DUFRESNE GROUP
CONSULTING ENGINEERS

dufresnegroup.com
info@dufresnegroup.com

November 15, 2024

Hugo Martínez Cazón, P.E
Department of Environmental Conservation
1 National Life Drive, Dean Davis Building
Montpelier, VT 05602

Re: Danville Wastewater Treatment Facility Preliminary Engineering Report
60% DEC Comments Response

Dear Mr. Martínez Cazón,

Below please find a summary of the comments provided on the Danville Wastewater Treatment Facility 60% Preliminary Engineering Report and the responses.

Section 1.1
Expansion of the WWTF is not the only trigger for a review of environmental resources. If a project is funded through the State Revolving Fund, it will require a NEPA compliant evaluation of the Environmental Information Document.
EID completed and attached as Appendix B to the report.

If a project triggers Act 250 review, it may require a separate consultation of the state of Vermont Rare Threatened or Endangered information with the Fish and Wildlife Department office.
Act 250 not required due to it being a municipal project with less than 10 acres of disturbance.

Usually the Watershed Protection division uses the 3-1235 permit number. No change necessary, VT0100633 is correct.
Noted and added to report.

Section 1.5
Does the per capita estimate wastewater use account for buildings that require water/wastewater for a 2-person bedroom but which are only occupied by 1 person? Actual use may not be equal to required availability. Please make reference to the Wastewater systems and Potable Water Supply Rule.
As the per capita estimate is based on population and not number of bedrooms, the number of people per bedroom is irrelevant. Note that population and growth projections are very rough estimates and getting to the level of detail of number of people per bedroom for projected growth does not provide added value.

Section 2.1
The 2003 inspection and recommendations are over 20 years old.
It is likely that the collection system and pump stations will need to be evaluated in the next permit. The requirements for a 20-year engineering evaluation typically include ~10% of the collection system.

Pump station inspection is also over 20 years past and should be updated for this PER.

Please clarify if the Town has provided the current most EPFP to the Dufresne Group. At least one of the pump stations probably requires additional storage and/or a generator.
Pump station inspections were completed by Laramie Water Resources in October 2024. Recommended improvements included in the report. The results of these inspections are included in the report and the inspections report is included in Appendix C.

All three pump stations in Danville have duplex pumps. The Railroad Street (Peacham Road) pump station serves the largest area with an estimated design flow of 6,080 gallons per day and an emergency storage volume of 2,086 gallons. This pump station is setup to allow for a supplemental pump to be connected to an emergency connection in the event of an extended power outage.

The nursing home pump station has an estimated daily flow of 825 gallons and an emergency storage volume of approximately 2,100 gallons.

The Sugar Ridge pump station serves approximately 10 homes with an estimated daily flow of 2,100 gallons. The pump station has duplex pumps and emergency storage of approximately 2,100 gallons.

Section 2.2
The Vulcan telescoping valves are reported as being in fair condition. This implies they may be past their service life and should be replaced with a certain replacement schedule. The PER needs to clarify and make the recommendation.
Section 2 discusses existing facilities, recommendations for replacement are included in Section 4.

Section 2.2.3
Aquafine Corporation is a subsidiary of Trojan Technologies currently and may still support this product, but the PER should ensure if that is true. Please indicate if the existing effluent channel will accommodate the recommended UV system, or if extensive reconfiguration will be necessary.
Section 2 discusses existing facilities, recommendations for replacement are included in Section 4. Additional detail about the replacement UV System has been added to the discussion in Section 4. The existing UV units are slightly

larger than those used for the cost estimates and therefore, only plumbing adjustments will be necessary and extensive reconfiguration should not be required.

Section 2.2.4
The last sludge removal was over 20 years ago. Has the Town budgeted for sludge removal? Currently Cell #1 is storing more sludge than the removal volume in 2002. The PER needs to address this operational need in this section.
The cost estimates include sludge removal in both basins.

Section 2.2.5
Why is there no section 2.2.5
This was a typo and has been corrected.

Section 2.2.6
Was the Control Building review of the electrical and HVAC equipment by Engineering Services of Vermont LLC presented?
The report is included in Appendix D and discussed in detail in Section 2.4.4.

Section 2.3.1 Table 2-2
Minor clarification, the required analysis is for Total Ammonia Nitrogen which is the nitrogen content of ammonia and ammonium.
Noted, text updated.

The collection system apparently had three service area extensions, post original design. Does that affect the lagoon's storage? Please discuss this in the PER.
The service extensions and connections that have been approved but not made yet do not exceed the facility design flow. Discussion of this has been added to the PER.

Section 2.3.2
Was DEC notified that during the "review period" monthly ADF exceeded the 80% for 92 consecutive days? How many times was the daily flow exceeding this value?
The operator of the facility has recently changed. The current operator has no knowledge of whether this reporting was completed or the reason for the exceedance however, the operator did state that past practice was to draw down the lagoon prior to the summer months to provide capacity for storage during the low flow periods of the receiving water. These exceedances were in April – June so this is likely the cause.

Does the project propose installing a roof?
See Section 4 for the discussion of alternatives.

Please describe the justification for not including precipitation in the water received and treated at the facility.
Precipitation is included in the effluent flow measurements for the facility.

How do the collection extension areas affect the storm flow volume?
The Danville wastewater collection system is not a combined collection system and the collection system was constructed with modern methods and materials so stormwater has little impact on the collection system.

Section 2.3.3
The PER should note the higher BOD_5 spikes. Please discuss the Town of Danville's ordinances on commercial effluent controls.
The operator has no knowledge of the source of these spikes. The Town's sewer ordinance does limit the wastewater service connections to domestic strength water quality however, there are several restaurants in Town and it is possible that the discharge was caused by one of the restaurants. The operator has no knowledge of any enforcement action taken against system users related to these spikes in BOD. Additional discussion of these BOD spikes has been added to the report.

Section 2.3.4
Is the TSS design capacity value available from the 1981 O&M manual (135 lbs/day)?
See Table 2-1.

Section 2.3.6
Figure 2-6
Is there a change in operations or chemicals that can explain the latest higher value?
This change was due to a temporary change in operations with new staff on-site and need to adjust aeration blower speed.

Section 2.3.7
Table 2-4
Also look at the effluent concentrations. Toxic pollutants are assigned concentration limits, and it isn't clear that these values are based on full design flow rather than observed flow.
Table has been updated.

These assimilative capacity values give the appearance that more TAN may be discharged than the likely limits that John Merrifield provided to Stan on 12/31/23.
Table has been updated.

Please be sure to apply the TSD Method to all reasonable potential calculations and for toxic limit determinations. Here is a link to the document:
https://www3.epa.gov/npdes/pubs/owm0264.pdf
Noted.

Section 2.4.2

The PER needs to state when “fair” condition elements will be scheduled for refurbishment.
See Section 4 for discussion of recommended improvements.

Section 2.4.3 Table 2-9
Is turbidity ever a concern with the current UV system?
Effluent turbidity increases in winter but is generally under 10 mg/L and mostly under 5 mg/L with only seasonal spikes over 10 mg/L. The UV system included in the alternatives requires TSS lower than 30 mg/L.

An explanation is necessary for the “deficiency” comment that a waiver may be required. Backup power supply to ensure proper effluent disinfection and system redundancy are necessary.
Report has been updated, backup power is recommended in Section 4.

Recommend replacement of expended UV system and refurbishment of channel appurtenances to avoid corrosion problems. Maintain redundancy.
See Section 4 for recommendations.

Section 2.4.4
Does the regular dredging of the monitoring weir trigger a streambed alteration permit? Is the volume small enough that Army Corps notification is adequate?
The volume is under the permit threshold, notification is adequate.

Figure 2-12
Ensure that access to electrical and control panels are kept clear. The bucket visible in the photograph could restrict access.
Noted.

Figure 2-14
The secondary device should be located upstream a minimum of 4 times the head value. The PER should indicate that this is established at the facility.
It is unclear what this comment is intended to address.

Section 2.5
The current sludge levels are high, and action is recommended at this time. Is there a budget for sludge removal? Is the plan to haul liquid sludge or to first dewater it? Are unit costs available? Section 4.2 evaluates an option that includes dewatering.
See Section 4 for recommendations. Sludge removal is included in all alternatives.

Section 3.1
Sludge levels are high and action is recommended at this time as part of this PER.
See Section 4 for recommendations. Sludge removal is included in all alternatives.

Section 3.2

The pump stations will likely be included in the next permit.
Pump station inspections were completed by Laramie Water Resources in October 2024. Recommendations from these inspections are included in the alternatives in Section 4 and the inspection report is included in the Appendix.

Systems that are at or past the end of service life have to be refurbished or replaced. The term "considered for replacement" is unclear. Necessary replacements should include the system elements that are past their service life. Change the "considered" language throughout the PER to recommend replacement or not. The electrical system and ventilation refurbishment should be recommended as the evaluation indicates these systems are degraded.
Systems recommended for replacement are included in Section 4.

Section 3.3
The PER should state what measures the Town is implementing to control the effluent quality for commercial operations.
Recommendations for enforcement of the Town's sewer ordinance have been added to the report.

Before expansion or redesign: existing and future commercial users should have municipal ordinance to control and monitor discharge quality and quantity
Recommendations for enforcement of the Town's sewer ordinance have been added to the report.

Table 4-1
Total Project Cost Estimate details the estimated cost for removal and disposal of sludge from Lagoon 1. The narrative says that "As part of **any** alternative implemented, the sludge accumulated in both lagoons should be removed, dewatered and disposed of". The alternative #3 provides a cost of $95,000 to remove and dispose of sludge in lagoons 1&2 (see Table 4-2). Shouldn't the cost to manage Lagoon #2 be included?
Cost estimates have been updated to include sludge removal for both lagoons.

Section 4.3
The current lagoon has extra storage for times when UOD prevents discharge into the Water Andric. Can an SBR consistently treat to a low enough UOD to allow for year-round discharge?
The UOD discharge capacity is determined by BOD, TKN and the Water Andric stream flow. The biggest challenge is when the stream flow in the Water Andric is low. For the couple of periods in the data when storage has been required, improved nitrogen removal may have eliminated the need for storage. However, the capital cost and operation cost of converting this system to an SBR is substantially more than the other alternatives. With the existing infrastructure in place to allow for storage, the additional treatment achieved by an SBR is not adequate justification for the additional expense.

This section refers to regular removal of sludge. Would that be dewatered sludge?
Yes, dewatered sludge.

Section 4.4
Please submit the calculations that evaluates the UOD. Can the UOD be dropped enough to avoid the need for storage.
See response related to UOD above.

Comment on Table 4-2 is same as for Table 4-1
Cost estimates have been updated to include sludge removal for both lagoons.

Section 4.5
PER should consider and discuss a Solar backup generator comparison.
Noted.

Section 5.1
Tables 4-1, 4-2, and 4-3 all include budget line items for "Replace UV System"
Comment to Alternative 2 text: Does not match above. Since Alternative 2 would keep the overall hydraulic retention time of the system and would be expected to improve BOD and TSS removals, maintaining an ultraviolet disinfection system as opposed to transitioning to chlorine disinfection is viewed as the optimal disinfection alternative.
The existing UV system is in need of replacement due to age. It is intended that UV will remain as the means of disinfection, but the existing equipment will be replaced.

Comment to Alternative 4: Does not match above.
Alternative 4 still includes replacement of the UV equipment.

Section 5.2
Regarding Alternative 2: The 2nd paragraph of Section 4.2 talks about adding "a covered cell... to the head of the lagoon". Would this really cost more to heat than Alternatives 3 and 4?
This section was a placeholder to be updated with the 90% submittal.

<u>Table 5-3</u>
Clarify that low score is the best option.
Text indicates the Fire District is making the decision. Please clarify.
This section was a placeholder to be updated with the 90% submittal.

<u>Appendix A</u>
Figure 1: No blue shown on map. Are your pump stations not shown?
Map has been updated.

<u>Appendix B Nutrients</u>
See Appendix E for updated analysis and recommendations.

If you have any questions, please contact our office.

Sincerely,
DUFRESNE GROUP

Andrea Day, PE
Vice President
Enclosure: Danville Wastewater Treatment Facility 90% Preliminary Engineering Report

C: Town of Danville, Audrey DeProspero
H_2O Innovation, Rodger Sheldon

Preliminary Engineering Report for

WASTEWATER TREATMENT PLANT EVALUATION

DANVILLE, VT

November 15, 2024

90% DRAFT

Submitted to:
Audrey DeProspero
Town of Danville
PO Box 183
Danville, VT 05828

DUFRESNE GROUP
CONSULTING ENGINEERS
Springfield, VT | Barre, VT | St. Johnsbury, VT | Manchester Center, VT | 802.674.2904 | info@dufresnegroup.com | www.dufresnegroup.com

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1 PROJECT PLANNING AREA

The Project Planning area is within the Town of Danville, Caledonia County, Vermont. The focus of this Preliminary Engineering Report (PER) is the Town of Danville's Wastewater Treatment Facility located at 406 US Route 2 East, Danville, VT. The wastewater collection system for the facility serves the Town of Danville's village area.

The wastewater collection system is comprised of approximately 11,350 linear feet (LF) of gravity collection sewer and manholes, and three wastewater pump stations with 2,120 LF of 2 1/2" and 3" force main. The bulk of the collection system is original to the 1983 system construction, including the Railroad Street pump station. Three expansions to the system were constructed in the early 1990's to serve the Larrabee development, the Sugar Ridge development, and a nursing home east of the WWTF. The Sugar Ridge and nursing home expansions each included construction of a duplex submersible pump station. The service area of the collection system covers an area of approximately 0.42 square miles or 265 acres.

Although the specific focus of this report is the wastewater treatment facility at 406 US Route 2 East the entire collection system will be considered when evaluating future flow and loading projections. Figure 1 in Appendix A provides an outline of the service area and notes the location of key wastewater infrastructure.

1.1 ENVIRONMENTAL RESOURCES

If any recommendations include expansion of the WWTF site into currently undeveloped areas existing environmental resources must be considered. Even without an expansion of the existing footprint of the facilities, is emphasized that control of the liquid and solid byproducts of the facility are critical to mitigating negative impacts to the receiving waters of the Water Andric, or to the sites receiving the facility's sludge. Effluent limitations and monitoring requirements referenced herein are as provided by the Facility's NDPES permit, No. VT0100633 (3-1235).

An Environmental Information Document reviewing the potential impacts of the project on Environmental Resources is included in Appendix B.

1.2 GROWTH AND POPULATION TRENDS

A review of the census data for the period 1990 – 2020 shows a slight increase in the Town of Danville's population with the current population exceeding previous estimates of growth. The most recent census data for the Town indicates a total population of 2,335 residents, exceeding published growth projections by approximately 87 residents. This is most likely attributed to growth in rural areas resulting from the COVID-19 pandemic in 2019 and 2020.

Although census data for the Town provides a useful metric, the wastewater collection service area is more closely represented by the village area and the census designated place

(CPD). In 2010 the CDP had a population of 383 residents, increasing to 385 in 2020, with the most recent estimates indicating a population of 416 residents.

Considering the historical population data, and the sewer system service area, there is the possibility that the wastewater collection system could be expanded into currently unserved areas, or into future developments. There are currently 9 undeveloped lots in the Larabee development between US 2 and Walden Hill Road that are approved for connection to the wastewater system. The allocation for these undeveloped lots is 3,780 gallons per day. Additional infill beyond these lots is possible within the sewer service area.

1.3 COMMUNITY ENGAGEMENT

The Town of Danville was established in 1786 and is governed by a selectboard who are responsible for managing the municipal services within the Town including the department of public works, emergency services, and wastewater services. The selectboard is made up of 5 elected members serving either a 3-year, or 1-year term. The Town also staffs a selectboard assistant. Public selectboard meetings are held on the first and third Thursdays of each month at the Danville Town Hall.

1.4 EXISTING FLOW

Currently the wastewater treatment facility serves approximately 160 connections categorized as indicated by Table 1-1below.

Table 1-1: Town of Danville Wastewater Connections

Description	Units Per Category	Connections per Category
Apartment House (per unit)	34	10
Base Commercial (per unit)	20	18
Beauty Shop (per chair)	4	2
Church (per unit)	2	2
Grocery/Mini-Mart (per unit)	1	1
Health Center (per unit)	3	3
Office Space (per unit)	6	4
Restaurant (per Seat)	133	5
School w/caf & gym (per student)	485	1
Single Family (per unit)	115	109
Senior Housing (per unit)	19	2
Service Stations (per unit)	1	1
Non-food retail (per unit)	2	2
Total Sewer System Connections		**160**

Based on monthly effluent flow data reported by the facility for the period January 2018 through October 2023, the average daily flow through the facility is 0.035 MGD, approximately 58% of the 0.060 MGD design flow of the facility.

For the period January 2018 through June 2023 the highest maximum day flow was 0.087 MGD. In July of 2023 a maximum effluent flow of 0.132 was recorded as a result of an unusually wet July which resulted in significant flooding throughout the State, and damage to the Water Andric flow monitoring station.

1.5 PROJECTED FLOW

Between 2010 and 2020 the Village population grew from 383 to 416 which represents a rate of growth of less than 1 percent per year. If the growth rate from 2010 to 2020 is projected for the next 20 years, the population would be approximately 488 or an increase of 72 residents. It is expected that some of this increase would be due to development of housing on already approved lots, as noted above, and therefore the estimated flow from those lots it not considered separately. At a per capita estimated wastewater use of 70 gallons per day, this would increase the flow to the wastewater treatment plant by 5,040 gallons. This increase in flow is within the existing plant capacity and available hydraulic reserve. Should specific projects be pursued in Town with greater contribution to the wastewater treatment facility, they will need to be reviewed on a case-by-case basis to confirm capacity in the system exists and identify any collection or treatment system impacts the project may have.

2 EXISTING FACILITIES

2.1 COLLECTION SYSTEM

As previously discussed, the bulk of the collection system was constructed along with the wastewater treatment facility in the early 1980's. Construction is of modern means and methods and utilizing industry standard materials which today are still well within their expected useful lifespan.

The gravity portion of the collection system is comprised of approximately 61 precast concrete manholes, PVC gravity sewer main, and ductile iron gravity sewer main. In addition to the gravity sections of the system, three duplex submersible pump stations are located at local low points with associated PVC force mains. Evaluation of the collection system condition was not included as part of the development of this report, but the collection system was thoroughly inspected by R. Allyn Lewis, P.E. in 2003 and noted to be in excellent condition. A map of the collection system is included in Appendix A.

The pump stations were inspected by Laramie Resources as part of this report, the results of that inspection are included in Appendix C. Recommendations for improvements of the Railroad Street station were made which include pump, float, check valve and rail replacements. The Sugar Ridge pump station is recommended for minor equipment replacement including the rail system and check valve replacements. The Nursing Home pump station was noted to be in excellent condition. Upgrades were made to the 116 US Route 2 pump station in 2022 by Laramie Resources which included new pumps, rails and control panel. Pump stations are critical to sustainable operation of the collection system and should be inspected regularly. It is typical for controls, monitoring systems, and pumps to be upgraded every 10 – 15 years. Considerations should also be made for cellular monitoring at the Sugar Ridge and Nursing Home pump stations and at all pump stations, emergency operation in the event of a power outage by providing the ability to connect standby generator power, or through available wastewater storage in the wet well or adjacent tankage.

2.2 WASTEWATER TREATMENT FACILITY

2.2.1 HEADWORKS

The existing headworks infrastructure is comprised of an open channel containing a rock/grit trap, a 1-1/2" manual bar screen, a Parshall flume, and diversion valves for flow control to lagoon #1 or lagoon #2.

It is noted that the facility does not seem to have a significant problem with the functionality of the headworks and that the manual bar rack is reported to be adequate to prevent excessive accumulation of wipes and rags in the lagoons. The manual bar screen is cleaned daily, and there are no concerns with the current condition of the channel or the screen structure. Although the flume is installed for flow measurement, a level sensor is not installed, and influent flow is not normally recorded at the facility.

2.2.2 Aerated Lagoon System

The Danville WWTF contains two lagoon ponds of identical size which can be isolated to provided independent, individual, or series operation. Each lagoon is of inverted trapezoidal shape with a sidewall slope of 1 foot vertical on 3 feet horizontal. The base of each lagoon is approximately 137 feet long by 36 feet wide. At maximum water depth the lagoons are approximately 238 feet long by 140 feet wide. Each lagoon cell is lined with a 36 mil Hypalon reinforced plastic liner covered with sand and crushed stone. Below the liner each lagoon contains an underdrain system to maintain consistent foundation conditions.

Lagoon #2 can be divided into two sections by a floating baffle to create two individual cells. During normal operation the lagoons are operated in series and the lagoon #2 baffle is utilized to create cell #2 and cell #3. Cell #3 is provided with less aeration and mixing to allow final settling and clarification of the system effluent.

Each lagoon contains Environmental Dynamics, Inc. FlexAir advanced membrane diffuser systems for aeration and mixing. The diffusers are located within each lagoon with cables and connected by HDPE aeration piping fed from the blowers in the main control building. The existing diffusers were installed as part of an upgrade in 2001 to replace the original LaSaire diffusers.

Aeration is provided by two Gardner Denver positive displacement 10 hp blowers in the main control building. One of the blowers is original to the facility and has been rebuilt, and the second blower was replaced in 2016. One blower is utilized at a time and the blowers are alternated to balance wear. A VFD has been installed on the lead blower allowing for a speed reduction to optimize performance and provide a power usage cost savings.

The lagoon levels and discharge flows are controlled by Vulcan telescoping valves contained in the control structure PMH 3. These valves can be operated independently to control the water level in each lagoon and the flow from each lagoon to the disinfection chamber. Although the valves are original, they are operable.

In 2021 excessive weed growth was observed in lagoon #2 causing frequent cleaning of the lagoon's telescoping effluent valve and the UV system. The operator was unable to determine the cause at that time, but this issue has not occurred since.

2.2.3 Ultraviolet Disinfection

After biological treatment and clarification in the lagoons the wastewater flows through the effluent control valve structure, PMH 3 and into the ultraviolet disinfection system. The system is housed underground in a tri-level concrete access structure. The structure is comprised of access stairs, and landings, for safe operator access and inspection. In the center of the structure is an opening that passes through all levels and the roof that can be utilized to remove and replace equipment to the lower level.

On the lower level of the disinfection building are housed two UV systems in parallel. The systems are Aquafine Corporation RBE-8 with individual control panels. The UV systems were upgraded in 2004, but the existing units and panels are showing signs of wear. Wastewater flows through one of the two UV units where disinfection of the effluent takes place before the flow moves into an open effluent trough with v-notch weir. Located above the weir is a level transducer to monitor and record effluent flow.

Effluent piping in the UV building is PVC and contains PVC isolation valves for each of the UV units.

2.2.4 Sludge Management

Sludge levels in the lagoons are monitored and sludge is removed infrequently in a bulk process. Historically, sludge has been stabilized with the application of lime and transported to local farm fields for land application. The land application process has taken place through coordination with the Town of St. Johnsbury. Since the last sludge removal evolution in 2002, St. Johnsbury has discontinued their land application program as a result of accumulated PFAS/PFOA.

In 2022 sludge depths were utilized to estimate the total volume of sludge to be removed. The volumes are as noted below:

- Cell #1 – 153,560 gallons
- Cell #2 – 38,048 gallons
- Cell #3 – 54,406 gallons

It was noted that in 2002 approximately 140,000 gallons of liquid sludge was removed from lagoon/cell #1.

2.2.5 Control Building

The control building contains the maintenance and storage garage, office, laboratory, blower room and mechanical equipment. The control building is a small structure that does not have full-time use. The building overall has been well maintained however, much of the electrical and HVAC equipment in the building is original and is recommended for replacement in the review completed by Engineering Services of Vermont, LLC included in Appendix D and discussed in more detail in Section 2.4.4.

2.3 FLOW, WASTE STRENGTH, AND PERFORMANCE

2.3.1 ORIGINAL DESIGN CRITERIA & PERMIT LIMITS

Table 2-1 below is provided to summarize the original design criteria of the facility based on the 1981 WWTF O&M Manual by Dufresne Henry. Original flows and loadings were based on a per capita method of a facility serving 672 persons with BOD loading of 0.17 lb/person/day and TSS loading of 0.20 lb/person/day.

Table 2-1: WWTF Design Criteria

Item	Design Year Conditions
Average Daily Flow (ADF)	0.060 mgd
Peak Flow	0.192 mgd
Biochemical Oxygen Demand (BOD_5)	115 lbs/day – 230 mg/L
Total Suspended Solids (TSS)	135 lbs/day – 270 mg/L

Notes:
1. Flows and loadings are as provided in the 1981 O&M Manual for the Danville WWTF.

Table 2-2 below provides a summary of the permit requirements as outlined by the facility's authorization to discharge under Permit No. VT0100633 dated September 30, 2021. In accordance with the permit the Town is authorized to discharge to the Water Andric effluent that is in compliance with the limitations presented below.

