4	480V GENERATOR FIXED SWITCHBOARD	EA	1.0		0		0	10,000.00	10,000	180,000.00	180,000	**190,000**
26	5	CAPACITOR BANK	EA	1.0	100,000.00	100,000		0	5,000.00	5,000		0	**105,000**
26	6	SPD	EA	2.0	13,900.00	27,800		0	1,050.00	2,100		0	**29,900**
26	7	MCC SECTIONS	EA	12.0	2,200.00	26,400		0	505.00	6,060		0	**32,460**
26	8	FVNR SZ1	EA	30.0	1,700.00	51,000		0	149.00	4,470		0	**55,470**
26	9	100A CIRCUIT BREAKERS	EA	30.0	950.00	28,500		0	101.00	3,030		0	**31,530**
26	10	120/208V SPD	EA	2.0	3,890.00	7,780		0	450.00	900		0	**8,680**
26	11	480V POWER PANEL	EA	2.0	4,950.00	9,900		0	2,000.00	4,000		0	**13,900**
26	12	LIGHTING PANEL	EA	2.0	2,250.00	4,500		0	1,500.00	3,000		0	**7,500**
26	13	30KVA DRY TYPE TRANSFORMER	EA	2.0	2,225.00	4,450		0	895.00	1,790		0	**6,240**
26	14	LED LIGHTING	LS	1.0	40,000.00	40,000		0	5,000.00	5,000		0	**45,000**
26	15	VFD	EA	20.0	8,000.00	160,000		0	3,000.00	60,000		0	**220,000**
26	16	CONDUIT AND CONDUCTORS	LS	1.0	155,000.00	155,000		0	50,000.00	50,000		0	**205,000**
26	17	MOTOR CONNECTIONS	EA	50.0		0		0	200.00	10,000		0	**10,000**
26	18	WIRING DEVICES	LS	1.0	4,000.00	4,000		0	1,500.00	1,500		0	**5,500**
26	19	3000A MAIN CB	EA	4.0	30,000.00	120,000		0	2,500.00	10,000		0	**130,000**
26	20	FVNR SZ 2	EA	10.0	1,950.00	19,500		0	201.00	2,010		0	**21,510**
26	21	DUCT BANK AND SITE WORK	LS	1.0	30,000.00	30,000		0	20,000.00	20,000		0	**50,000**
26	22	3000A BUSWAY	EA	4.0	4,725.00	18,900		0	1,600.00	6,400		0	**25,300**
26	23	BUS ELBOW	EA	8.0	5,675.00	45,400		0	800.00	6,400		0	**51,800**
26	24	BUSWAY CONNECTION	EA	8.0	5,775.00	46,200		0	685.00	5,480		0	**51,680**
26	25												
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26	DIV 26	ELECTRICAL (continued next page)											

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	500
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	BIOSOLIDS DRYING BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
26													
26	45												
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26	74												
26	75	I&C Wiring & Conduit	LS	1.0	10,000.00	10,000		0	5,000.00	5,000		0	**15,000**
26	76												
26	77												
26	78												
26	79												
26													
26		SUBTOTAL				939,330		0		332,140		1,080,000	**2,351,470**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			140,900		0		49,821			**190,721**
26		Major Vendor O&P	15.0%									162,000	**162,000**
26		Global Markups	15.0%	2.0%		162,034		0		57,294		24,840	**244,169**
26	DIV 26	**TOTAL w/o Global Markups**				**1,080,230**		**0**		**381,961**		**1,242,000**	**2,704,191**
		TOTAL w/ Global Markups				**1,242,264**		**0**		**439,255**		**1,266,840**	**2,948,359**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**1,490,717**		**0**		**527,106**		**1,393,524**	**3,411,347**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	31	**EARTHWORK**											
31	1		structure excavation	CY	1,200.0		0	7.00	8,400	6.00	7,200		0	**15,600**
31	2		Haul excess excavation off site	CY	800.0		0	2.75	2,200	2.50	2,000		0	**4,200**
31	3		Earth Backfill	CY	400.0		0	1.50	600	3.50	1,400		0	**2,000**
31	4													
31	5		foundation improvements	LS	1.0	200,000.00	200,000		0		0		0	**200,000**
31	6													
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31			SUBTOTAL				200,000		11,200		10,600		0	**221,800**
31														
31			Material, Construction Equipment, Labor O&P	15.0%			30,000		1,680		1,590			**33,270**
31			Major Vendor O&P	4.0%									0	**0**
31			Global Markups	15.0%	2.0%		34,500		1,932		1,829		0	**38,261**
31	DIV	31	**TOTAL w/o Global Markups**				**230,000**		**12,880**		**12,190**		**0**	**255,070**
			TOTAL w/ Global Markups				**264,500**		**14,812**		**14,019**		**0**	**293,331**
31			**TOTAL w/ Contingency**	20.0%	10.0%		**317,400**		**17,774**		**16,822**		**0**	**351,997**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		Process Mechanical Piping Systems	LS	1.0	750,000.00	750,000		0	375,000.00	375,000		0	**1,125,000**
40M	2													
40M	3													
40M	4													
40M	5													
40M	6													
40M	7													
40M	8													
40M	9													
40M	10													
40M	11													
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40M														
40M			SUBTOTAL				750,000		0		375,000		0	**1,125,000**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			112,500		0		56,250			**168,750**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		129,375		0		64,688		0	**194,063**
40M	DIV	40M	**TOTAL w/o Global Markups**				**862,500**		**0**		**431,250**		**0**	**1,293,750**
			TOTAL w/ Global Markups				**991,875**		**0**		**495,938**		**0**	**1,487,813**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**1,190,250**		**0**		**595,125**		**0**	**1,785,375**

CLIENT: CITY OF LA CROSSE
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03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40IC	**PROCESS INTERCONNECTIONS: IC**											
40IC	1		Optical Switch (Polymer System)	Ea.	1.0	300.00	300		0	60.00	60		0	**360**
40IC	2		Polymer Lube Pump Control Station	Ea.	1.0	500.00	500		0	120.00	120		0	**620**
40IC	3		Pressure Indicating Switch (Polymer System)	Ea.	1.0	600.00	600		0	120.00	120		0	**720**
40IC	4		BFP Electromagnetic Flow Meter (Sludge 6")	Ea.	2.0	5,000.00	10,000		0	480.00	960		0	**10,960**
40IC	5		BFP Electromagnetic Flow Meter (Polymer 1.5")	Ea.	2.0	2,200.00	4,400		0	400.00	800		0	**5,200**
40IC	6		BFP CCTV	Ea.	2.0	1,200.00	2,400		0	360.00	720		0	**3,120**
40IC	7		Cake Conveyance Control Stations	Ea.	4.0	750.00	3,000		0	120.00	480		0	**3,480**
40IC	8		Cake Pump Annular Seal	Ea.	1.0	2,800.00	2,800		0	360.00	360		0	**3,160**
40IC	9		Cake Pump Pressure Transmitter	Ea.	1.0	2,200.00	2,200		0	180.00	180		0	**2,380**
40IC	10		Cake Conveyance Instrumentation (Misc.)	LS	1.0	3,000.00	3,000		0	600.00	600		0	**3,600**
40IC	11		Dryer Eq. Control Stations	Ea.	5.0	750.00	3,750		0	120.00	600		0	**4,350**
40IC	12		Dryer Air Handling Temperature Transmitters	Ea.	7.0	770.00	5,390		0	180.00	1,260		0	**6,650**
40IC	13		Dryer Air Handling Pressure Transmitters	Ea.	2.0	2,200.00	4,400		0	180.00	360		0	**4,760**
40IC	14		Heat Recovery Pump Control Station	Ea.	1.0	750.00	750		0	120.00	120		0	**870**
40IC	15		Moisture Sensors	Ea.	2.0	2,200.00	4,400		0	300.00	600		0	**5,000**
40IC	16		Pressure Gauge	Ea.	2.0	250.00	500		0	60.00	120		0	**620**
40IC	17		Odor Control Eq. (Misc.)	LS	1.0	3,000.00	3,000		0	600.00	600		0	**3,600**
40IC	18		Drag Conveyor Eq. Control Stations	Ea.	4.0	750.00	3,000		0	120.00	480		0	**3,480**
40IC	19		Dry Biosolids Storage Instrumentation & Controls	LS	1.0	2,000.00	2,000		0	300.00	300		0	**2,300**
40IC	20		Nitrogen Instrumentation & Controls	LS	1.0	250.00	250		0	60.00	60		0	**310**
40IC	21		Siloxane Temperature Transmitter	Ea.	1.0	770.00	770		0	180.00	180		0	**950**
40IC	22		Siloxane Differential Pressure Transmitter	Ea.	2.0	2,500.00	5,000		0	220.00	440		0	**5,440**
40IC	23		Siloxane Thermal Dispersion flow meter	Ea.	1.0	4,400.00	4,400		0	600.00	600		0	**5,000**
40IC	24		Boiler Water Pump C/S	Ea.	4.0	750.00	3,000		0	120.00	480		0	**3,480**
40IC	25		Boiler System Pressure Gauge	Ea.	20.0	300.00	6,000		0	75.00	1,500		0	**7,500**
40IC	26		Boiler System Temperature Gauge	Ea.	8.0	150.00	1,200		0	60.00	480		0	**1,680**
40IC	27		Boiler System Temperature Transmitter	Ea.	4.0	770.00	3,080		0	180.00	720		0	**3,800**
40IC	28		Boiler System Thermal Dispersion flow meter	Ea.	5.0	4,400.00	22,000		0	600.00	3,000		0	**25,000**
40IC	29		Boiler System Safety Controls	LS	1.0	1,600.00	1,600		0	480.00	480		0	**2,080**
40IC	30		Dryer and Plant HW Pumps Control Stations	Ea.	6.0	750.00	4,500		0	120.00	720		0	**5,220**
40IC	31		Dryer and Plant HW Pumps Pressure Gauge	Ea.	6.0	300.00	1,800		0	75.00	450		0	**2,250**
40IC	32		Dryer and Plant HW Pumps Temperature Transmitter	Ea.	6.0	770.00	4,620		0	180.00	1,080		0	**5,700**
40IC	33		Dryer and Plant HW System Electromagnetic FM	Ea.	4.0	5,000.00	20,000		0	480.00	1,920		0	**21,920**
40IC	34		Generator Pressure Gauge	Ea.	3.0	300.00	900		0	75.00	225		0	**1,125**
40IC	35		Generator Temperature Gauge	Ea.	2.0	150.00	300		0	60.00	120		0	**420**
40IC	36		Generator Temperature Transmitter	Ea.	2.0	770.00	1,540		0	180.00	360		0	**1,900**
40IC	37		Generator Temperature Indicating Switch	Ea.	1.0	600.00	600		0	120.00	120		0	**720**
40IC	38		Generator NG Thermal Dispersion flow meter	Ea.	1.0	4,400.00	4,400		0	600.00	600		0	**5,000**
40IC	39		NaOH Controls & Instrumentation	LS	1.0	6,500.00	6,500		0	2,000.00	2,000		0	**8,500**
40IC	40													
40IC	41		Biosolids Drying Building PLC Panel	Ea.	1.0	50,000.00	50,000		0	20,000.00	20,000		0	**70,000**
40IC	42		Network Equipment	Ea.	1.0	4,000.00	4,000		0	1,000.00	1,000		0	**5,000**
40IC	43		PLC Programming	LS	1.0		0		0	40,000.00	40,000		0	**40,000**
40IC	44		SCADA HMI Programming	LS	1.0		0		0	40,000.00	40,000		0	**40,000**
40IC														
40IC														
40IC			SUBTOTAL				202,850		0		125,375		0	**328,225**
40IC														
40IC			Material, Construction Equipment, Labor O&P	15.0%			30,428		0		18,806			**49,234**
40IC			Major Vendor O&P	4.0%									0	**0**
40IC			Global Markups	15.0%	2.0%		34,992		0		21,627		0	**56,619**
40IC	DIV	40IC	**TOTAL w/o Global Markups**				**233,278**		**0**		**144,181**		**0**	**377,459**
			TOTAL w/ Global Markups				**268,269**		**0**		**165,808**		**0**	**434,078**
40IC			**TOTAL w/ Contingency**	20.0%	10.0%		**321,923**		**0**		**198,970**		**0**	**520,893**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	500
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	BIOSOLIDS DRYING BUILDING
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
DIV	41	MATERIAL PROCESSING AND HANDLING											
1													
2		Cake Conveyors	LS	1.0		0		0	20,250.00	20,250	135,000.00	135,000	**155,250**
3		Drag Conveyors, Silo, and Dust Collection	LS	1.0		0		0	240,000.00	240,000	##########	1,200,000	**1,440,000**
4		Nitrogen System	LS	1.0		0		0	45,000.00	45,000	225,000.00	225,000	**270,000**
5		Dry Product Controls	LS	1.0		0		0	38,000.00	38,000	190,000.00	190,000	**228,000**
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		SUBTOTAL				0		0	343,250		1,750,000		**2,093,250**
		Material, Construction Equipment, Labor O&P	15.0%			0		0	51,488				**51,488**
		Major Vendor O&P	7.5%									131,250	**131,250**
		Global Markups	15.0%	2.0%		0		0	59,211		37,625		**96,836**
DIV	41	**TOTAL w/o Global Markups**				**0**		**0**	**394,738**		**1,881,250**		**2,275,988**
		TOTAL w/ Global Markups				**0**		**0**	**453,948**		**1,918,875**		**2,372,823**
		TOTAL w/ Contingency	20.0%	10.0%		**0**		**0**	**544,738**		**2,110,763**		**2,655,500**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	42	**PROCESS HEATING, COOLING, AND DRYING**											
42	1		Flex Tube Boilers	Ea	4.0		0		0	13,900.00	55,600	139,000.00	556,000	**611,600**
42	2		Heat Exhchangers	Ea	2.0	10,000.00	20,000		0	2,000.00	4,000		0	**24,000**
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42			SUBTOTAL				20,000		0		59,600		556,000	**635,600**
42														
42			Material, Construction Equipment, Labor O&P	15.0%			3,000		0		8,940			**11,940**
42			Major Vendor O&P	7.5%									41,700	**41,700**
42			Global Markups	15.0%	2.0%		3,450		0		10,281		11,954	**25,685**
42	DIV	42	**TOTAL w/o Global Markups**				**23,000**		**0**		**68,540**		**597,700**	**689,240**
			TOTAL w/ Global Markups				**26,450**		**0**		**78,821**		**609,654**	**714,925**
42			**TOTAL w/ Contingency**	20.0%	10.0%		**31,740**		**0**		**94,585**		**670,619**	**796,945**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	43	PROCESS GAS AND LIQUID HANDLING											
43	1		Biogas Conditioning System	LS	1.0		0		0	51,100.00	51,100	511,000.00	511,000	**562,100**
43	2		Chemical Storage Tank	EA	1.0	22,000.00	22,000		0	2,200.00	2,200		0	**24,200**
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43			SUBTOTAL				22,000		0		53,300		511,000	**586,300**
43														
43			Material, Construction Equipment, Labor O&P	15.0%			3,300		0		7,995			**11,295**
43			Major Vendor O&P	7.5%									38,325	**38,325**
43			Global Markups	15.0%	2.0%		3,795		0		9,194		10,987	**23,976**
43	DIV	43	**TOTAL w/o Global Markups**				**25,300**		**0**		**61,295**		**549,325**	**635,920**
			TOTAL w/ Global Markups				**29,095**		**0**		**70,489**		**560,312**	**659,896**
43			**TOTAL w/ Contingency**	20.0%	10.0%		**34,914**		**0**		**84,587**		**616,343**	**735,844**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	46	WATER AND WASTEWATER EQUIPMENT											
46	1		2-m Belt Press	Ea	1.0		0		0	35,000.00	35,000	350,000.00	350,000	**385,000**
46	2		Relocate/Rehab Existing Belt Press	Ea	1.0		0		0	30,000.00	30,000	300,000.00	300,000	**330,000**
46	3		Polymer Feed System	Ea	2.0		0		0	4,000.00	8,000	40,000.00	80,000	**88,000**
46	4		Polymer Tote Rack	Ea	1.0	6,000.00	6,000		0	1,200.00	1,200		0	**7,200**
46	5		Dryer System	LS	1.0		0		0	700,000.00	700,000	##########	3,500,000	**4,200,000**
46	6		Chemical Feed Pumps	Ea	3.0		0		0	4,000.00	12,000	20,000.00	60,000	**72,000**
46	7		Cake Feed Equipment	LS	1.0		0		0	22,500.00	22,500	150,000.00	150,000	**172,500**
46	8		Scrubber System	LS	1.0		0		0	75,000.00	75,000	750,000.00	750,000	**825,000**
46	9		Polymer Ring	Ea	1.0	2,500.00	2,500		0	500.00	500		0	**3,000**
46	10		Flame Trap Assemblies	Ea	5.0	15,000.00	75,000		0	1,500.00	7,500		0	**82,500**
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46			SUBTOTAL				83,500		0		891,700		5,190,000	**6,165,200**
46														
46			Material, Construction Equipment, Labor O&P	15.0%			12,525		0		133,755			**146,280**
46			Major Vendor O&P	7.5%									389,250	**389,250**
46			Global Markups	15.0%	2.0%		14,404		0		153,818		111,585	**279,807**
46	DIV	46	**TOTAL w/o Global Markups**				**96,025**		**0**		**1,025,455**		**5,579,250**	**6,700,730**
			TOTAL w/ Global Markups				**110,429**		**0**		**1,179,273**		**5,690,835**	**6,980,537**
46			**TOTAL w/ Contingency**	20.0%	10.0%		**132,515**		**0**		**1,415,128**		**6,259,919**	**7,807,561**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 500
STRUCTURE NAME: BIOSOLIDS DRYING BUILDING

03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	48	**ELECTRICAL POWER GENERATION**											
48	1		633 KW Cogen System	LS	1.0		0		0	61,000.00	61,000	610,000.00	610,000	**671,000**
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48	3													
48	4													
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48			SUBTOTAL				0		0		61,000		610,000	**671,000**
48														
48			Material, Construction Equipment, Labor O&P	15.0%			0		0		9,150			**9,150**
48			Major Vendor O&P	15.0%									91,500	**91,500**
48			Global Markups	15.0%	2.0%		0		0		10,523		14,030	**24,553**
48	DIV	48	**TOTAL w/o Global Markups**				**0**		**0**		**70,150**		**701,500**	**771,650**
			TOTAL w/ Global Markups				**0**		**0**		**80,673**		**715,530**	**796,203**
48			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**96,807**		**787,083**	**883,890**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 530
STRUCTURE NAME: BIOGAS STORAGE MEMBRANE

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	3	CONCRETE											
3	1		concrete foundation	CY	450.0	290.00	130,500	39.00	17,550	91.00	40,950		0	**189,000**
3	2													
3	3													
3	4													
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3			SUBTOTAL				130,500		17,550		40,950		0	**189,000**
3														
3			Material, Construction Equipment, Labor O&P	15.0%			19,575		2,633		6,143			**28,350**
3			Major Vendor O&P	4.0%									0	**0**
3			Global Markups	15.0%	2.0%		22,511		3,027		7,064		0	**32,603**
3	DIV	3	**TOTAL w/o Global Markups**				**150,075**		**20,183**		**47,093**		**0**	**217,350**
			TOTAL w/ Global Markups				**172,586**		**23,210**		**54,156**		**0**	**249,953**
3			**TOTAL w/ Contingency**	20.0%	10.0%		**207,104**		**27,852**		**64,988**		**0**	**299,943**

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	530
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	BIOGAS STORAGE MEMBRANE
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV 26	ELECTRICAL											
26	1	CONDUITS AND CONDUCOTRS	LS	1.0	5,000.00	5,000		0	1,000.00	1,000		0	**6,000**
26	2	MOTOR CONNECTIONS	EA	5.0		0		0	200.00	1,000		0	**1,000**
26	3												
26	4												
26	5												
26	6												
26	7												
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26	42												
26	43												
26	44												
26													
26	DIV 26	ELECTRICAL (continued next page)											

CLIENT	CITY OF LA CROSSE	STRUCTURE NO.	530
PROJECT	WASTEWATER TREATMENT FACILITY IMPROVEMENTS	STRUCTURE NAME	BIOGAS STORAGE MEMBRANE
PROJECT NO.	13655		03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
26	DIV 26	**ELECTRICAL (concluded)**											
26													
26	45												
26	46												
26	47												
26	48												
26	49												
26	50												
26	51												
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26	77												
26	78												
26	79												
26													
26		SUBTOTAL				5,000		0		2,000		0	**7,000**
26													
26		Material, Construction Equipment, Labor O&P	15.0%			750		0		300			**1,050**
26		Major Vendor O&P	15.0%									0	**0**
26		Global Markups	15.0%	2.0%		863		0		345		0	**1,208**
26	DIV 26	**TOTAL w/o Global Markups**				**5,750**		**0**		**2,300**		**0**	**8,050**
		TOTAL w/ Global Markups				**6,613**		**0**		**2,645**		**0**	**9,258**
26		**TOTAL w/ Contingency**	20.0%	10.0%		**7,935**		**0**		**3,174**		**0**	**11,109**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 530
STRUCTURE NAME: BIOGAS STORAGE MEMBRANE

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	31	EARTHWORK											
31	1		Structure excavation	CY	1,500.0		0	7.00	10,500	6.00	9,000		0	**19,500**
31	2		Haul excess excavation off site	CY	750.0		0	2.75	2,063	2.50	1,875		0	**3,938**
31	3		Earth backfill	CY	750.0		0	1.50	1,125	3.50	2,625		0	**3,750**
31	4													
31	5		subgrade improvements	LS	1.0	50,000.00	50,000		0		0		0	**50,000**
31	6													
31	7													
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31														
31			SUBTOTAL				50,000		13,688		13,500		0	**77,188**
31														
31			Material, Construction Equipment, Labor O&P	15.0%			7,500		2,053		2,025			**11,578**
31			Major Vendor O&P	4.0%									0	**0**
31			Global Markups	15.0%	2.0%		8,625		2,361		2,329		0	**13,315**
31	DIV	31	**TOTAL w/o Global Markups**				**57,500**		**15,741**		**15,525**		**0**	**88,766**
			TOTAL w/ Global Markups				**66,125**		**18,102**		**17,854**		**0**	**102,080**
31			**TOTAL w/ Contingency**	20.0%	10.0%		**79,350**		**21,722**		**21,425**		**0**	**122,497**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 530
STRUCTURE NAME: BIOGAS STORAGE MEMBRANE
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40M	**PROCESS INTERCONNECTIONS: PROCESS**											
40M	1		Piping	LS	1.0	75,000.00	75,000		0	37,500.00	37,500		0	**112,500**
40M	2													
40M	3													
40M	4													
40M	5													
40M	6													
40M	7													
40M	8													
40M	9													
40M	10													
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40M	44													
40M														
40M														
40M			SUBTOTAL				75,000		0		37,500		0	**112,500**
40M														
40M			Material, Construction Equipment, Labor O&P	15.0%			11,250		0		5,625			**16,875**
40M			Major Vendor O&P	6.0%									0	**0**
40M			Global Markups	15.0%	2.0%		12,938		0		6,469		0	**19,406**
40M	DIV	40M	**TOTAL w/o Global Markups**				**86,250**		**0**		**43,125**		**0**	**129,375**
			TOTAL w/ Global Markups				**99,188**		**0**		**49,594**		**0**	**148,781**
40M			**TOTAL w/ Contingency**	20.0%	10.0%		**119,025**		**0**		**59,513**		**0**	**178,538**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 530
STRUCTURE NAME: BIOGAS STORAGE MEMBRANE
03/16/20

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	40IC	PROCESS INTERCONNECTIONS: IC											
40IC	1													
40IC	2													
40IC	3													
40IC	4													
40IC	5		Controls (unk.)	LS	1.0	5,000.00	5,000		0	1,000.00	1,000		0	**6,000**
40IC	6													
40IC	7													
40IC	8													
40IC	9													
40IC	10													
40IC	11													
40IC	12													
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40IC	44													
40IC														
40IC														
40IC			SUBTOTAL				5,000		0		1,000		0	**6,000**
40IC														
40IC			Material, Construction Equipment, Labor O&P	15.0%			750		0		150			**900**
40IC			Major Vendor O&P	4.0%									0	**0**
40IC			Global Markups	15.0%	2.0%		863		0		173		0	**1,035**
40IC	DIV	40IC	**TOTAL w/o Global Markups**				**5,750**		**0**		**1,150**		**0**	**6,900**
			TOTAL w/ Global Markups				**6,613**		**0**		**1,323**		**0**	**7,935**
40IC			**TOTAL w/ Contingency**	20.0%	10.0%		**7,935**		**0**		**1,587**		**0**	**9,522**

CLIENT: CITY OF LA CROSSE
PROJECT: WASTEWATER TREATMENT FACILITY IMPROVEMENTS
PROJECT NO.: 13655

STRUCTURE NO.: 530
STRUCTURE NAME: BIOGAS STORAGE MEMBRANE

OPINION OF PROBABLE CONST COST
PRELIMINARY DESIGN PHASE
03/16/20
DONOHUE & ASSOCIATES, INC.