Table 2-2: NDPES Permit Requirements

Effluent Characteristic	Average Monthly	Weekly Average	Maximum Day	Instantaneous Max
Flow	0.060 MGD	-	-	
Ultimate Oxygen Demand (UOD)	As necessary to meet the Vermont Water Quality Standards			
Biochemical Oxygen Demand (BOD_5)	30 mg/l (15 lbs/day)	45 mg/l (22.5 lbs/day)	50 mg/l	
BOD_5 Removal	≥85%			
Total Suspended Solids (TSS)	30 mg/l (15 lbs/day)	45 mg/l (22.5 lbs/day)	50 mg/l	
TSS Removal	≥85%			
Settleable Solids				1.0 mL/L
E. Coli		-		77 colonies/100ml
pH	Between 6.5 and 8.5 SU			

Notes:
1. Limitations are as provided by the Town of Danville NDPES Permit # VT0100633, amended effective date January 17, 2018.

In addition to the limits presented in Table 2-2, effluent monitoring and reporting for Total Phosphorus (TP), Total Ammonia Nitrogen (TAN), Total Kjeldahl Nitrogen (TKN), Nitrate + Nitrite (NO_x), and Ammonia (NH_3) is required.

In accordance with the discharge authorization the facility must also monitor the streamflow in the Water Andric daily from June 1st through September 30th of each year. The effluent flow must then be adjusted as necessary to not exceed allowable discharge volume as defined in the NDPES permit. The calculation for allowable flow considers the effluent BOD_5 concentration, effluent TKN concentration, and base flow of the receiving water. To account for restricted flow periods, the lagoons were designed with approximately 21 days of additional storage beyond the normal operating level of the lagoons.

2.3.2 Flow

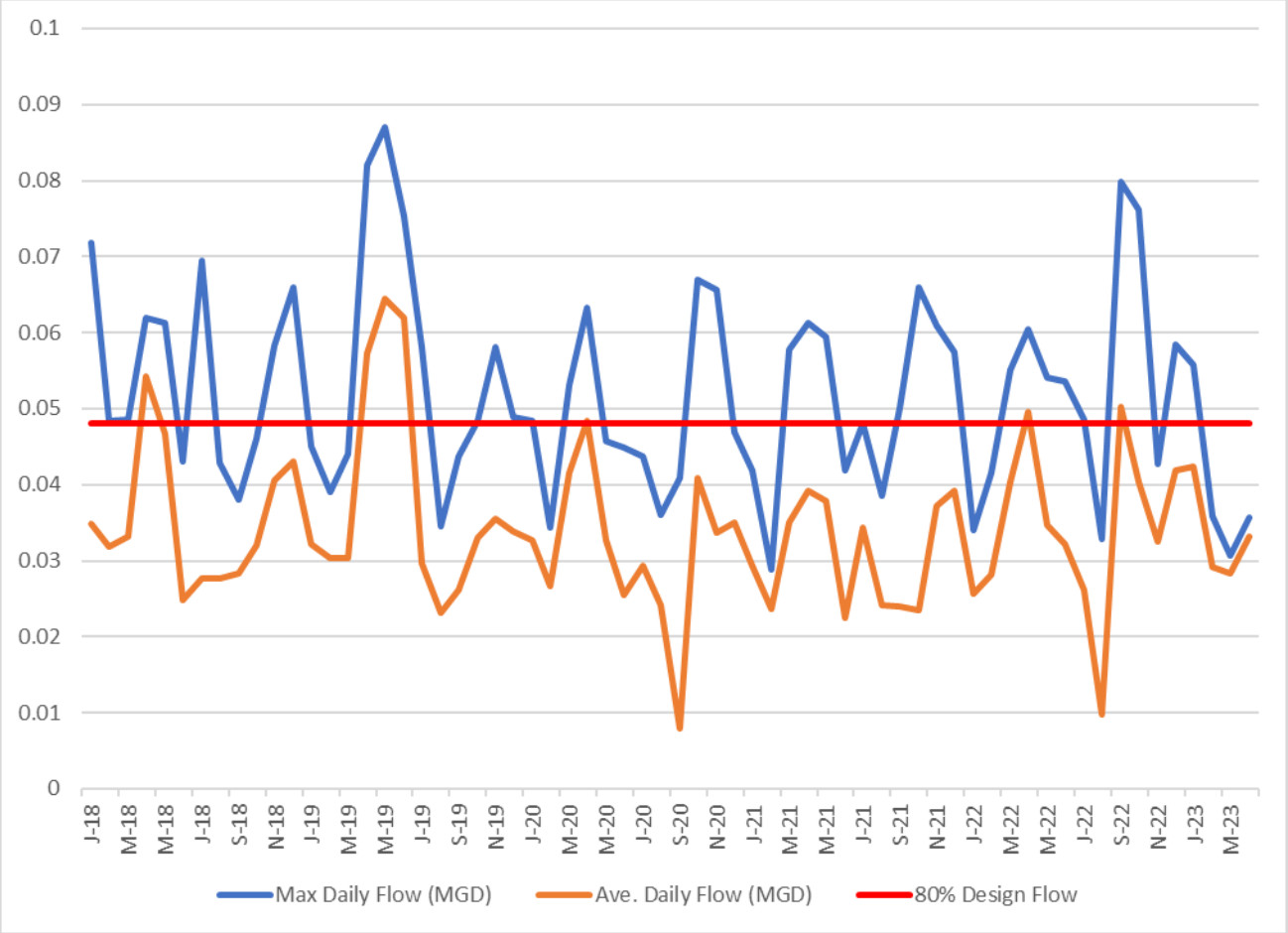
Although the headworks is equipped with a Parshall flume, a meter is not installed in the flume and the influent flow is not monitored or recorded. The Town is in the process of obtaining equipment to measure the influent flow. Only effluent flow is monitored and recorded using the v-notch weir in the disinfection chamber effluent trough. Figure 2-1 below provides a summary of the facilities average monthly and maximum monthly flow for the period January 2018 through June 2023. For this period, the average daily flow is 0.034 MGD, roughly 57% of the design ADF of 0.060 MGD. During the review period, the highest daily flow observed was 0.087 MGD in March of 2019. The installation of influent flow monitoring equipment will provide more a more accurate picture of flow into the plant.

Based on the data presented in the Danville Wastewater Treatment Facility operation and maintenance manual the peak hourly flow is 192,000 gallons per day, equating to a peaking factor for peak hourly flow and average daily flow of 3.2. The data reviewed indicates a maximum day to average day peaking factor of approximately 2.5. Both of these factors are considered within the typical range for a plant of this type and size.

As noted by the special conditions section, paragraph A, 5 of the NPDES permit, once a facility reaches 80% of its design flow or design loading capacity for 90 consecutive days, additional studies of capacity, expansion, or optimization can be required by the State to ensure sustainability of the facility to reliably meet the permit limitations. During the review period April 2019 through June 2019 monthly ADF exceeded the 80% for 92 consecutive days. Since that period, the monthly average daily flow has only exceeded the 80% threshold three times, none of which were consecutive. The 2019 data was due to an unusually wet spring combined with significant snowmelt. During this three-month period, 15.85 inches of rain fell at the facility equating to approximately 644,916 gallons of direct rainfall collected by the lagoons. Over 92 days, which is approximately 7,010 gallons per day. Deducting this direct rainfall average from the ADF would pull many of the days in April and May below the 80% threshold. Based on the facility performance, and the additional storage capacity provided within the lagoons, capacity is not currently considered an issue under existing flow and loading conditions.

When determining the available reserve hydraulic capacity at the facility, the 80% design ADF threshold of 0.048 MGD is compared to the average flow for the review period of 0.034 MGD. The resulting difference is an estimated 14,000 GPD of available hydraulic reserve capacity at the facility.

Figure 2-1: WWTF Effluent Flow



2.3.3 Biochemical Oxygen Demand (BOD_5)

For the review period January 2018 – June 2023 the average BOD_5 loadings were 73.5 lbs/day, which is approximately 64% of the design capacity of 115 lbs/day. It is noted that the average influent BOD_5 concentration is 262 mg/l, which is slightly higher than what would be considered typical for municipal wastewater influent strength. Expected influent BOD_5 concentrations for municipal wastewater are 200 – 250 mg/l. The higher strength observed in Danville along with spikes in load shown in Figure 2-3 below are likely attributed to several food preparation facilities including restaurants and a deli. It is also noted that there is no significant trend attributed to influent waste strength, however and the average levels remain consistent with historical data.

The Town's Sewer Ordinance limits discharges of BOD_5 to 300 mg/L and TSS to 350 mg/L. Recourse for exceeding these limits include: rejection of wastewater flow, requiring pre-treatment, limits on quantities or rates of flow, fines, or any combination of these items. To date, the Town has not enforced these limits. Should there continue to be spikes in influent water quality received at the plant, the Town has these requirements to allow enforcement of the standards.

The facility consistently meets the permit limitations for effluent BOD_5 strength. During the review period, the average effluent strength was 8.3 mg/l, with an average 96.4% removal rate. The lowest percent removal rate observed in the data period was 85.8%.

BOD_5 and TSS influent concentration, effluent concentration, and percent removal are illustrated in Figures 2-2, 2-3, and 2-4.

2.3.4 Ultimate Oxygen Demand (UOD)

The limit for Ultimate Oxygen Demand for Danville is calculated based on the Total Kjeldahl Nitrogen (TKN), Biochemical Oxygen Demand (BOD_5) and flow in the receiving stream from June 1 to September 30. For the review period of January 2018 – June 2023 during the summer months, the discharge from the plant was limited on two occasions when the flow in the receiving water was at or below 0.12 CFS. This need, to restrict discharge, requires storage capacity or additional treatment at the plant.

2.3.5 Total Suspended Solids (TSS)

For the review period January 2018 – June 2023 the average TSS loadings were 65.4 lbs/day, which is approximately 48% of the assumed design capacity of 135 lbs/day. It is noted that the average influent TSS concentration is 228 mg/l, which is within the expected range for municipal wastewater influent of 200 – 250 mg/l.

During the review period, the average effluent concentration was 5.61 mg/l, with an average 96.9% removal rate. The lowest percent removal rate observed in the data period was 88.1%.

BOD_5 and TSS influent concentration, effluent concentration, and percent removal are illustrated in Figures 2-2, 2-3, and 2-4.

Figure 2-2: Average Monthly Influent BOD & TSS Concentrations

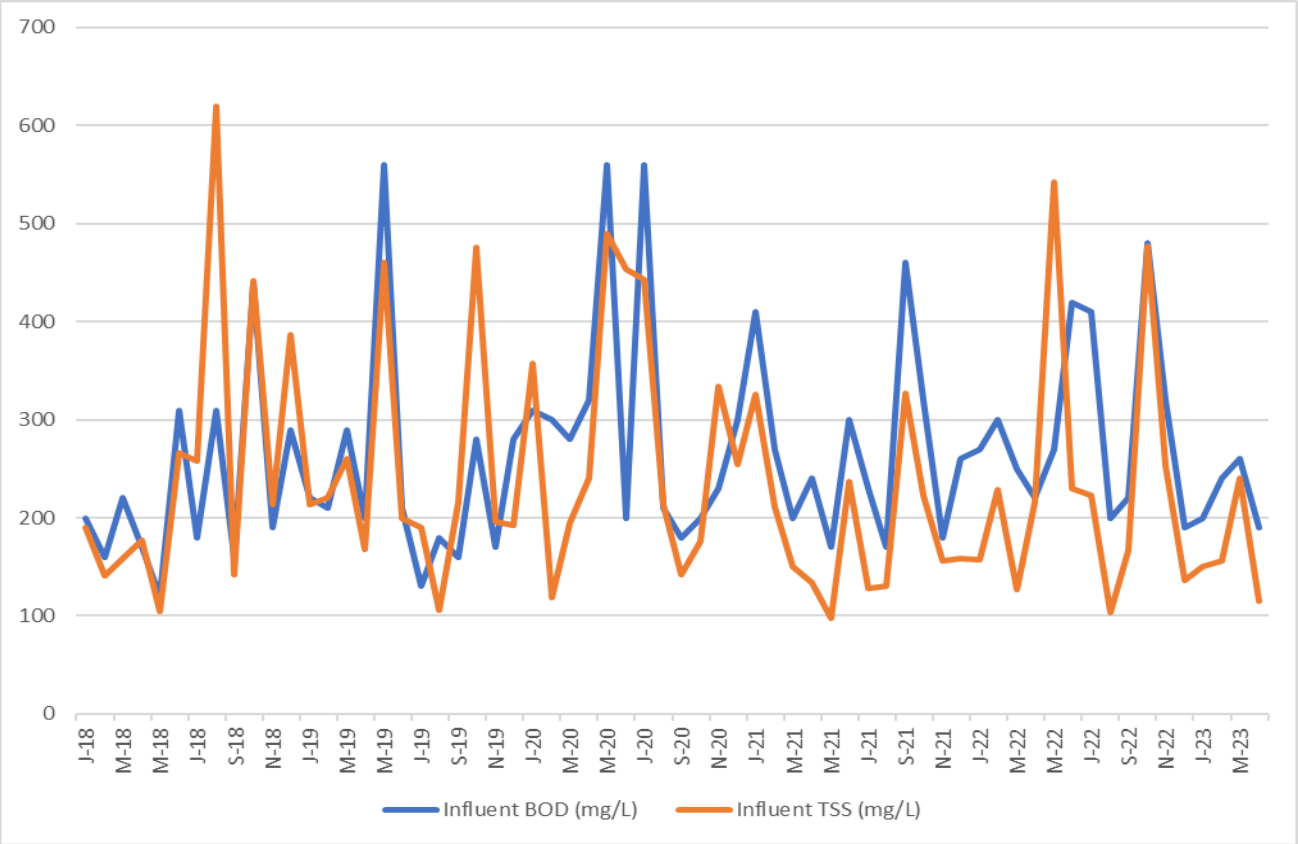


Figure 2-3: Average Monthly Effluent BOD & TSS Concentrations

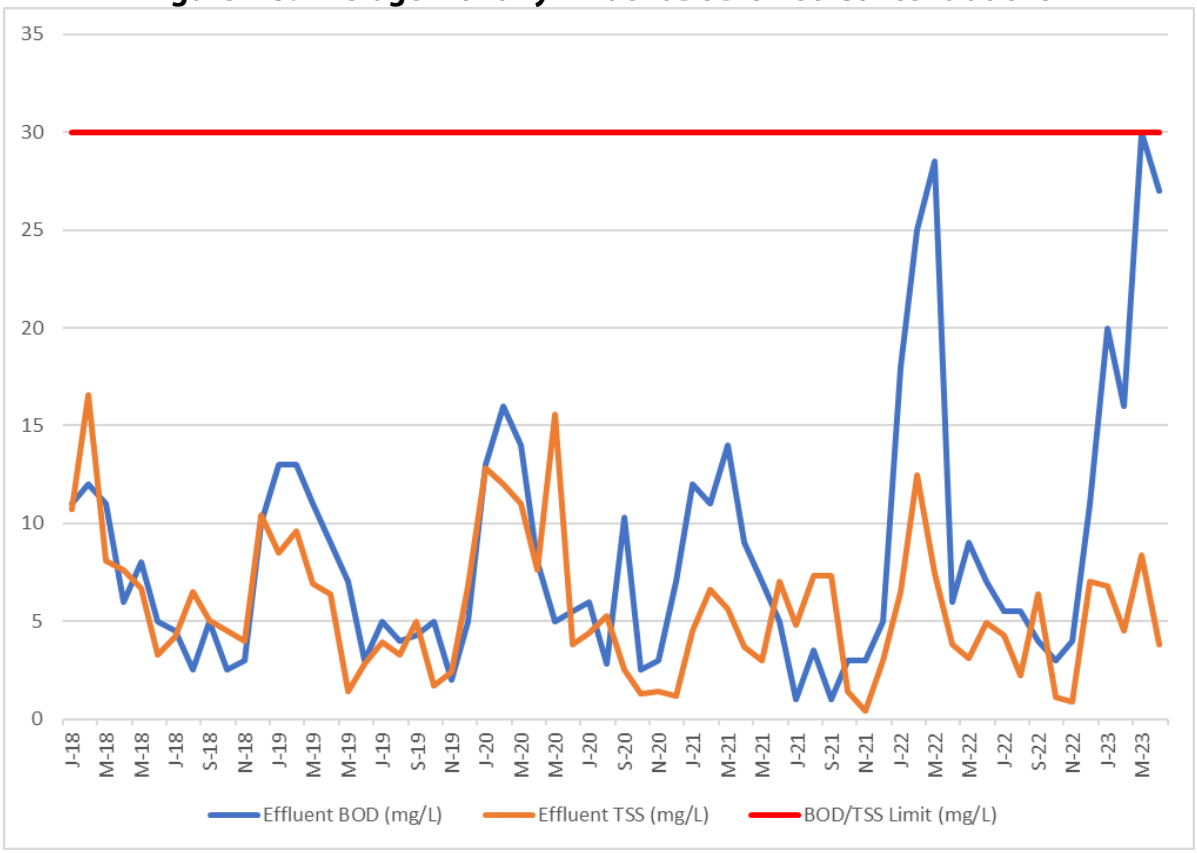
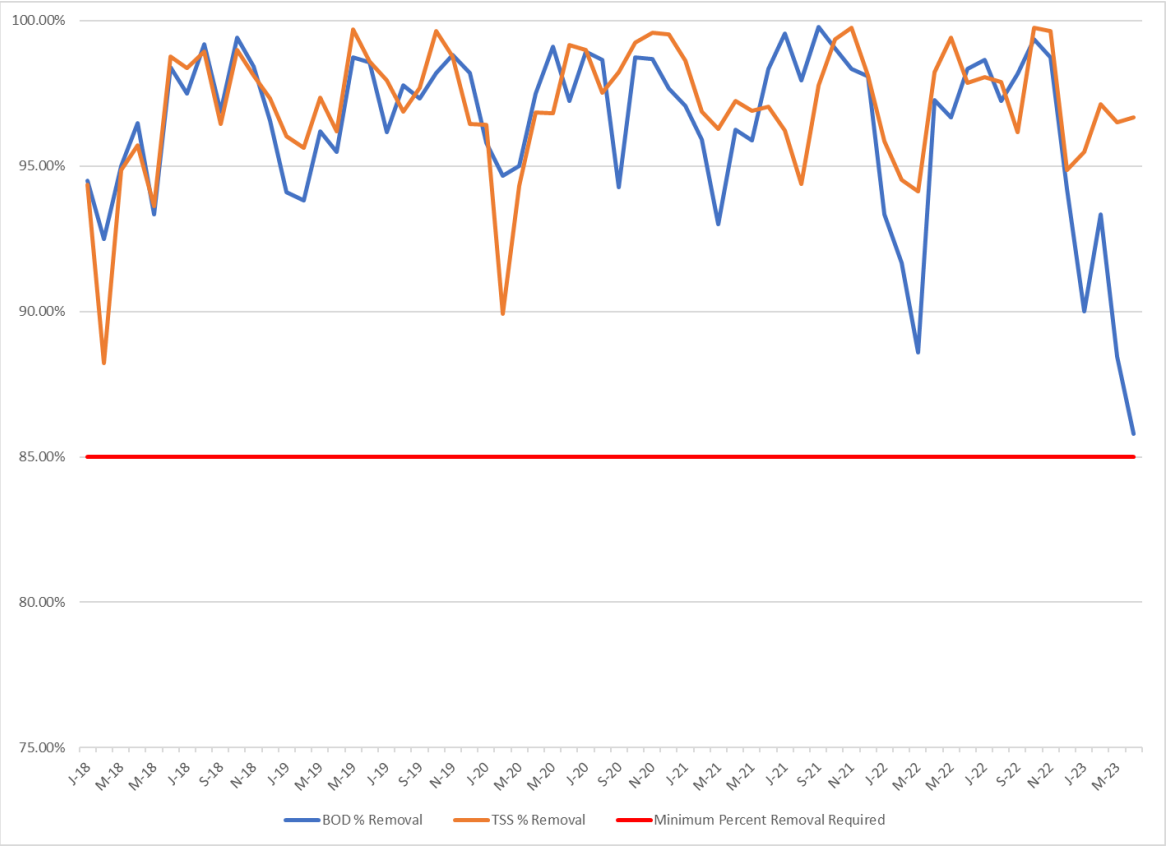


Figure 2-4: BOD & TSS Percent Removals

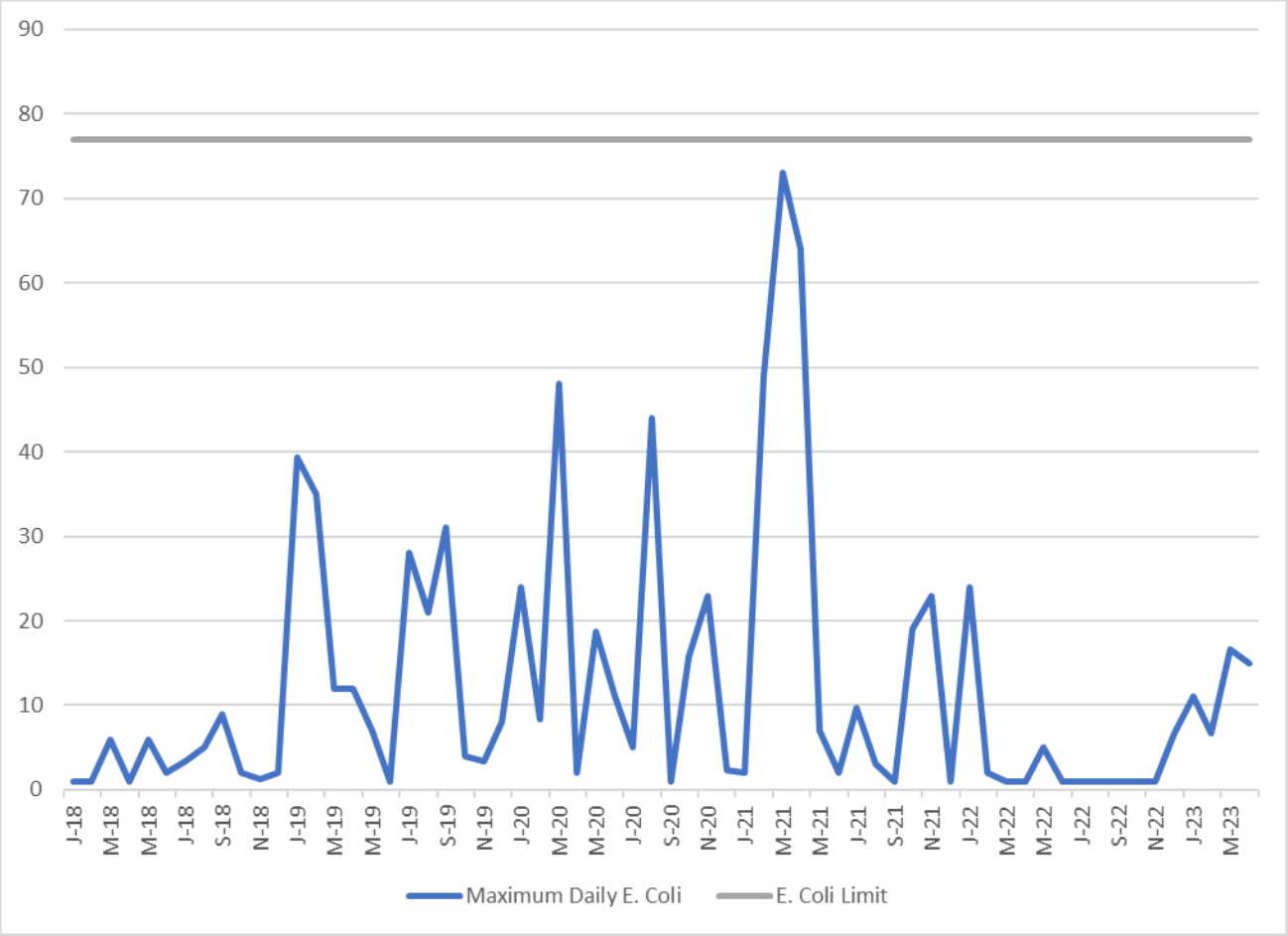


2.3.6 E. Coli

Effluent Escherichia Coli bacteria (E. Coli) counts are performed twice per month as a demonstration of the disinfection achieved by the facility. The NDPES permit includes an instantaneous maximum limit of 77 colonies per 100 mLs. Over the review period the average E. coli count was 11.8 colonies per 100 mLs, and the maximum observed count was 73 colonies per 100 mLs.

Figure 2-5 illustrates the effluent E. Coli performance of the facility showing the instantaneous maximum colony count permit limit.

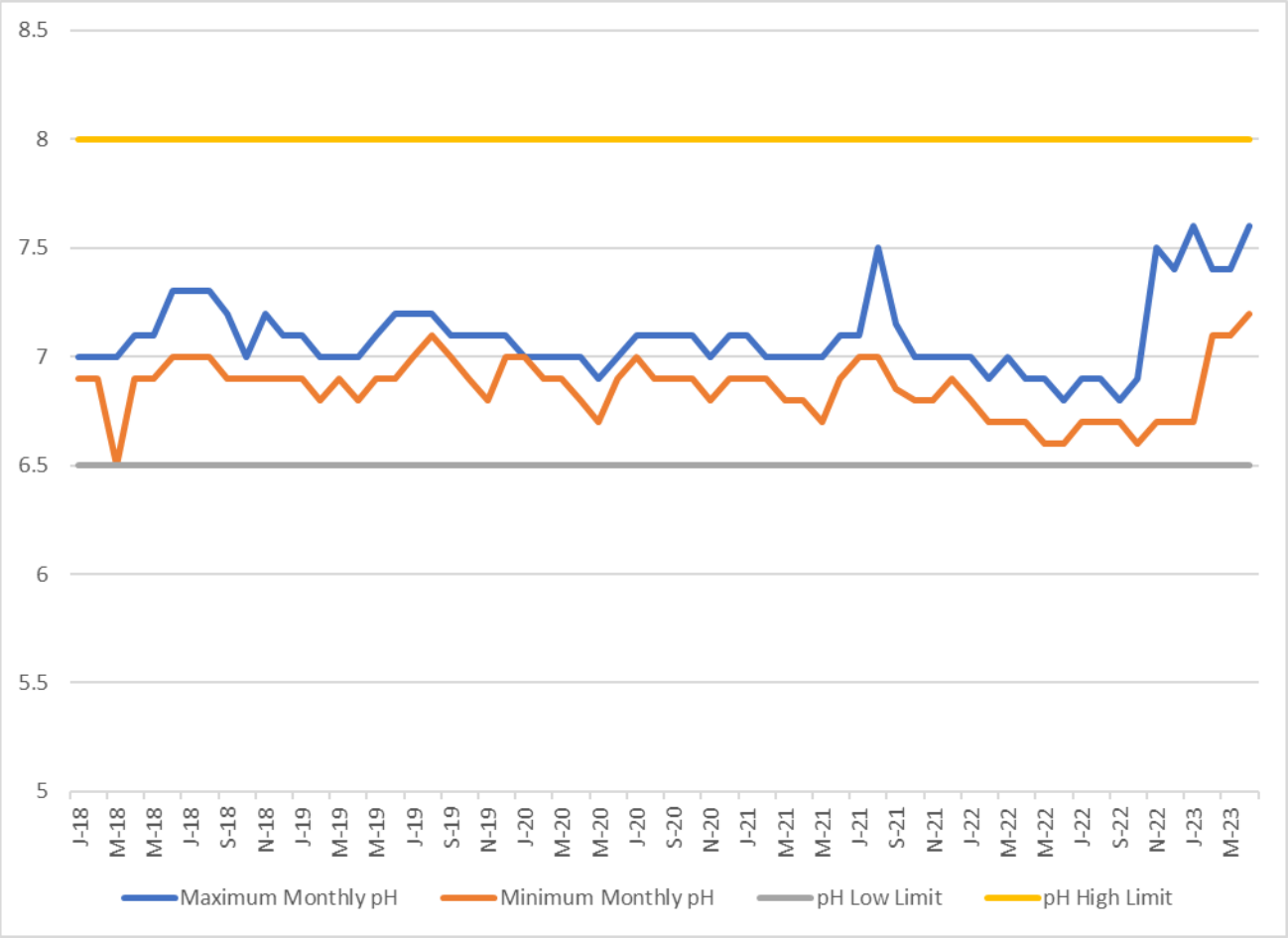
Figure 2-5: Effluent E. Coli Sampling Results



2.3.7 pH

Effluent pH is monitored with daily grab samples. The minimum and maximum pH for each month were reviewed and are shown on Figure 2-6 along with the NDPES permit limits of 6.5 and 8.5 standard units. As shown, there have been no permit exceedances in the data review period.

Figure 2-6: Effluent pH



2.3.8 Future Water Quality Limits

As part of this study, Randy Bean of RAB Consulting & Services reviewed the existing performance of the wastewater treatment plant against current and anticipated future water quality limits for ammonia and phosphorus. Based on that analysis and discussions with the State of Vermont, a summary of the findings is presented below. More detailed information is included in Appendix E.

The receiving water for the wastewater treatment plant discharge is the Water Andric which is classified as a "Small High Gradient" stream with the following characteristics.

Table 2-3: Water Andric Characteristics

Period	Critical Instream Flow (CFS)	Discharge Instream Waste Concentration
Summer 7Q10	0.60	0.1340
Winter 7Q10	0.93	0.0910
Summer 30Q10	0.74	0.1120
Winter 30Q10	1.30	0.0670
Summer Low Median Monthly	1.18	0.0732

The current ammonia and phosphorus discharges to the Water Adric were reviewed against water quality regulations.

Ammonia is a pollutant that impacts aquatic organisms. Temperature of the receiving water impacts sensitivity with higher temperatures and higher pH during the summer resulting in greater effects. Due to this, the Agency of Natural Resources has historically established summer and winter limits. A summary of the resulting instream ammonia concentrations and in-stream capacity of the Water Andric are presented in Table 2-4 below.

Table 2-4: Ammonia Discharge Concentrations

		RAB Analysis		WID Recommendations	
Period	Avg Effluent Ammonia Discharged (mg/L)	Chronic Assimilative Capacity in Water Andric (mg/L)	Acute Assimilative Capacity in Water Andric (mg/L)	Chronic Assimilative Capacity in Water Andric (mg/L)	Acute Assimilative Capacity in Water Andric (mg/L)
Summer (June - Sept)	19.1	3.14	12.55	2.7	5.0
Winter (Oct-May)	21.5	16.5	46.49	15.0	25.1

As shown in Table 2-4, based on both the analysis completed by RAB and recommendations provided by WID, the Danville wastewater treatment facility does not meet the assimilative capacity for ammonia therefore, any planned upgrades to the facility should include treatment for ammonia.

Excessive phosphorus in surface water bodies, typically in the summer months, contributes to eutrophication, the overgrowth of aquatic plants, algae and bacteria. The current discharge of phosphorus in the Water Andric is not violating the Vermont Water Quality Standards or causing or contributing to eutrophication in the Water Andric at the current average day flows. However, when additional water quality standards such as the "EPA Quality Criteria of Water 1986" (aka Gold Book) are considered and the potential for increased flow, Phosphorus discharges may have an impact to the water quality in the Water Andric. Therefore, providing for future phosphorus treatment with any plant upgrades is recommended. Phosphorus data is shown below in Table 2-5.

Table 2-5: Phosphorus Discharge Concentrations

	At 0.030 MGD	At 0.060 MGD
Avg Total Phosphorus Concentration (mg/L)	3.29	
Avg Total Phosphorus Effluent Mass Loading (lbs/day))	0.87	
Average instream Total Phosphorus (mg/L)	0.125	2.41
Gold Book Recommended Standard (mg/L)	0.1	
Anticipated future permit limit (mg/L)	0.8	

There are currently no phosphorus limits on the discharge for the Danville facility, however, should the discharge be found to significantly contribute to an instream violation of Section 29-A-306 of the VWQS, limits will be placed on the discharge. Based on discussions with the State, it is expected that those limits will require a discharge concentration of 0.8 mg/L or less.

Based on the current and future nutrient analysis by RAB Consulting, including ammonia and the option for future phosphorus treatment at the Danville Wastewater Treatment Plant is recommended.

2.4 EXISTING FACILITIES EVALUATION

An evaluation of the process systems at the Danville WWTF was performed in comparison to modern design criteria as outlined in the "Recommended Standards for Wastewater Facilities (2014 edition)", "TR-16, Guides for the Design of Wastewater Treatment Works" (2016 edition), and the Vermont Wastewater System and Potable Water Supply Rules (2020 edition).

The following subsections and narratives provide an overview of the adequacy and deficiencies of facility systems relative to noted key design criteria.

Functionality of subsystems are reviewed relative to the original design parameters of the facility, existing design parameters, and future design parameters. A summary of flows and loadings is provided by Table 2-6.

Table 2-6: Danville WWTF Flows and Loadings

Item	2023 Conditions	Original Design Conditions - 1981
Influent Flow		
Average Daily Flow (ADF)	0.034 MGD	0.060 MGD
Peak daily Flow (PDF)	0.087 MGD	---
Peak Hourly Flow (PHF)	---	0.192 MGD
Influent Loadings		
Biochemical Oxygen Demand (BOD_5)	75 lbs/day – 262 mg/l	115 lbs/day – 230 mg/l
Total Suspended Solids (TSS)	65 lbs/day – 228 mg/l	135 lbs/day – 270 mg/l

2.4.1 HEADWORKS

Equipment & Status Summary

The existing headworks system is limited to a single channel exterior to the main control building including a rock/grit trap, manually cleaned bar screen, and Parshall flume. Operators report that the screen is cleaned daily, and the stone trap as required. There are no operational complaints or significant conditional issues with the headworks channel at the Danville facility. A summary of the design criteria, existing equipment and any deficiencies is included in Table 2-7 below.

Table 2-7: Headworks Equipment Evaluation

Equipment	Design Criteria	Existing Conditions	Deficiency
Screens (Manually Cleaned)	Clear openings of 1-2 inches	1.5-inch openings	None
	Slope of 30-45 degrees	30-degree angle	None
	Bypass provided	6-inch diameter bypass	None
Grit Removal	Placed based on effects of grit on downstream equipment	Stone trap	Adequate for existing process

Figure 2-7: Headworks Channel & Influent Sampler

2.4.2 AERATED LAGOON SYSTEM

Equipment & Status Summary

The existing lagoon structure appears to be in good condition with no reported concerns associated with the aeration diffusers, piping, or lagoon liners. The blower systems function properly and appear in fair condition. The telescoping valves to control the lagoon levels are reported as operable and in good condition. At design average day flow and a 10-foot operating depth the lagoons have a hydraulic residence time (HRT) of 27 days and accommodate an additional 21 days of storage for dry weather flow periods. Under current average day flow conditions, the HRT is approximately 44 days. The additional storage is necessary to meet the NDPES permit ultimate oxygen demand (UOD) limitations based on the baseline stream flow of the Water Andric during the summer months (June 1st through September 30th). To meet this requirement, the UOD of the wastewater is calculated based on the most recent BOD_5 and TKN measurements. The wastewater UOD is them compared to the daily streamflow and if necessary, the facility effluent discharge is limited using the PVC ball valves in the disinfection vault to maintain stream health.

As discussed above, the secondary treatment provided by the lagoons has been consistently acceptable based on historical performance relative to permit limits.

Sludge depths have been monitored and recent measurements indicate approximately 155,000 gallons of sludge is present in lagoon #1, with an additional 95,000 gallons in lagoon #2. Sludge depths and volumes indicate that the Town should be planning for a significant sludge removal evolution in the next year or two. A summary of the design criteria, existing equipment and any deficiencies is included in Table 2-8 below.

Table 2-8: Lagoon Evaluation

Design Criteria	Existing Conditions	Deficiency
Length to width ratio between 2:1 and 4:1	Length to width ratio is 3.8:1	None
Minimum of two lagoons capable of parallel operation	Two lagoons provided	None
Capable of isolation of any cell	Isolation possible	None
Hydraulic Retention Time (HRT) of typically 20-40 days	Design HRT 27 days, at average day flow HRT is 44 days	None
Aeration capable of providing 3 lbs of O_2 per lb BOD	Current system provides 4 lbs O_2 per lb BOD	None
Freeboard 3 feet	Under peak flow, freeboard is approximately 7 feet. During storage, freeboard is approximately 3.1 feet	None
Side slopes between 1:2.5 and 1:4	Side slopes are 1:3	None
Depth of 10-20 feet	Operating depths are 10-14 feet	None
Inlet piping at 1/5 - 1/3 total water depth but not less than 2ft above floor	Inlet piping is 2.1 ft above floor	None

Figure 2-8: Lagoon #2

Figure 2-9: Aeration Blowers & Discharge Manifold

2.4.3 Ultraviolet Disinfection System

Equipment & Status Summary

The existing UV disinfection systems have reached the end of their expected useful lifespan and are in need of replacement. Although they have maintained adequate performance as demonstrated by the e-coli sampling results of the facility, spare parts are difficult to find, and the control panels are showing significant signs of age.

Although the UV disinfection building is in fair condition, and access is reasonable with the use of stairwells and railings, the UV control panels are located on the lowest level and evidence of significant condensation causing corrosion is apparent. It is believed that the open effluent channel allows condensation to build up within the structure leading to corrosion of steel components including electrical conduit, fixtures, and handrails. A

summary of the design criteria, existing equipment and any deficiencies is included in Table 2-9 below.

Table 2-9: UV Disinfection System Evaluation

Design Criteria	Existing Conditions	Deficiency
Provide minimum UV dose at average and peak flows	UV system design flow is 100 gpm, plant peak hourly flow is 66 gpm	None
Deliver design dose at peak flow with one module out of service	Two units, capable of treating 100 gpm, 30 mg/L TSS and 30 mg/L BOD to 77 counts of e. coli per 100 ml are provided.	None
Backup electrical supply required	No standby generator but flow is stopped by a solenoid valve during power outages	Backup power required
UV Intensity meter for each module	Each module has an intensity meter	None
Alarm when UV intensity drops below 80% original output	Alarm provided when intensity drops below 80%	None
Lamp status display	Lamp status display provided	None
Sufficient exposure time provided during peak flow	Historical performance during normal flow conditions have shown adequate disinfection. Performance under peak flow conditions has not been analyzed.	Verification of adequate disinfection during peak flow conditions recommended.

Figure 2-10: UV Disinfection Systems & Control Panels

2.4.4 CONTROL BUILDING AND SUPPORT EQUIPMENT

Equipment & Status Summary

Although much of the facility's control building is original, the structures and systems have been well maintained. The buildings exterior has been refreshed recently with new paint and a new roof. The gravel access roadway and parking areas are maintained on a regular basis by the Town's Road crews.

Heating, ventilation, electrical and air condition systems were reviewed by Engineering Services of Vermont (ESV), a summary report is included as Appendix D of this PER. In summary, the electrical heating systems should be replaced, along with much of the ventilation system infrastructure. Significant electrical improvements should also be considered. ESV recommends replacement of both of the facility circuit panels, raceway replacement, lighting upgrades, the installation of a standby generator, installation of GFCI outlets, and the installation of emergency lighting in the blower room. It is also recommended that the autodialer alarm system be replaced and modernized to include more information as part of an alarm callout than just one general alarm signal.

The effluent v-notch weir and level transducer are in fair condition and operate reliably.

During the flooding in July of 2023 the Water Andric monitoring weir was buried in sediment. In February of 2024 the weir was relocated and dredged. The system remains in fair and operable condition but should be regularly dredged to maintain reliability.

Figure 2-11: Control Building

Figure 2-12: Electrical Service & Water Heater

Figure 2-13: Alarm Autodialer

Figure 2-14: Effluent V-Notch Weir

2.5 FINANCIAL STATUS OF EXISTING FACILITIES

The Town of Danville collects revenue based on budgeted wastewater fund expenditures including contributions to long term maintenance or capital investment per user connection based on the rates established for each connection type, refer to Appendix F.

Based on the 2022-2023 town of Danville sewer budget, $92,446.00 of total revenue is projected to be collected, $79,196.00 through the collection of user fees. Expenditures are anticipated to total $84,246.00 leaving a net positive income to the sewer fund of $8,246.00. The income is normally transferred into seven accounts associated with the collection system, treatment facility, or sludge removal funds. At 2022 year end the accounts had a total balance of $152,000.88 of which $40,813.38 of this is dedicated to sludge removal.

There is no long-term debt currently associated with the Town's wastewater system.

There have not been any waste or energy audits recently performed to reference as part of this PER.

3 NEED FOR PROJECT

3.1 HEALTH, SANITATION, AND SECURITY

Maintaining the effective performance of the wastewater collection system and wastewater treatment facility is critical to sustaining environmental health. Without the sustainable performance of the collection system uncontrolled discharges of untreated wastewater could occur exposing the public and environment to unnecessary health hazards. Discharges of partially treated wastewater from the treatment facility can also cause a deterioration to the receiving water's stream health, ultimately impacting any ecosystems or recreation that depend on the resource.

During the development of this PER, the State of Vermont has indicated that the next NDPES permit issued to the Town for the wastewater treatment facility will include total ammonia nitrogen (TAN) limits to protect the Water Andric. It has also been indicated that a phosphorus limit may be considered in the future. A review of the current performance of the facility indicates that satisfactory TAN removal would not take place with the current lagoon process, and that a process revision is necessary to promote nitrification to convert TAN to nitrite and nitrate.

Any project recommending a process change to address TAN removal should also incorporate sludge removal from both lagoons. Although the sludge levels do not appear to be impacting the facility performance, they are considered high and should be lowered in the short term. Allowing the sludge blanket to continue to grow will lower the effective treatment volume in each lagoon, could short circuit the lagoons, and impact the facility's ability effectively treat for BOD and TSS.

3.2 AGING INFRASTRUCTURE

Although the WWTF and the collection system have functioned reliably since initial construction in 1983 many of the systems and components are original and should be considered for replacement based on their estimated useful lifespans.

The gravity portions of the collection system are in good condition. Modern materials and construction methods were utilized, and these materials have an estimated useful lifespan of 75 -100 years. The pump stations have been maintained regularly, but routine evaluation and improvements to controls, alarms, and pumps should be made on 10–20-year cycles.

At the wastewater treatment facility there are systems that have reached the end of their useful life that should be considered for replacement. The UV disinfection systems are in need of replacement and can no longer be reliably serviced. The blowers are original to the facility, and although one has been rebuilt and retrofitted with a VFD, consideration of a blower upgrade based on age should be made. Although the aeration diffusers were upgraded in 2006, significant improvements to aeration have been made over the past 20-years and replacement of the diffuser membranes should be considered. There are no known

issues with other process equipment associated with age and condition (pipes, valves, headworks channel, lagoon structures, diversion structures).

The control building is in fair condition, but much of the HVAC and electrical systems are original and should be modernized. An electrical and ventilation upgrade should also be considered in the disinfection building where corrosion of electrical conduit and panels is visibly noted.

3.3 REASONABLE GROWTH

As discussed in section 1.2, the Town of Danville has experienced some growth both in population and in types of businesses served with an emphasis of food service. Based on flow the current facility runs on average at about 57% capacity, but based on BOD loading the current facility runs on average at about 65% capacity. The BOD influent strength is higher than the original design values utilized and as such there is a disproportionate available capacity when considering flow and loading. There is an estimated available hydraulic capacity of about 14,000 gallons per day in reference to the 80% design flow threshold specified in the NDPES permit. In terms of loading and referencing the same 80% design threshold there is only about 7,700 gallons per day of reserve capacity at the existing facility. In terms of new living units and assuming 210 gallons per day per unit, which leaves capacity for the system to expand to reliably serve an additional 36 living units.

Any additional commercial, industrial, or food processing facilities would need to be carefully reviewed to ensure that they can be reliably served by the current wastewater system.

When considering reserve capacity along with the proposed TAN effluent limits, a process modification should also review expansion of the treatment capacity to provide additional ability for the community to reasonably grow.

4 ALTERNATIVES CONSIDERED

4.1 ALTERNATIVE 1: DO NOTHING

Consideration of the do nothing alternative assumes that no significant capital investment is made at the wastewater treatment facility and the existing process, and operation would remain as-is.

There are several significant concerns associated with the do nothing alternative that make this alternative non-viable. They are noted in bullet form below:

- Both Lagoon #1 and Lagoon #2 are due to have sludge removed to restore the operating volumes and maintain adequate system performance.
- The existing UV disinfection system has reached the end of its useful life and can no longer be depended on for reliable performance.
- The existing lagoon treatment configuration is unable to reliably nitrify the wastewater. Without a process change or modification this plant will be unable to meet the proposed TAN limits expected to be implemented in the next NPDES permit.
- The current discharge is not reliably complying with the Water Quality Standards for instream ammonia.

Because the do nothing alternative would not address the concerns noted above, it is not considered further.

4.2 ALTERNATIVE 2: ANAEROBIC REACTOR CELL

Alternative 2 considers the installation of an anaerobic reactor cell (ARC) at the head end of lagoon #1 as previously developed in 2021 by the facility operators and Lemna Environmental Technologies (LET).

The ARC concept adds a covered cell with a hydraulic retention time of 2-3 days to the head of the lagoon where primary settling can take place, and anaerobic digestion of the settled sludge can also take place due to temperature control provided by the cover. This concept is not widely utilized but has been successfully implemented in cold weather climates throughout the country including in Maine, and in Hardwick, VT (2007).

The primary intent of the previous operations staff reviewing this alternative with LET was to continue to allow the plant's biological processes to remain effective at removing BOD in the presence of higher strength effluent. The ARC concept has been proven effective in Hardwick, and a similar design model was followed. In Hardwick, BOD removal in the ARC is approximately 50%, and TSS removal is approximately 75%. With the cover controlling temperatures, the solids digestion has shown an 83% reduction in sludge volumes. With such a large portion of the BOD and TSS being removed in a fixed area, sludge must be removed

on a routine basis from the ARC but in theory larger sludge removal evolutions would be more infrequent.

With larger portions of the BOD removed in such a small area without utilizing oxygen, the remaining oxygen provided through the diffusers in lagoon #1 would be working to continue BOD removal, but also to nitrify the ammonia in the summer months when temperature does not stall the reaction.

Using 133 feet of baffle, and 1,508 square feet of cover an ARC with approximately 2.5 days of hydraulic retention time could be developed.

Since Alternative 2 would keep the overall hydraulic retention time of the system and would be expected to improve BOD and TSS removals, maintaining an ultraviolet disinfection system as opposed to transitioning to chlorine disinfection is viewed as the optimal disinfection alternative. Construction of new tankage for contact time and managing a new chemical and chemical feed onsite is not considered a better alternative when compared to replacing the UV infrastructure in the existing UV disinfection vault.

As part of any alternative implemented, the sludge accumulated in both lagoons should be removed, dewatered, and disposed of and the recommended mechanical, heating and ventilation improvements based on the recommendations from ESV discussed in Section 4.5 below should be made.

Figure 4-1 below illustrates the baffle and cover layout as developed and proposed by LET in 2021 for the Danville wastewater treatment facility operator.

Figure 4-1: Alternative 2 – ARC Layout

Table 4-1: Alternative 2
Total Project Cost Estimate

Item Description	Estimated Cost
Remove and Dispose of Sludge (Lagoons 1 & 2)	$95,000
Replace Diffuser Membranes	$4,500
Replace UV System	$118,000
Purchase and Installation of LEMNA Equipment	$114,000
Mechanical and Electrical Upgrades	$90,600
Generator	$75,000
Pump Station Upgrades	$54,500
Miscellaneous Work & Cleanup 25%	$110,400
Construction Cost	**$662,000**
Contingency (30%)	$198,600.0
Engineering	$152,300.00
Legal, Fiscal, Admin	$19,900.00
Total Project Cost Estimate	**$1,032,800**

Although this concept has been proven successful at other facilities, there are very few design references and guides for the implementation of an ARC, and it is difficult to guarantee performance due to a lack of empirically developed mathematical design equations. Little to no nitrification can be expected within the ARC, and without the ability to maintain temperatures throughout the winter in the rest of the lagoon with a complete cover, this alternative is not considered viable in itself, to address the proposed TAN limits.

Combining this method with a complete covered system as reviewed in Alternative 4 however could prove effective based on the performance seen in Hardwick. If pursued, blower and diffuser upgrades should also be considered to improve delivery of oxygen and promote nitrification.

4.3 ALTERNATIVE 3: SEQUENCING BATCH REACTOR

Alternative #3 considers the conversion of the facility from a lagoon facility to a Sequencing Batch Reactor (SBR) facility. At the existing site within the footprint of lagoon #1, new tankage to support an SBR facility would be installed including an aerated mixed pre-batch equalization basin, two SBR cells, and a waste sludge storage tank. In this configuration, lagoon #2 would be operated at the normal low water elevation and provide the post batch equalization volume and additional storage capacity for dry weather flows when the effluent flow may need to be throttled down based on the oxygen demand to protect the Water Andric.

The second lagoon would also allow for the flow to the UV chamber to be throttled to maintain a consistent flow through the systems separate from the batch discharge rate. This would enable the UV system to remain in its current configuration without needing to be upsized. However, due to condition, the UV system would be replaced as part of this alternative. The replacement UV system should fit within the existing space and have the capacity to treat up to 100 gpm per train.

With the ability to adjust the aeration and batch times as necessary, it is estimated that the SBR facility could reliably provide effluent quality suitable to meet the existing permitting limits. The design of the SBR system is based on effluent concentrations of less than 24 mg/L BOD and TSS and less than 1.6 mg/L ammonia nitrogen and less than 19.2 mg/L total nitrogen. Because the nitrification reaction is temperature dependent, there may be cold weather periods where bypassing the influent equalization basin to preserve the wastewater temperature and promote nitrification may be desirable, but this flexibility would be provided in the design.

Unlike with the lagoon system, the installation of fine screening and grit removal before the reactors is necessary for a sustainable system. This would require construction of a headworks building, a mechanical fine screen, a grit removal system, and a grit washer/classifier. It is noted that the installation of a headworks facility would improve the quality of the sludge produced at the facility, but that any facility accepting the sludge would also pre-screen and grind the material.

A transition to an SBR facility would be a significant operational change, but most notably the waste sludge would need to be removed on a regular basis. Onsite aerated sludge storage would be constructed to store 2-weeks of process sludge, with the intent of the Town negotiating a weekly hauling contract with a local septage hauler, and a receiving facility.

An additional advantage provided by an SBR system is that the process can be continually modified by adjusting batch rates, times, and aeration. The system could be modified in the future to denitrify if a total nitrogen limit were to be enforced with a future permit.