	LINE	SPEC SECTION	DESCRIPTION	UNIT OF MEASURE	QUANTITY	MATERIAL Unit Cost	MATERIAL Total	CONSTRUCTION EQUIPMENT Unit Cost	CONSTRUCTION EQUIPMENT Total	LABOR Unit Cost	LABOR Total	VENDOR Unit Cost	VENDOR Total	TOTAL COST
	DIV	46	WATER AND WASTEWATER EQUIPMENT											
46	1		Gas Holder Membrane	LS	1.0		0		0	111,800.00	111,800	559,000.00	559,000	**670,800**
46	2													
46	3													
46	4													
46	5													
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46														
46			SUBTOTAL				0		0		111,800		559,000	**670,800**
46														
46			Material, Construction Equipment, Labor O&P	15.0%			0		0		16,770			**16,770**
46			Major Vendor O&P	7.5%									41,925	**41,925**
46			Global Markups	15.0%	2.0%		0		0		19,286		12,019	**31,304**
46	DIV	46	**TOTAL w/o Global Markups**				**0**		**0**		**128,570**		**600,925**	**729,495**
			TOTAL w/ Global Markups				**0**		**0**		**147,856**		**612,944**	**760,799**
46			**TOTAL w/ Contingency**	20.0%	10.0%		**0**		**0**		**177,427**		**674,238**	**851,664**

NOTICE TO CONTRIBUTING COMMUNITIES OF THE LA CROSSE SEWER UTILITY

At the beginning of the Waste Water Treatment Plant (WWTP) facility planning process, we met with each community and discussed needs and direction of the facility plan. A draft version of the WWTP Facility Plan and an associated draft Sewer Rate Study is now available for your review and comment. The draft plan addresses new phosphorous removal requirements, needed capacity for bio-solid storage, increased sustainability by the reuse of methane, and various general maintenance/process improvement needs. This draft was prepared in the traditional cooperative approach as past facility plans. The rate study is the conventional rate analysis with a calculation for wholesale sewage treatment cost to partner communities defined. An updated connection fee analysis starts on page 42. You will see some minor changes in this calculation (mostly related to assets) based on comments from Onalaska.

A public information and listening session on the Draft Sewer Facilities Plan and Draft Sewer Rate Study has been scheduled for Tuesday, June 25, 2019, at 6:00 p.m. at the Myrick Park Center, 789 Myrick Park Dr, La Crosse, WI. We would like to follow that public meeting with a workshop with just our partner communities. We would start the workshop about 15 minutes after the public information session ends (estimated to be 7pm). The workshop will be an opportunity to further discuss the alternatives in the plan and define the need for additional preliminary engineering.

Additionally, our consultants have been looking at different approaches to sharing the cost of improvements to our WWTP facility based on various possible future scenarios. Similar to what other regional sewer providers in the state have done, they started by looking at what the needs at the plant would be without regional partners. They also are exploring alternate approaches to addressing the burden of improvements based on each individual communities' need, such as dividing the capital expense of capacity improvements amongst the communities based on each communities' individual future capacity requirement.

Our consultants are still working on this analysis. If -we can get you information on these alternate scenarios ahead of the workshop we will. If not, they will be presenting this analysis to you at the workshop. We hope all our partner communities can attend. Administrators, elected officials, and technical staff are all welcome.

A copy of the draft plans can be found on the City's web page at:
www.cityoflacrosse.org/wwfacilityplanning.

In lieu of attending the public information session; written comments can be mailed or delivered to the La Crosse Utilities Office at 400 La Crosse Street or emailed to utilities@cityoflacrosse.org.

If you have any questions, please contact the La Crosse Utilities Office at (608) 789-7536

Public Information Session on Sewer Utility Facility Plan and Rate Study

DATE/TIME: June 25, 2019 @ 6:00PM

LOCATION: Myrick Park Center

NAME (PLEASE PRINT NAME)	AGENCY (IF APPLICABLE)	ADDRESS	CITY/STATE/ZIP	EMAIL
KURT KNUTSON	SHELBY SD #2	2231 HIAWATHA AVE	LACROSSE	
Rose Knutson	Shelby - Supervisor	" " "	" " 54601	
ERIC LYNNE	Donohue	5600 River Bluff Dr	Bloomington MN	
Greg Kozelek	City of LaCrosse	400 La Crosse St.	La Crosse	
STEVEN LUNDSTEN	SHELBY SD #2	N2083 ORCHARD VALLEY DR.	LA CROSSE	
Bob MUELLER	" "	~~N2385~~ N2385 BRIARWOOD AVE	LA CROSSE	MUELLERI@PMUELLER.086
FRED BUEHLER	City of Onalaska	415 Main St	Onalaska	
JARROD HOLTEN	CITY of ONALASKA	415 MAIN ST	ONALASKA	JHOLTEN@ONALASKAWI.GOV
Bernard Lenz	City of LaCrosse	418 La Crosse St	La Crosse	LenzB@cityoflacrosse.org
Tina Erickson	City of LaCrosse	400 LaCrosse St	LaCrosse	ericksont@cityoflacrosse.org
Jared Greeno	City of LaCrosse	400 LaCrosse st	LaCrosse	greenoja@cityoflacrosse.org
Mike Gabrik	Donohue	3311 Weeden Creek Rd	Sheboygan	
Randy Sanford	SEH (Representing Shelby)	529 Jay Street Suite 301	La Crosse, WI 54601	rsanford@sehinc.com
Steve Asp	City of LaCrosse	905 Joseph Hauska Dr	La Crosse	
BRIAN HEIN	" " "	" " "	"	

Draft Sewer Facilities Plan & Draft Sewer Rate Study

Public Information Meeting
Myrick Park Center
La Crosse, WI

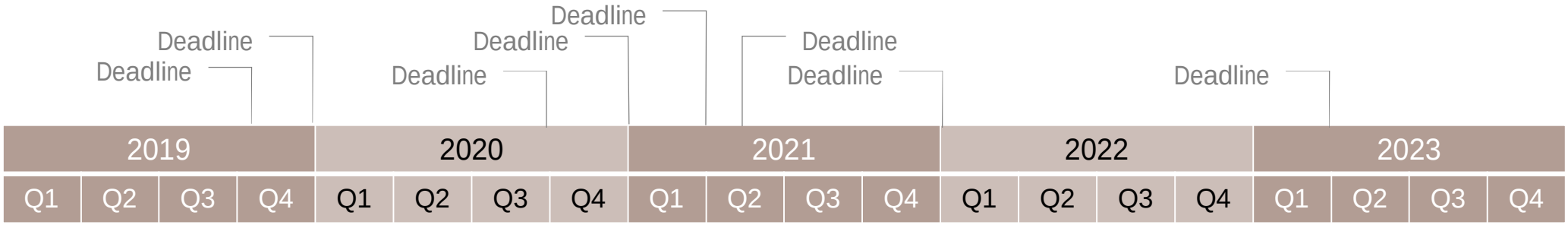
June 25, 2019

DONOHUE

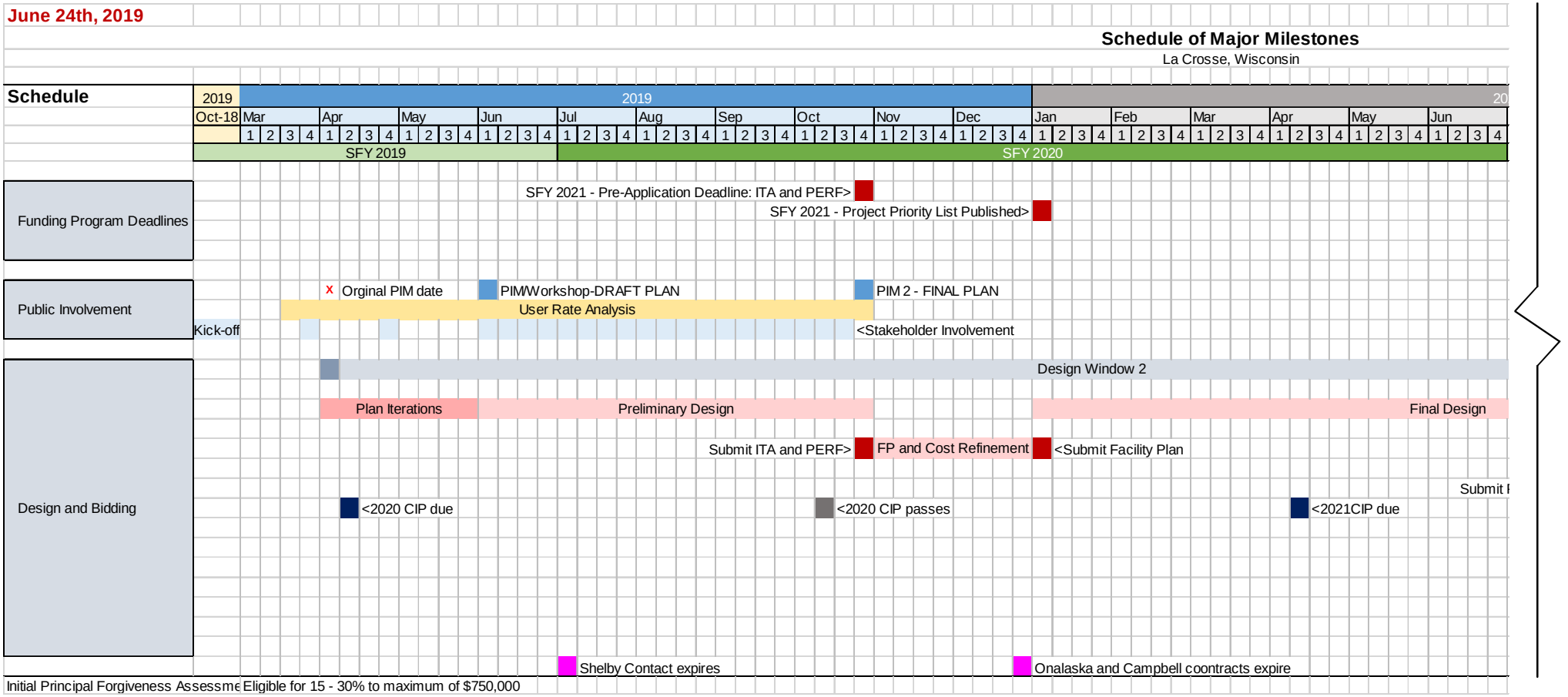
The La Crosse Wastewater Treatment Plant

Agenda

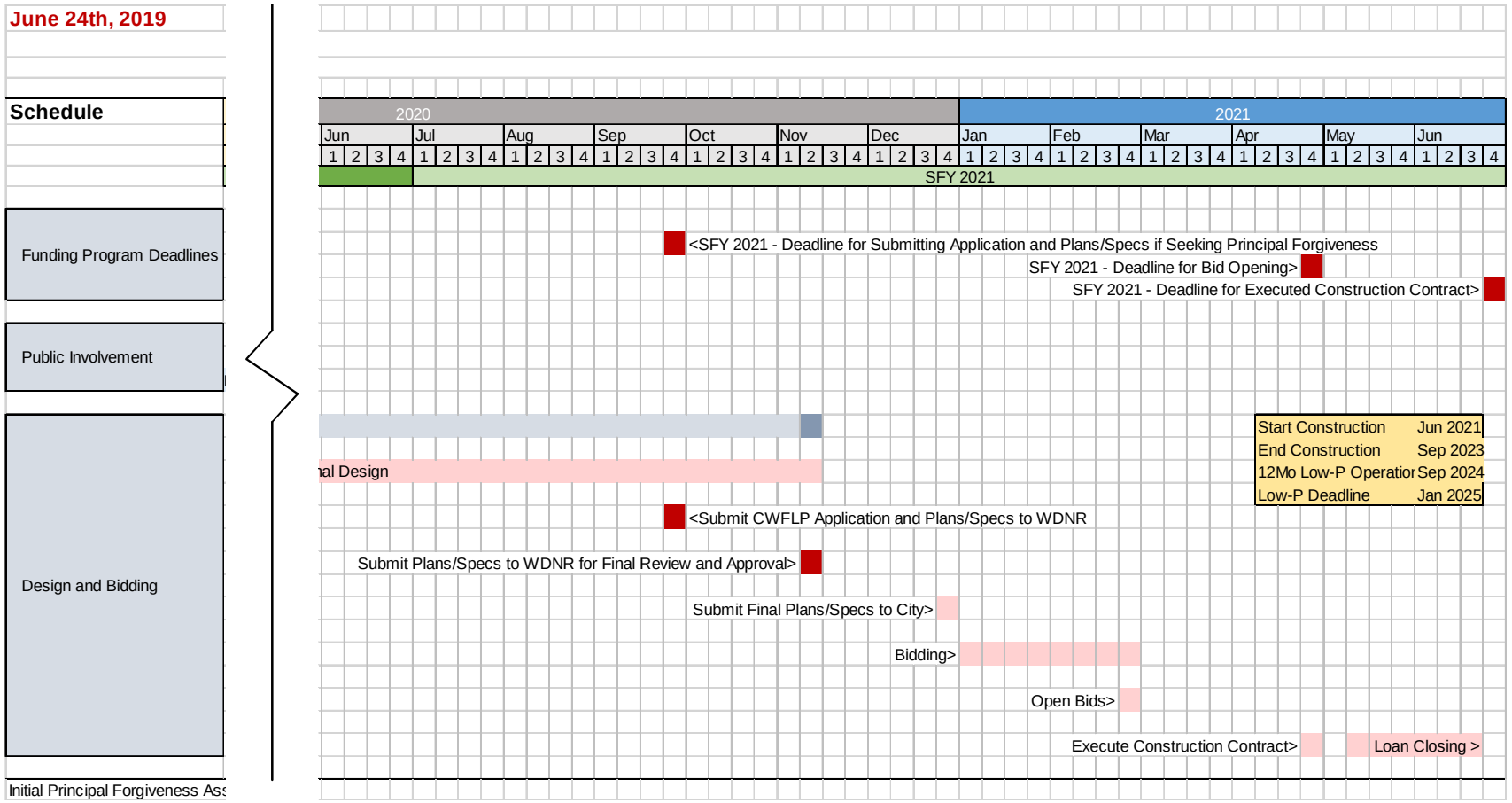
- Overview/Schedule - Bernard Lenz
- Operator's Perspective – Jared Greeno
- Wastewater Facilities Plan – Eric Lynne/Mike Gerbitz (Donohue & Associates)
- Sewer Rate Study – Christine DeMaster/Erik Granum (Trilogy)
- City Resources – Greg Kozelek/Brian Hein/Tina Erickson



Schedule


June 24th, 2019
Schedule of Major Milestones
La Crosse, Wisconsin
Schedule
2019
2019
Oct-18
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
SFY 2019
SFY 2020
Funding Program Deadlines
SFY 2021 - Pre-Application Deadline: ITA and PERF>
SFY 2021 - Project Priority List Published>
Public Involvement
Orginal PIM date
PIMWorkshop-DRAFT PLAN
PIM 2 - FINAL PLAN
User Rate Analysis
Kick-off
<Stakeholder Involvement
Design and Bidding
Design Window 2
Plan Iterations
Preliminary Design
Final Design
Submit ITA and PERF>
FP and Cost Refinement
<Submit Facility Plan
<2020 CIP due
<2020 CIP passes
<2021CIP due
Shelby Contact expires
Onalaska and Campbell coontracts expire
Initial Principal Forgiveness Assessme
Eligible for 15 - 30% to maximum of $750,000

Schedule


June 24th, 2019
Schedule
Funding Program Deadlines
Public Involvement
Design and Bidding
Initial Principal Forgiveness Ass
2020
2021
Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun
SFY 2021
<SFY 2021 - Deadline for Submitting Application and Plans/Specs if Seeking Principal Forgiveness
SFY 2021 - Deadline for Bid Opening>
SFY 2021 - Deadline for Executed Construction Contract>
Start Construction Jun 2021
End Construction Sep 2023
12Mo Low-P Operatior Sep 2024
Low-P Deadline Jan 2025
<Submit CWFLP Application and Plans/Specs to WDNR
Submit Plans/Specs to WDNR for Final Review and Approval>
Submit Final Plans/Specs to City>
Bidding>
Open Bids>
Execute Construction Contract>
Loan Closing >

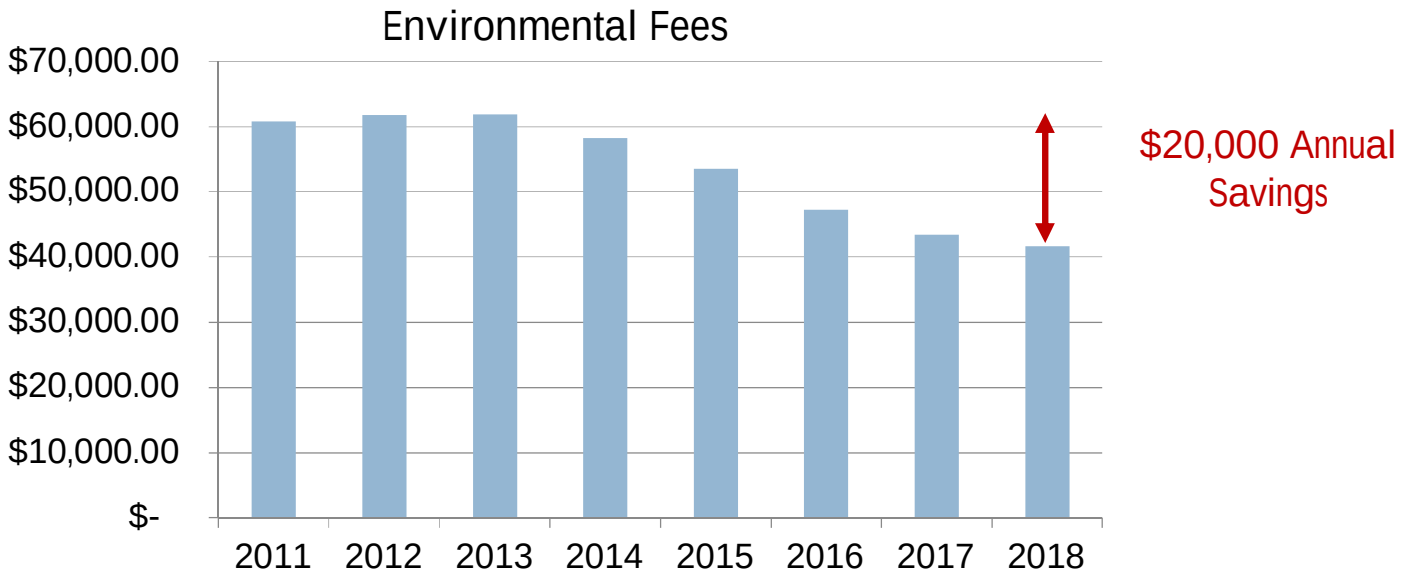
The La Crosse Wastewater Treatment Plant