Since the designed reaction would incorporate nitrification, significant alkalinity in the wastewater would be used up, and it is recommended that a chemical injection system be installed for pH neutralization within the SRBs.

As part of any alternative implemented, the sludge accumulated in both lagoons should be removed, dewatered, and disposed of and the recommended mechanical, heating and ventilation improvements based on the recommendations from ESV discussed in Section 4.5 below should be made.

Table 4-2: Alternative 3
Total Project Cost Estimate

Item Description	Estimated Cost
Remove and Dispose of Sludge (Lagoons 1 & 2)	$95,000
Remove Diffusers in Lagoon 1	$2,000
Replace UV System	$118,000
SBR System Purchase and Installation	$468,000
Fine Screening	$240,000
Grit Removal	$200,000
Headworks Building	$400,000
Sludge Storage Tanks	$20,000
SBR Tanks	$170,000
Equalization Basin	$100,000
Blower Replacement	$10,000
Chemical Feed System	$10,000
Mechanical and Electrical Upgrades	$90,600
Generator	$75,000
Construction Phasing	$102,000
Pump Station Upgrades	$54,500
Miscellaneous Work & Cleanup 25%	$431,100
Construction Cost	**$2,586,200**
Contingency (30%)	$775,900.0
Engineering	$543,600.00
Legal, Fiscal, Admin	$77,600.00
Total Project Cost Estimate	**$3,983,300**

4.4 ALTERNATIVE 4: COVER LAGOON #1 AND IMPLEMENT INTERMEDIATE TREATMENT ZONES

Alternative #4 considers the installation of a full cover system over lagoon #1 and the conversion of this lagoon to a complete mix – partial mix baffled system. The cover over the entire surface of lagoon #1 would create a less ambient temperature reliant environment where the nitrification reaction could be supported year-round.

The complete mixed portion of the lagoon would provide aggressive growth of heterotrophic bacteria to support BOD removal that can be predicably modeled. These bacteria are also utilized for ammonia removal once the BOD is depleted. Nitrifier growth will also occur within the complete mixed cell. The hydraulic retention time of the complete mixed cell would be 3.5 days under average flow conditions.

After the complete mix zone, the flow would enter the partially mixed zone with a hydraulic retention time of 9.6 days where further biological treatment will occur for BOD, TSS, and ammonia removal. Also, in this cell the solids will begin to settle and will undergo anaerobic digestion over the floor of the lagoon.

For improved reliability of the nitrification reaction and ammonia removal a polishing reactor would be added between the two lagoons. In this polishing reactor suspended media would be utilized to create an ideal environment for nitrifying bacteria. The flow through this reactor would be aggressively aerated through floor mounted diffusers so that the ammonia removal process could be reliably depended on year-round.

Using the complete mix, partial mix system with a polishing reactor, the ammonia concentrations of the effluent would not be expected to exceed 2.0 mg/L and the phosphorus effluent concentration is expected to be under 1.0 mg/L as shown in the comparable systems included in Appendix G. To provide adequate oxygen supply and mixing the blower would be upgraded to 15 hp, and new diffusers installed in lagoon #1.

To accommodate the cover in lagoon #1, the water surface elevation would need to be fixed and this lagoon would no longer be available for storage during dry weather periods. Noting the improved nitrification reaction, it is emphasized that ultimate oxygen demand (UOD) of the effluent which contributes to the allowable discharge volume of the facility would be significantly reduced, and the storage volume in lagoon #1 would no longer be necessary to protect the effluent receiving water.

If future phosphorus limits were to be implemented, removal could also be achieved by adding alum at the polishing filter and baffling off a settling area in lagoon #2 for the alum sludge. This sludge would need to be removed on a semi-regular basis which would increase the operational burden of the facility.

It is also noted that the nitrification reaction utilizes available alkalinity in the wastewater, and that pH stabilization may be necessary with the addition of sodium hydroxide.

Similar to as reviewed in Alternative #2, the transition to chlorine disinfection is not viewed as a viable alternative. Replacement of the UV system in place is the most desirable disinfection alternative considering the extended hydraulic retention times provided by the lagoon system.

During construction, the sludge from both lagoons would be removed, new air diffusers added, and new blowers installed to increase the oxygen rate to the lagoons to improve nitrification. The recommended mechanical, heating and ventilation improvements based on the recommendations from ESV discussed in Section 4.5 below should be made.

One disadvantage of this proposal is that the lagoon cells could no longer operate independently as separate treatment ponds and would need to be operated in series from Lagoon #1 to Lagoon #2. Careful consideration would need to be made regarding maintenance of the lagoon systems to maintain operation without 100% process redundancy for ammonia removal. Plumbing to allow for bypass of Lagoon #1 temporarily as is currently used during sludge removal would be maintained to allow for maintenance operations.

The figure below represents the complete mixed, partial mixed covered system as provided by LET. Also shown are baffles and mixers in lagoon #2 associated with phosphorus removal if required.

Table 4-3: Alternative 4
Total Project Cost Estimate

Item Description	Estimated Cost
Remove and Dispose of Sludge (Lagoons 1 & 2)	$95,000
Replace Diffuser Membranes	$4,500
Replace UV System	$118,000
Purchase and Installation of LEMNA Equipment	$600,000
Chemical Feed System	$10,000
Lagoon 1 Temporary Bypass Piping and Pumping	$20,000
Mechanical and Electrical Upgrades	$90,600
Generator	$75,000
Pump Station Upgrades	$54,500
Miscellaneous Work & Cleanup 20%	$213,600
Construction Cost	**$1,281,200**
Contingency (30%)	$384,400.0
Engineering	$284,800.00
Legal, Fiscal, Admin	$38,500.00
Total Project Cost Estimate	**$1,988,900**

During design, piping would need to be incorporated to allow for flow to continue to be received during periods of cleaning and maintenance of Lagoon #1 so that flows could be directed to Lagoon #2 temporarily then pumped back to the head of the system after maintenance is complete.

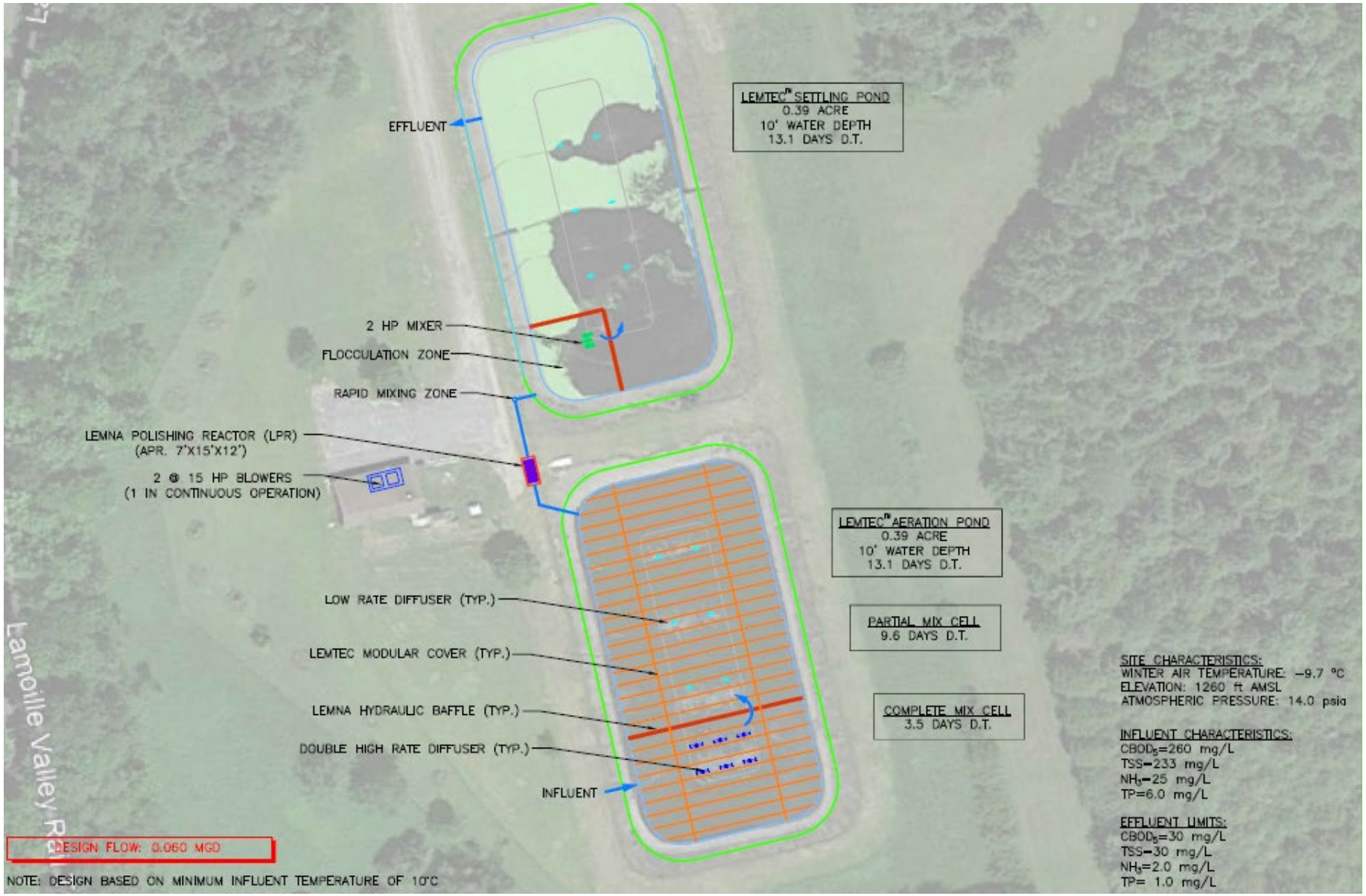


Figure 4-2: Alternative 4 – Covered Lagoon Layout

4.5 CONTROL BUILDING, HVAC, ELECTRICAL IMPROVEMENTS

Coupled with any selected alternative there are electrical, mechanical, and HVAC improvements that should be implemented within the main control building and UV disinfection space. These recommendations are as provided by Engineering Services of Vermont and can be viewed in Appendix D. A summary table of the recommended improvements and the associated costs is provided below. Note that these costs are included in the cost estimates presented for each alternative.

Table 4-4: Mechanical, Plumbing and Electrical Upgrades Cost Estimate

Description	Construction Cost
Mechanical & Plumbing	
New Bathroom Electric Strip Heater	$500
Cold Climate Heat Pump	$12,000
New Bathroom Exhaust Fan	$1,000
New U.V. Building Exhaust Fan and Dampers	$7,000
New Process Room Exhaust Fan & Thermostat	$5,000
Remove Process Room Transfer Fan and Duct	$1,500
New Hot Water Heater	$5,000
New Eyewash & Mixing Valve	$2,000
New Lavatory, Water Closet, & Shower	$6,000
Mechanical & Plumbing Subtotal	$40,000
Electrical	
New Circuit Breaker Panels & Blower #2 VFD	$18,000
Raceway, Boxes, and Supports Improvements	$7,500
GFCI Outlet Installations	$700
GFCI receptacle at condensing unit	$200
GFCI receptacle on dedicated circuit at sampler	$700
Replace interior lights with LEDs	$7,000
Correct water source for UV Lighting	$2,000
Provide Illuminated Exit Signs	$500
Provide emergency lighting in blower room	$500
Replace exterior lighting with LEDs	$700
Motion sensor flood light	$500
Replace Process Alarm System	$12,000
Provide Internet Access	$300
40 kW LP Generator	$75,000
Electrical Subtotal	$125,600

The installation of a liquid propane (LP) standby generator and automatic transfer switch has also been included to power the process and building systems during a power outage. It is noted that the facility currently ceases to pass effluent during a power outage and that influent flow just gets stored, but a generator could power the process equipment and maintain the heating and ventilating systems in the event of an outage.

5 SELECTION OF AN ALTERNATIVE

5.1 GENERAL

As discussed in Section 3, the Danville Wastewater Treatment Facility faces both aging infrastructure and permit nutrient limits that require upgrades to the existing process and equipment. To address this need, three alternatives were developed. Alternative 1, do nothing, is not considered.

- Alternative 2: Anerobic Reactor Cell
- Alternative 3: Sequencing Batch Reactor Facility
- Alternative 4: Cover Lagoon #1, Implement Intermediate Treatment Zones

Costs associated with each alternative are presented in Section 4, non-monetary considerations associated with each alternative are also discussed in Section 4.

5.2 ALTERNATIVE COMPARISON

Due to the anticipated future limits and need for reliable, documented treatment ability, Alternative 2 is not considered further. Additional comparison is between Alternatives 3 and 4.

The most appropriate way to evaluate the different alternatives in terms of economic value is through a life cycle cost analysis, **Table 5-1** compares Life Cycle Costs for the three alternatives over a 20-year period. As shown Alternative 3 has a slightly higher annual operational cost because it requires the most electrical use and has higher electrical and equipment costs.

Table 5-1: Treatment Life Cycle Cost Comparison

Item	Alternative 3	Alternative 4
Equipment Replacement	$ 17,000	$ 25,000
Supplies	$ 500	$ 2,000
Chemical Costs	$ 2,500	$ 11,000
Electrical Costs	$ 15,500	$ 10,000
Net Present Worth	$ 18,500.00	$ 23,000.00
Construction Cost	$ 2,586,200	$ 1,281,200
Total Life Cycle Cost	$ 2,854,621	$ 1,618,778

Notes:
1. Total construction costs were developed in **Section 4**.
2. Salvage value assigned for all alternatives is $0 based on industry experience.
3. All costs presented in **Table 5-1** are in present day dollars projected over 20-years.
4. Short lived assets are identical for all alternatives, so costs have been excluded.

5.3 ALTERNATIVE SELECTION

Selection Matrix

To incorporate non-monetary factors a selection matrix was created as shown in **Table 5-2**. In this selection tool, we have assigned different weighting factors between 10 and 5 based on the importance of the various parameters and local preference. A parameter with a weighting factor of 10 is most important and a weighting factor of 5 is the least important parameter. The various alternatives are then ranked between 10 and 1 with 10 being the alternative that exhibits the best characteristics related to a certain parameter. The alternative with the highest score represents the "best" alternative.

Table 5-2: Evaluation Criteria for Alternatives

#	Parameter	Weight	Remarks
1	Life Cycle Cost	10	Are there significant differences in the life cycle costs to complete the project?
2	Construction Cost	10	Are there significant differences in the construction costs to complete the project?
3	Permit Compliance	10	Does the system have the ability to meet current and anticipated future permit nutrient limits?
4	Sustainability	9	Is a particular alternative more or less likely to provide expansion further into the future?
5	Ease of Operation	8	Are there significant differences in how the treatment systems are operated or maintained? Is one easier to operate and maintain than the other?
6	Public Acceptance	6	Will customers serviced by the system be satisfied with the end result?
7	Constructability	6	Are there differences in the project's construction impacts and time to complete?

Table 5-3: Evaluation Matrix for Alternatives

			Alt. 3		Alt. 4	
#	Weight	Parameter	Rank	Score	Rank	Score
1	10	Life Cycle Cost	5	50	10	100
2	10	Construction Cost	5	50	10	100
3	10	Permit Compliance	10	100	8	80
4	9	Sustainability	6	54	9	81
5	8	Ease of Operation	6	48	9	81
6	6	Public Acceptance	6	36	6	36
7	6	Constructability	2	12	6	36
TOTAL			350		514	

As shown in the evaluation matrix above, Alternative 3 provides the best overall solution. This evaluation considers monetary and non-monetary factors, and it is understood that budgetary constraints, funding options, and local preferences may also factor in the Fire District's decision.

6 PROPOSED PROJECT

6.1 PRELIMINARY PROJECT DESCRIPTION

The proposed project is Alternative 4 which includes the installation of a full cover system over lagoon #1 and the conversion of this lagoon to a complete mix – partial mix baffled system and polishing reactor with option to add baffles to Lagoon # 2 with chemical injection for additional phosphorus removal to meet future permit limits.

6.2 PROJECT SCHEDULE

The proposed project schedule is based on several criteria including the following factors:

- The need for the improvements as defined by local officials.
- Upgrades to other Town owned utilities within the project area.
- The rate effect of the project and implementation of rate increases.
- Funding requirements.

Based on these factors, we suggest a project schedule as shown in Table 6-1.

Table 6-1
Project Schedule

Project Task	Date
Bond Vote	March 2025
Submit Final Design Plans and Specifications	April 2025
Submit Application for Construction Funding	April 2025
Authorization to Bid	September 2025
Open Bids	October 2025
Construction	**2026**

This project schedule is based on several items beyond the control of the Town of Danville including the availability of funding, the time necessary to obtain permits, the time the regulatory and funding agencies need to review plans and specifications, and the success or failure of local bond votes. The schedule may change based on the actual time needed to complete these tasks.

6.3 PERMIT SUMMARY

Permit requirements for the proposed project are limited because work is anticipated to remain within the Town owned right-of-way. At this time, we anticipate the following permits may be required for the project:

- Water Investment Division Design Approval

6.4 TOTAL PROJECT COST ESTIMATE

As shown in Table 6-2 below the 2026 construction cost for the project is $1,359,300 with a total project cost of $2,244,600.

Table 6-2
Estimated 2026 Total Project Cost

2024 Construction Cost	**$1,281,200**
Inflation to 2026 Construction	$78,100
Construction Cost in 2026	**$1,359,300**
Construction Contingency (20%)	$271,900
BABA Contingency (20%)	$271,900
Legal, Fiscal and Administrative	$40,800
Engineering	$300,700
Total Project Cost	**$2,244,600**

Notes:
1. Contingencies are estimated at 20% of the construction cost.
2. Additional contingency is included to account for unknown cost and schedule implications due to BABA.
3. Legal, fiscal and administrative costs are estimated at 3% of the construction cost.
4. Inflation is estimated at 3% per year due.
5. Engineering costs estimated in accordance with the Vermont Water Investment Division's engineering fee allowances.

6.5 ANNUAL OPERATING BUDGET

6.5.1 REVENUE:

The Wastewater system receives its revenue through user charges. Sewer users are billed based on the type of use. The rates are included in Appendix F. A typical single family sewer connection would incur a total annual bill of $330.

In the Town's 2023-2024 budget, the projected revenue received by the Sewer Fund was $92,676 which includes income from delinquent fees, penalty and interest charges, connection fees, and grant reimbursements.

6.5.2 EXPENDITURES:

The budgeted expenditures for 2023-2024 include operation, maintenance, and contribution to a reserve fund. The system does not currently have any long-term debt. The recommended project is not expected to introduce new O&M costs until the need to add chemical is required to meet future permit limits, estimated principal and interest costs are described in Table 6-4.

In the Town's 2023-2024 budget, the projected expenditures of the Sewer Fund are $91,242.

6.5.3 RESERVES:

For the recommended project, all of the proposed infrastructure has a 20+ year life expectancy and is typically funded with long-term capital financing. Within the 20-year short-lived asset evaluation range only annual O&M expenses are expected for the proposed system infrastructure.

6.6 PROPOSED FINANCING

The Town of Danville does not have the funds to finance the proposed improvements locally and therefore the Town must take on long-term debt to finance the proposed project. Funding alternatives include local borrowing through the Municipal Bond Bank, the State Clean Water State Revolving Fund (CWSRF) program, and the United States Department of Agriculture Rural Development (RD) water and wastewater grant/loan program.

The concepts and customer costs outlined in this section represents our interpretation of these different program requirements and should not be considered a guarantee of a grant/loan offer. Town officials will be required to obtain a written offer of funding from an agency representative.

6.6.1 LOCAL BORROWING:

If local borrowing was used exclusively to fund the capital costs, with a 30-year bond at 3.5% interest using conventional funding from the State Bond Bank.

6.6.2 CLEAN WATER STATE REVOLVING FUND:

The U.S. Environmental Protection Agency and the Vermont Agency of Natural Resources have developed a program to help local communities fund wastewater and stormwater projects with the intent of preventing untreated wastewater and stormwater from reaching rivers and lakes. The Clean Water State Revolving Fund (CWSRF) offers both grants and loans for projects that work to eliminate pollutants from infrastructure entering waterways.

The CWSRF program provides Federal and State subsidized low interest loans to small wastewater systems implementing improvements. Grants applicable to the CWSRF program are subject to availability of State Pollution Control grant funding. Water pollution abatement and control projects may be granted 35% of eligible costs pending available pollution grant funding, but based on our knowledge of the grant program, it is unlikely that state pollution control grant funds would be appropriated for this project.

Municipal CWSRF loans have a maximum term length of 30 years, which is dependent on the life of the constructed asset and are currently issued at 0% interest. CWSRF loans do not contain terms that result in a penalty for earlier repayment or refinancing but do require an administrative fee of 2% on construction loans, which is utilized to fund the administration of the CWSRF program.

The program disburses funds based on a priority list developed in accordance Environmental Protection Rules, Chapter 2 Municipal Pollution Control Priority System. The priority system outlines 13 different criteria on which a project is evaluated and assigned a score. Higher scoring projects are considered a higher priority to receive CWSRF funding. Projects that do not achieve readiness deadlines can be bypassed so ready projects can be funded.

In addition to low interest rates, additional subsidy can be applied to municipal projects in the form of principal forgiveness. Only qualifying municipalities and projects can receive forgiveness based on population, affordability criteria, or project classification. Those criteria include median household income (MHI) being less that the State of Vermont. Danville Villages MHI is $64,417 while the State MHI is $74,014. Another criterion is that the project twill result in an annual household user cost that exceeds two percent of MHI. Unemployment rates being higher than statewide median rate and decreasing 10-year population trend are the last two criteria to be considered disadvantaged.

6.6.3 USDA Rural Development:

The United States Department of Agriculture (USDA) administers a loan and/or grant program for small communities (population fewer than 10,000 people) to complete infrastructure improvement projects for drinking water, sanitary sewer, storm sewer, and solid waste collection. The program is administered by USDA Rural Development (RD) Field Offices. The field office serving the Town of St. Johnsbury is located on Summer Street in St. Johnsbury.

The program disburses funds to community projects based on a priority basis, which is determined by RD during the application process. Grant and loan eligibility criteria includes a target annual water rate for a typical residential household (210 gpd consumption) of 1.5% of the MHI. RD uses MHI data from the American Community Survey, which lists the Town MHI as $62,617 and the State MHI as $71,180. The target water rate under the RD program is $939.25 per year, while the current annual sewer rate is approximately $330 for a single-family residential connection. If a municipality is required to increase the customer rate due to the annual costs necessary to amortize the project capital above the "target rate" the Town may receive grant funds for the project.

Grant funds are disbursed on a graduated scale with applicants from small communities with low median household incomes receiving a higher percentage of grant funds. Grant and loan funds are available only after a community has obtained the legal authority necessary to incur debt for construction and has been unable to obtain the needed funds from commercial sources at reasonable rates. Grants range from 25% to 75% with the RD program. Receipt of additional grant funds from other sources reduces the RD grant amount and not the loan (local share) amount.

The Town of Danville, along with the entire Vermont Northeast Kingdom, has been designated as a Rural Economic Area Partnership (REAP) Zone. RD has defined REAP

Zones as communities of geographic isolation with the absence of large metropolitan centers, low-density settlement patterns, historic dependence on agriculture, continued population loss, outmigration, and economic upheaval or economic distress. The REAP Zone pilot initiative was established to address critical issues related to these constraints.

Low interest federally subsidized loans are available through RD loan funding and vary based on the household income of the community. RD does offer Vermont communities the option to finance terms up to 40 years based on the useful life of the facility. The three categories of loan rates available are as follows:

- Market Rate: 3.875% interest rate if the Median Household Income (MHI) equals or exceeds the current State non-metropolitan MHI.
- Intermediate Rate: 3.125% interest rate if the service area MHI is below the State MHI.
- Poverty Rate: 2.375% interest rate if the service area MHI is less than 80% of the State MHI and the project is needed to meet health or sanitary standards.

The Town MHI is 87% of the State MHI ratio, therefore the project would qualify for the intermediate interest rate. The sewer rate is well below the target rate so it is assumed that the Town would not qualify for a grant.

Costs for borrowing money from each funding program are presented in Table 6-3.

6.7 COST PROJECTIONS AND RATE EFFECTS

To evaluate water rate adjustments necessary to fund the recommended improvements, we have assessed future expenses including long-term debt.

Currently the existing debt cost is the annual repayment of the loans for the Town's utility upgrade projects. We have shown the estimated annual cost of debt for this project based on a level payment plan that includes both interest and principal. The analysis was prepared for local borrowing, CWSRF, and RD funding, as shown in Table 6-3.

Table 6-3
Rate and Revenue Projections

	Local Borrowing at 3.5% for 30-Years	CWSRF Loan at 0% for 30-Years with 2% Administrative Fee	USDA-RD Loan 3.125% for 30-Years
Estimated Total Project Cost	$2,244,600	$2,244,600	$2,244,600
Less Anticipated Grants in Aid	$0	$0	$0
Remaining Local Share	$2,244,600	$2,244,600	$2,244,600
Annual Payment to Capitalize Project (including principal and interest)	$122,050	$100,250	$116,375
Existing Sewer System Revenue	$92,676	$92,676	$92,676
Estimated % Increase in budget to fund project	132%	108%	126%
Current Single-Family Residential Annual Sewer Rate	$330	$330	$330
Funding Source Target Sewer Rate	N/A	$1,288	$939
Estimated new sewer rate for Single-Family Residential	$765	$687	$745

Notes:
1. Total project costs are shown previously in Table 6-2.
2. Total existing revenue is based on estimated 2024 revenue.
3. Other capital projects are not included and the total rate increase may differ from the amount estimated for this project.

As shown, a rate increase is necessary to fund the debt costs associated with the improvements using any of the funding options. Sewer rates in Danville are low so the estimated new rate for a typical single-family household would not qualify the project for grant funds or loan forgiveness based on the required rate increase to fund the project. The lowest rate increase and total project cost with interest option for the Town would be to pursue funding through the CWSRF loan program.

7 CONCLUSIONS AND RECOMMENDATIONS

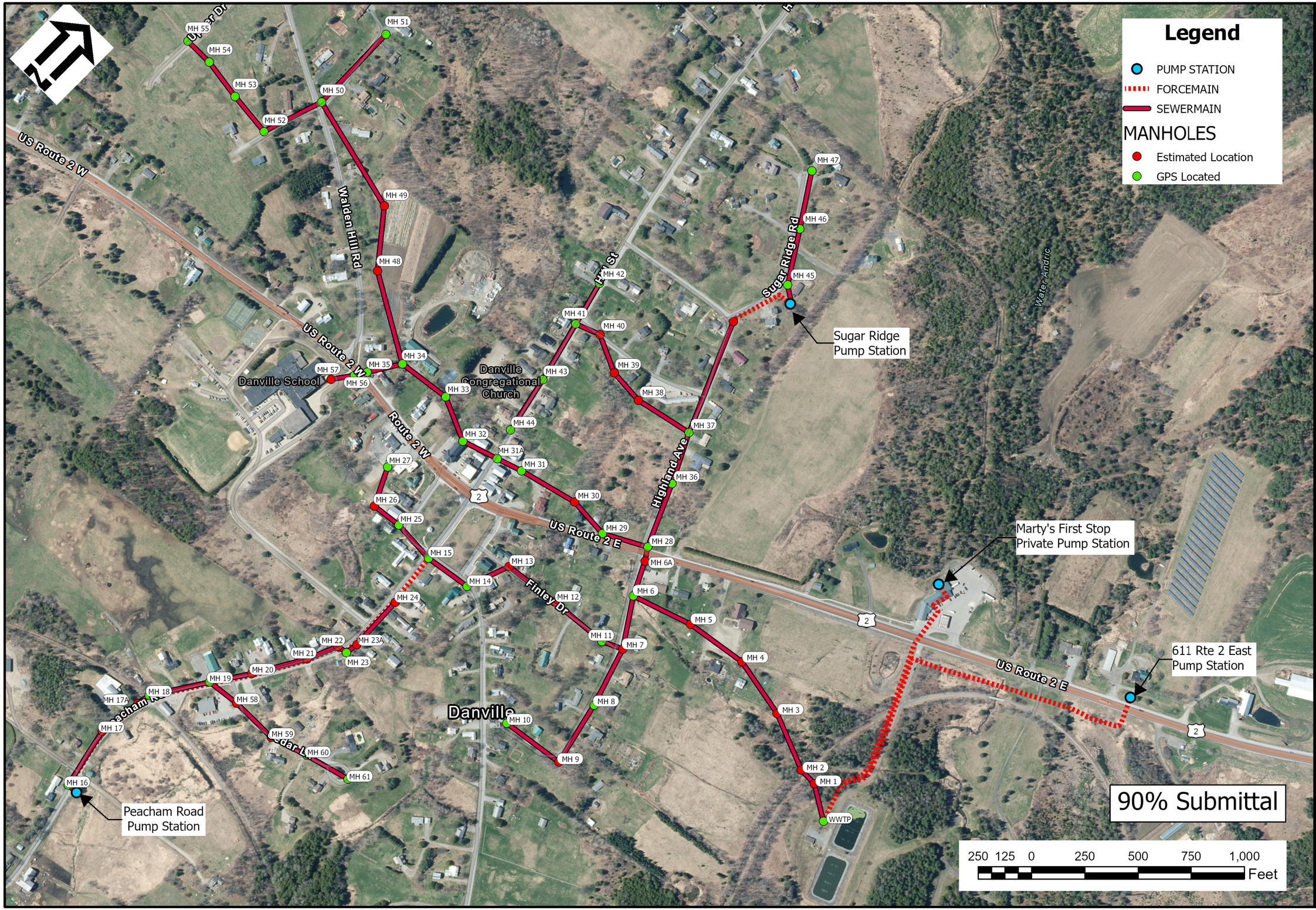
The Danville Wastewater Treatment Facility has functioned well, meeting permit limits since construction. However, due to the sensitivity of the receiving water, there are times when this becomes difficult, and effluent must be stored until conditions change in the receiving water that allow treated wastewater to be discharged.

Anticipated future permit limits and aging infrastructure resulted in the development of this report to best prepare the Danville Wastewater Treatment Facility to continue to provide adequate treatment and protect water quality. The condition of existing infrastructure and anticipated future permit limits were reviewed through the development of this report to determine the best alternative.

The recommended improvements to the Danville Wastewater System include:

- Collection System Improvements
  - Equipment replacement and upgrades at the Railroad Street Pump Station
  - Equipment replacement and upgrades at the Sugar Ridge Pump Station
- Treatment Facility Improvements
  - Sludge removal.
  - Installation of a cover and upgraded mixing in Lagoon #1 and a polishing reactor with option to add baffles to Lagoon # 2 with chemical injection for additional phosphorus removal to meet future permit limits.
  - Upgrades to the existing UV system.
  - Mechanical and electrical upgrades.
  - Generator installation.

APPENDIX A - WASTEWATER SYSTEM MAP



DUFRESNE GROUP
CONSULTING ENGINEERS
481 Summer Street, Suite 8
St. Johnsbury, Vermont 05819
Tel: (802) 748-8605
E-mail: info@dufresnegroup.com
Home page: http://www.dufresnegroup.com

Project #	3123007
Project Mgr.	AJD
Design	AJD
Checked by	AJD
Date	OCTOBER 17, 2024
Scale	AS SHOWN
Approved by	AJD

FIGURE 1
EXISTING WASTEWATER COLLECTION MAP
DANVILLE, VERMONT

FIG 1

DWG NO		Date	
SHEET	1	OF	1

APPENDIX B - ENVIRONMENTAL INFORMATION DOCUMENT (EID)

VERMONT
ENVIRONMENTAL CONSERVATION

EnvRep-103

Appendix H

Water Investment Division

Environmental Information Document
and Environmental Report

Project Name Danville Wastewater Treatment Plant Preliminary Engineering Report

Project Owner Town of Danville Address PO Box 183, Danville, VT 05828

Project Location Danville, VT

Drinking Water System Name _____ WSID No._____

State Assigned Drinking Water Revolving Loan (DWSRF) Number RF3-_____

Wastewater and/or Stormwater System Name Danville Wastewater System

List Existing Permit Numbers: 3-1235

State Assigned Clean Water Revolving Loan (CWSRF) Number RF1-346

All Projects: USEPA Grant (STAG) Number_____

Federal Fiscal Years (s) of USEPA Grant Appropriation _____

Applicants are strongly encouraged to consult early and frequently with our staff to ensure that all environmental issues are described, evaluated, and impacts appropriately considered and mitigated, in order to expedite the application process and SRF review and approval of a proposed project

SRF design review staff will independently evaluate and verify accuracy of information supplied in the project environmental report, and issue the CATEX, FONSI or ROD determination.

If an SRF determination is made that an Environmental Assessment or an Environmental Impact Statement is required, for projects with a greater complexity of impacts and mitigation, the SRF staff will be responsible for initiating the preparation of this document internally or by a third party.

The EIS will result in a Record of Decision determination, instead of a CATEX or FONSI.

Through a memorandum of understanding between United States Department of Agriculture-Rural Development and the Vermont Agency of Natural Resources, this environmental report format is acceptable to both funding agencies.

Please note that Environmental Review Determination eligibility, public comment, and public notice requirements may differ among the funding agencies.

Provide the “need of project” statement:	The Danville Wastewater Treatment Facility and Pump Stations have not been evaluated in nearly 20 years.
Provide the “purpose of project” statement:	Planning needs to begin to address upgrades necessary to maintain existing levels of treatment and to plan for future permit limits.
Provide a brief description of the project scope and design as detailed in the Preliminary Engineering Report:	Evaluate the existing wastewater treatment facility and pump stations against current and anticipated future needs and recommend improvements.
Highlight the project features that will likely have an environmental impact or impact to historical resources or involve environmental justice issues. The level of project detail should be in keeping with the scope and magnitude of the construction project.	None anticipated. All improvements are planned within the limits of the existing facility in previously disturbed areas.

Program Loan	Information Request	YES	NO	WID
Projects requiring **no** Mitigation measures will qualify to proceed with a Categorical Exclusion (CATEX) process. Projects requiring Mitigation may qualify for a Finding of No Significant Impact (FONSI).				
CWSRF and DWSRF	Is the Project likely to have no or very minimal effects?	◉	○	☐
CWSRF and DWSRF	Does the project require mitigation measures?	○	◉	☐
CWSRF and DWSRF	Does the authorized project representative make a written request for a Categorical Exclusion, for Projects likely to have no or very minimal effects (included)?	◉	○	☐
Projects of greater complexity and impact will require an Environmental Impact Statement (EIS) and result in a Record of Decision (ROD)				
CWSRF and DWSRF	Does the project involve greater complexity and impact or controversy[1]?	○	◉	☐
CWSRF and DWSRF	Attach ***additional information*** such as a qualified consultant assessment or determination letters, permits from regulatory authorities, and mapping	○	○	☐
Projects limited to the existing footprint of a building (e.g., a UV disinfection project)				
CWSRF and DWSRF	No Impact Certification Statement, submitted?	◉	○	☐
CWSRF and DWSRF	The project is restricted to the footprint of the existing building:	◉	○	☐
Project Scope				
DWSRF	Will the project expand capacity to serve more than 500 additional users or a 30% increase in the existing population, whichever is greater?	○	◉	☐
CWSRF	Will the project increase hydraulic (flow) treatment capacity by more than 20%	○	◉	☐
CWSRF	Percent increase in hydraulic capacity	0%		
CWSRF	Will the project increase influent 5-day biochemical oxygen demand (BOD5) organic treatment capacity by more than 30% ?	○	◉	☐
CWSRF	Percent increase in BOD5 capacity	0%		☐
CWSRF	Existing hydraulic capacities		gal.	☐
CWSRF	Existing organic capacities		mg/l	☐
CWSRF	Proposed hydraulic capacities		gal.	☐
CWSRF	Proposed organic capacities		mg/l	☐
Sole Source Aquifer				
DWSRF and CWSRF	Will the project take place in an area designated by the Environmental Protection Agency as a "Sole Source Aquifer"?	○	◉	☐
New Project Features				
DWSRF	Does the project call for a jurisdictionally new withdrawal of groundwater or of surface water (10 V.S.A. § 1042(b))?	○	◉	☐
CWSRF	Does the project include a new discharge to surface water or groundwater?	○	◉	☐
DWSRF	Will the project result in a 30% increase in groundwater or surface water withdrawal at an existing site?	○	◉	☐
DWSRF	Percent increase in groundwater/surface water withdrawal			☐
Mitigation				
DWSRF and CWSRF	Do you believe your project qualifies for a Categorical Exclusion in accordance with the Environmental Review Procedures for projects funded through the Vermont/EPA Drinking Water Revolving Loan Program and/or the Vermont/EPA Clean Water Revolving Loan Program, based on the environmental information and documentation, presented in the attached form?	◉	○	☐
DWSRF and CWSRF	With your applicant's signature below, do you request a Categorical Exclusion for your project?	◉	○	☐
DWSRF and CWSRF	If "No" above (Not a CATEX project), you must fill out all affected environmental and historical considerations below. If you answer "Yes" you will also need to provide the mitigation measures or an alternative action plan			

[1] Environmental controversy. Controversy includes not only scientific disagreement about the mitigation's effectiveness, but also public interest or debate. Controversy is an unresolved group opposition, disagreement or concern to the proposed project within the affected community

WID

1. Environmental Justice Considerations

Considerations	Yes or No	Basis for Determination and Documentation	
The WID uses this form to establish compliance with NEPA requirements. The WID determination of NEPA compliance does not extend to other permitting by other agencies. The intention of the WID review/determination is to establish that the project development takes into account all direct and indirect aggregated environmental impacts of the project.			
Sensitive Communities include persons who: may have reduced mobility; persons who reside in hospitals, nursing homes, convalescent homes, intermediate care facilities, board and care facilities, and retirement service centers; communities disenfranchised due to economic condition; communities disenfranchised by minority status, such as ethnic, religious, race, color or sexual identity. Sensitive communities includes children and elderly individuals within each of the definitions above.			
Will the project adversely affect a sensitive population? Present a map produced using the online EJSCREEN tool, showing the project perimeter.	○ ◉	EJ Screen Community Report Attached.	☐
Will the project affect sensitive populations? Project characteristics that may result in effects on sensitive populations include: Measures to avoid loss of life or injury during flood or storm events; construction or operation dust, odor or noise control measures; storage of hazardous chemicals in areas of sensitive communities; limitations on transportation access etc.	○ ◉		☐
Is the project known or expected to have a significant negative effect on the quality of the human environment? Consider the cumulative and also the long term effects of the project on the community. Provide a narrative of anticipated effects.	○ ◉	The improvements will be limited to existing areas of the treatment plants.	☐
Will the project contribute to significant changes to the socioeconomic makeup of the area?	○ ◉		☐
Is the project unaffordable? Provide an evaluation of the projected effect on user rates versus the affordability analysis.	○ ◉	See Preliminary Engineering Report for project affordability.	☐
Has the project undergone an alternatives analysis evaluating practicable alternatives to address the pollutant or pollutants of concern (Criterion 9 of Chapter 2)?	◉ ○		☐
Does the project implement the least cost alternative based upon a Life Cycle Cost Analysis (Criterion 9 of Chapter 2)?	◉ ○		☐
Does the project implement the least cost alternative of the Long-Term Cost Effectiveness Analysis per (Criterion 9 of Chapter 2)?	◉ ○		☐
Does the project impact an "existing use" contact recreational activity (on or after November 28, 1975) such as a swimming hole listed in a published Tactical Basin Plan?	○ ◉		☐

2. Cultural, Historic and Archaeological Resources

Considerations	Yes or No	Basis for Determination and Documentation	WID
Projects shall protect cultural, historical and archaeological resources as they are of value to the community. Qualified consultants will assist and coordinate with WID and SHPO staff in making determinations and concurring with project applicant.			
Historic Sites Act: Will the project adversely affect a federal [16 U.S.C. sec. 461-467, (1935)] historic site?	○ ◉	All improvements to take place within the boundaries of the existing wastewater treatment	☐
Will the project adversely affect a state Vermont historic preservation act historic site? (*Please include copies of the historic resources assessment or archeological reports and subsequent phases as needed. List the qualified consultant, agencies and groups consulted.)*	○ ◉	All improvements to take place within the boundaries of the existing wastewater treatment plant.	☐
National Historic Preservation Act [16 U.S.C. §470 et. seq. (1966)]: Will the project adversely affect historic buildings, over 50 years old, or listed in the National Register of Historic Places? https://www.nps.gov/subjects/nationalregister/database-research.htm Provide a list of any listed buildings, buildings over 50 years old, in the project area, and photos of each building, or a report by a qualified ACCD listed consultant.	○ ◉	All improvements to take place within the boundaries of the existing wastewater treatment plant.	☐
Vermont listed historic preservation resource: Will the project adversely affect a Vermont listed historic resource? https://accd.vermont.gov/historic-preservation/identifying-resources Provide a list of any listed buildings, buildings over 50 years old, in the project area, and photos of each building, or a report by a qualified ACCD listed consultant.	○ ◉	All improvements to take place within the boundaries of the existing wastewater treatment plant.	☐
Archaeological and Historic Preservation Act: Will the project adversely affect cultural resources? [16 U.S.C. §469a-1 (1974)] current 54 U.S.C. chapter 3125	○ ◉	All improvements to take place within the boundaries of the existing wastewater treatment plant in previously disturbed areas.	☐
Vermont archaeological and historic preservation: Does the project adversely affect a Vermont listed cultural archaeological or historic resource? https://accd.vermont.gov/historic-preservation/resources-rules https://accd.vermont.gov/historic-preservation/identifying-resources Provide documentation that the project perimeter has been evaluated for presence of these resources.	○ ◉		☐
Executive Order 11593: **Will the project adversely affect cultural resources** "Protection and Enhancement of the Cultural Environment" https://www.archives.gov/federal-register/codification/executive-order/11593.html	○ ◉		☐

3. Land Use

Considerations	Yes or No	Basis for Determination and Documentation	WID
Project applicant should identify related General Land Use features such as: a) Existing zoning ordinances, land use plans, development plans, etc.; b) Total land area required and/or proposed for purchase and the area that will be disturbed by construction for and operation of the proposed project; c) Current land uses in the area affected by the proposal, such as residential, commercial, agricultural, rangeland, forest land, recreational, etc; d) Compatibility of the proposed project with existing, if any: local, regional or state land use plans or controls; e) Any necessary mitigation measures.			
Does the project directly or indirectly adversely affect existing current land use? Provide mapping and information from local, regional, and state planning documents. Provide documentation of consultation with local and regional planning officials.	○ ◉	All improvements to take place within the boundaries of the existing wastewater treatment plant. CONTRIBUTOR EXPERIENCE	☐
Will the project convert federally classified Agricultural Soils to non-agricultural uses?	○ ◉	All improvements to take place within the boundaries of the existing wastewater treatment plant.	☐
Present a map showing the project along with Natural Resources Conservation Service (NRCS) soil classifications. [NRCS soil mapping survey]	○ ○	ANR Atlas map attached.	☐
Farmland Protection Policy Act; Present a completed AD-1006 Farmland Conversion Impact Rating form. [7 U.S.C. §4201 et. seq. (1981)]	○ ○		☐
Submit a determination by the federal Natural Resources Conservation Service List agencies and groups consulted.	○ ○		☐
Does the project involve new impacts to identified primary agricultural soils, that may require mitigation of such impacts, to comply with Vermont Statute Act 250 Criterion 9(B)? State primary agricultural soils are defined: [10 V.S.A. Section 6001(15)]	○ ◉	All improvements to take place within the boundaries of the existing wastewater treatment plant. ANR Atlas map attached.	☐
Refer to the online NRCS soil mapping survey and submit a map showing the project tract along with NRCS soil classifications [focused on rated Prime, Statewide, or Local soils of agricultural value group 1-7].	○ ○		☐
Provide a pre-application review letter from the Vermont Agency of Agriculture, Food & Markets.	○ ○		☐
If offsite mitigation is anticipated to be proposed, please review the online "Fee Memo" indicating the current year estimated cost of offsite farmland mitigation acres (subject to annual revision), to present an estimated fee. Please note that all mitigation is subject to approval by the District Commission, and a proposed use of off-site mitigation outside a designated area would be subject to the Commission's findings as to appropriate circumstances. See 10 V.S.A. Section 6093.	○ ○	Estimate Mitigation Fee $ 0.00	☐
Is Land Use and Development review and approval under Act 250 necessary? Attach a copy of the ANR Project Review Sheet, or Permit Navigator output, including the District Environmental Commission determination on Act 250 permit requirements. *List agencies and groups consulted.*	○ ◉	See attached correspondence from the Act 250 District Coordinator.	☐

			WID
Does the project contribute to sprawl growth outside of Designated Growth Centers? Present a map showing the project in relation to the Designated Growth Center. Attach copies of the Town Plan. Discuss using the Growth Center and Growth Management Document. List agencies and groups consulted.	○ ◉ ○ ○ ○ ○	Project does not increase service area or capacity of existing facility.	☐ ☐ ☐
Will the project cause other significant environmental impacts, including secondary impacts? List agencies and groups consulted.	○ ◉	Contributor Experience: Project will result in improved water quality discharges from the treatment facility.	☐
Does the project alter or affect Formally Classified Lands (properties that are administered by either Federal, State, or local agencies)? Present a project area map, identifying each of the administered lands, from resources below as applicable. Federally Administered: Federal Tribal Lands BIA (download geospatial data) Surface Management Agency DoI (downloadable polygon) U.S. Forest Service (USFS) U.S. National Park Service (NPS) Nationwide Rivers Inventory Nat. Bureau Land Management BLM National Parks Conservation Association US Wildlife Refuges (USFWS) State and local land management and planning agencies: parks, and other state-owned and state administered lands (State Game Refuges, State Conservation Camps, State Fishing Access Areas, State Wildlife Management Areas etc.)	○ ◉ ○ ○	Project is wholly located on Town owned land.	☐

4. Intergovernmental Review of Federal Programs

Considerations	Yes or No	Basis for Determination and Documentation	
Does the project coordinate local government concerns in the review of proposed Federal financial assistance and direct Federal development? Executive Order 12372, Intergovernmental Review of Federal Programs	◉ ○	Private projects must present a letter of municipal support. For Municipal projects check Yes.	☐

5. Wetlands, floodplains, coastal zones, wild and scenic rivers

Considerations	Yes or No	Basis for Determination and Documentation	
A qualified wetland professional is responsible for mapping lands meeting the definition of a wetland and its buffer area, to ensure proper continued function. The project applicant must demonstrate viability of the project without deterioration of wetland function.			
Will there be construction in a wetland or wetland buffer? Executive Order 11990, "Protection of Wetlands;" as amended by Executive Order No. 12608 (1997) A wetland buffer perimeter compliant with Vermont Wetland Rules applies A qualified consultant's assessment and/or the regulatory authority's determination must be attached for any construction in wetlands.	○ ◉	All construction will occur within the existing facility boundaries. ANR Atlas map attached.	☐

For any new construction please provide the wetlands classification delineation. List agencies and groups consulted. Indicate if a State permit or US Army Corps of Engineers permit is required. Qualified consultants are listed at: https://dec.vermont.gov/watershed/wetlands/what/id/wetland-consultant-list Present a printout of the map for the project location using: https://anrmaps.vermont.gov/websites/WetlandProjects/default.html The map should show the perimeter of the project, the wetlands in the project area and their corresponding **buffer zone**.	○	○	☐
Floodplain and Floodway hazard considerations. A detailed description of floodplain construction and a qualified consultant's assessment and/or the regulatory authority's determination must be attached. Show locations of all utility infrastructure on the Flood Insurance Rate Map (FIRM). Flood map available from Flood Insurance Rate Map. Refer to the SRF Guidance Document 37 on Floodplain management for additional information. **Caution**: ANR ATLAS (floodready) contains digital DFIRM mapping for 6 of the 14 Vermont counties: (Bennington, Chittenden, Rutland, Washington, Windham and Windsor County) and seven communities: (Bradford Village, Hardwick, Jay, Montgomery, Newbury, Stowe, and Wolcott). "About half of the flood hazard data in Vermont has been officially digitized". **Note:** TR-16 and other standard require that Critical Infrastructure is expected to be protected from a 500-year flood event. List agencies and groups consulted. All projects must comply with EO 11988 as amended by EO 13690 and reinstated by EO 14030.			
Will the project involve construction in a floodway? Publicly funded infrastructure should not be located within the floodway. Linear projects may have to cross a floodway but must be vertically located sufficiently above or below to avoid impacts. Include floodway boundaries on site plans and profiles.	○	◉	ANR Atlas map attached. ☐
Will the project involve construction in a 100-year floodplain? Executive Order 11988, "Floodplain Management," as amended by Executive Order 12148 (1979) Publicly funded infrastructure should not be located within the 100-year floodplain. Linear projects may have to cross a 100-year floodplain, but must be vertically located sufficiently above or below to avoid impacts. All efforts to be made to locate critical infrastructure outside of floodplains to avoid impacts, however where unavoidable infrastructure shall be protected in accordance with the Executive Order and accepted standards. Include 100-year floodplain boundaries on site plans and profiles. Consult state guidance documents: https://floodtraining.vermont.gov/sites/floodtraining/files/documents/Accessory-Structures-Checklist.pdf	○	◉	☐
Will the project involve construction in a 500 year floodplain? Publicly funded infrastructure should not be located within the 500-year floodplain (24 CFR §55.2(3)(i)&(4)). Linear projects may have to cross a 500-year floodplain, but may be vertically located sufficiently above or below to avoid impacts. All efforts to be made to locate critical infrastructure outside of floodplains to avoid impacts, however where unavoidable infrastructure shall be protected in accordance with accepted	○	◉	☐

standards. Include 500-year floodplain boundaries on site plans and profiles.			WID
Will the project involve construction in a Vermont River Corridor? Provide a map created using the River Corridor layer of the ANR ATLAS, showing the perimeter of the project. Publicly funded infrastructure should not be located in the river corridor, as defined by the Vermont "Flood Hazard Area and River Corridor Protection Procedure" wherever practicable.	○ ◉		☐
Is a local zoning permit required for work in the flood hazard zone? Present copies of correspondence with local zoning official.	○ ◉	N/A	☐
Does the project require a hydraulic hydrologic study to comply with Act 250 Criterion 1(D)? Attach the hydraulic study as an appendix to the application.	○ ◉		☐
Coastal Zone Management Act; [16 U.S.C. § 1451 et. seq. (1972)] Vermont does not participate in the Coastal Zone Management program.	NO ○		☐
Coastal Barriers Resources Act; [16 U.S.C. §3501 et. seq. (1982)] Vermont waters are not affected by tidal action, therefore the Coastal Barrier Resource Act of 1982 does not apply.	NO ◉		☐
Will the project impact a wild, scenic or recreational river area and create conditions inconsistent with the character of the river? Discuss if the project is within a quarter-mile of a river on the National Park Service's Nationwide Rivers Inventory. A listing of rivers on the Nationwide Rivers Inventory is available at: Wild and Scenic Rivers Act; [16 U.S.C. §1271 et. seq. (1968)] *List agencies and groups consulted.*	○ ◉		☐
Will the project involve construction in a stream? A qualified consultant's assessment and/or the regulatory authority's permit for stream alteration determination must be attached for construction in streams. List agencies and groups consulted.	○ ◉		☐
Will the project involve: directional drilling under a stream, or an aerial crossing over a stream? Explain how the project was designed to address flood resiliency. List agencies and groups consulted (VTDEC Rivers Program, VTRANS).	○ ◉		☐
Does the project involve earthen impoundment of more than 500,000 CF (4 MG) of wastewater (Vermont Dam Safety Rule §37-108)? Explain if the impoundment is a Dam under the jurisdiction of the VT-ANR and what additional engineering and design standards apply.	○ ◉		☐