Facilities Plan – Operations Perspective

- 1st – Produce clean water

Facilities Plan – Operations Perspective

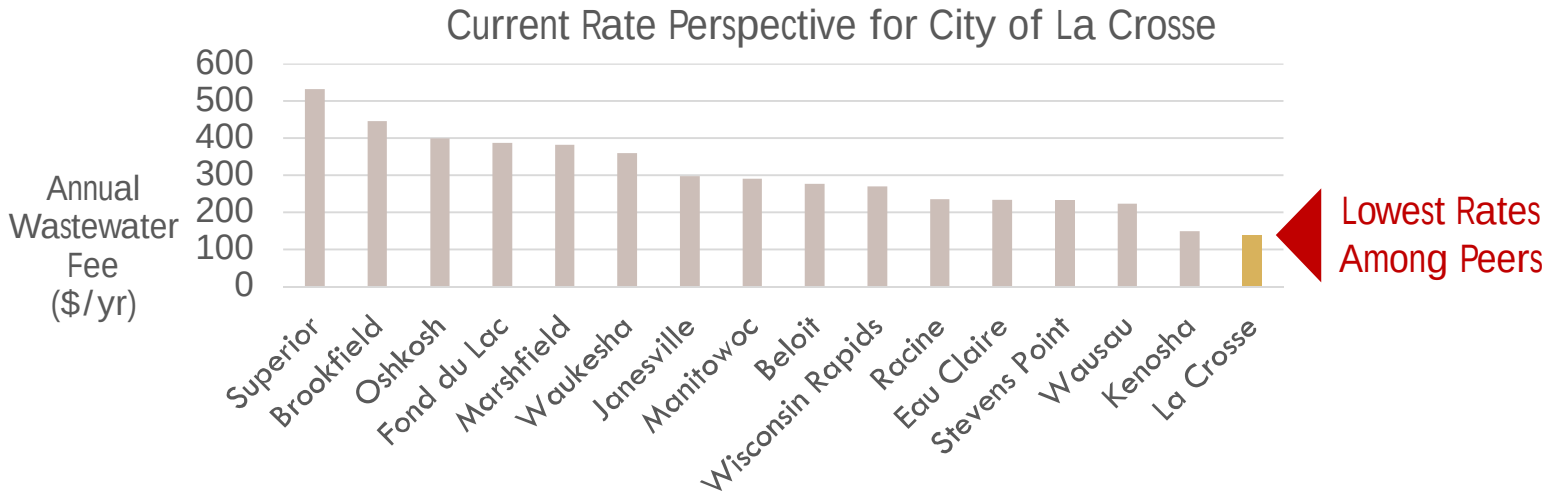
- 1st – Produce clean water
- 2nd – Do it well
  (uninterrupted service, exceed discharge standards, avoid backups/overflows)



Facilities Plan – Operations Perspective

- 1st – Produce clean water
- 2nd – Do it well
- 3rd – Keep rates low

  (self perform repairs, in-house engineering, utilize historical capacity)



Facilities Plan – Operations Perspective

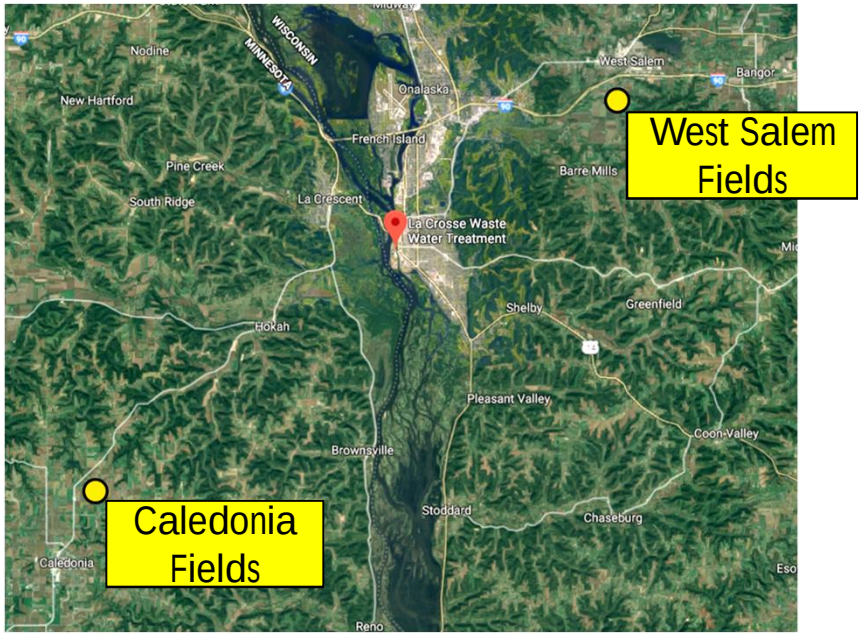
- 1st – Produce clean water
- 2nd – Do it well
- 3rd – Keep rates low

<u>Difficulties</u>

- Aging Infrastructure (replace or wait)

Facilities Plan – Operations Perspective

- 1st – Produce clean water
- 2nd – Do it well
- 3rd – Keep rates low



Difficulties

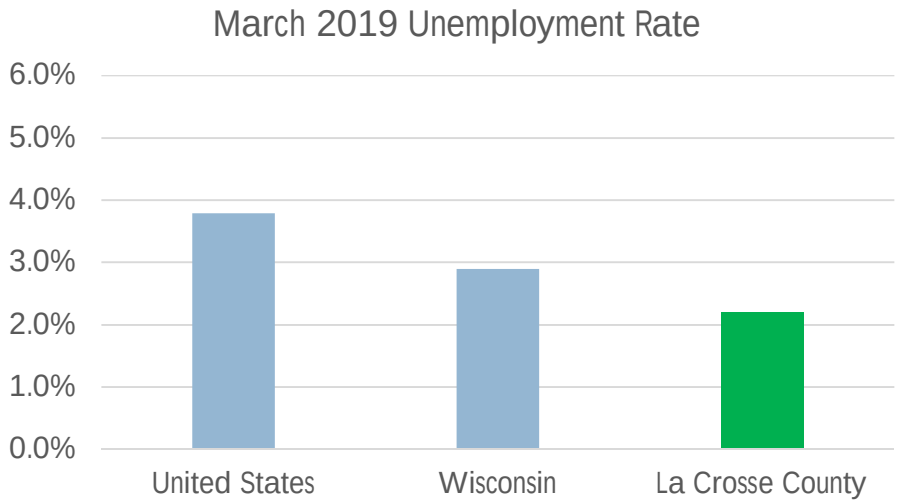
- Aging Infrastructure
- Biosolids Management
  (limited storage, big volume, distant location, weather dependent, anticipated regulations)

Facilities Plan – Operations Perspective

- 1st – Produce clean water
- 2nd – Do it well
- 3rd – Keep rates low

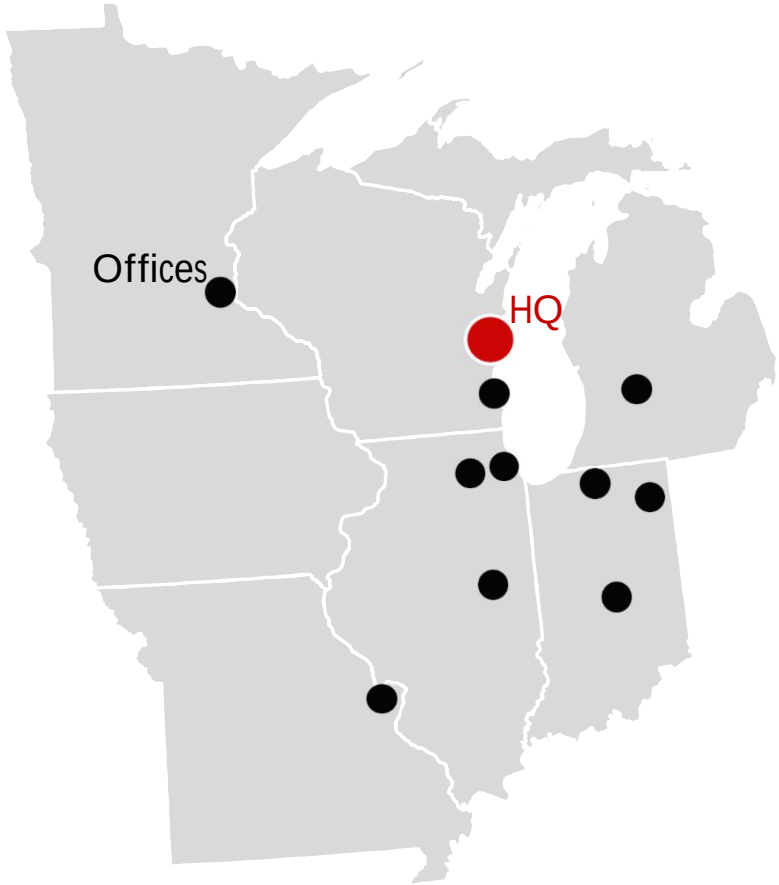
<u>Difficulties</u>

- Aging Infrastructure
- Biosolids Management
- Employee Retention



Facility Planning Consultant

Wisconsin-Based Water and Wastewater Specialty Firm



Employing exceptional expertise, specialization, and service to deliver valuable, practical, and sustainable solutions to the most challenging water and wastewater infrastructure projects

Nationally-Ranked in Wastewater Treatment Plants

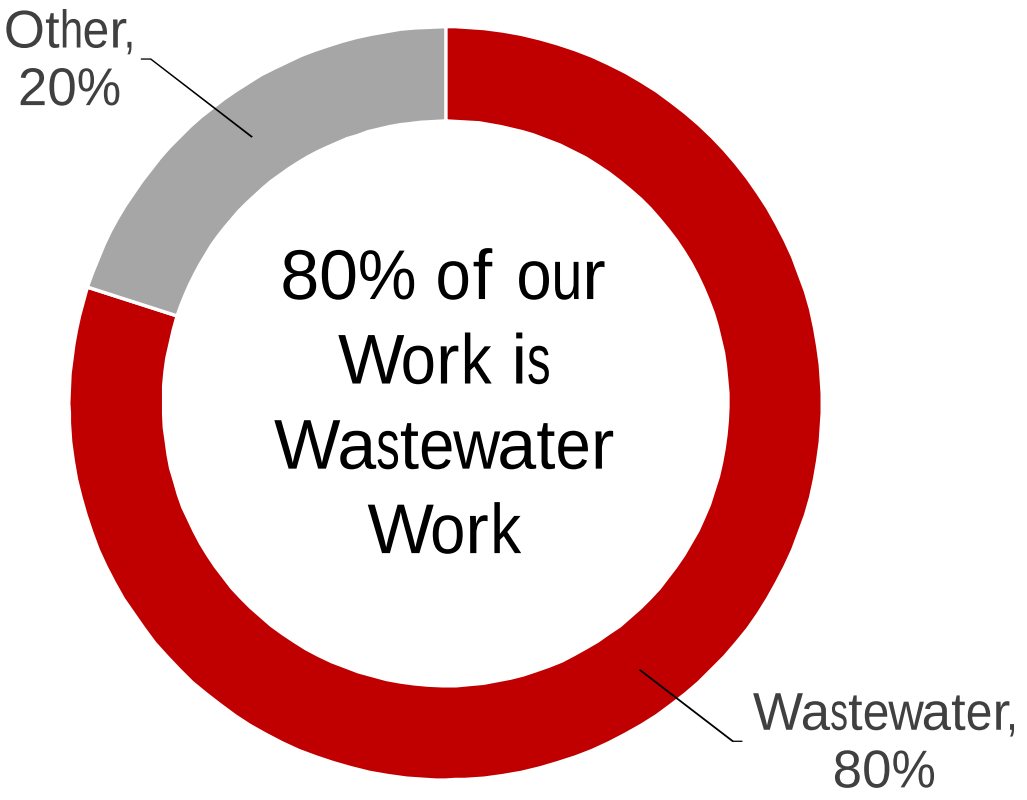
ENR TOP 500 SOURCEBOOK ENVIRONMENT

The Top Design Firms in Environment

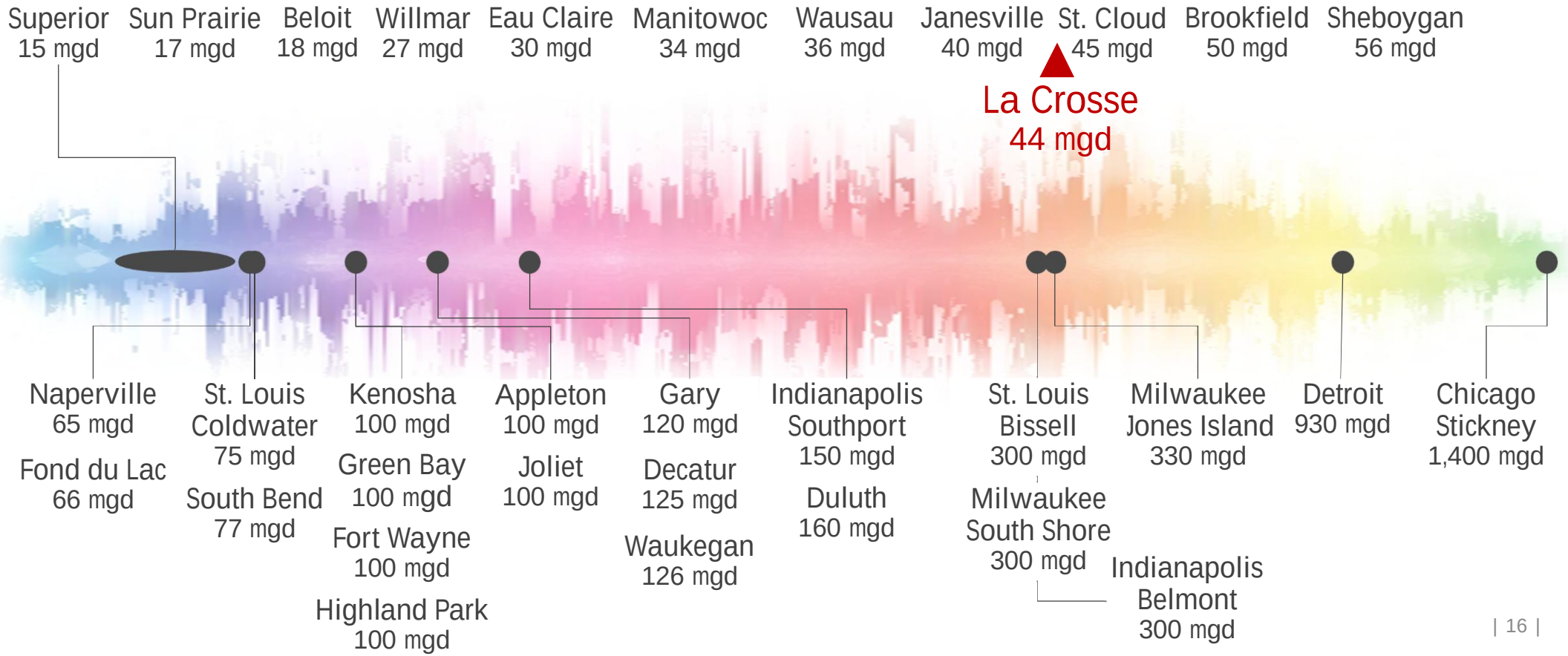
WASTEWATER TREATMENT PLANTS

Rank	FIRM
19	DONOHUE & ASSOCIATES, INC.

enr.com ■ 2017 ■ ENR SOURCEBOOK



Clients and Treatment Plants Span the Entire Capacity Spectrum



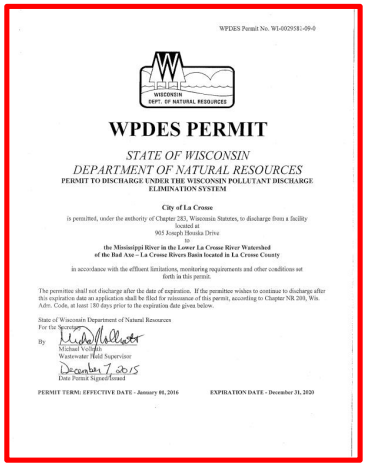
The La Crosse Wastewater Treatment Plant

Accepts Wastewater from the Greater La Crosse Service Area

- Capacity
  - Average Flow
    - 10 million gallons per day
  - Peak Flow
    - 42.5 million gallons per day
    - 29,500 gallons per minute

Accepts and Cleans Wastewater from the La Crosse Service Area

- Produces Clean Water
  - Disinfects
  - Removes Debris
    - Diapers, Hand Wipes, Sticks, Plastics
  - Removes Oxygen-Consuming Material
  - Removes Nutrients



WPDES Permit No. WI-0029581-09-0

WISCONSIN DEPT. OF NATURAL RESOURCES

WPDES PERMIT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

City of La Crosse

is permitted, under the authority of Chapter 283, Wisconsin Statutes, to discharge from a facility located at
905 Joseph Houska Drive
to
the Mississippi River in the Lower La Crosse River Watershed of the Bad Axe – La Crosse Rivers Basin located in La Crosse County

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

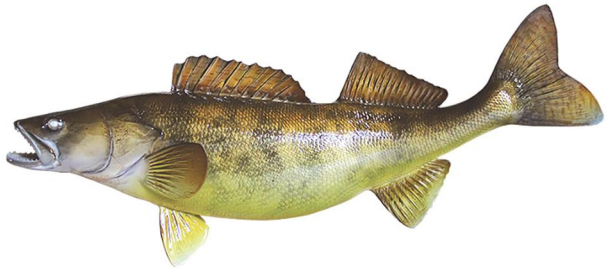
The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit, according to Chapter NR 200, Wis. Adm. Code, at least 180 days prior to the expiration date given below.

State of Wisconsin Department of Natural Resources
For the Secretary

By
Michael Vedrich
Wastewater Field Supervisor

December 7, 2015
Date Permit Signed/Issued

PERMIT TERM: EFFECTIVE DATE - January 01, 2016 **EXPIRATION DATE - December 31, 2020**



Mississippi River
One of La Crosse's Greatest Resources

La Crosse has been Accepting and Cleaning Wastewater for Generations

- Phase 1 1936 83 Years Old
- Phase 2 1972 47 Years Old
- Ongoing Replacements
  - Biological Phosphorus, 1996
  - Sludge Storage, 1997-2001
  - Screening and Grit, 2001
  - UV Disinfection, 1991/2004/2008
  - Blowers and Diffusers, 2011
  - Digester Covers, 2015-2018

Debt Free Since 2014

La Crosse Produces Clean Water Efficiently

- Plant has Performed Well and is Operated Efficiently
  - Consume 572 kWh/klb BOD Treated
  - 15 FTEs
    - 24/7/365 Operation That *Must* Perform

63% of best-practice benchmark. One of the most efficient in the State.

The Plant is One of the Most Valuable City-Owned Assets

- Potential Value = $420M*

* Based on recent new 24-mgd nutrient-removing treatment facility for Denver, CO. Grand opening 2017. Cost = $417M.
[CCI 2018 = 10,959. CCI 2011 = 9070. Cost = $504M in $2018. Includes a 7-mile forcemain.]

The Plant Needs Improvements for the Next Generation

- Phase 1 1936 — 83 Years Old
- Phase 2 1972 — 47 Years Old

The City has received a lifetime of reliable service on major infrastructure, and surpassed two generations since the last major upgrade. Its time for another upgrade.

Facility Planning

The EPA and WDNR Require Comprehensive Planning for a Generation: 20 Years

- Facility Planning Considers
  - Capacity
  - Regulatory Compliance
  - Resource Recovery
  - Environmental Stewardship
  - Public Safety
  - Aging Infrastructure

Facility Planning Process

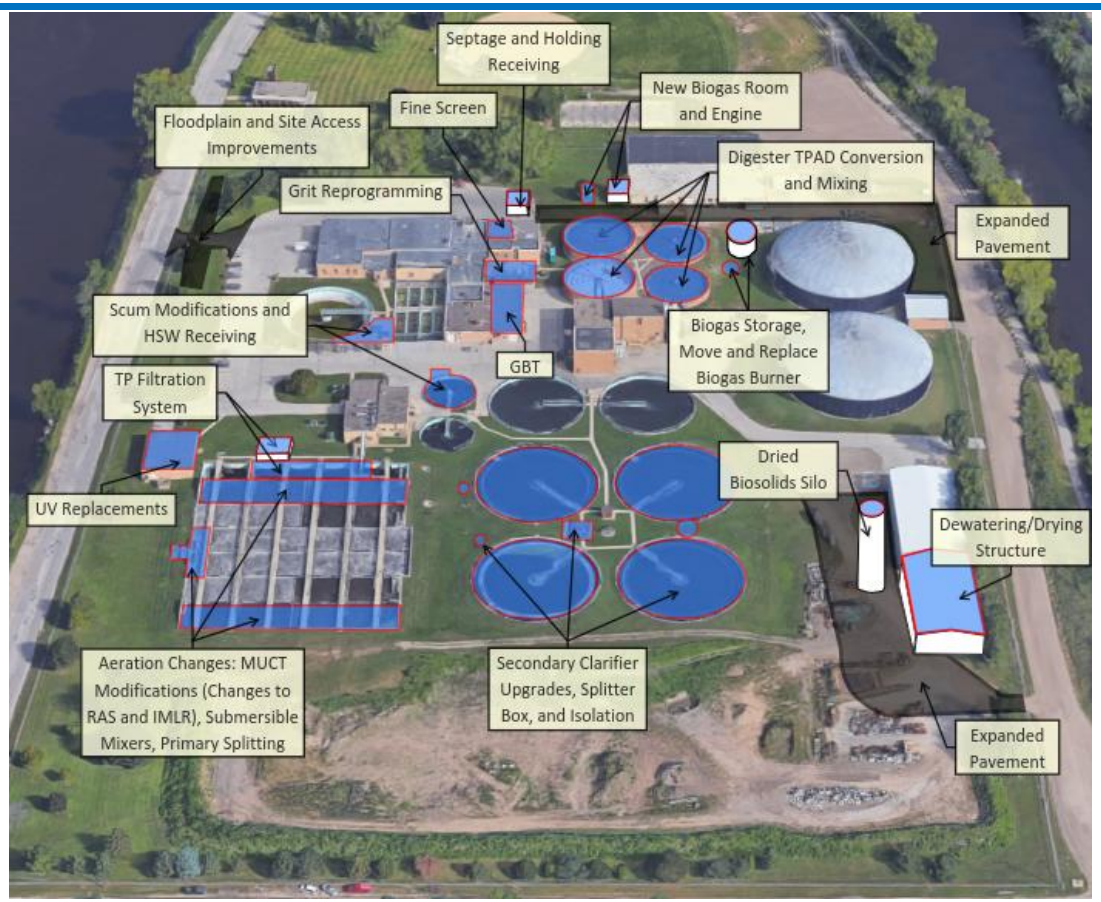
- TM1 – Project Definition (Strategic Direction)
- TM2 – Existing Conditions
- TM3 – Future Conditions (Growth)
- TM4 – System Needs
- TM5 – Alternative Screening and Retained Alternatives
- TM6 – Alternatives Analysis (Capital and O&M Costs)
- TM7 – Recommended Plan

The Plant is One of the Most Valuable City-Owned Assets

- Potential Value = $420M
- Foremost Facility Planning Objectives
  - Maximize Benefit of Existing Infrastructure
  - Maximize Return on Tremendous Previous Investment

The Issues are Pervasive, but Not Dire. Plant Offers Tremendous Value.

- Capacity
  - Biosolids Processes
- Safety, Reliability, Performance
  - Pervasive
  - Safety Standards Revised
  - Biosolids
- Regulations
  - Effluent Phosphorus
  - Potential Biosolids

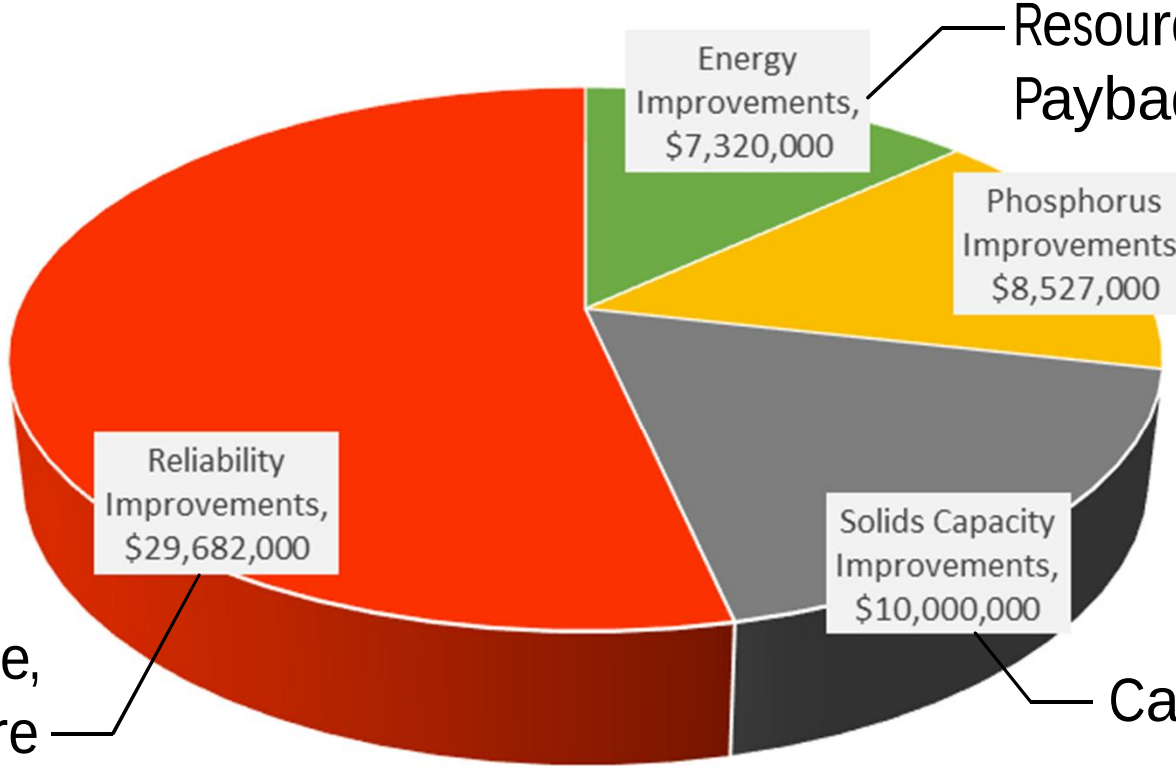


The Plant will be 60 – 100+ Years Old at the End of the Facility Planning Period

- Phase 1 1936 103 Years Old
- Phase 2 1972 67 Years Old

The Initial Budgetary Plan

Comprehensive Upgrade for the Next Generation $55.5M



Resource Recovery
Payback <20 years

Regulatory Compliance

Capacity

Public Safety, Environmental Stewardship, Code Conformance, Aging Infrastructure

The Initial Budgetary Plan

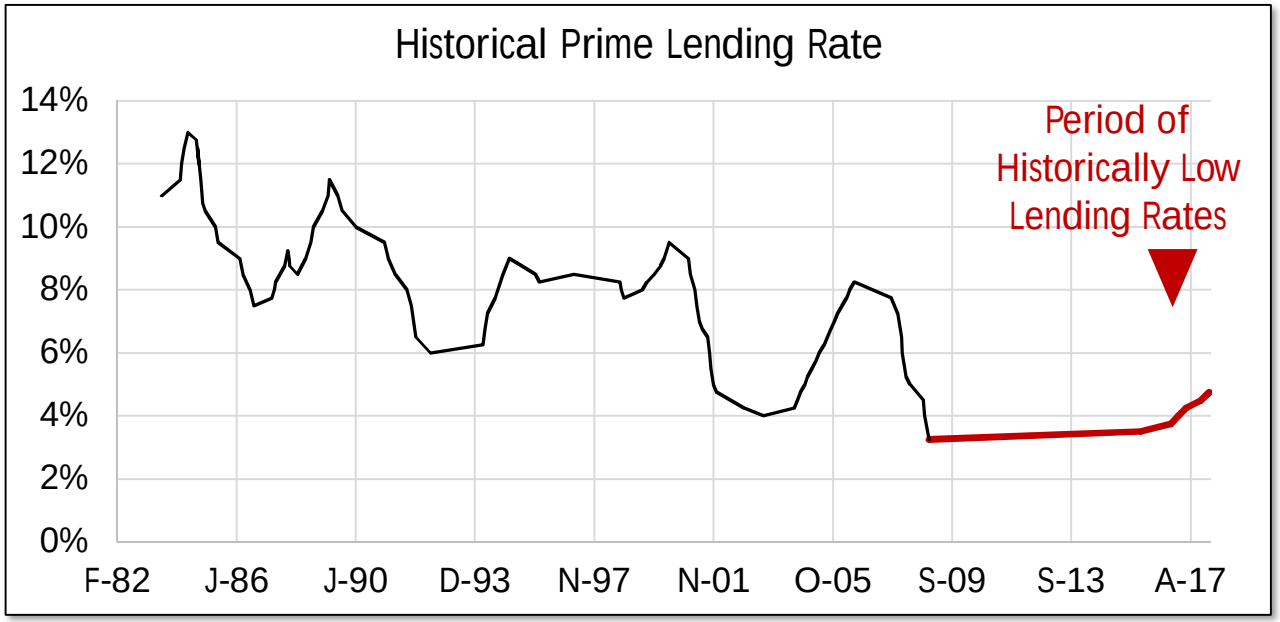
- Rehabilitate
- Repurpose
- New
- Do Nothing

The Initial Budgetary Plan

- Rehabilitate
- Repurpose
- New
- Do Nothing

Enhance Efficiency
- Energy
- Chemicals
- Automation

Piecemeal Upgrade More Expensive, Disruptive, Risky



WDNR lowered interest rates 06/24/2019
Base Rate: 1.76%

Economic

- Higher Construction Cost
  - ❖ Poor Economy of Scale
- Higher Borrowing Cost

Non-Economic

- Perpetual Disruption
- Higher Risk

Sewer Rate Consultant

TRILOGY
CONSULTING, LLC
MUNICIPAL & UTILITY ADVISORS

Trilogy Consulting is a registered Municipal Advisor with the Municipal Securities Rulemaking Board and the U.S. Securities and Exchange Commission.

We offer local governments and utilities an objective, independent perspective on planning, economic and fiscal issues.

Our partners, Christine DeMaster and Erik Granum, founded Trilogy in 2011.

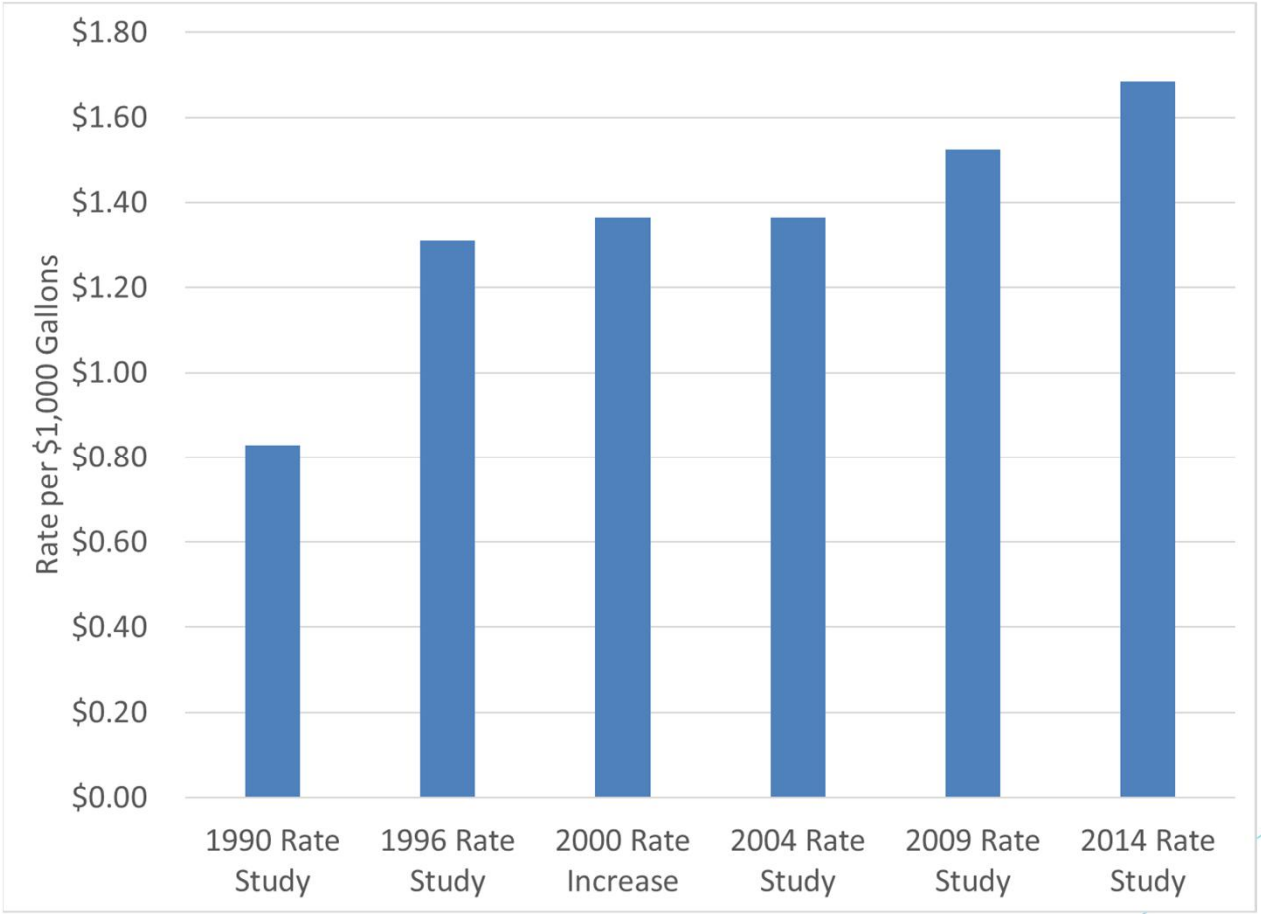
What Services Does the Sewer Utility Provide?

- Conveyance
  - Collection System
  - Interceptor System
  - Lift Stations
- Wastewater Treatment
- Metering and Billing

Who Does the Sewer Utility Serve?

- La Crosse retail customers – residential, multi-family, commercial, industrial, public authority
- Wholesale customers – Onalaska, La Crescent, Campbell, Shelby
- Hauled waste – Holding Tank, Septic Tank, Grease Trap
- Industries with high-strength waste

Historical Rates – La Crosse Retail Customers



Cost of Common Household Activities

8-minute
shower
(40 gallons)
7¢

Wash a load
of dishes
(16 gallons)
3¢

Flush a toilet
(3 gallons)
0.5¢

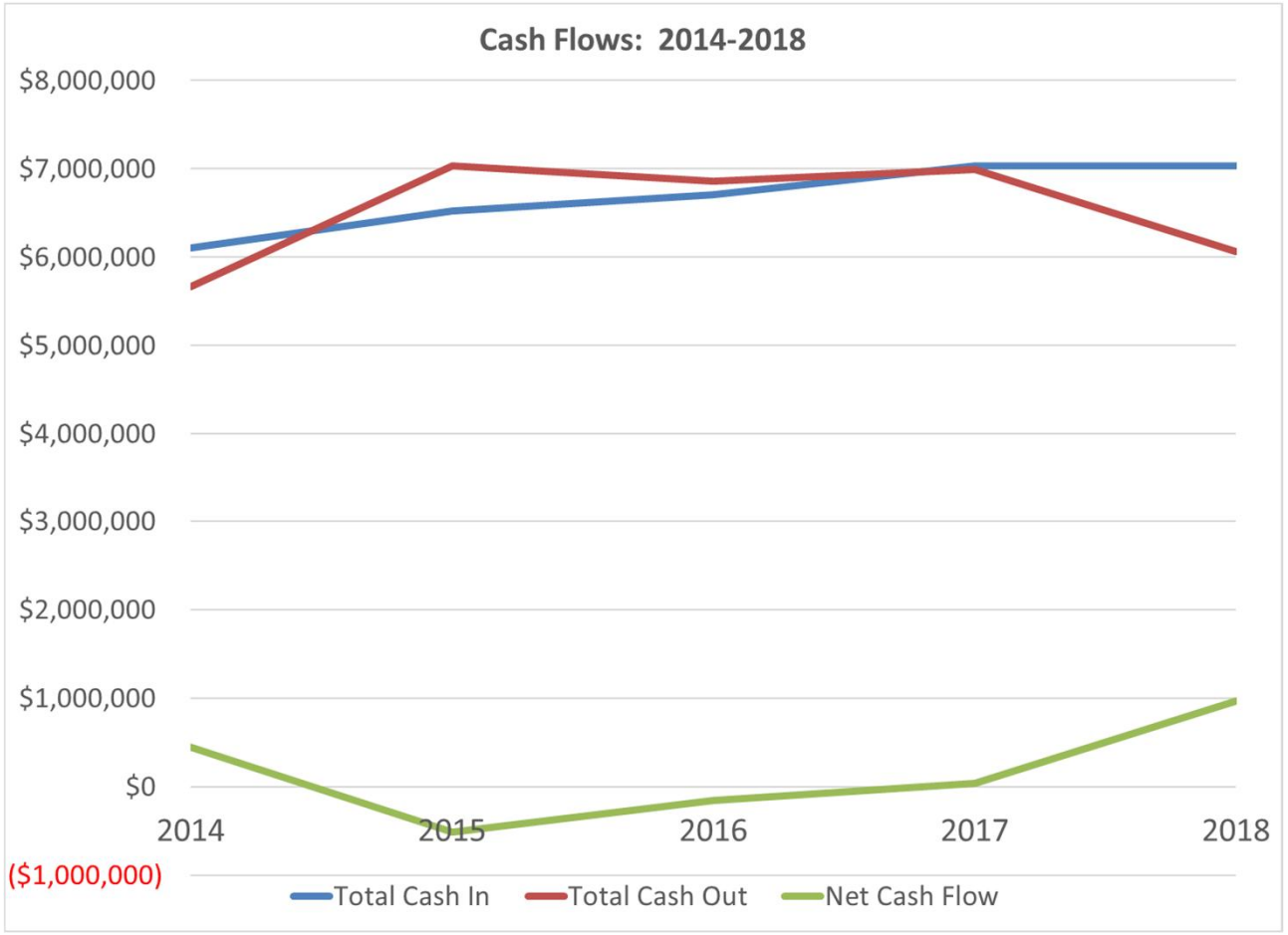
Reasons for the Rate Study

- Wastewater Treatment Plant Project
- Catch up with current operation & maintenance expenses and capital costs
- Adjust rates based on shifts in costs and customer demands

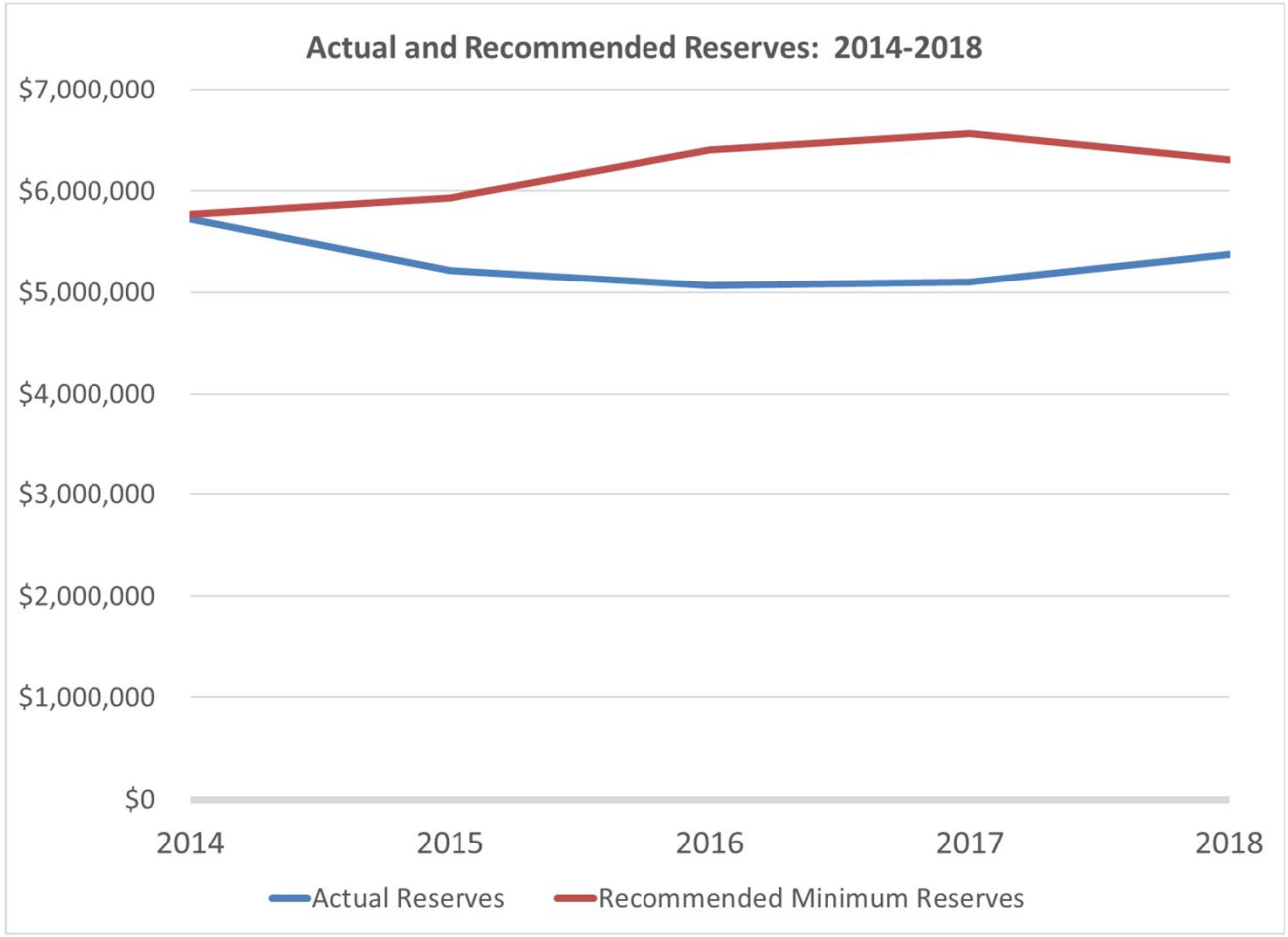
Steps in the Rate Setting Process

1. Evaluate Current Financial Status
2. Rate Increase and Cash Flow Scenarios
3. Revenue Requirements
4. Cost of Service Allocation
5. Rate Design

Current Financial Status



Cash Flows: 2014-2018



Reserve Levels: 2014-2018

Financial Status of the Utility – Key Findings

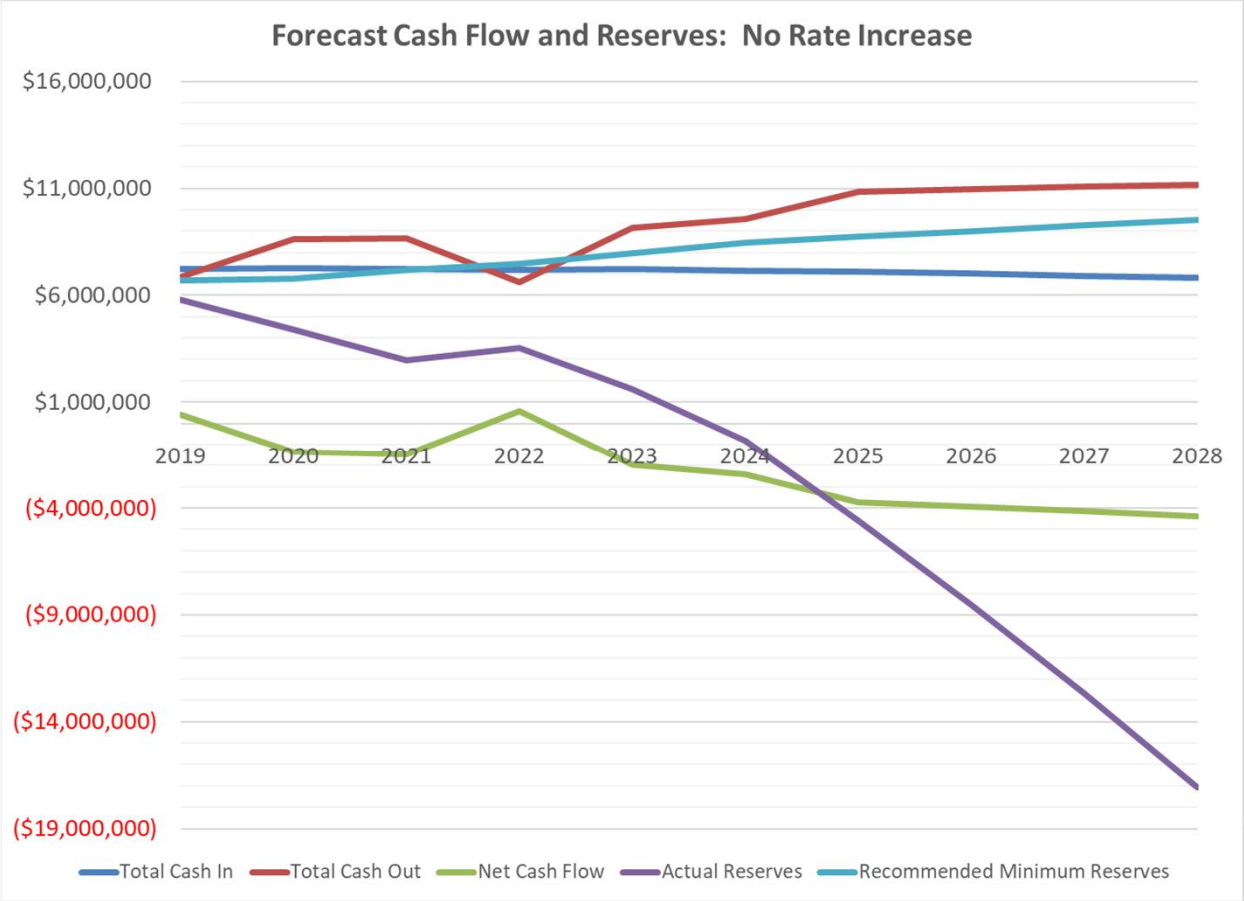
- Revenues have generally increased over the last five years.
- Fluctuations in expenses and capital outlay have resulted in fluctuating cash flows. Total cash flow over the last five years has been slightly positive.
- The Utility has not had any outstanding debt since 2014.
- As of December 31, 2018, the Utility had cash on hand totaling $5.3 million. The unrestricted portion of these funds was equal to 185 days cash on hand, or about $1.1 million short of the recommended minimum of 250 days cash on hand.