6. Fish and wildlife, and endangered species.

Considerations	Yes or No	Basis for Determination and Documentation	WID
The preservation of Vermont's natural fauna is an objective of all CWSRF funded projects. The EID related efforts should ensure that affected species are **not identified by name**, to protect their habitat.			
Will the project affect coastal fishing? Magnuson-Stevens Act (Rule at Fed. Reg. 85 FR 44220) and Essential Fish Habitat Consultation Process [as amended 16 U.S.C. §1801 et. seq (1996)]	No ◉	Vermont does not have Exclusive Economic Zones.	☐
Will the project: impound, divert, or otherwise control or modify the waters of any stream or body of water of the State? Fish and Wildlife Coordination Act [16 U.S.C. 661-667e (1934); as amended 1936, 1946, 1947, 1948, 1949, 1958, 1965] Identify the affected waters of the state. Provide citation and/or ANR Atlas map. Detail how many gallons will be impounded, what controls will be implemented, and the engineering and design standards applied, as well as any additional permiting, monitoring and reporting.	○ ◉		☐
Is the project likely to adversely affect birds covered by the Migratory Bird Treaty Act (MBTA) [(16 U.S.C. 703–712 (1918)]? All Vermont birds are listed and migratory and will affect consideration of proposed project designs. Involuntary "take" of birds should be identified in the project definition.	○ ◉	ANR Atlas map attached.	☐
Does the project affect an eagle habitat or nest? Bald and Golden Eagle Protection Act	○ ◉		☐
Is the project likely to adversely affect an federally endangered or threatened species? Endangered Species Act [16 U.S.C. §1531 et. seq. (1973)] *A qualified consultant's assessment and/or the regulatory authority's determination must be attached demonstrating compliance with US Fish & Wildlife guidance.* *List agencies and groups consulted. Submit IPaC summary.*	○ ◉	Do NOT name endangered species.- Contributor experience - No adverse affect anticipated - project will not involve construction in areas that provide habitat. Improvements are limited to the existing facility area. See attached determination from US F&W.	☐
Is the project likely to adversely affect a Vermont state listed rare, threatened or endangered species? https://legislature.vermont.gov/statutes/section/10/123/05406 *A qualified consultant's assessment and/or the regulatory authority's determination must be attached*	○ ◉	Do NOT name endangered species.- No rare, threatened or endangered species in project area. Seen ANR Atlas map attached.	☐
Is the project likely to adversely affect an ubiquitous statewide bat population? (area of tree removal) *VTrans Ind Bat and Northern Long Eared Tree Cutting Guidance by Region.pdf (vermont.gov)*	○ ◉	Do NOT name endangered species.-	☐
	○ ○		☐

7. Drinking water and Groundwater Protection

Considerations	Yes or No	Basis for Determination and Documentation	
Project Objectives shall safeguard the sources of drinking water and be protective of the groundwaters of the state, which are held in public trust. The Safe Drinking Water Act - 42 U.S.C. 300f et. seq. as amended in 1976, 1986, and 1996, and the State of Vermont Groundwater Protection Rules provide a framework for these objectives.			WID
Are there Sole Source Aquifers in the project area? Present a map showing the project perimeter area using the EPA online map "EPA_Sole_Source_Aquifers": and indicate any "sole source aquifers". https://geopub.epa.gov/DWWidgetApp/	○ ◉	(As of August 2022, Vermont has no identified sole source aquifers).	☐
Will there be negative direct impacts to groundwater quality or quantity? Discuss positive and negatives impacts to nutrients, groundwater, existing drinking water supplies	○ ◉		☐
Subsurface Contamination and Constituents of Concern			
Has the desktop review of reasonably available information identified a need for a workplan submittal for approval by SMS to address recognized environmental conditions (RECs), contamination or suspected contamination? Links to guidance: 1) "**Linear Construction Projects Guidance** Document" for projects that take place within a public or private roadway, railroad, utility line, or rights-of-way (ROW). 2) "**Guidance For Construction of Public** Works Projects in Areas Where Contamination is Suspected or Known" 3) Resources: **ANR ATLAS** layers- Hazardous Sites, Hazardous Waste Generators, Brownfields, Salvage Yard, Aboveground Storage Tank, Underground Storage Tank. Additional ANR ATLAS layers: Dry Cleaners – verify, PFAS results – where known, Urban Soil Background Areas, Land use restrictions status, Others as needed	○ ◉	Summarize Findings: None, see attached map from ANR Atlas.	☐
4) Does the desktop review identify any potential **Emerging Contaminants**?	○ ◉	None, see attached map from ANR Atlas.	☐

8. Air Quality, Noise and Emissions

Considerations	Yes or No	Basis for Determination and Documentation	
Construction, related to the installation and upgrade of infrastructure, and operation of water and wastewater facilities can potentially have emissions and may be required to meet federal and state air emission thresholds. Air Quality - Clean Air Act, as amended in 1990. [42 U.S.C. §7401 et. seq.]			WID
Will there be any changes to air quality (VTDEC Air Control Regulations)?	○ ◉	Contributor Experience.	☐
Is an Air Pollution Control Permit required? Note: Emergency generators/pumps are only subject to limited requirements provided they are used strictly for emergency purposes (includes limited emergency demand response programs) and do not participate in peak shaving programs.	○ ◉	Contributor Experience.	☐
Will there be any changes in emissions?	○ ◉		☐
Is your digester unequipped and operated without a flare?	○ ◉	N/A	☐
Are there any other non-emergency combustion devices at your facility, including but not limited to: stationary internal combustion engines such as diesel generators/ pumps, boilers or space heaters greater than 3 million BTU, or combustion turbines and/or boilers?	○ ◉		☐
Will there be any changes in noise levels?	○ ◉		☐
Will there be any changes in atmospheric dust levels?	○ ◉		☐
Will there be any explosive dust generation?	○ ◉		☐
Will there be any odor generation?	○ ◉		☐

9. NEPA Related Considerations

Considerations	Yes or No	Basis for Determination and Documentation	WID
Project planning and development should consider both direct and indirect impacts of the project on archaeological, cultural, and environmental site features. These are further defined in the federal NEPA language.			
Is there a controversy[2] with respect to environmental effects of the project based on reasonable and substantial issues?	○ ◉		☐
Is the project significantly greater (requiring a new Act 250 permit, or permit amendment) in scope than normal projects for the area?	○ ◉		☐
Does the project have significant unusual characteristics (defined at 23 CFR 771.117 (b))?	○ ◉		☐
Does the project establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects (cumulative impact based on current information)?	○ ◉		☐
Does the project have significant adverse direct or indirect effects on federal or state parkland, other public lands, or areas of recognized Scenic or recreational value?	○ ◉		☐
Cumulative Impacts: Will the project cause other significant environmental impacts, including secondary impacts? *List agencies and groups consulted.*	○ ◉		☐
Will the project provide new drinking water facilities to serve a population greater than 2,000 persons, using population metrics consistent with the Public Water System regulatory program?	○ ◉	Current DW Population 37 New DW Population 23	☐

[2] Environmental controversy. Controversy includes not only scientific disagreement about the mitigation's effectiveness, but also public interest or debate. Controversy is an unresolved group opposition, disagreement or concern to the proposed project within the affected community.

10. Mitigation Measures and/or Alternative Plans of Action

Mitigation measures are applicable, to minimize adverse effects. Explain how mitigation measures will be achieved and monitored (Special Grant Condition or review of Plans and Specifications). Remember to consider structural and non-structural methods.	
Affected Environmental or Archeological Resources	**Mitigation Measures or Alternative Plan of Action**
A.)	
B.)	
C.)	
D.)	

Potential Mitigation Measure Decisions, must evaluate consider the following:
The adverse effect must have a **reasonable chance of occurring** in the foreseeable future; mitigation measures are only useful and appropriate when there is a compelling reason to address an identified impact. If an adverse effect has a low expectancy in the foreseeable future, mitigation is not likely necessary.
Mitigation measures must be **reasonable and enforceable**. There must be a reasonable expectation that the measure can be implemented and have the desired outcome.
The WID often relies on other federal state and local permitting entities to **monitor and enforce implementation**; environmental regulatory or natural resource agencies are technically in the best position to accomplish this. As much as possible, the WID will work with applicants to ensure mitigation follow-up. This may require a brief mitigation plan or need to be detailed in loan agreements.
Measures must balance the potential for impact on a resource and the resource's relative environmental value. Potential impacts on unique or scarce resources, for example, may require a strong mitigation measure (e.g. restrictive measure).

10. Mitigation Measures and/or Alternative Plans of Action continued

Mitigation measures are applicable, to minimize adverse effects. Explain how mitigation measures will be achieved and monitored (Special Grant Condition or review of Plans and Specifications). Remember to consider structural and non-structural methods.	
Affected Environmental or Archeological Resources	**Mitigation Measures or Alternative Plan of Action**
E.)	
F.)	
G.)	
H.)	

Potential Mitigation Measure Decisions, must evaluate consider the following:
The adverse effect must have a **reasonable chance of occurring** in the foreseeable future; mitigation measures are only useful and appropriate when there is a compelling reason to address an identified impact. If an adverse effect has a low expectancy in the foreseeable future, mitigation is not likely necessary.
Mitigation measures must be **reasonable and enforceable**. There must be a reasonable expectation that the measure can be implemented and have the desired outcome.
The WID often relies on other federal state and local permitting entities to **monitor and enforce implementation**; environmental regulatory or natural resource agencies are technically in the best position to accomplish this. As much as possible, the WID will work with applicants to ensure mitigation follow-up. This may require a brief mitigation plan or need to be detailed in loan agreements.
Measures must balance the potential for impact on a resource and the resource's relative environmental value. Potential impacts on unique or scarce resources, for example, may require a strong mitigation measure (e.g. restrictive measure).

Andrea Day, PE	10/10/24	Project Engineer
Prepared By	Date	Title
Reviewed By	Date	Authorized Representative

*Basis for Determination and Documentation

The basis for determination and documentation information must be traceable and establish the factual data to support the response to each question. Any environmental concerns that are raised by federal, state, or local agencies or the public must be addressed as completely as possible and resolved before the environmental report will be considered complete. All supporting documentation (e.g., correspondence and exhibits) should be attached and easily cross-referenced back into the main body of the environmental report. Types of information to be included in this column are outlined below.

1. FIELD OBSERVATION: A site visit that does not usually involve any testing or measurements. FIELD OBSERVATION is an important method for initial screening of the issues, but for some of the categories it may be inadequate for final evaluation. Support documentation should include date of the site visit and by whom.

2. PERSONAL CONTACT: Personal contacts are useful when the individual contacted is an accepted authority on the subject(s) and the interview is documented. Supporting documentation should include the name, organization, and title of the person contacted and the date of the conversation. *Copies of written site inspection reports and determinations by regulatory authorities on applicability of regulations and permit requirements should be attached*.

3. PRINTED MATERIALS: These are useful sources of detailed information, materials such as comprehensive land use plans, maps, statistical surveys, and studies. Information must be current, i.e., not so old that changing conditions make them irrelevant and must represent accepted methodologies. Citations for the material should include enough information so that an outside reviewer can locate the specific reference.

4. SPECIAL STUDY: This is a study conducted for an individual factor or resource, and should be performed by a qualified person using accepted methodologies. Some tests are relatively simple to perform but others may require elaborate equipment or personnel with additional expertise. The preparer is responsible for obtaining assistance from others in order to have the appropriate test or studies conducted. Copy of the study must be appended or referenced as for Printed Materials.

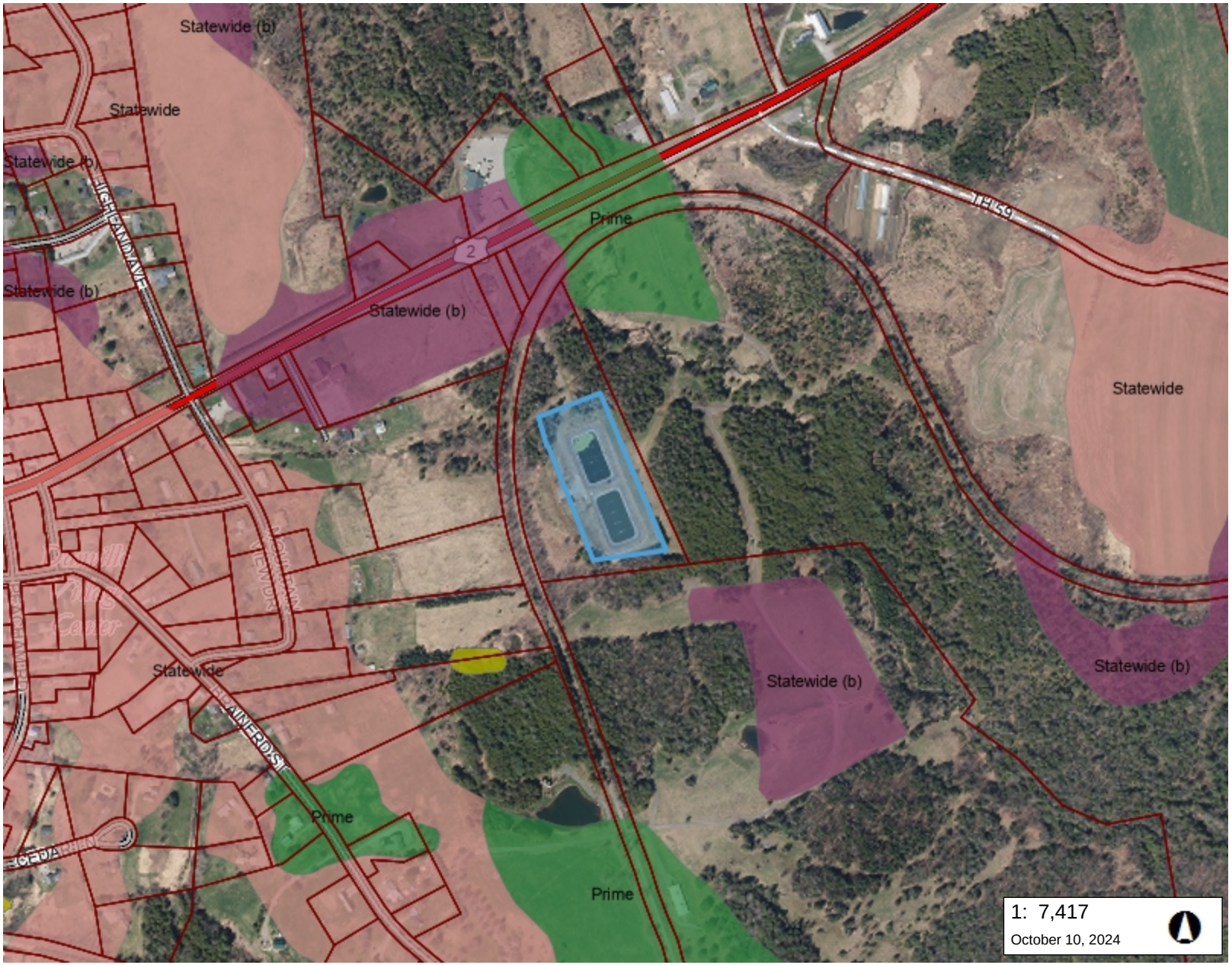
5. CONTRIBUTOR EXPERIENCE: The professional judgment of the persons contributing to this environmental report can be useful provided their expertise is relevant. The contributor may have previous knowledge from familiarity with the area, or may have professional background to make judgments about a specific factor. Provide information of the person's qualification in addition to name, organization and position.

SUBMIT

Danville Wastewater Treatment Facility

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Rare Threatened and Endange
  - RTE Animal
  - RTE Plant
- Indiana Bat Summer Range
  - Observed
  - Potential
- Wetland - VSWI
  - Class 1 Wetland
  - Class 2 Wetland
  - Wetland Buffer
- Soils - Primary Agricultural
  - Local
  - Local (b)
  - Not rated
  - Prime
  - Prime (b)
  - Prime (f)
  - Statewide
  - Statewide (a)
  - Statewide (b)
  - Statewide (c)
- Parcels (standardized)
- Roads
  - Interstate
  - US Highway; 1
  - State Highway
  - Town Highway (Class 1)

NOTES

Map created using ANR's Natural Resources Atlas

377.0 0 188.00 377.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 618 Ft. 1cm = 74 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

Project Area

1 mile Ring around the Area
Population: 445
Area in square miles: 3.43

LANGUAGES SPOKEN AT HOME

LANGUAGE	PERCENT
No language data available.	

COMMUNITY INFORMATION

- Low income: 20 percent
- People of color: 6 percent
- Less than high school education: 4 percent
- Limited English households: 0 percent
- Unemployment: 0 percent
- Persons with disabilities: 17 percent
- Male: 49 percent
- Female: 51 percent
- 83 years — Average life expectancy
- $47,814 — Per capita income
- Number of households: 190
- Owner occupied: 84 percent

BREAKDOWN BY RACE

- White: 94%
- Black: 0%
- American Indian: 0%
- Asian: 1%
- Hawaiian/Pacific Islander: 0%
- Other race: 0%
- Two or more races: 3%
- Hispanic: 1%

BREAKDOWN BY AGE

From Ages 1 to 4	5%
From Ages 1 to 18	20%
From Ages 18 and up	80%
From Ages 65 and up	23%

LIMITED ENGLISH SPEAKING BREAKDOWN

Speak Spanish	0%
Speak Other Indo-European Languages	0%
Speak Asian-Pacific Island Languages	0%
Speak Other Languages	0%

Notes: Numbers may not sum to totals due to rounding. Hispanic population can be of any race.
Source: U.S. Census Bureau, American Community Survey (ACS) 2018-2022. Life expectancy data comes from the Centers for Disease Control.

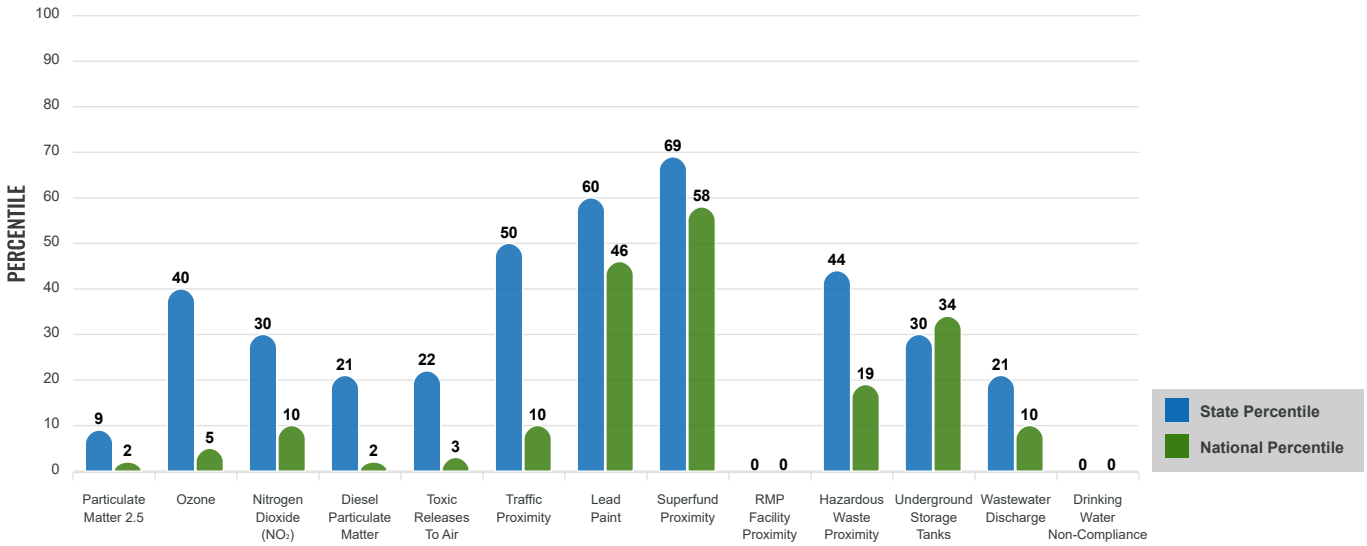
Environmental Justice & Supplemental Indexes

The environmental justice and supplemental indexes are a combination of environmental and socioeconomic information. There are thirteen EJ indexes and supplemental indexes in EJScreen reflecting the 13 environmental indicators. The indexes for a selected area are compared to those for all other locations in the state or nation. For more information and calculation details on the EJ and supplemental indexes, please visit the EJScreen website.

EJ INDEXES

The EJ indexes help users screen for potential EJ concerns. To do this, the EJ index combines data on low income and people of color populations with a single environmental indicator.

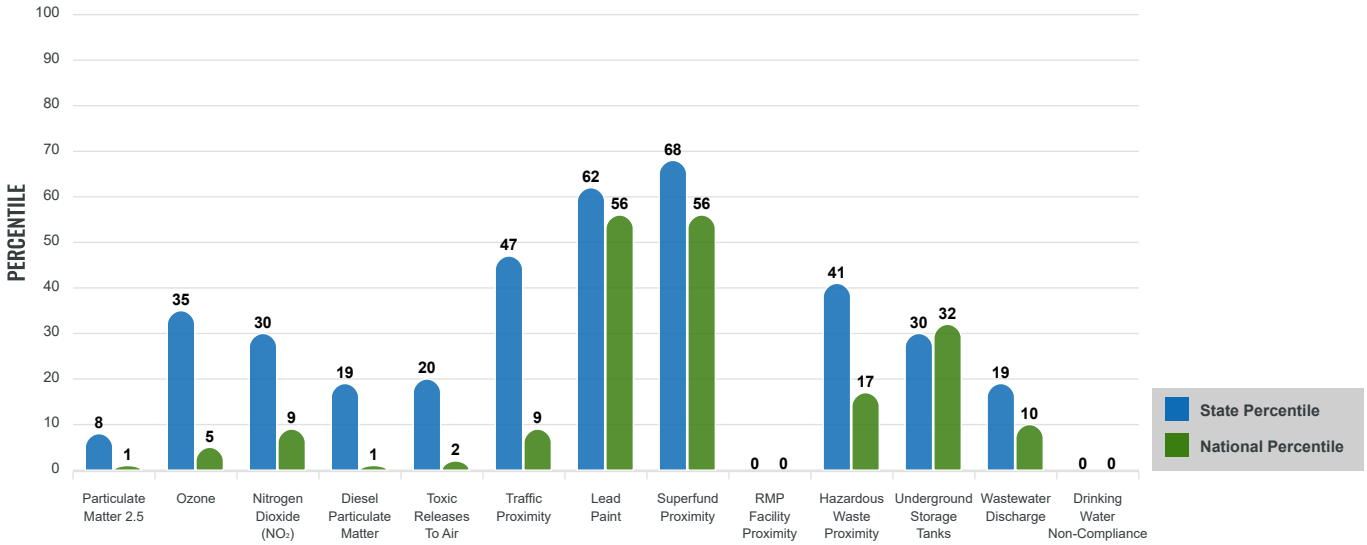
EJ INDEXES FOR THE SELECTED LOCATION



SUPPLEMENTAL INDEXES

The supplemental indexes offer a different perspective on community-level vulnerability. They combine data on percent low income, percent persons with disabilities, percent less than high school education, percent limited English speaking, and percent low life expectancy with a single environmental indicator.