Rate Increase and Cash Flow Scenarios

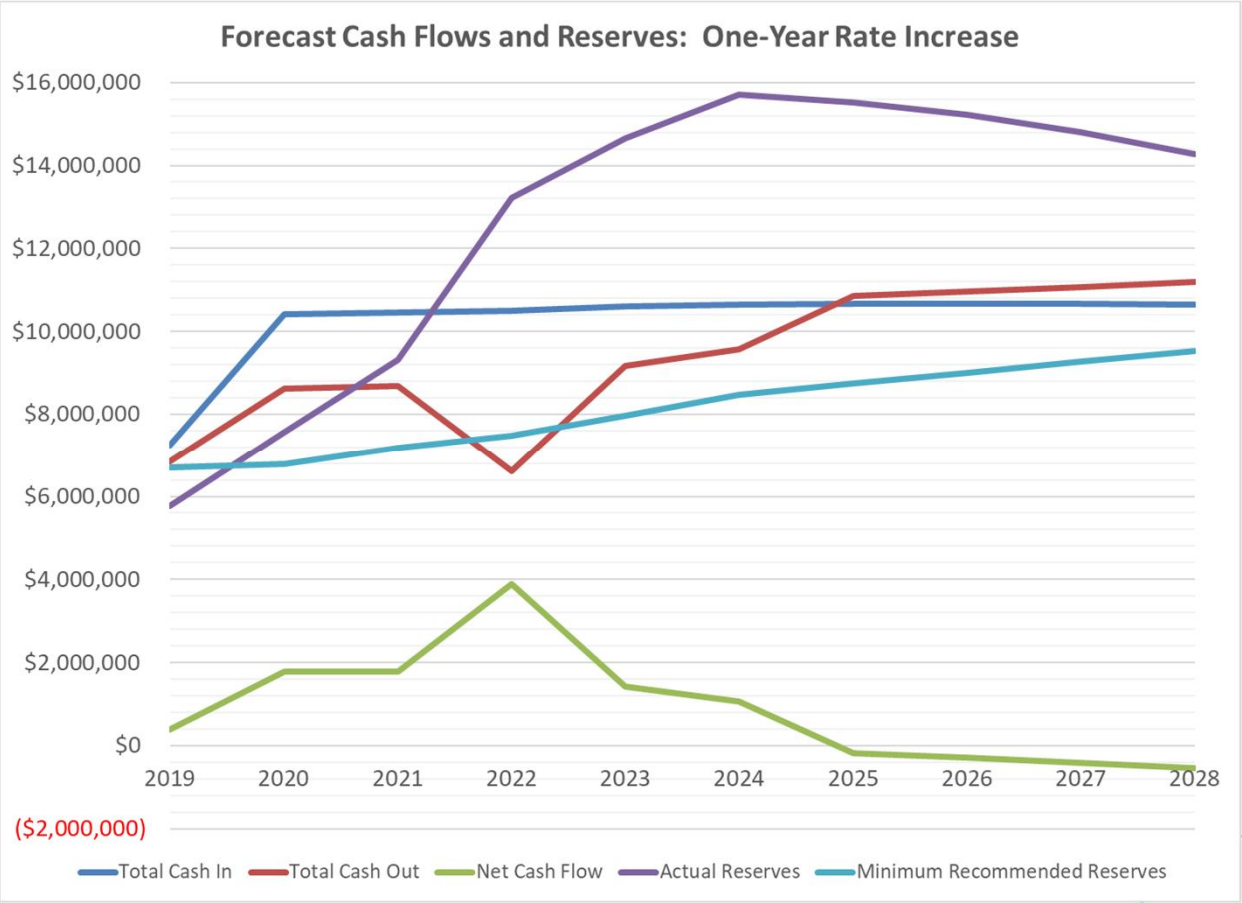
Objectives for Rate Increase(s)

- Allow the Utility to be able to obtain a Clean Water Fund loan in 2021 to fund the WWTP project
  - Will need to have rates in place by 2023 to cover full debt service plus 10% coverage
- Continue to cash fund routine capital projects and equipment replacement
- Increase reserves to at least the minimum recommended levels
- Mitigate rate spikes to the extent possible

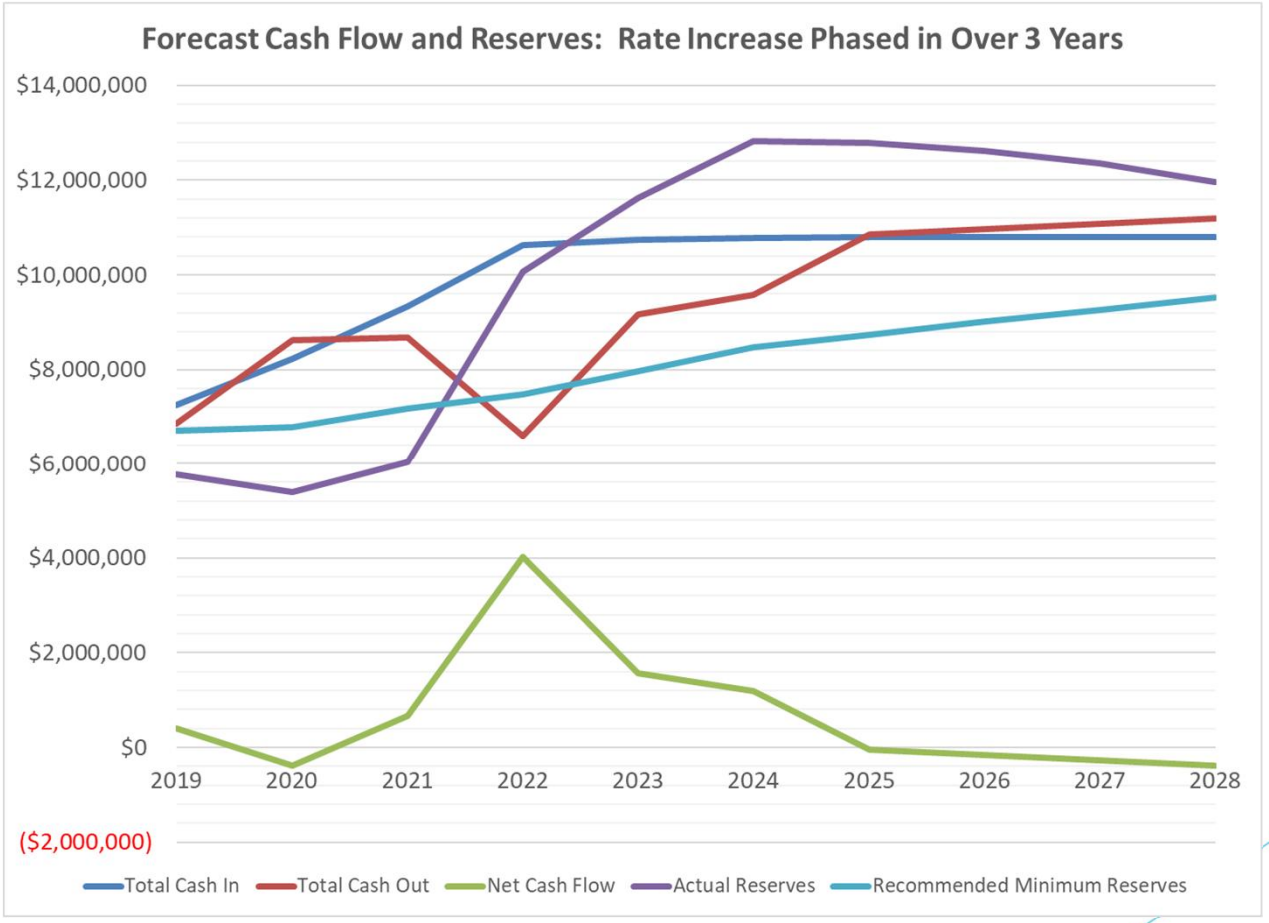
No Rate Increase



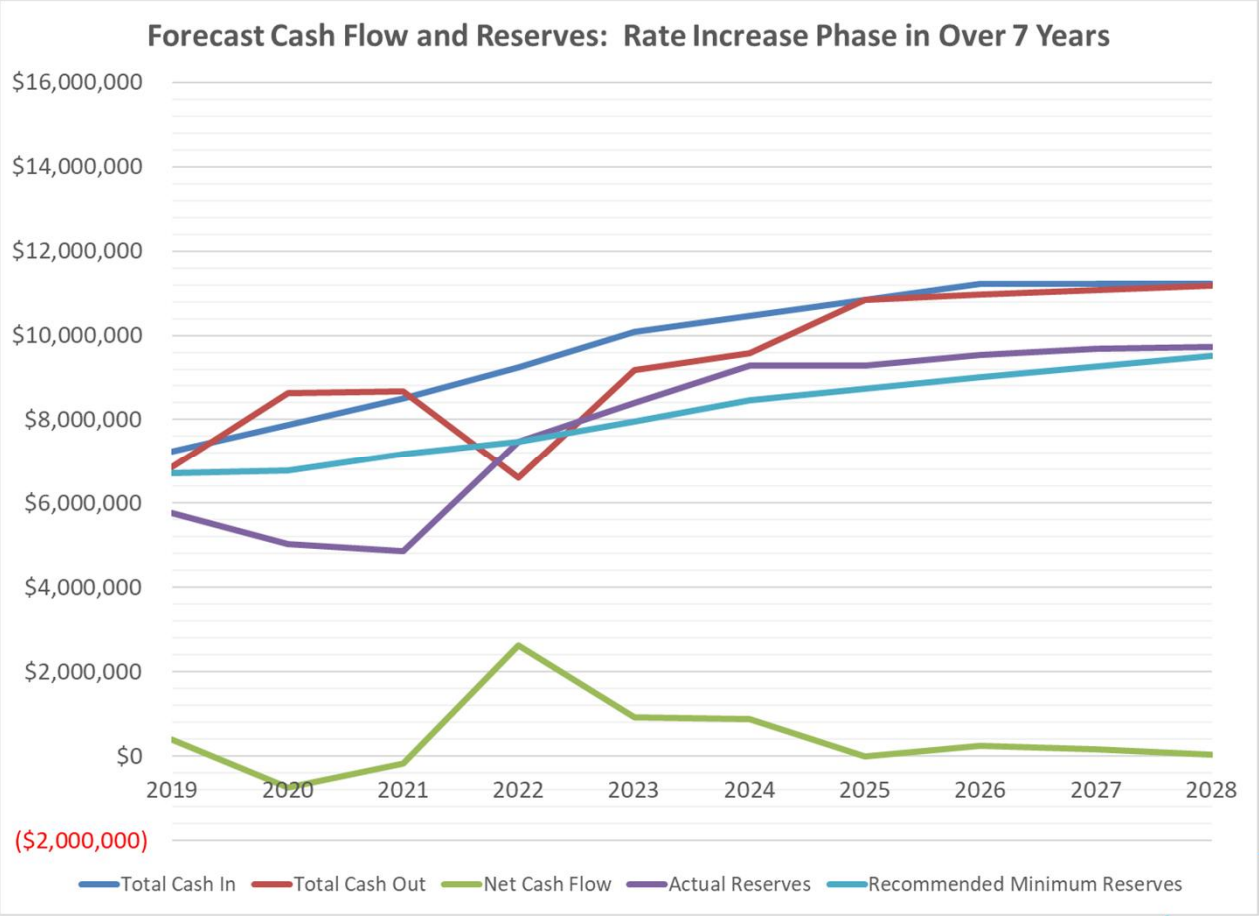
Entire Increase in 2020



3-Year Phase In



7-Year Phase In



Revenue Requirements

Revenue Requirements: 2015 and 2023

	2015	Proposed	Difference	% Difference
Operation and Maintenance	$5,418,350	$5,583,136	$164,786	3.0%
Equipment Replacement Fund	$399,380	$394,808	-$4,572	-1.1%
Debt Service - WWTP	$0	$3,340,389	$3,340,389	--
Debt Service - Collector	$0	$0	$0	--
Capital Outlay / Reserves	$844,542	$1,675,615	$831,073	98.4%
Total	$6,662,272	$10,993,948	$4,331,676	65.0%
User Charge Revenues at Current Rates	$5,938,929	$6,839,157	$900,228	15.2%
Other Income / Withdrawals from ERF	$126,323	$797,626	$671,303	531.4%
Total Revenues at Current Rates	$6,065,252	$7,636,783	$1,571,531	25.9%
Required Increase in Revenues			$3,357,165	

Sewer Connection Fees

Basis for Proposed Connection Fees

- Purpose - to recover the value of the available capacity in the utility system that has been paid for by past and current customers.
- Basis - value of excess capacity in existing system-wide facilities
  - System-wide facilities include wastewater treatment facilities, interceptor sewers and interceptor lift stations.
- Who would pay – Properties that need new or additional sewer service
  - Amount of the fee determined based on amount of sewer capacity needed

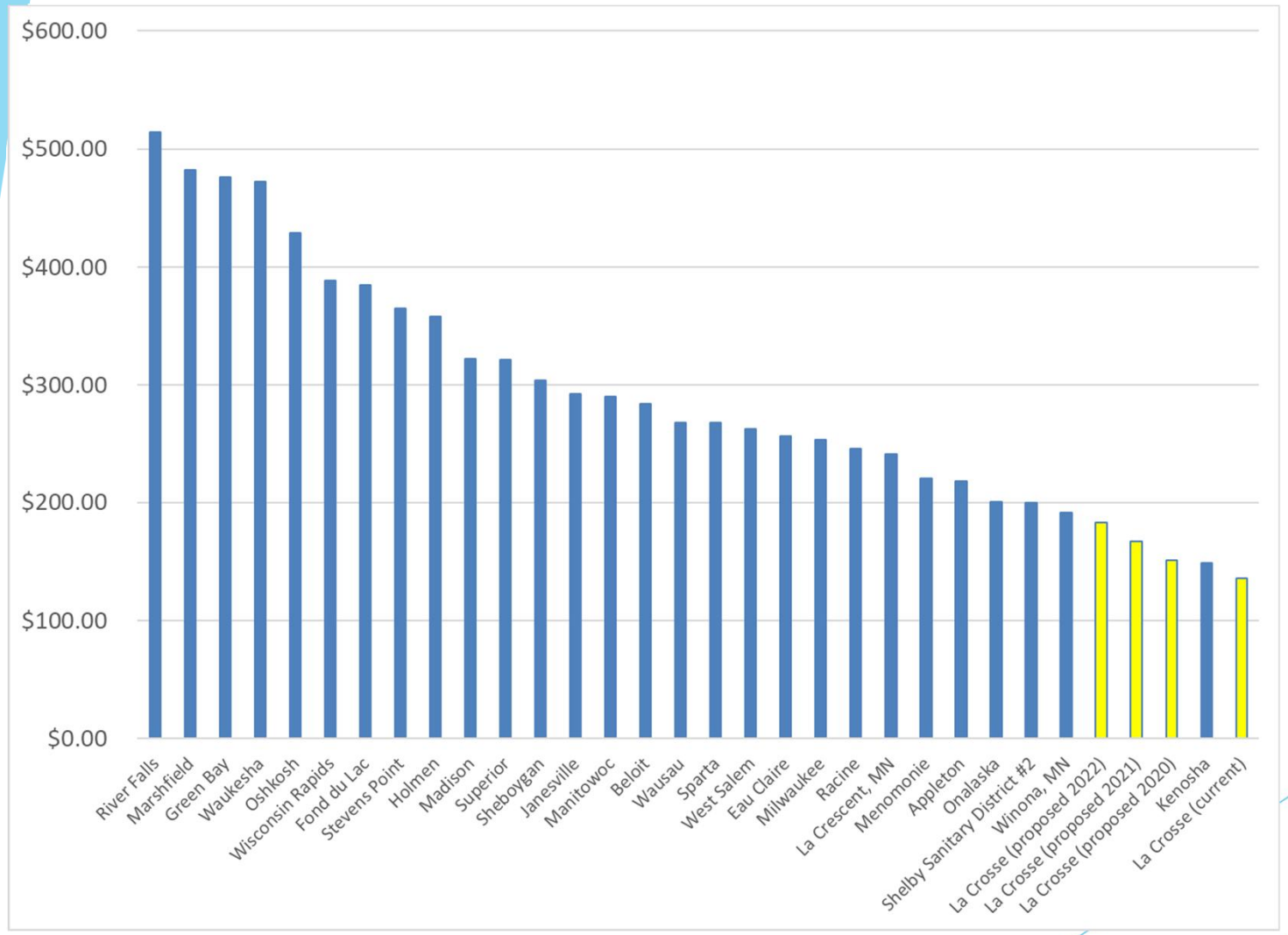
Proposed Connection Fees

	Total
Value of System Assets	$113,009,534
System Capacity (Average Day Flow in gpd)	20,000,000
Asset Value per Unit of Capacity (gpd)	$5.65
Est. Capacity Requirements per Residential Equivalent Connection (gpd)	126
Asset Value per REC	$711

Next Steps

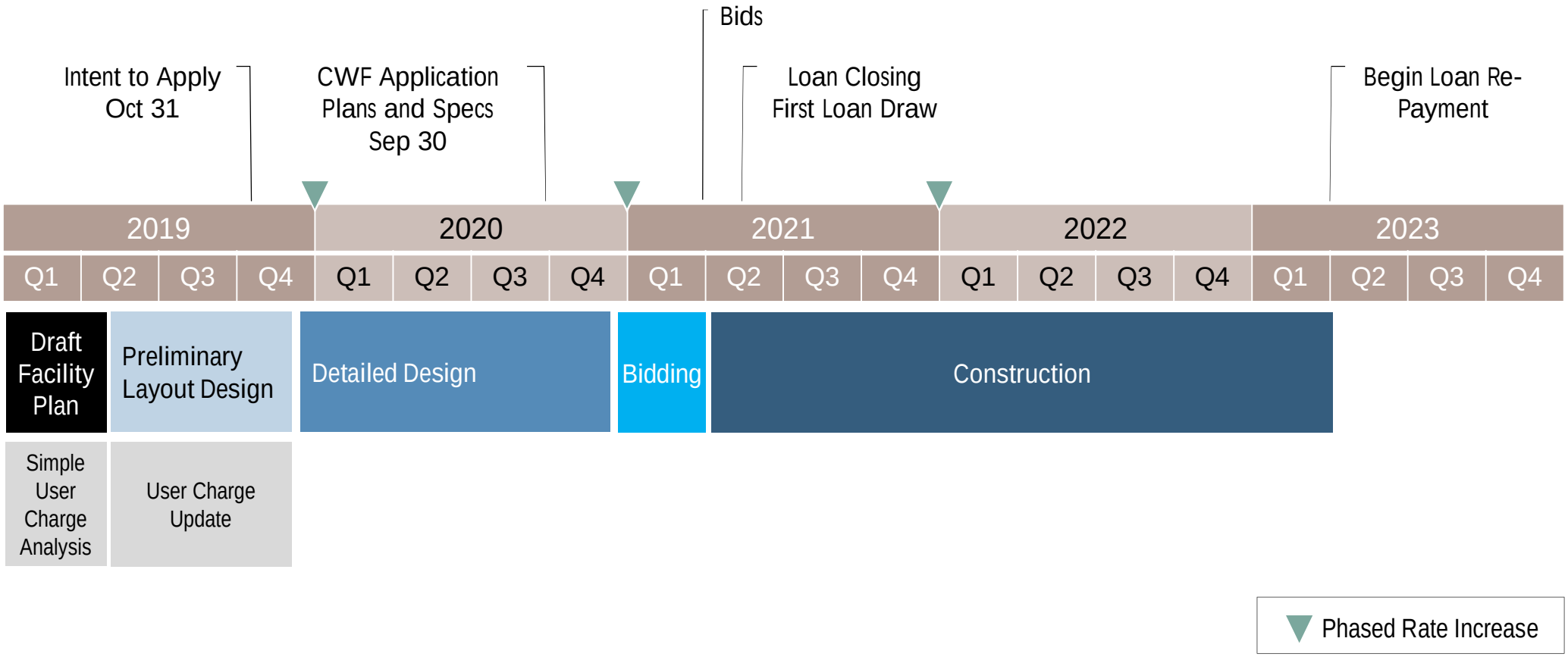
- Consideration of the proposed 2020 rates by the City Council
- Connection fees
  - La Crosse adopted an ordinance to implement connection fees effective January 1, 2020
  - Negotiating with partner communities to adopt fees as part of intermunicipal agreements
- Revenue from connection fees could reduce the amount of future rate increases