SUPPLEMENTAL INDEXES FOR THE SELECTED LOCATION



Report for 1 mile Ring around the Area

Report produced October 10, 2024 using EJScreen Version 2.3

EJScreen Environmental and Socioeconomic Indicators Data

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA
ENVIRONMENTAL BURDEN INDICATORS					
Particulate Matter 2.5 ($\mu g/m^3$)	5.1	5.83	7	8.45	1
Ozone (ppb)	51.8	52.2	37	61.8	6
Nitrogen Dioxide (NO_2) (ppbv)	3.6	5	28	7.8	11
Diesel Particulate Matter ($\mu g/m^3$)	0.0302	0.0586	18	0.191	2
Toxic Releases to Air (toxicity-weighted concentration)	0.19	15	17	4,600	3
Traffic Proximity (daily traffic count/distance to road)	50,000	220,000	47	1,700,000	12
Lead Paint (% Pre-1960 Housing)	0.42	0.36	66	0.3	68
Superfund Proximity (site count/km distance)	0.036	0.18	66	0.39	56
RMP Facility Proximity (facility count/km distance)	0	0.13	0	0.57	0
Hazardous Waste Proximity (facility count/km distance)	0.091	0.89	38	3.5	17
Underground Storage Tanks (count/km^2)	0.12	3.9	27	3.6	34
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.0072	190	21	700000	10
Drinking Water Non-Compliance (points)	0	0.38	0	2.2	0
SOCIOECONOMIC INDICATORS					
Demographic Index USA	0.57	N/A	N/A	1.34	18
Supplemental Demographic Index USA	1.2	N/A	N/A	1.64	28
Demographic Index State	1.09	1.42	35	N/A	N/A
Supplemental Demographic Index State	1.24	1.48	37	N/A	N/A
People of Color	6%	8%	48	40%	14
Low Income	20%	26%	38	30%	38
Unemployment Rate	0%	4%	25	6%	23
Limited English Speaking Households	0%	1%	0	5%	0
Less Than High School Education	4%	6%	44	11%	31
Under Age 5	5%	4%	64	5%	52
Over Age 64	23%	21%	60	18%	74

*Diesel particulate matter index is from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

Sites reporting to EPA within defined area:

Superfund 0
Hazardous Waste, Treatment, Storage, and Disposal Facilities 0
Water Dischargers 2
Air Pollution 0
Brownfields 0
Toxic Release Inventory 0

Other community features within defined area:

Schools 1
Hospitals 0
Places of Worship 1

Other environmental data:

Air Non-attainment ..... No
Impaired Waters ..... No

Selected location contains American Indian Reservation Lands* ..... No
Selected location contains a "Justice40 (CEJST)" disadvantaged community ..... No
Selected location contains an EPA IRA disadvantaged community ..... No

Report for 1 mile Ring around the Area

Report produced October 10, 2024 using EJScreen Version 2.3

EJScreen Environmental and Socioeconomic Indicators Data

HEALTH INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Low Life Expectancy	15%	17%	31	20%	12
Heart Disease	5.9	5.7	51	5.8	54
Asthma	10.3	11	14	10.3	52
Cancer	8.2	7.2	81	6.4	86
Persons with Disabilities	16.6%	14.8%	72	13.7%	72

CLIMATE INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Flood Risk	15%	15%	56	12%	78
Wildfire Risk	0%	0%	0	14%	0

CRITICAL SERVICE GAPS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Broadband Internet	7%	15%	20	13%	37
Lack of Health Insurance	4%	4%	45	9%	25
Housing Burden	No	N/A	N/A	N/A	N/A
Transportation Access Burden	Yes	N/A	N/A	N/A	N/A
Food Desert	No	N/A	N/A	N/A	N/A

Report for 1 mile Ring around the Area

Report produced October 10, 2024 using EJScreen Version 2.3

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: 10/10/2024 14:30:20 UTC
Project code: 2025-0004279
Project Name: Danville Wastewater Treatment Facility Improvements

Subject: Consistency letter for the 'Danville Wastewater Treatment Facility Improvements' project under the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (NLEB).

To whom it may concern:

The U.S. Fish and Wildlife Service (Service) has received your request dated October 10, 2024 to verify that the **Danville Wastewater Treatment Facility Improvements** (Proposed Action) may rely on the amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion Opinion (dated March 23, 2023) for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat (PBO) to satisfy requirements under section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you provided (Project Description shown below), you have determined that the Proposed Action will have no effect on the endangered Indiana bat (*Myotis sodalis*) or the endangered northern long-eared bat (*Myotis septentrionalis*). If the Proposed Action is not modified, **no consultation is required for these two species.** If the Proposed Action is modified, or new information reveals that it may affect the Indiana bat and/or northern long-eared bat in a manner or to an extent not considered in the PBO, further review to conclude the requirements of ESA section 7(a)(2) may be required.

For Proposed Actions that include bridge/culvert or structure removal, replacement, and/or maintenance activities:
If your initial bridge/culvert or structure assessment failed to detect Indiana bats and/or NLEBs use or occupancy, yet later detected prior to, or during construction, please submit the Post Assessment Discovery of Bats at Bridge/Culvert or Structure Form (User Guide Appendix E) to this Service Office within 2 working days of the incident. In these instances, potential incidental take of Indiana bats and/or NLEBs may be exempted provided that the take is reported to the Service.

If the Proposed Action may affect any other federally-listed or proposed species and/or designated critical habitat, additional consultation between the lead Federal action agency and this Service Office is required. If the proposed action has the potential to take bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act may also be required. In either of these circumstances, please advise the lead Federal action agency accordingly.

The following species may occur in your project area and **are not** covered by this determination:

- Monarch Butterfly *Danaus plexippus* Candidate

PROJECT DESCRIPTION

The following project name and description was collected in IPaC as part of the endangered species review process.

NAME

Danville Wastewater Treatment Facility Improvements

DESCRIPTION

Upgrading the existing treatment facilities within the footprint of the existing plant. Construction anticipated 2026.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.41602655,-72.12462583306234,14z

DETERMINATION KEY RESULT

Based on the information you provided, you have determined that the Proposed Action will have no effect on the endangered Indiana bat and/or the endangered northern long-eared bat. Therefore, no consultation with the U.S. Fish and Wildlife Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended 16 U.S.C. 1531 *et seq.*) is required for these two species.

QUALIFICATION INTERVIEW

1. Is the project within the range of the Indiana bat[1]?

   [1] See Indiana bat species profile

   Automatically answered
   No

2. Is the project within the range of the northern long-eared bat[1]?

   [1] See northern long-eared bat species profile

   Automatically answered
   Yes

3. [Semantic] Does your proposed action intersect an area where Indiana bats and northern long-eared bats are not likely to occur?

   Automatically answered
   Yes

DETERMINATION KEY DESCRIPTION: FHWA, FRA, FTA PROGRAMMATIC CONSULTATION FOR TRANSPORTATION PROJECTS AFFECTING NLEB OR INDIANA BAT

This key was last updated in IPaC on October 30, 2023. Keys are subject to periodic revision.

This decision key is intended for projects/activities funded or authorized by the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and/or Federal Transit Administration (FTA), which may require consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act (ESA) for the endangered **Indiana bat** (*Myotis sodalis*) and the endangered **northern long-eared bat** (NLEB) (*Myotis septentrionalis*).

This decision key should only be used to verify project applicability with the Service's amended February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion (dated March 23, 2023) for Transportation Projects. The programmatic biological opinion covers limited transportation activities that may affect either bat species, and addresses situations that are both likely and not likely to adversely affect either bat species. This decision key will assist in identifying the effect of a specific project/activity and applicability of the programmatic consultation. The programmatic biological opinion is not intended to cover all types of transportation actions. Activities outside the scope of the programmatic biological opinion, or that may affect ESA-listed species other than the Indiana bat or NLEB, or any designated critical habitat, may require additional ESA Section 7 consultation.

IPAC USER CONTACT INFORMATION

Agency: Dufresne Group
Name: Andrea Day
Address: 56 Main Street Suite 200
City: Springfield
State: VT
Zip: 05156
Email aday@dufresnegroup.com
Phone: 8026742904

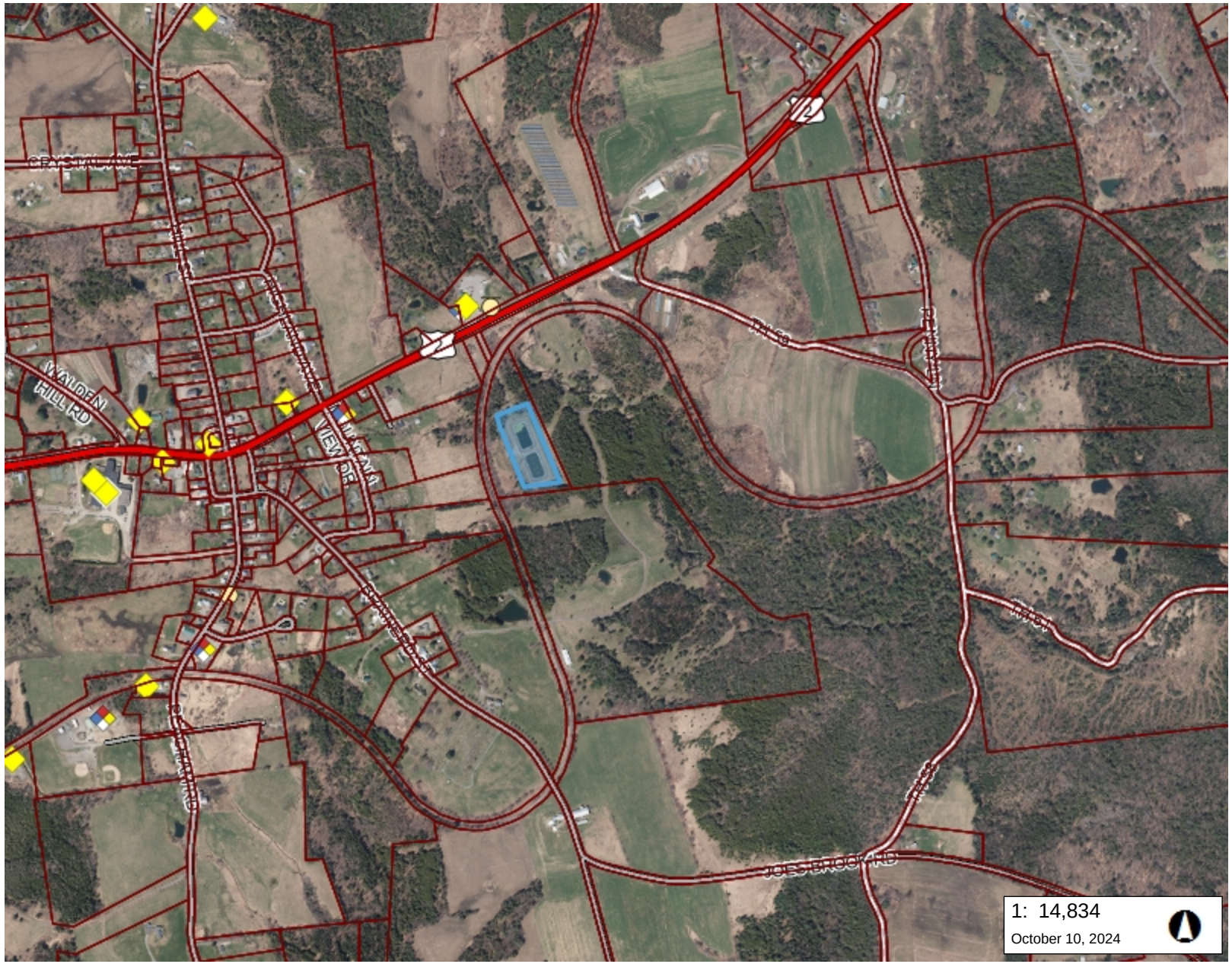
You have indicated that your project falls under or receives funding through the following special project authorities:

- BIPARTISAN INFRASTRUCTURE LAW (BIL) (OTHER)

Danville Wastewater Treatment Facility

Vermont Agency of Natural Resources

vermont.gov



LEGEND

PFAS Results (Waste Manage
- Hazsite, Non-Detect
- Hazsite, Below Standard
- Hazsite, Detected-No Standards
- Hazsite, Above Standard
- Residuals, Non-Detect
- Residuals, Below Standard
- Residuals, Detected-No Standards
- Residuals, Above Standard
- Solid Waste, Non-Detect
- Solid Waste, Below Standard
- Solid Waste, Detected-No Standarc
- Solid Waste, Above Standard
- Waste Water, Non Detect
- Waste Water, Below Standard
- Waste Water, Detected-No Standar
- Waste Water, Above Standard

Hazardous Site

Hazardous Waste Generators

Brownfields

Salvage Yard

Aboveground Storage Tank

Underground Storage Tank (w

Dry Cleaner

Parcels (standardized)

Roads
- Interstate
- US Highway 1

NOTES

Subsurface Contamination and Constituents of Concern

754.0 0 377.00 754.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1236 Ft. 1cm = 148 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

APPENDIX C - PUMP STATION INSPECTIONS

LARAMIE WATER RESOURCES LLC
Water and Wastewater System Operations

2024 Danville VT Sewer Pump Station Inspection

On October 7, 2024, representatives from H2O Innovations and Laramie Water Resources LLC performed pump station inspections on the 3 Danville VT Sewer pump stations listed below. Each pump was run to watch for signs of failure. Overall, the Danville VT Sewer Pump Stations are in "**Working**" Condition. I found each of these locations well maintained, clean, and mostly in proper working order. I have included the field reports on each station.

Railroad ST Pumping Station: The pump station is in **"Help Needed" Condition**. It is a submersible pump type station. The wet-well has minimal buildup of debris and grease. The Wet well measures 5' wide and 10' Long and is 8' deep with manhole riser sections. Each pump was removed from the wet well, disassembled, inspected, and reinstalled in the tank. Drawdown measurements were taken for each pump after inspection.

Pump #1; Myers WG50H-21-25 This pump is at the end of its useful life. Inspection found worn out cutters, extreme erosion of the castings in the volute and back plate, the impeller was partially plugged with debris but looked ok. The cutting ring was flipped over to try to utilize the sharper side more effectively. A drawdown test was performed. A 12" span was timed at 6.46 minutes with the pump running. There was no flow into the station during the drawdown time. This calculated at 58 GPM for pump #1. Amperage readings during the drawdown test were 25 and 23.2 this is well below the 32 FLA of the motor. The pump seemed to run smoothly with little vibration.

Pump #2; Myers WG50H-21 This is a new pump (customer spare) that we installed while onsite. We found that the existing pump that we replaced was running backwards due to an internal wiring failure. A drawdown test was performed. A 12" span was timed at 5.33 minutes with the pump running. There was no flow into the station during the drawdown time. This calculated at 70 GPM for pump #2. The amperage readings during the drawdown test were 25.2 and 23.1 this is well below the 32 FLA of the Motor. The pump runs smoothly with no vibration.

Guide Rail System; Old Style Myers Bottom plug base with pull out check valve. The guide rails at this station are Galvanized Iron and are showing heavy rust buildup at the waterline. The bases and rail guides are outdated and hard to use. The hold down clamps are set at a level as it requires a confined space entry to remove them. The overall condition of the system is at the end of its useful life and should be replaced.

Pump Controls: This station is controlled with a Siemens HydroRanger 200 ultrasonic level system. The Panel was a Pratt and Smith control panel built in 2013. Overall, the control panel is in good condition. All fuses, relays, and contacts are good and show no signs of arcing or heating. All indicator lights and switches seemed to be in working order except for the Pump 1 green running light. There are floats in the tank, but they do not seem to be connected to the panel. A Redundant float system should be considered. The panel is equipped with a Sigma Controls radio for monitoring and alarm notification. The operators noted that the radio system has given them trouble. A Cloud Based Cellular Monitoring system such as Sensaphone Sentinal may be a good fit.

Valves and Check Valves, The Ball Valves in the vault for this station seem to be functioning properly. The Check valves are the Myers Pull out style. The Check valves were disassembled, cleaned, and inspected. These check valves are at the end of their useful life. Pump 1 check valve rubber flapper was torn

Recommendations.

- **Replace Guide Rail Systems on both pumps to allow removal for Maintenance.**
- **Replace Pump #1**
- **Install Redundant Float system in case of HydroRanger failure.**
- **Remove the abandoned electrical junction boxes in the wet well.**

LARAMIE WATER RESOURCES LLC
Water and Wastewater System Operations

Sugar Ridge Development Pump Station: Pump station #2 is a submersible pump station. It is in **"Working" Condition**. The wet-well is estimated to be 5'x10' and 8' deep. The wet-well has a minimal buildup of debris. The Valve vault was flooded and was not inspected. The Pumps were not removed due to rail system condition and accessibility for crane truck. The ground was saturated due to rain and we did not want to cause ruts in the property owners lawn.

Pump #1; Goulds WS1512D4 The pump was operated and looked like it was pumping well. The water level in the tank did not allow for a drawdown test. The Pump seemed to run smoothly with little vibration.

Pump #2; Goulds WS1512D4 The pump was operated and looked like it was pumping well. The water level in the tank did not allow for a drawdown test. The Pump seemed to run smoothly with little vibration.

Rail System: The Rail system at this station is in poor condition. The Rails and Support structure is heavily corroded. The Lifting chains should not be trusted.

Valves and Check Valves: The check valves seem operational. It appears that one of them has been replaced at some point. The discharge pipe in the wet well is PVC. The Isolation valves were not operated due to flooded vault.

Pump Controls: This station is controlled with 4 floats. The control panel is basic but seems to do the job. There is only a local alarm light and buzzer to indicate trouble. All indicator lights and switches seemed to be in working order. A Cloud Based Cellular Monitoring system such as Sensaphone Sentinal may be a good fit.

Recommendations.

- **Replace Rail System and Base Elbows**
- **Eliminate Wet Well Junction Box for Floats (Recommend Kwik Switch Float system to match nursing home pump Station)**
- **Replace both check valves when rail system is replaced as it will require piping modification.**
- **Consider installing a Cloud Based Cellular Monitoring system such as Sensaphone Sentinal**

Nursing Home Pump Station: is in **"Excellent" Condition**. The wet-well has minimal buildup of grease. The wet-well is 4' x 8' concrete tank, with Manhole Risers. This Pump Station was upgraded in 2022

Pump #1; Barmesa BGP203DS grinder pump. Drawdown flow rate was measured. A 6" span was timed at 3.08 minutes giving us 39 GPM with the pump running. No inflow was observed during the test. The Amps during the test were 6.5, 7.7, 7.1 this is well below the FLA of 8.8 for the pump. The pump seemed to run smoothly with little vibration.

Pump #2; Barmesa BGP203DS grinder pump. Drawdown flow rate was measured. A 6" span was timed at 3.0 minutes giving us 40 GPM with the pump running. No inflow was observed during the test. The Amps during the test were 6.2, 6.9, 7.3,

this is well below the FLA of 8.8 for the pump. The pump seemed to run smoothly with little vibration.

Pump Controls: Barmesa 2HP Grinder Panel new in 2022. The panel is in Excellent Condition. All fuses, relays, and contacts are good and show no signs of arcing or heating. All indicator lights and switches are in working order. The system operates on a 4-float system. The Floats are a Kwik Switch and are in excellent condition. The panel has a local alarm light and buzzer for local alarm notification. A Cloud Based Cellular Monitoring system such as Sensaphone Sentinal may be a good fit.

Valves and Check Valves: The valves and check valves were replaced in 2022 and are in excellent condition. There is an air release valve on the force main.

Recommendations.

- **Consider installing a Cloud Based Cellular Monitoring system such as Sensaphone Sentinal.**

Summary.

The Danville VT Sewer pump stations are well maintained by the operators. There were no safety issues found at any of the locations. Locations are clean and professionally maintained. Access to the Sugar Ridge Development Pump Station and the Nursing Home Pump Station is limited and must be difficult to maintain in the winter. Consider adding access roads.

The Railroad ST Pump #1 should be a high priority for replacement.

APPENDIX D - MECHANICAL AND ELECTRICAL EVALUATION

Engineering Services of Vermont, LLC
Mechanical-Electrical Consulting Engineers

9 Washington Street
Rutland, Vermont 05701
802.855.8091

5430 Waterbury-Stowe Rd., 2nd Floor
Waterbury Center, VT 05677
802.882.8449

www.EngineeringVermont.com

Danville Wastewater Treatment Plant

Danville, Vermont
Mechanical, Electrical & Plumbing Systems Conditions Report

January 15, 2024

DIVISIONS 22/23 MECHANICAL & PLUMBING

1. General
    a. A site inspection was performed 12/13/2023 by Jerry L. Marshall, P.E., to inspect and evaluate the existing conditions, identify any deficiencies, and identify any potential opportunities to reduce operational costs.
    b. ESVT was provided with existing condition drawing dated May 1981 along with a Status and Condition of existing equipment dated 2022 from Dufresne Group.
2. Heating
    a. The U.V. Building is unheated, as all of the equipment in that space is in the Lower-Level Headworks & Disinfection space.
    b. The Maintenance Room in the operations building has a through the wall LP gas-fired empire heater that is aging but is still working.
    c. The Maintenance Room has an electric heater in the opposite corner of the room that exists and appears to be original. It is unclear if this heater is being used.
    d. The Office in the operations building has a through the wall LP gas-fired empire heater that is aging but is still working.
    e. The bathroom has a strip of electric resistance heating. It is unclear if this operational.
    f. <u>Recommendations</u>
        i. Thru the wall LP gas-fired heaters to remain.
        ii. New bathroom electric strip heater
            1. Magnitude of Cost - $500-$750
        iii. See below for discussion of adding a cold climate heat pump that can also be used for heating for the Office and Lab space.
            1. Magnitude of Cost – *See below*

3. Ventilation

a. The U.V. Building has an existing original centrifugal utility exhaust fan located in the Lower-Level with 14" diameter ductwork extended above grade with gooseneck and insect screen. The fan is original and is to be replaced with new. The exterior gooseneck is to be cleaned and painted with an exterior paint.

b. There are 2 associated make-up air intake 120V motorized dampers with connected 6"x18" ductwork that are wired to the exhaust fan starter. These are original and should be replaced with new.

c. The existing bathroom exhaust fan shall be removed and replaced with new 2-speed Panasonic exhaust fan that runs at low speed continuously and will ramp up to high speed when a switch is turned on.

d. There is a centrifugal upblast exhaust fan on the roof above the process pump/blower room. There is a cooling only thermostat that is to activate this exhaust fan if the room temperature achieves 90degF. There is an associated outdoor air intake with motorized damper that shall open when the exhaust fan is energized. This is system original and is to be replaced with new.

e. The process pump/blower room has a supplemental exhaust fan that "transfers" air from the process room to the adjacent office space if this room needs supplemental heat. It is unclear if this system is operational. Additionally there does not appear to be a ducted path to be able to recirculate that air back to the process room.

f. Recommendations

i. Replace the bathroom exhaust fan with a new Panasonic exhaust fan to run off a switch.
   1. Magnitude of cost - $750 - $1,000.

ii. New U.V. building exhaust fan and dampers.
   1. Magnitude of cost - $6,500-$7,000.

iii. New process room exhaust fan and 120v cooling only thermostat.
   1. Magnitude of cost - $4,500 - $6,000.

iv. Remove Process room transfer fan and all associated ductwork.
   1. Magnitude of cost - $1,000-$1,500.

4. Air Conditioning

a. The U.V. building has no air conditioning.

b. There is an existing air handling unit with DX coil, electric heating coil (noted on original drawings), outdoor air connection (with motorized damper), supply air distribution to the Lab and Office space, return air from the office space,

refrigeration liquid and suction lines and an associated outdoor condensing unit. Based on discussions with facilities, this appears to not be operating.

c. Recommendations

i. Replace the existing air handling unit and outdoor condensing unit with a cold climate outdoor heat pump and an associated indoor fan coil unit. This will provide HVAC for the Office and Lab space. Note: the existing through the wall LP gas-fired heater shall remain as a back-up.

1. Magnitude of cost - $10,500-$12,000.

5. Plumbing

a. The U.V. building has two plumbing wall hydrants which are original and appear that they are in working order.

b. The lab has sink with hot/cold faucet and vacuum breaker. This is in OK condition and shall remain.

c. The existing hot water heater is in poor condition and shall be replaced with new. The new water heater shall be a 50-gallon hybrid heat pump water heater with new isolation valves, check valves, thermostatic mixing valve, and all other accessories for a complete installation.

d. The existing lavatory and faucet shall be removed and replaced with a new wall mounted lavatory with concealed arm support, stainless steel stops, p-trap with insulation kit and sensor single hole faucet with ASSE mixing valve for temperature adjustment below.

e. The existing toilet shall be removed and replaced with new universal height, 1.28 gpf, handle on approach side with open front seat with soft close cover, waxless seal and johnnie bolts.

f. The existing shower shall be removed and replaced with new 36"x36" shower with new shower head, control valve and rough-in valve.

g. There is an existing hand- held eyewash mounted adjacent to the lab sink that should be replaced with new.

h. Recommendations

i. New hot water heater and accessories as defined above

1. Magnitude of cost - $4,500 - $5,500.

ii. Provide a new deck mounted swivel emergency eyewash with an ASSE 1071 thermostatic mixing valve.

1. Magnitude of cost - $1,850 - $2,500.

iii. New lavatory, water closet, shower as defined above.

1. Magnitude of cost - $6500 - $8,000.

DIVISIONS 26/27/28 ELECTRICAL

1. General

a. A site inspection was performed 12/13/2023 by Claus Bartenstein, P.E., to inspect and evaluate the existing conditions of the facility electrical power systems, identify any deficiencies, and identify any potential opportunities to reduce operational costs.

b. ESVT was provided with existing condition drawing dated May 1981 along with a Status and Condition of existing equipment dated 2022 from Dufresne Group.