Customer Bill Comparisons – Avg Annual Residential Bill



The Path Forward

Potential Implementation Schedule



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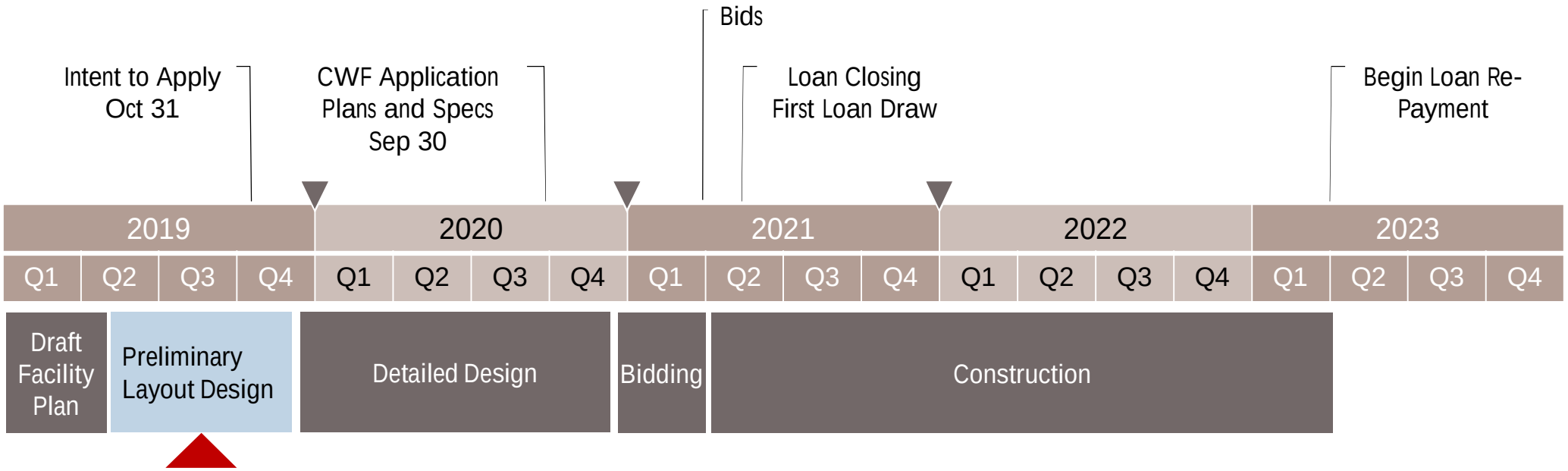
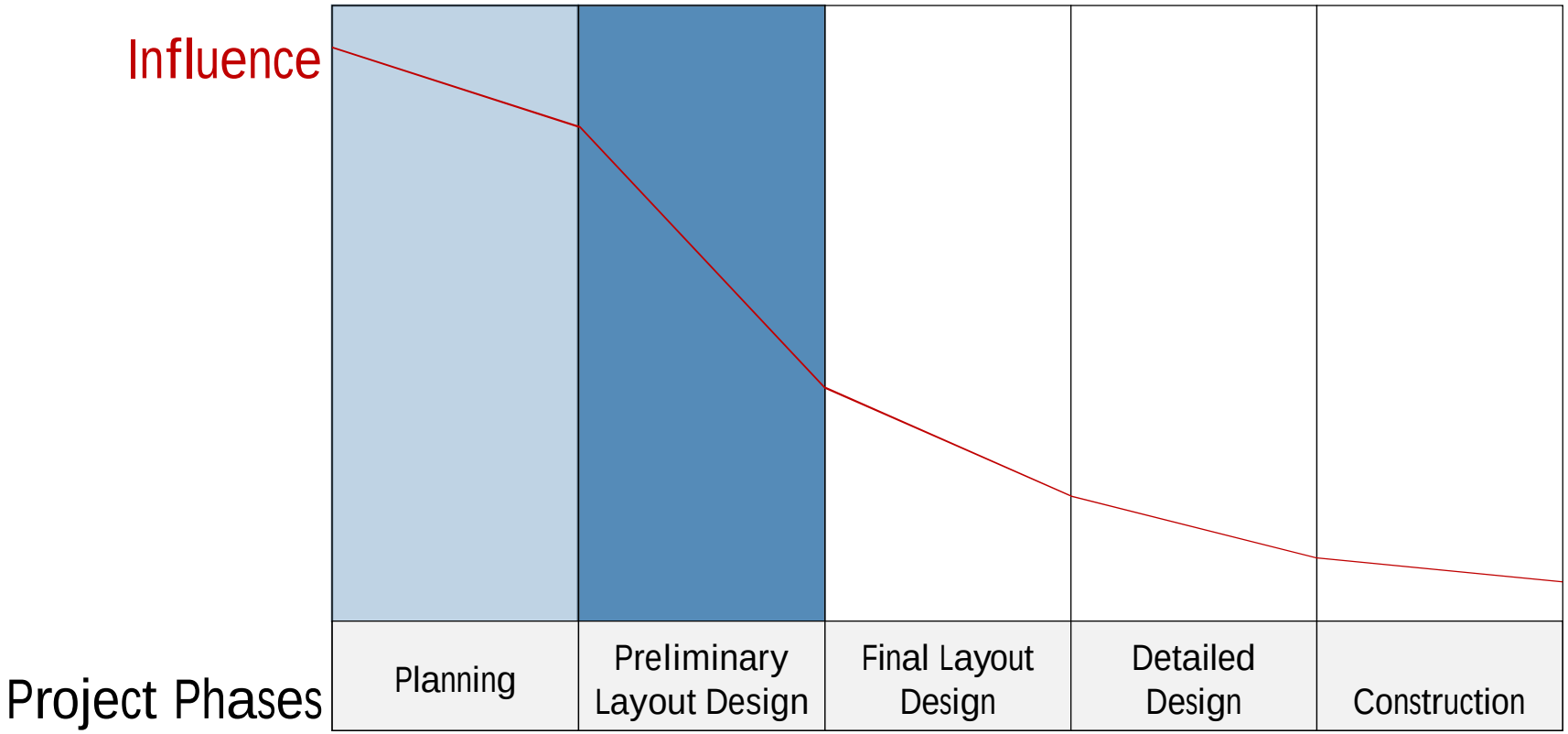


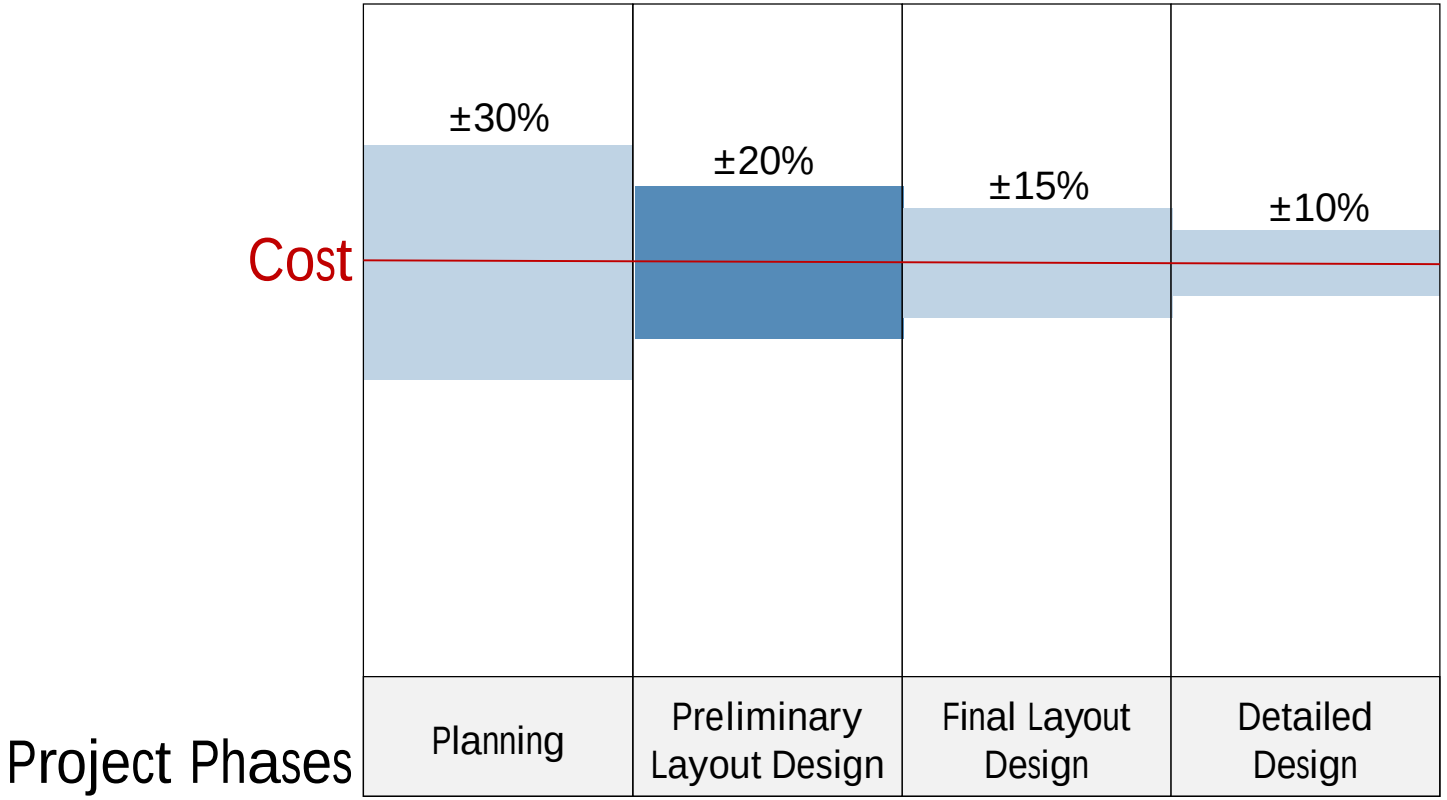
Most important phase: defines the Project and its cost

- High cost resolution
- High cost influence

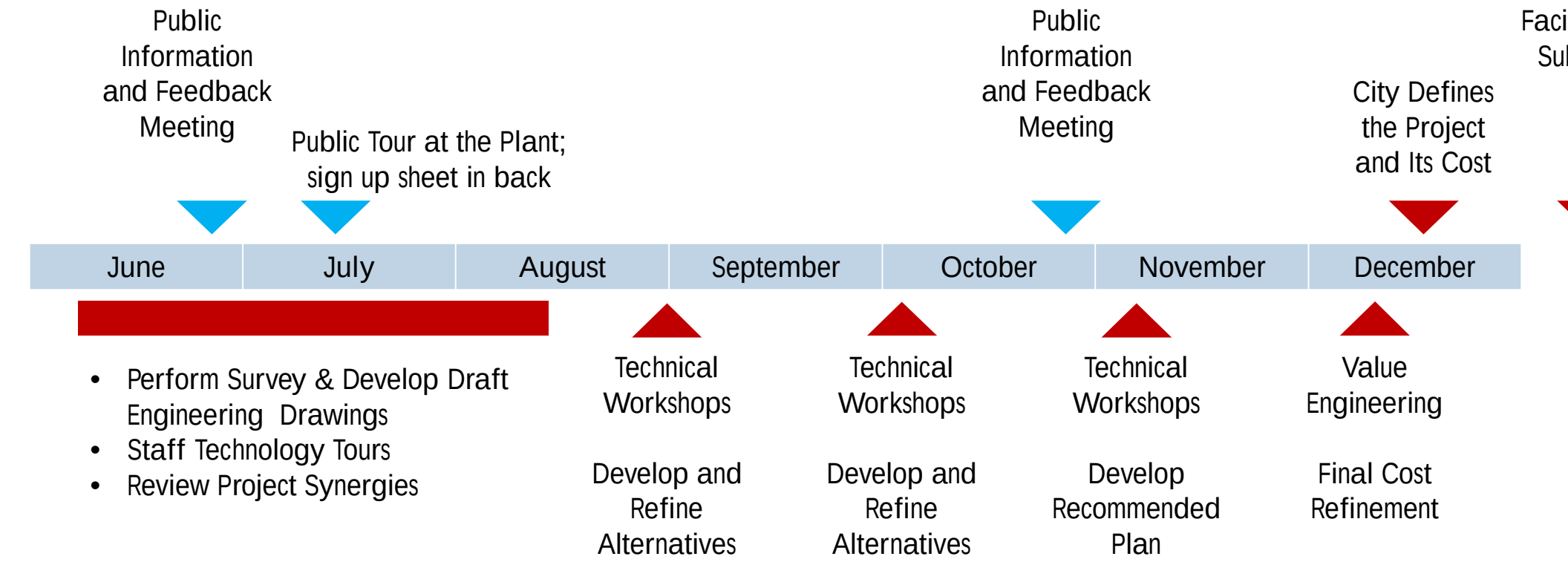
Opportunity to Influence Cost



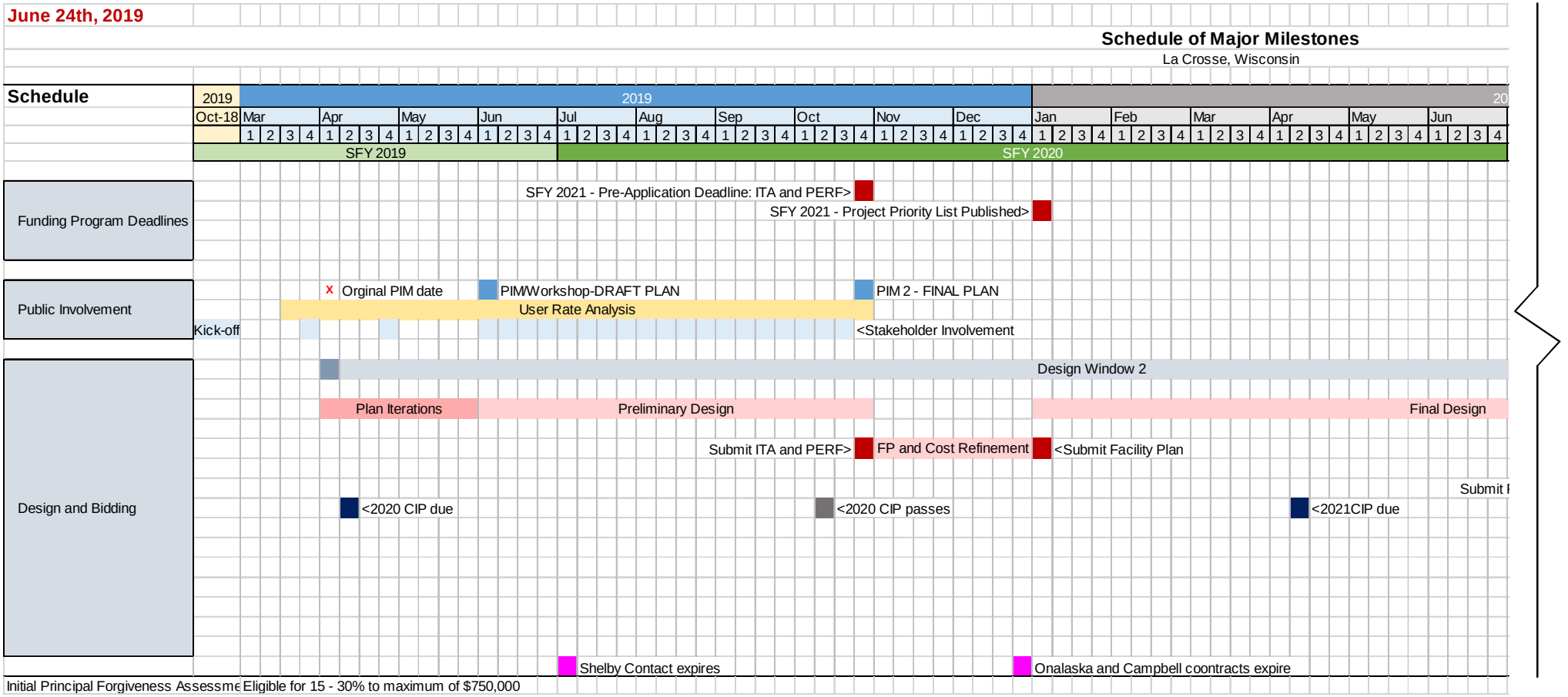
Cost Opinion Accuracy



Preliminary Layout Design Schedule with Partner Entities' Involvement



Schedule


June 24th, 2019
Schedule of Major Milestones
La Crosse, Wisconsin
Schedule
2019
2019
Oct-18
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May
Jun
Jul
Aug
Sep
Oct
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Dec
Jan
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SFY 2019
SFY 2020
Funding Program Deadlines
SFY 2021 - Pre-Application Deadline: ITA and PERF>
SFY 2021 - Project Priority List Published>
Public Involvement
Orginal PIM date
PIMWorkshop-DRAFT PLAN
PIM 2 - FINAL PLAN
User Rate Analysis
Kick-off
<Stakeholder Involvement
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Design Window 2
Plan Iterations
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Final Design
Submit ITA and PERF>
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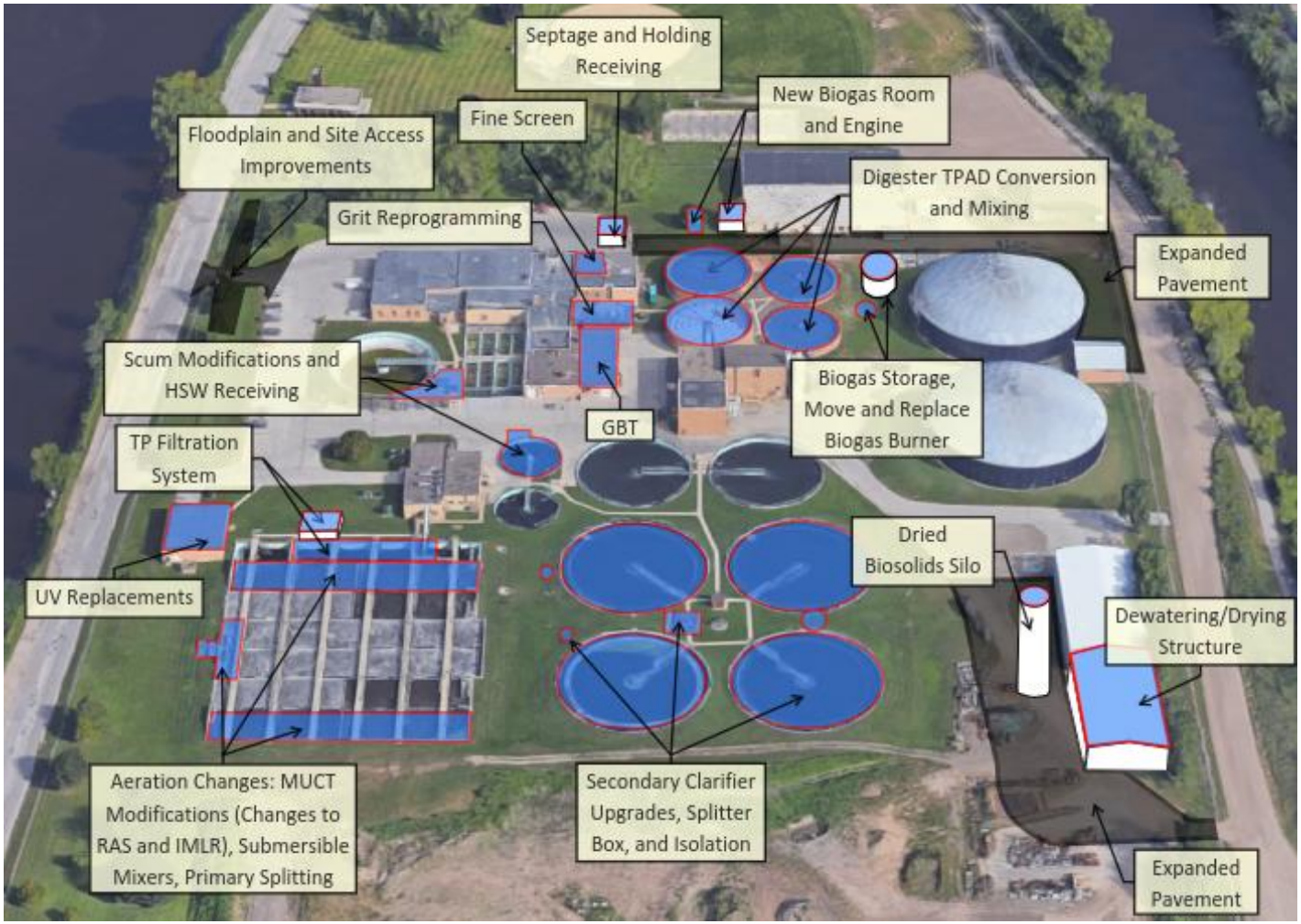
Shelby Contact expires
Onalaska and Campbell coontracts expire
Initial Principal Forgiveness Assessme
Eligible for 15 - 30% to maximum of $750,000

End of Public Informational Meeting



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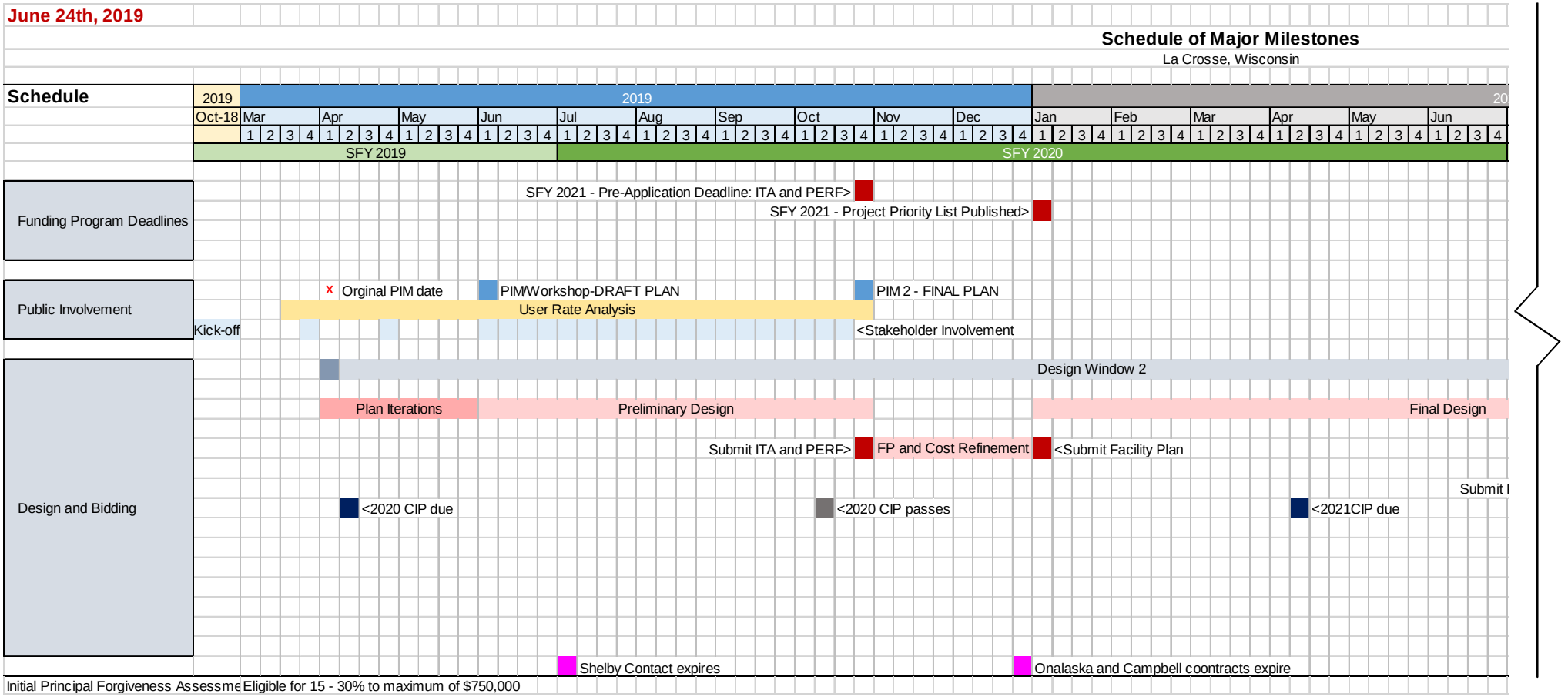
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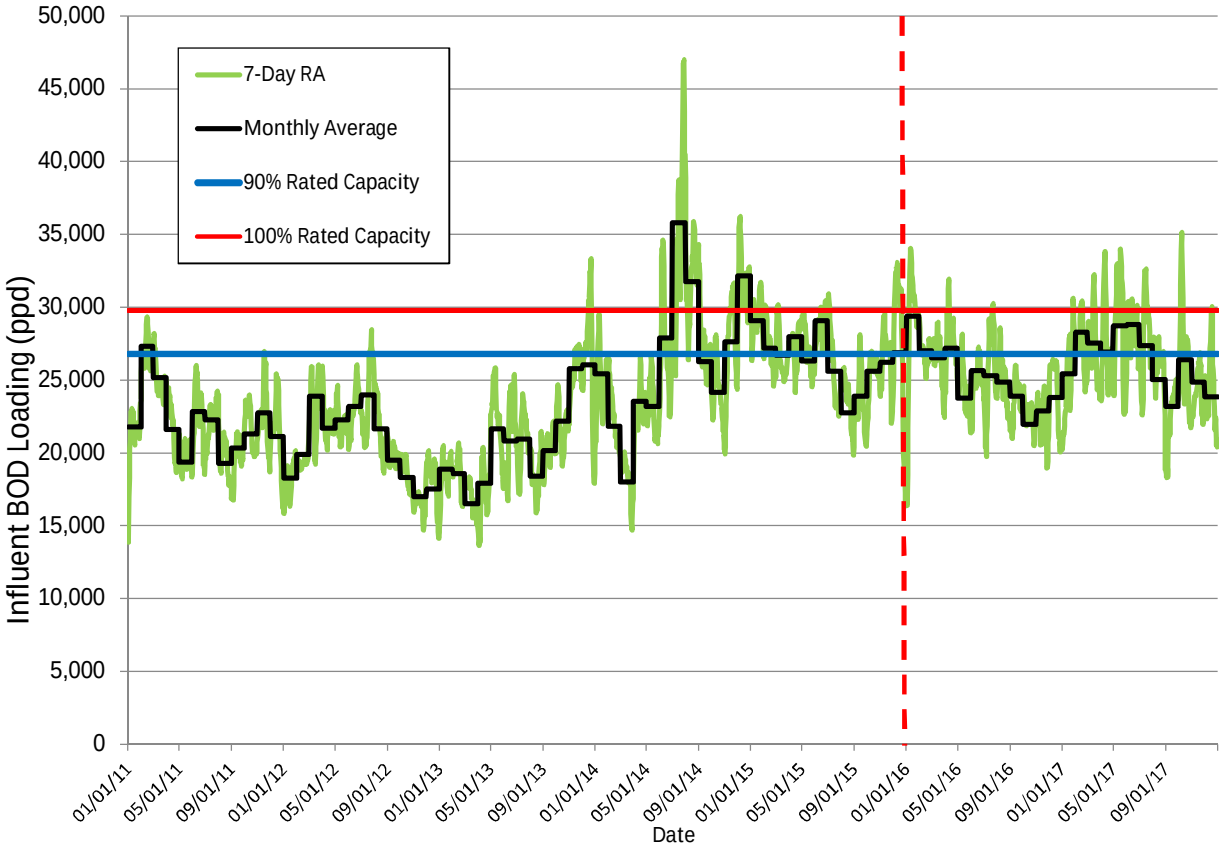
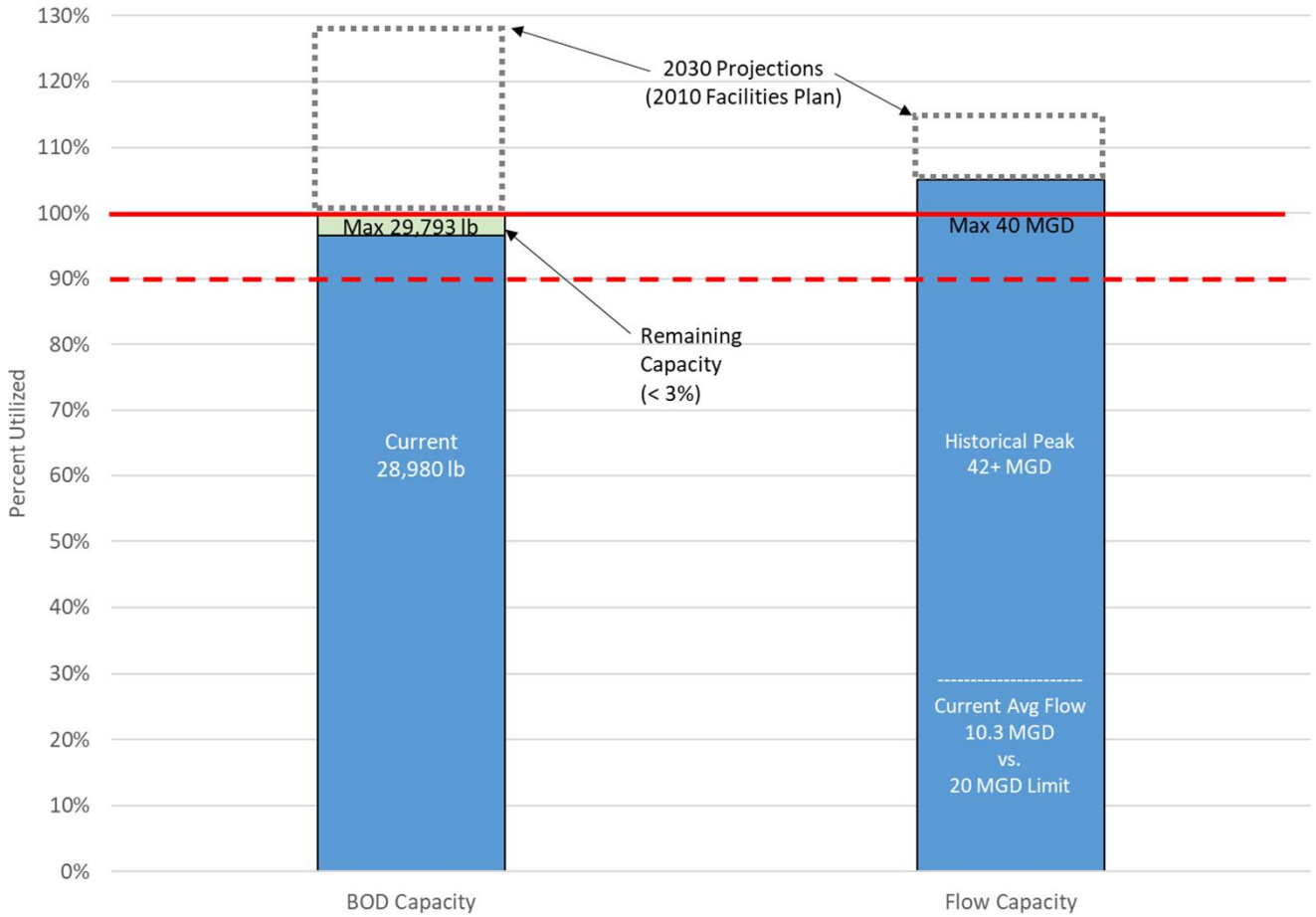
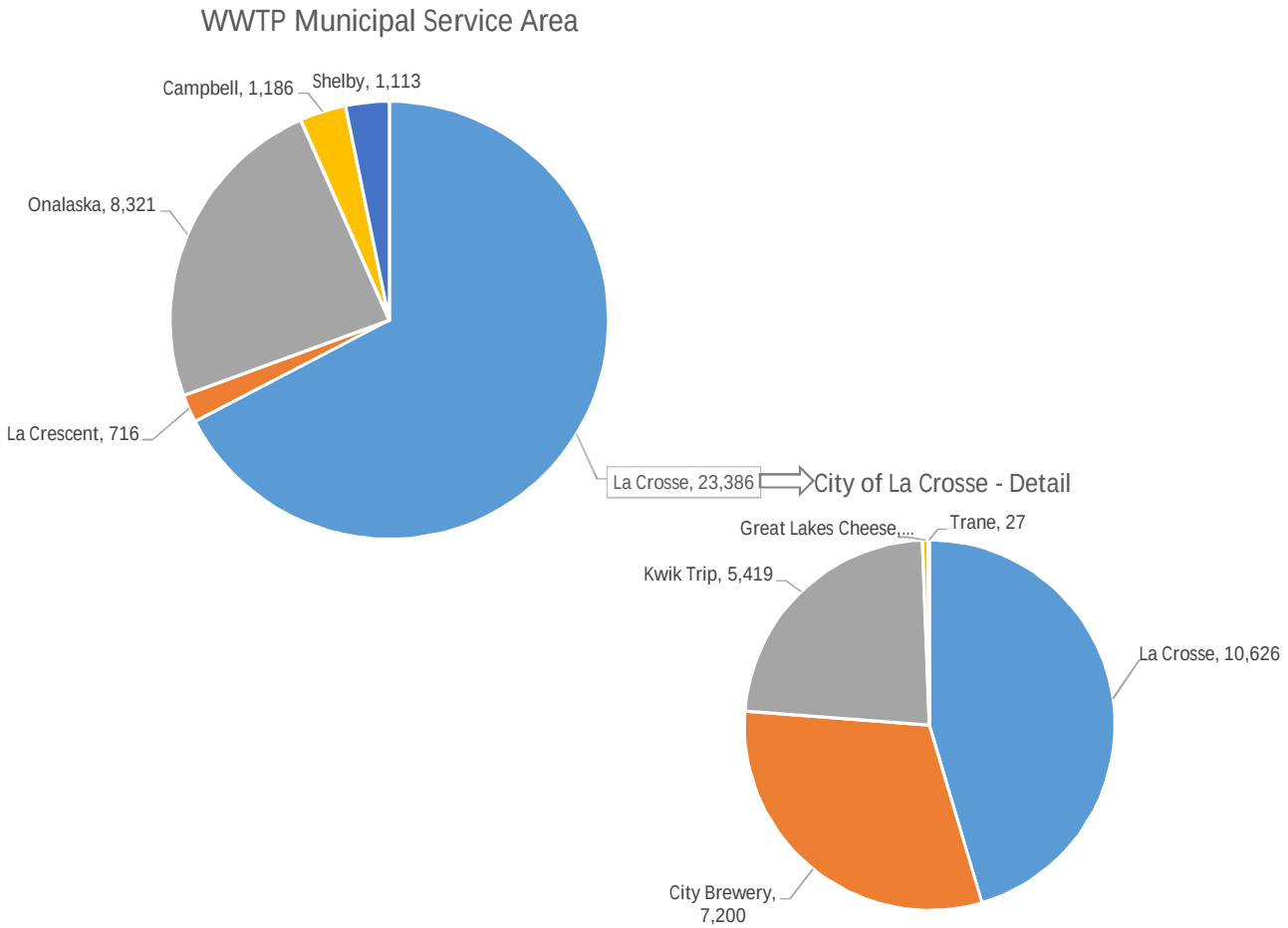
City of La Crosse - Wastewater Treatment Facility
Daily BOD Loading Data – Provided in September 2018



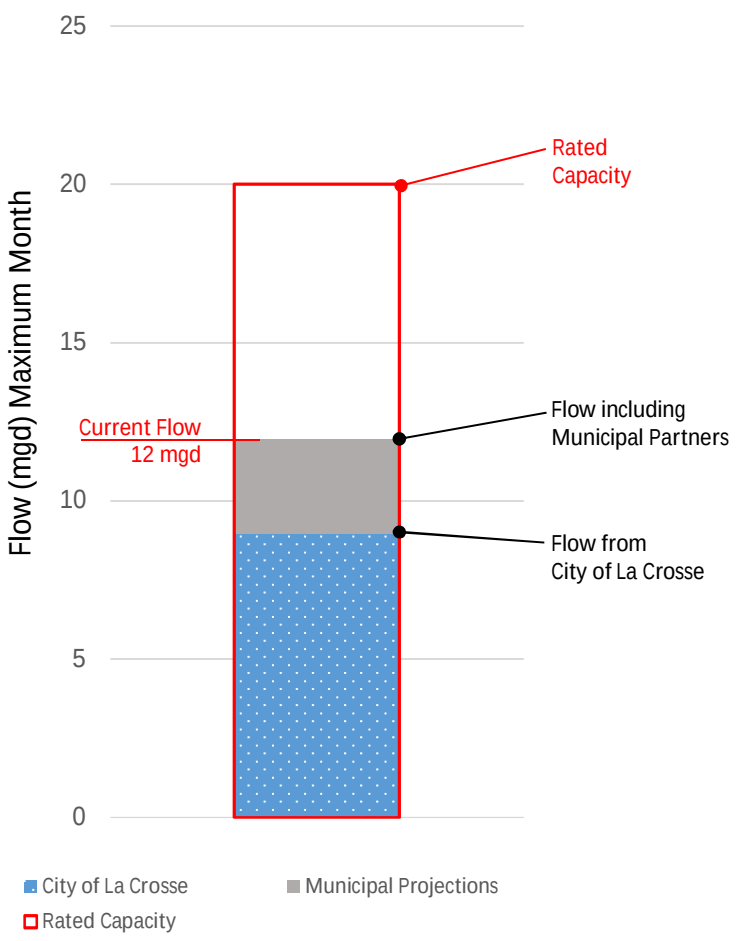
City of La Crosse - Wastewater Treatment Facility
Capacity Utilization – Provided in September 2018

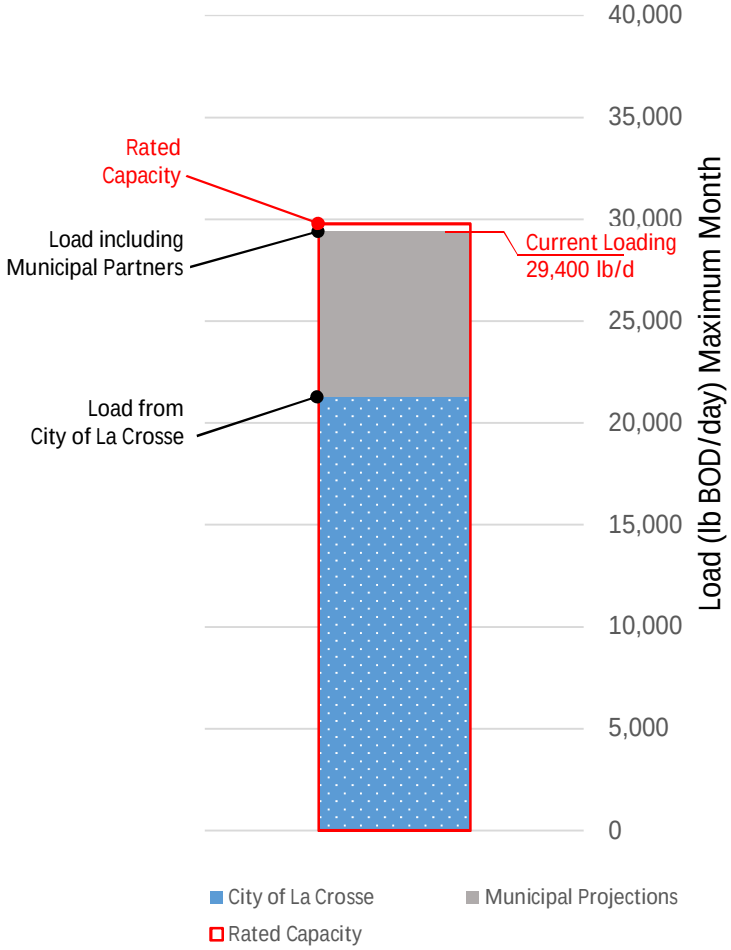


City of La Crosse - Wastewater Treatment Facility
Projected Loadings by Entity

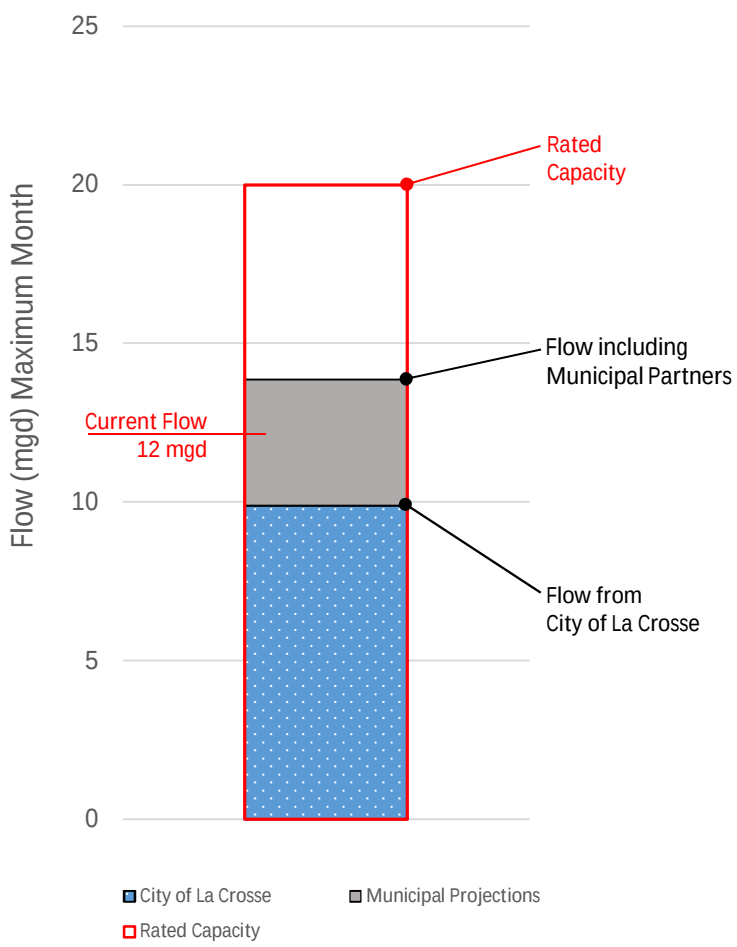


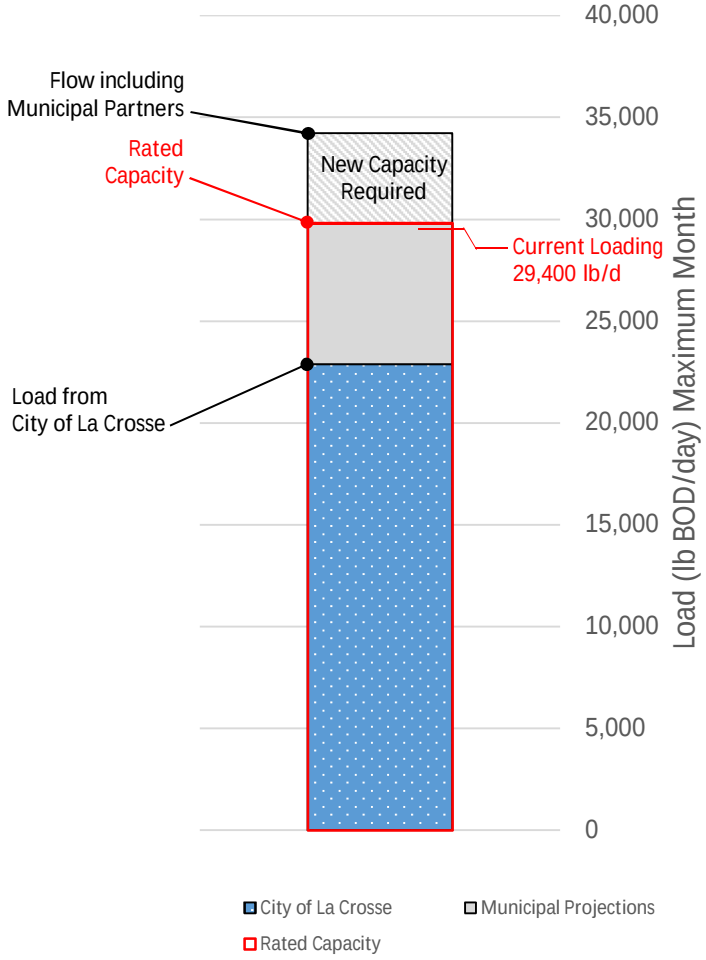
City of La Crosse - Wastewater Treatment Facility
Capacity Summary - Current Conditions - Maximum Month Basis



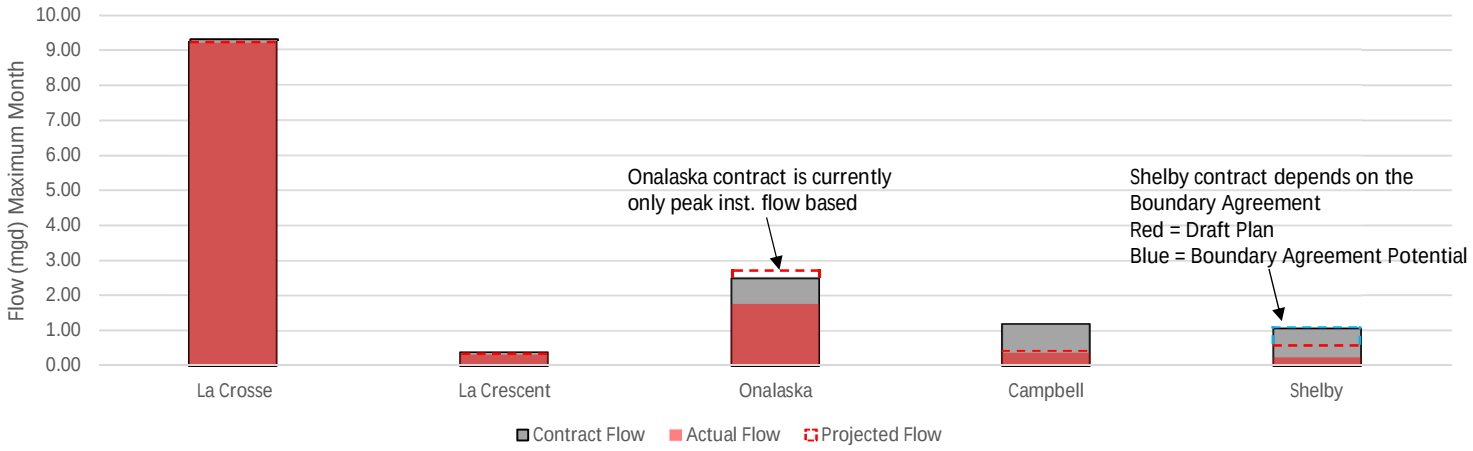


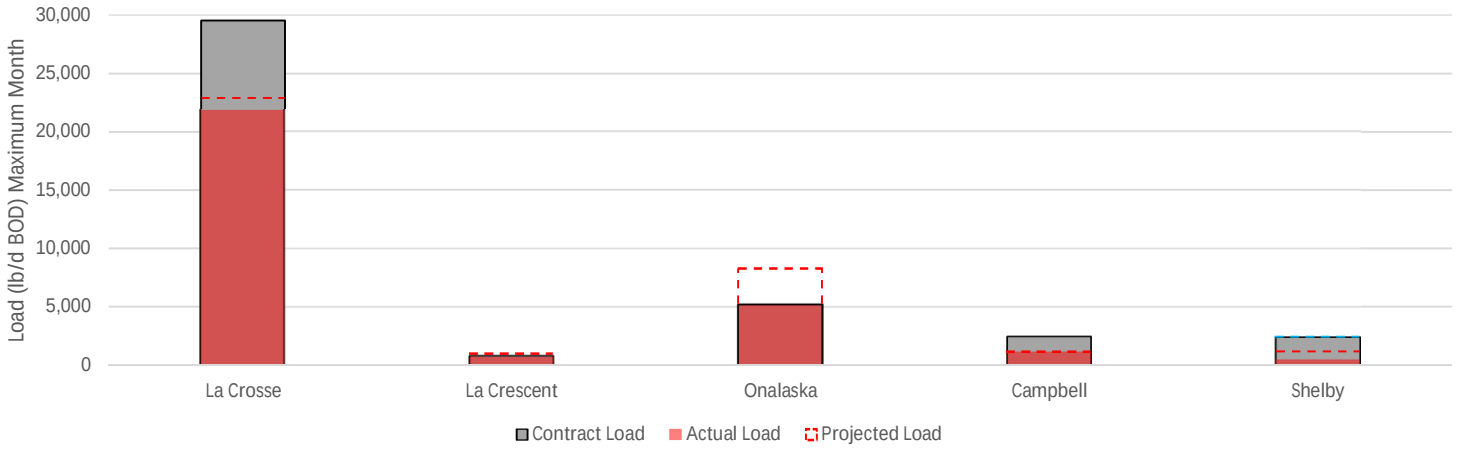
City of La Crosse - Wastewater Treatment Facility
Capacity Summary - 2040 Projections - Maximum Month Basis



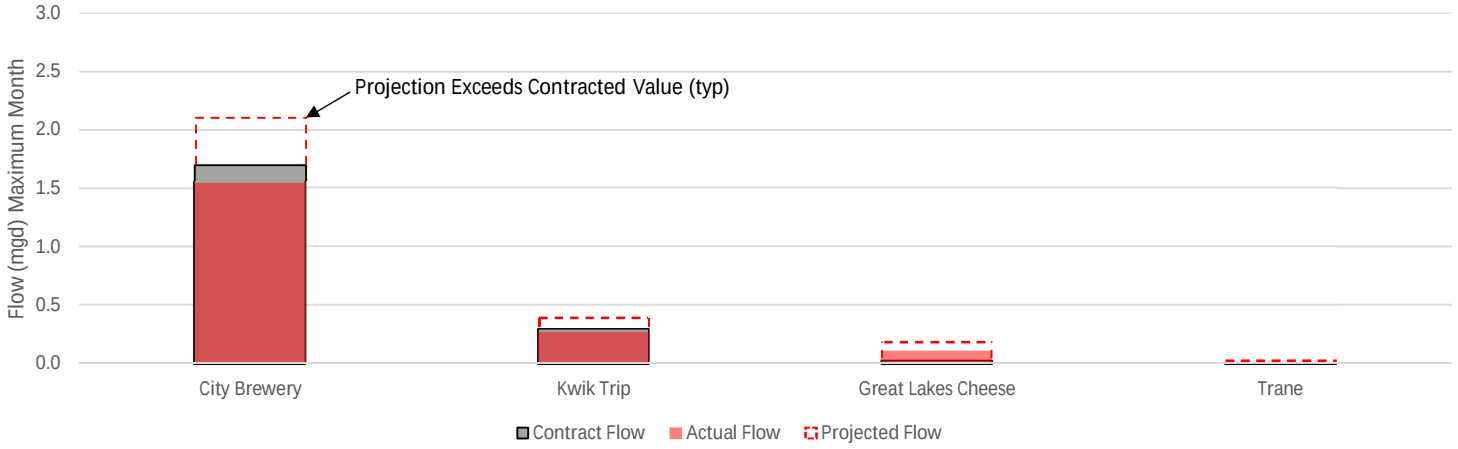


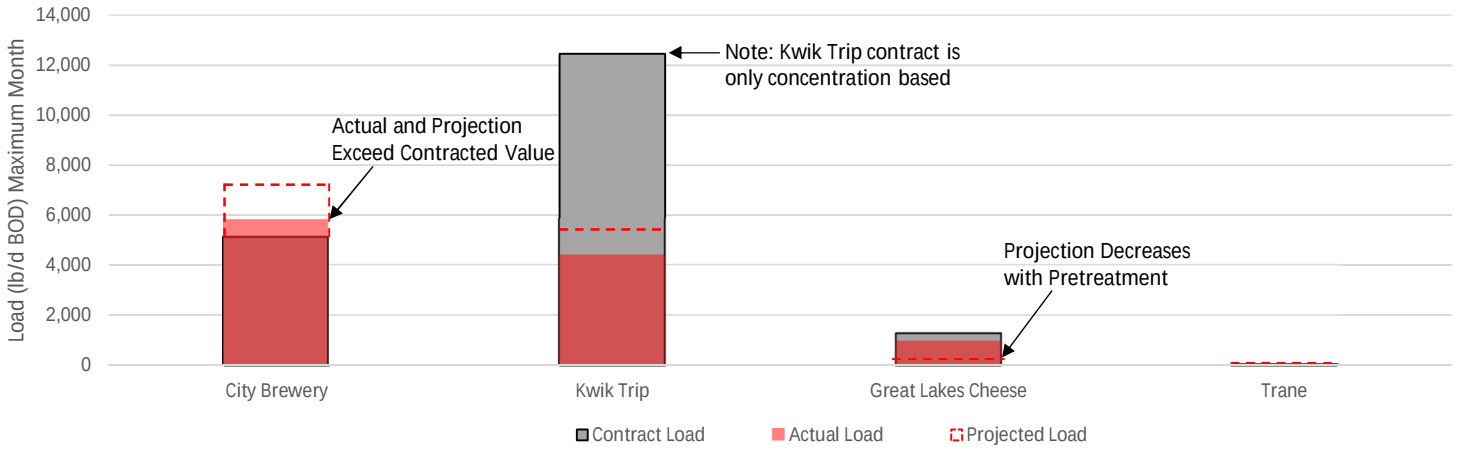
City of La Crosse - Wastewater Treatment Facility
Contract Summary - Maximum Month Basis





City of La Crosse - Wastewater Treatment Facility
Industry Contract Summary - Maximum Month Basis





Findings and Recommendations for Overall Rate Increase

- The Utility cannot obtain CWF financing for the WWTP project without a minimum cumulative rate increase of 40 percent by 2023
- A total rate increase of 46 percent is recommended to meet all the Utility's financial objectives
- Shorter phase-in periods result in lower cumulative rate increases and higher reserve levels at the end of the 10-year forecast
- A 3-year phase in of the rate increases is recommended
  - Mitigation of rate spikes
  - Keeps the cumulative rate increase lower
  - Provides flexibility to adjust to changes

Cost of Service Allocation

Steps in the Cost of Service Allocation

- Allocate costs to utility functions
  - Conveyance - Collection System, Interceptor System
  - Wastewater Treatment – Flow, BOD, TSS, P, NH-3
  - Customer Costs – Billing, Metering Costs
  - Hauled Waste – Septage Receiving
- Allocate costs for each utility function to customer classes based on type of service received
  - La Crosse retail customers – residential, multi-family, commercial, industrial, public authority
  - Wholesale customers – Onalaska, La Crescent, Campbell, Shelby
  - Hauled waste – Holding Tank, Septic Tank, Grease Trap
  - Category “B” Industrial Surcharge Loadings
  - Infiltration / Inflow (costs shared by retail customers only)

Summary of Cost-of-Service Allocation

	Total	Residential	Multi-Family	Commercial	Industrial	Public Authority	Onalaska	La Crescent	Campbell	Shelby	Holding Tank Waste	Septic Tank Waste	Grease Trap Waste	Category "B" Surcharge Loadings	Infiltration / Inflow
	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)
CONVEYANCE COSTS:															
Collection	1,058,280	229,435	102,728	192,453	294,024	62,839	0	0	0	0	0	0	0	0	176,801
Interceptor	798,306	131,795	59,010	110,551	168,897	36,097	127,193	23,458	28,254	11,493	0	0	0	0	101,560
FLOW COSTS:															
Flow	1,230,955	181,669	81,341	152,386	232,811	49,757	260,947	48,126	57,965	23,579	1,134	943	305	0	139,993
TREATMENT COSTS:															
BOD	2,319,554	394,447	176,611	330,867	505,490	108,034	373,119	68,813	82,882	33,715	4,221	10,535	14,193	216,627	0
TSS	2,794,872	467,628	209,377	392,252	599,272	128,077	443,451	81,785	98,505	40,070	16,168	41,097	36,242	240,948	0
P	1,197,465	213,847	95,748	179,378	274,048	58,570	199,955	36,877	44,417	18,068	4,768	9,519	6,156	56,114	0
NH-3	257,870	45,920	20,560	38,519	58,848	12,577	42,611	7,859	9,465	3,850	358	596	386	16,321	0
CUSTOMER COSTS:															
Billing	32,626	27,541	1,583	2,921	195	386	0	0	0	0	0	0	0	0	
Equivalent Meters	427,874	269,838	36,569	74,799	24,798	21,870	0	0	0	0	0	0	0	0	
HAULED WASTE	78,520	0	0	0	0	0	0	0	0	0	35,094	30,610	12,816	0	
SUBTOTAL COST before I/I	10,196,322	1,962,119	783,526	1,474,126	2,158,383	478,207	1,447,276	266,918	321,488	130,776	61,743	93,300	70,097	530,009	418,354
I/I Adjustment Allocation %		79%	6%	11%	2%	2%	0%	0%	0%	0%	0%	0%	0%	0%	
I/I Adjustment	0	330,819	24,161	46,379	7,937	9,058	0	0	0	0	0	0	0	0	(418,354)
SUBTOTAL COST after I/I	10,196,322	2,292,938	807,687	1,520,505	2,166,320	487,265	1,447,276	266,918	321,488	130,776	61,743	93,300	70,097	530,009	0
COST OF SERVICES	10,196,322	2,292,938	807,687	1,520,505	2,166,320	487,265	1,447,276	266,918	321,488	130,776	61,743	93,300	70,097	530,009	0
REVENUE AT PRESENT RATES	6,839,157	1,800,799	515,522	974,556	1,302,588	306,156	891,856	164,483	198,111	80,588	34,169	60,030	50,162	460,137	
DIFFERENCE	3,357,165	492,139	292,165	545,949	863,733	181,109	555,419	102,435	123,377	50,188	27,574	33,270	19,936	69,872	
PERCENT INCREASE/DECREASE	49.09%	27.33%	56.67%	56.02%	66.31%	59.16%	62.28%	62.28%	62.28%	62.28%	80.70%	55.42%	39.74%	15.18%	

Proposed Rates

Current and Proposed Flat Charges

Connection Size	Current Charge	Proposed Charges - 2020-2022
5/8	$15.00	$15.00
3/4	$15.00	$15.00
1	$24.00	$24.00
1 1/2	$39.00	$39.00
2	$60.00	$60.00
3	$108.00	$108.00
4	$174.00	$174.00
6	$342.00	$342.00
8	$543.00	$543.00
10	$813.00	$813.00
12	$1,080.00	$1,080.00

Current and Proposed Volume and Surcharge Rates

	Units	Current Rate	Proposed Rate - 2020	Proposed Rate - 2021	Proposed Rate - 2022
Domestic Sewage	$/CCF	$1.26	$1.52	$1.78	$2.05
Unmetered	Per Quarter	$36.42	$40.84	$45.26	$49.85
Surcharge Rates					
BOD	$/pound	$0.224	$0.226	$0.228	$0.231
TSS	$/pound	$0.211	$0.239	$0.267	$0.295
Phosphorus	$/pound	$4.177	$4.867	$5.557	$6.246
NH-3	$/pound	$0.559	$0.451	$0.343	$0.234
Holding Tank Waste	$ / 1,000 gal.	$5.70	$7.22	$8.74	$10.27
Septic Tank Waste	$ / 1,000 gal.	$15.90	$18.50	$21.10	$23.70
Grease Trap Waste	$ / 1,000 gal.	$46.00	$51.41	$56.82	$62.23
Admin. Charge	$ / load	$11.00	$14.00	$17.00	$20.00
Onalaska	$ / MG	$1,631.00	$1,970.00	$2,309.00	$2,647.00
La Crescent	$ / MG	$1,631.00	$1,970.00	$2,309.00	$2,647.00
Campbell	$ / MG	$1,631.00	$1,970.00	$2,309.00	$2,647.00
Shelby	$ / MG	$1,631.00	$1,970.00	$2,309.00	$2,647.00

Example Customer Bill Impacts – 2022 Rates

Customer Class	Customer Size	Meter Size (Inches)	Billed Volume	Bill at Old Rates	Bill at New Rates	Percentage Change
Residential	Small	5/8	10	$27.60	$35.50	28.6%
Residential	Average	5/8	15	$33.90	$45.75	35.0%
Residential	Large	5/8	30	$52.80	$76.50	44.9%
Multi-Family	Average	1	450	$591.00	$946.50	60.2%
Commercial	Average	3/4	460	$594.60	$958.00	61.1%
Commercial	Large	3	1,500	$1,998.00	$3,183.00	59.3%
Industrial	Average	2	10,500	$13,290.00	$21,585.00	62.4%
Industrial	Very Large	8	150,000	$189,543.00	$308,043.00	62.5%
Public Authority	Average	1	1,100	$1,410.00	$2,279.00	61.6%

*** Proof of Publication ***

STATE OF WISCONSIN
County of La Crosse } SS.

Tracy L. Gorkin, being duly sworn, says that he/she is the principal clerk of the LA CROSSE TRIBUNE, a public daily newspaper of general circulation, published in the City of La Crosse, in the county and state aforesaid, and that the notice of which the annexed is printed copy taken from the paper in which the same was published, was inserted and published in the said newspaper on the dates listed below,

being at least once in each week for 1 successive week(s).

Tracy K. Gorkin

LA CROSSE CITY WATER UTILITY

400 LA CROSSE ST
LA CROSSE WI 54601

ORDER NUMBER 55090

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Sworn to and subscribed before me this 24th day of April, 2020

Holly Hutschenreuter
Notary Public, La Crosse County, Wisconsin

My Commission as Notary Public will expire on the
18th day of December, 2023

HOLLY HUTSCHENREUTER
Notary Public
State of Wisconsin

Section: Legals
Category: 0001 Wisconsin Legals
PUBLISHED ON: 04/24/2020

TOTAL AD COST: 58.29
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Public Hearing
May 7, 2020
Wastewater Treatment Facility Plan

The City Council reviewed the draft Wastewater Facility Plan with the public in summer of 2019. The City received comments, underwent preliminary design to revise the draft plan, and has revised the document as a Final Wastewater Facility Plan and is prepared to submit the plan to the WDNR. A public hearing will be held at the Judiciary & Administration Committee in order for the sewer utility to receive public comments and questions on the plan.

Meeting date and location:
Date/Time: Thursday, May 7, 2020 starting at 6pm
Location: City Hall – Council Chambers on the 1st Floor
400 La Crosse St.
La Crosse, WI 54601

In an effort to keep members of the public, City staff and Council Members as safe as possible from the spread of COVID-19, the Judiciary & Administration Committee meetings will be conducted through video conferencing.

The meetings can be viewed using the following link:
https://stream.lifesizecloud.com/extension/1271327/e7506959-fe5d-44ac-805c-9016fb33bd90

The draft and revised plans as well as a video of the Public Information Meeting is available on the City web site at: https://www.cityoflacrosse.org/your-government/departments/utilities/sewer-utility/sanitary-sewer-utilty-projects-planning-activities/facility-planning-sanitary-sewer

Members of the public who would like to provide comments on any agenda item are encouraged to submit them in writing prior to the respective meeting. Written comments should be submitted to Bernie Lenz at lenzb@cityoflacrosse.org, dropped in a drop box outside of City Hall or mailed to the Utilities Office, 400 La Crosse Street, La Crosse WI 54601.

Please contact Bernard Lenz, Utilities Manager, at 608-789-7536 with any questions related to the project or how to view the meeting remotely.

04/24 55090-1 WNAXLP
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Resolution on Accepting Final Wastewater Treatment Plant Facility Plan

RESOLUTION

WHEREAS, the Sanitary District has contracted with Donahue and Associates, Inc. to prepare a Draft Facility Plan for La Crosse's wastewater treatment system that covers a 20-year planning period;

WHEREAS, on June 25th, 2019, the Draft Facility Plan that assumes continued contracted wholesale service was presented at a Public Information Meeting at the Myrick Center, follow-up workshops on engineering and rate setting based on that Draft Facility Plan were held on August 9th and September 18th, 2019 with La Crosse's high strength waste and wholesale customers, and a draft plan was presented to City Council on September 18, 2019 (Res #19-1268);

WHEREAS, feedback from these meetings and information obtained during preliminary design and contract negotiations was used to inform and update the Plan;

WHEREAS, a Final Facility Plan for La Crosse's wastewater treatment system is consistent with La Crosse Sewer Service Area Water Quality Management Plan 2013 - 2035, will be submitted to the WDNR, and is part of La Crosse's application for a State Clean Water Loan;

AND WHEREAS, La Crosse currently provides wholesale wastewater treatment services to the City of La Crescent, MN by contract and to the City of Onalaska, the Town of Campbell, and the Town of Shelby Sanitary District No. 2 by Ordinance.

NOW, THEREFORE, BE IT RESOLVED, by the Common Council of the City of La Crosse, that the Final Facility Plan should include these communities;

BE IT FURTHER RESOLVED, that the Utility continue efforts to secure long-term contracts with surrounding communities;

BE IT FURTHER RESOLVED, that the Final Facility Plan for La Crosse's Wastewater Treatment Facility attached to this resolution is approved by the Common Council of the City of La Crosse.