2. Electrical Service and Distribution

a. Electrical service is 120/208V 3 phase, with wiring routed underground from a pole top bank of transformers terminating in a 225 Amp main circuit breaker panel. A 100 Amp sub-panel located in the garage is fed from the main panel.

b. Capacity of the electrical service is 81 KW. Peak demand for the building, as obtained from Green Mountain Power is reported to be 11 KW which equates to 31 Amp at 208V 3 phase.

c. The circuit breaker panels are aging. The main 225 Amp panel is a circuit breaker panelboard with motor starters for the two blowers integral to it. The panel is a product of FPE (Federal Pacific Electric). The circuit breaker panel in the garage is a standard main lug panelboard and is also FPE. FPE products have been found to be unreliable and the company was sold off decades ago after falsifying UL Listings of some of their equipment.

d. Blower #1 is powered through a separate variable frequency drive (VFD) and the motor starter in the main panel is abandoned with only the circuit breaker being used.

e. There is no generator providing back-up power for the building.

f. <u>Recommendations:</u>

   i. Replace both circuit breaker panels with new and provide a VFD for blower #2.

      1. Magnitude of Cost – $16,000 - $20,000.

   ii. Provide a 40KW stand-by power LP gas fired generator for the building including service rated automatic transfer switch.

      1. Magnitude of Cost - $66,000 to $75,000.

         a. Does not include LP gas, assumed to be provided by gas supplier.

3. General Power

a. Wiring methods generally appear appropriate for the different spaces in the facility.

b. Some of the raceways, couplings and supports in the lower levels of the Effluent (UV) Building are severely corroded to the point of disintegration.

c. Ground fault protection of receptacles is missing throughout the facility.

d. No service receptacle exists at the condensing unit.

e. There is no receptacle in the sampling hut requiring extension cords to be run from the Control building.

f. Recommendations

i. Repair/replace corroded raceways, couplings and supports in the Effluent Building. Inspect all electrical connections for corrosion and repair/replace as necessary.

1. Magnitude of Cost - $5,000 - $7,500.

ii. Replace standard receptacles with GFCI type, where necessary

1. Magnitude of Cost - $600 - $750

iii. Provide a service receptacle (GFCI, weather proof cover) at condensing unit.

1. Magnitude of Cost - $175 - $250

iv. Provide a receptacle (GFCI, weather proof cover) at sampling hut on dedicated circuit. Wiring routed underground to building.

1. Magnitude of Cost - $500 - $750

4. Lighting

a. The lighting systems are original to the circa 1980 construction and show their age. The luminaires are generally in fairly good condition. Interior luminaires are linear fluorescent, T-8 and T-12 lamps, mix of magnetic and electronic ballasts. Fluorescent and LED replacement lamps have been installed in lamp holders. Lighting controls are typically manual switches.

b. The lighting in the Effluent Building is enclosed and gasketed lamp holders. There are a few of these with the glass globe filled with water. *See photo to right.*

c. No exit signage exists in the building. All egress doors are required to be marked with internally illuminated signage, with battery power.

d. No emergency lighting exists in the building. The only space requiring emergency lighting is the space containing the main panel (blower room), per our Code review.

e. Exterior building mount luminaires are HID wall packs controlled via switch inside the building.

f. The Operators had relayed that it would be helpful to have motion sensor lights on the exterior of the building to illuminate the front of the building when they arrive after dark.

g. Recommendations

i. Replace all interior lighting with new LED light source luminaires. Provide automatic lighting controls in all spaces to meet the requirements of the State Energy Code.

1. Magnitude of Cost – $5,000 - $7,500

ii. Investigate and correct source of water in raceways serving the Effluent Building lighting and correct to eliminate water collection in the luminaires.

1. Magnitude of Cost - $1,000 - $2,500

iii. Provide internally illuminated exit signage at all egress doors.

1. Magnitude of Cost - $400 - $500

iv. Provide emergency lighting in the blower room.

1. Magnitude of Cost - $400 - $500.

v. Replace all exterior lighting with full cut-off, LED light source wall pack luminaires with integral photocells.

1. Magnitude of Cost – $500 - $750

vi. Provide motion sensor-controlled flood lighting to the front of the building.

1. Magnitude of Cost - $250 - $500

5. Process Alarm System

a. The Sensa Phone process alarm system is antiquated. The system calls out that there is an alarm, but the Operators do not know what the problem is, big or small, until they arrive on-site.

b. Recommendations

i. Complete replacement of the process alarm system to send signal offsite.

1. Magnitude of Cost - $10,000 to $15,000.

6. Telecommunications

a. There is no internet at the facility, presently. There is no cellphone service at this location. The Operators relayed that it would be much more efficient to perform their work with internet service and Wi-Fi in the building.

b. Recommendations

i. Provide internet access with present telecom service provider along with wireless access in the Control Building.

1. Magnitude of Cost - $250 - $350

APPENDIX E - NUTRIENT ANALYSIS

To: Andrea Day, Dufresne Group Consulting Engineers
From: Randy Bean, RAB Consulting & Services LLC
Date: September 30, 2024
RE: Danville Wastewater Treatment Facility Ammonia Assessment: ANR Comment Response

As discussed, I have reviewed the Agency of Natural Resources (ANR) comments on the Town of Danville Wastewater Treatment Facility Ammonia and Phosphorus Assessment dated May 30, 2024.

Based on the comments regarding total nitrogen ammonia (TAN), a significant amount of additional information was compiled regarding the discharge of (TAN) from the Danville Wastewater Treatment Facility (WWTF) to the Water Andric and the TAN assimilative capacity of the Water Andric was recalculated using pH of 8.3.

TAN and the Vermont Water Quality Standards (VWQS) Background

In 1998, the Environmental Protection Agency (EPA) issued ambient aquatic life water quality criteria for TAN. These criteria were quickly superseded by the updated 1999 TAN ambient aquatic life water quality criteria. The 2000 revision of Vermont Water Quality Standards (VWQS) which became effective on July 2, 2000, incorporated the 1999 EPA Ammonia criteria as instream water quality criteria in Vermont. The subsequent updates of the VWQS continued to incorporated the requirements of the 1999 Ammonia criteria. Then in 2013, EPA issued updated TAN ambient aquatic life water quality criteria. The 2014 revision of the VWQS (effective October 30, 2014) incorporated the updated EPA 2013 Ammonia criteria as instream water quality criteria in Vermont. Subsequent revisions of the VWQS have also incorporated the requirements of TAN 2013 criteria, including the November 15, 2022, version, which is currently in effect.

Based on the properties of the receiving waters and the size of wastewater treatment facility (WWTF) discharges, the requirements of the TAN ambient aquatic life water quality criteria have been incorporated into several NPDES Discharge Permits for municipal WWTFs issued by ANR since the TAN criteria became effective in Vermont in 2000.

As previously indicated, TAN impacts correlate with the pH and/or temperature of a receiving water. Receiving waters with higher instream pH or temperature are more sensitive to TAN impacts. Therefore, in colder climates the impacts of TAN are seasonal and must be assessed for summer and winter conditions. To properly assess the seasonal impacts of TAN, instream pH, instream temperature, and the seasonal flow variations must be used in deriving the TAN assimilative capacity of receiving water during the summer and winter seasons.

pH concerns and TAN Assessment

The May 30, 2024, TAN Assessment of the assimilative capacity of the Water Andric used a pH of 8.0 as a modeling input. This input variable was based on the pH used in the 2016 Reasonable Potential Analysis of the Water Andric conducted by ANR as part of the renewal of the September 28, 2016, Danville WWTF NPDES Discharge Permit which currently regulates this discharge. A pH of 8.0 is also the median pH value of the instream pH sampling done by ANR in the Water Andric. The Town has also sampled the pH of the Water Andric upstream and downstream of the WWTF discharge during the summer of several years beginning in 2018. The pH of these samples ranged from 6.95 to 7.7. Therefore, to be consistent with the previous Reasonable Potential Analysis done by ANR, the May 30, 2024, TAN Assessment used a pH of 8.0.

Comments were received that the highest pH value detected in the instream sampling was 8.27 and this pH value should be used in the assimilative capacity derivations to reflect worst case conditions. Consequently, the TAN assimilative capacity modeling in the Water Andric was redone for summer and winter conditions using a pH of 8.3.

Using a pH of 8.3 in the assimilative capacity model resulted in lowering the TAN assimilative capacity in the Water Andric for a 0.060 MGD discharge during summer conditions from 11.67 lbs/day to 6.28 lbs/day for acute conditions. At chronic conditions, the assimilative capacity for TAN was lowered from 2.51 lbs/day to 1.57 lbs/day. This correlates to effluent concentrations of 12.55 mg/l for acute conditions and 3.14 mg/l for chronic conditions for a 0.060 MGD discharge into the Water Andric

During winter conditions the assimilative capacity in the Water Andric for TAN was reduced from 42.02 lbs to 23.26 lbs/day for acute conditions, and from 13.51 lbs/day to 8.25 lbs/day for chronic conditions. This correlates to effluent concentrations of 46.49 mg/l for acute conditions and 16.5o mg/l for chronic conditions for a 0.060 MGD discharge into the Water Andric

Adequacy of Ammonia Data

Comments were received concerning the number of samples used for the analysis of the current TAN discharged from the Danville WWTF to the Water Andric. The May 30, 2024, TAN Assessment used effluent sampling data collected at the WWTF from January 2021 through March 2024 (37 samples) to assess the current discharge from the Danville WWTF.

To address this comment, TAN effluent data from 2017, 2018, 2019, and 2020 and recent data collected in 2024 was included in the Assessment. This resulted in a total of 90 TAN effluent samples. Since the TAN has seasonal impacts, the effluent data was split into summer and winter seasonal conditions. This resulted in 60 effluent samples being used to quantify the current discharge of TAN from the Danville WWTF during winter conditions and 30 samples to quantify the TAN being discharged during summer conditions.

Based on this expanded data set, for the entire study period, the average flow discharged from the Danville WWTF was 0.0351 MGD on the days when TAN sampling was conducted. Approximately 58% of the WWTF design capacity. The average TAN concentration discharged was 16.1 mg/l and the average mass loading discharged was 4.6 lbs. The TAN effluent concentration ranged from 0.5 mg/l to 40.0 mg/l and the TAN mass loading discharged ranged from 0.15 lbs to 10.55 lbs.

Since instream TAN impacts directly to water temperature and stream flow, the expanded data based was broken down into “seasonal data”. To reflect summer water temperatures and summer low flow conditions, the period of June through September was used as “summer conditions” (30 samples) and the period of October through May was used as “winter conditions” (60 samples).

During summer conditions, the average flow discharged from the Danville WWTF on days when TAN sampling was 0.0324 MGD. Approximately 54.5% of the design capacity of the WWTF. The average TAN concentration discharged was 15.6 mg/l and the average mass loading discharged was 4.2 lbs/day.

The effluent TAN concentration ranged from 2.9 mg/l to 30.0 mg/l. The TAN mass loading discharged ranged from 0.79 lbs to 12.01 lbs.

During winter conditions, the average flow discharged from the Danville WWTF on days when TAN sampling was 0.0369 MGD. Approximately 61.5% of the WWTF design capacity. The average TAN concentration discharged was 16.3 mg/l and the average mass loading discharged was 4.9 lbs/day. The effluent TAN concentration ranged from 0.5 mg/l to 40.0 mg/l. The TAN mass loading discharged ranged from 0.15 lbs to 9.47 lbs.

Conclusion, Regulatory & Design Ramifications

During the summer season (June through September) based on a pH of 8.3, an instream temperature of 25ºC, a 30Q10 stream flow of 0.74 CFS, and a 0.060 MGD discharge, the Water Andric has a "Water Quality Based" assimilative TAN capacity of 6.28 lbs/day, acute (daily maximum) and 1.57 lbs/day chronic (monthly average). This correlates to a "Water Quality Based" effluent concentration of 12.55 mg/l, daily maximum, and 3.14 mg/l, monthly average, for a 0.060 MGD discharge. (See attachment)

During the winter season (October through May) based on a pH of 8.3, an instream temperature between 0-7ºC, a 30Q10 stream flow of 1.3 CFS, and a 0.060 MGD discharge, the Water Andric has a "Water Quality Based" assimilative TAN capacity of 23.26 lbs/day, acute (daily maximum) and 8.25 lbs/day chronic (monthly average). This correlates to a "Water Quality Based" effluent concentration of 46.49 mg/l, daily maximum, and 16.5 mg/l, monthly average, for a 0.060 MGD discharge. (See attachment)

The current treatment technology (aerated lagoon) at the Danville WWTF is not designed to reliably treat and removal TAN.

Based on the TAN effluent data collected at the WWTF from January 2017 through July 2024 (see attachment), during summer conditions, the current discharge from the Danville WWTF does not reliably meet the instream acute TAN criteria mandated in the VWQS. Nor does it meet the chronic TAN criteria mandated by VWQS

Based on the TAN effluent data collected at the WWTF from January 2017 through July 2024, during winter conditions, the current discharge from the Danville WWTF does not reliably meet the instream chronic TAN criteria mandated by VWQS.

Therefore, TAN removal will need to be incorporated into the design of the refurbishment of the Danville WWTF to ensure compliance with the VWQS and to allow for the WWTF to accept additional connections and reach design flows. Per Section 29-A-106(a)(3) of the VWQS, the design and operation of the TAN treatment system must be "adequate and sufficiently reliable" to ensure compliance the VWQS and the effluent limitations established in the WWTF's discharge permit.

The WWTF effluent limitations must be within the TAN assimilative capacity of the Water Andric, and ensure compliance with the VWQS including Section 29-A-106(c) which specifically addresses assimilative capacity of a receiving water and the "Wasteload Allocation Process" which references

margins of safety for inputs from other sources (stormwater and agricultural runoff) in the watershed and future growth.

While the neither the VWQS, the Vermont Water Pollution Control Permit Regulations or the EPA ambient aquatic life water quality criteria for TAN mandate how permit effluent limits must be specified in NPDES Discharge Permits for TAN, since ANR is the delegated permitting authority, they have the discretion to establish either mass-based effluent limitations, concentrations based effluent limitations, or a combination of mass and concentrations based effluent limits.

However, mass based effluent limitations are preferrable since they provide assurance with compliance with the VWQS but also provide the WWTF with operational flexibility and reduced operating costs when the WWTF is discharging at less than design flows.

Danville WWTF Current Ammonia Loadings
January 2017 - July 2024

Sample Date	Flow (mgd)	Ammonia mg/l	Ammonia lbs/day
1/3/17	0.0353	14.0	4.12
2/5/17	0.028	14.0	3.27
3/7/17	0.0373	20.0	6.22
4/4/17	0.0482	11.0	4.42
5/2/17	0.0535	9.9	4.42
6/6/17	0.0345	10.0	2.88
7/4/17	0.0383	11.0	3.51
8/1/17	0.0366	11.0	3.36
9/5/17	0.0366	5.6	1.71
10/3/17	0.0219	5.2	0.95
11/7/17	0.0486	5.7	2.31
12/5/17	0.0332	8.8	2.44
1/2/18	0.0346	12.0	3.46
2/6/18	0.0282	19.0	4.47
3/6/18	0.033	14.0	3.85
4/3/18	0.0485	13.0	5.26
5/15/18	0.0549	3.2	1.47
6/5/18	0.0252	20.0	4.20
7/2/18	0.0327	21.0	5.73
8/7/18	0.0284	8.4	1.99
9/4/18	0.0238	2.9	0.58
10/2/18	0.0397	2.5	0.83
11/6/18	0.0522	9.4	4.09
12/4/18	0.0452	13.0	4.90
1/8/19	0.0383	19.0	6.07
2/5/19	0.0322	13.0	3.49
3/5/19	0.023	21.0	4.03
4/2/19	0.0433	14.0	5.06
5/7/19	0.0571	8.4	4.00
6/4/19	0.0575	8.1	3.88
7/2/19	0.0543	11.0	4.98
8/6/19	0.0238	16.0	3.18
9/2/19	0.0332	12.0	3.32
10/1/19	0.0275	9.1	2.09
11/12/19	0.0368	8.0	2.46
12/3/19	0.0291	11.0	2.67

Summer Ammonia Discharge (Jun - Sep)

Date	Flow	NH3 mg/l	NH3 lbs/day
6/6/17	0.0345	10.0	2.88
7/4/17	0.0383	11.0	3.51
8/1/17	0.0366	11.0	3.36
9/5/17	0.0366	5.6	1.71
6/5/18	0.0252	20.0	4.20
7/2/18	0.0327	21.0	5.73
8/7/18	0.0284	8.4	1.99
9/4/18	0.0238	2.9	0.58
6/4/19	0.0575	8.1	3.88
7/2/19	0.0543	11.0	4.98
8/6/19	0.0238	16.0	3.18
9/2/19	0.0332	12.0	3.32
6/2/20	0.019	9.7	1.54
7/7/20	0.076	9.4	5.96
8/4/20	0.0279	13.0	3.02
9/1/20	0.0145	13.0	1.57
6/1/21	0.0218	20.0	3.64
7/6/21	0.048	30.0	12.01
8/3/21	0.0324	9.0	2.43
9/7/21	0.0191	18.0	2.87
6/7/22	0.0282	17.0	4.00
7/5/22	0.022	24.0	4.40
8/2/22	0.005	19.0	0.79
9/6/22	0.0239	20.0	3.99
6/6/23	0.0527	24.0	10.55
7/6/23	0.042	23.0	8.06
8/1/23	0.0313	13.0	3.39
9/5/23	0.0103	12.0	1.03
6/10/24	0.029	29.0	7.01
7/9/24	0.044	27.0	9.91
Average	**0.0324 mgd**	**15.6 mg/l**	**4.2 lbs/day**

Winter Ammonia Discharge (Jan - May & Oct - Dec)

Date	Flow	NH3 mg/l	NH3 lbs/day
1/3/17	0.0353	14.0	4.12

				2/5/17	0.028	14.0	3.27
1/7/20	0.0284	16.0	3.79	3/7/17	0.0373	20.0	6.22
2/4/20	0.025	17.0	3.54	4/4/17	0.0482	11.0	4.42
3/3/20	0.0328	15.0	4.10	5/2/17	0.0535	9.9	4.42
4/7/20	0.0436	10.0	3.64	10/3/17	0.0219	5.2	0.95
5/5/20	0.0349	0.5	0.15	11/7/17	0.0486	5.7	2.31
6/2/20	0.019	9.7	1.54	12/5/17	0.0332	8.8	2.44
7/7/20	0.076	9.4	5.96	1/2/18	0.0346	12.0	3.46
8/4/20	0.0279	13.0	3.02	2/6/18	0.0282	19.0	4.47
9/1/20	0.0145	13.0	1.57	3/6/18	0.033	14.0	3.85
10/6/20	0.0368	20.0	6.14	4/3/18	0.0485	13.0	5.26
11/3/20	0.0435	15.0	5.44	5/15/18	0.0549	3.2	1.47
12/1/20	0.0428	17.0	6.07	10/2/18	0.0397	2.5	0.83
				11/6/18	0.0522	9.4	4.09
1/5/21	0.0342	22.0	6.28	12/4/18	0.0452	13.0	4.90
2/2/21	0.0238	18.0	3.57	1/8/19	0.0383	19.0	6.07
3/11/21	0.0289	18.0	4.34	2/5/19	0.0322	13.0	3.49
4/6/21	0.0414	14.0	4.83	3/5/19	0.023	21.0	4.03
5/4/21	0.0342	13.0	3.71	4/2/19	0.0433	14.0	5.06
6/1/21	0.0238	20.0	3.97	5/7/19	0.0571	8.4	4.00
7/6/21	0.0289	30.0	7.23	10/1/19	0.0275	9.1	2.09
8/3/21	0.0414	9.0	3.11	11/12/19	0.0368	8.0	2.46
9/7/21	0.0191	18.0	2.87	12/3/19	0.0291	11.0	2.67
10/5/21	0.0296	18.0	4.44	1/7/20	0.0284	16.0	3.79
11/3/21	0.0439	24.0	8.79	2/4/20	0.025	17.0	3.54
12/7/21	0.041	14.0	4.79	3/3/20	0.0328	15.0	4.10
				4/7/20	0.0436	10.0	3.64
1/22/22	0.0228	40.0	7.61	5/5/20	0.0349	0.5	0.15
2/1/22	0.0208	29.0	5.03	10/6/20	0.0368	20.0	6.14
3/1/22	0.0307	37.0	9.47	11/3/20	0.0435	15.0	5.44
4/5/22	0.043	20.0	7.17	12/1/20	0.0428	17.0	6.07
5/3/22	0.0361	14.0	4.22	3/11/21	0.0289	18.0	4.34
6/7/22	0.0282	17.0	4.00	4/6/21	0.0414	14.0	4.83
7/5/22	0.022	24.0	4.40	5/4/21	0.0342	13.0	3.71
8/2/22	0.005	19.0	0.79	10/5/21	0.0296	18.0	4.44
9/6/22	0.0239	20.0	3.99	11/3/21	0.0439	24.0	8.79
10/4/22	0.0344	21.0	6.02	12/7/21	0.041	14.0	4.79
11/2/22	0.0329	25.0	6.86	1/22/22	0.0228	40.0	7.61
12/7/22	0.0466	22.0	8.55	2/1/22	0.0208	29.0	5.03
				3/1/22	0.0307	37.0	9.47
1/4/23	0.0467	21.0	8.18	4/5/22	0.043	20.0	7.17
2/8/23	0.0276	23.0	5.29	5/3/22	0.0361	14.0	4.22
3/7/23	0.0275	25.0	5.73	10/4/22	0.0344	21.0	6.02
4/4/23	0.0314	23.0	6.02	11/2/22	0.0329	25.0	6.86

5/2/23	0.0363	17.0	5.15	12/7/22	0.0466	22.0	8.55
6/6/23	0.0527	24.0	10.55	1/4/23	0.0467	21.0	8.18
7/6/23	0.042	23.0	8.06	2/8/23	0.0276	23.0	5.29
8/1/23	0.0313	13.0	3.39	3/7/23	0.0275	25.0	5.73
9/5/23	0.0103	12.0	1.03	4/4/23	0.0314	23.0	6.02
10/3/23	0.0099	12.0	0.99	5/2/23	0.0363	17.0	5.15
11/1/23	n/s			10/3/23	0.0099	12.0	0.99
12/20/23	0.0476	23.0	9.13	11/1/23	n/s		
				12/20/23	0.0476	23.0	9.13
1/10/24	0.0503	19.0	7.97	1/10/24	0.0503	19.0	7.97
2/14/24	0.047	23.0	9.02	2/14/24	0.047	23.0	9.02
3/13/24	0.044	23.0	8.44	3/13/24	0.044	23.0	8.44
4/2/24	0.042	20.0	7.01	4/2/24	0.042	20.0	7.01
5/18/24	0.024	17.0	3.40	5/18/24	0.024	17.0	3.40
6/10/24	0.029	29.0	7.01	**Average**	**0.0369 mgd**	**16.3 mg/l**	**4.9 lbs/day**
7/9/24	0.044	27.0	9.91				
Average	**0.0351 mgd**	**16.1 mg/l**	**4.6 lbs/day**				

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AMMONIA CAPACITY ANALYSIS - WATER ANDRIC

Summer Conditions pH 8.3

Receiving Water: Water Andric Oncorhynchus present

Stream Flow CFS 30Q10 *0.740*
Proposed Discharge Effluent Flow MGD *0.060*
Instream Waste Concentration 0.112

Instream Ammonia Criteria from EPA 2013 Ammonia Criteria

Instream Acute Ammonia Criteria - pH & Temperature Based
Page 44 Table 5a

pH 8.3
Instream Temperature 25
CMC w/ Oncorhynchus ***1.4*** **mg/l**

Instream Chronic Ammonia Criteria - pH & Temperature Based
Page 49 Table 6

pH 8.3
Temperature 25
CCC ***0.35*** **mg/l**

Effluent Mass Discharge (lbs/day) to meet Instream Ammonia VWQS

Acute	Chronic	
6.28	***1.57***	**lbs/day**

Effluent Ammonia Concentration (mg/l) @ Proposed Flow (0.060 MGD)

Acute	Chronic	
12.55	***3.14***	**mg/l**

AMMONIA CAPACITY ANALYSIS - WATER ANDRIC

Winter Conditions pH 8.3

Receiving Water: Water Andric *Oncorhynchus present*

Stream Flow CFS 30Q10 *1.300*
Proposed Discharge Effluent Flow MGD *0.060*
Instream Waste Concentration 0.067

Instream Ammonia Criteria from EPA 2013 Ammonia Criteria

Instream Acute Ammonia Criteria - pH & Temperature Based
Page 44 Table 5a

pH 8.3
Instream Temperature 0-14
CMC w/ Oncorhynchus ***3.1*** **mg/l**

Instream Chronic Ammonia Criteria - pH & Temperature Based
Page 49 Table 6

pH 8.3
Temperature 0-7
CCC ***1.1*** **mg/l**

Effluent Mass Discharge (lbs/day) to meet Instream Ammonia VWQS

Acute	Chronic	
23.26	***8.25***	**lbs/day**

Effluent Ammonia Concentration (mg/l) @ Proposed Flow (0.060 MGD)

Acute	Chronic	
46.49	***16.50***	**mg/l**

To: Andrea Day, Dufresne Group Consulting Engineers
From: Randy Bean, RAB Consulting & Services LLC
Date: September 16, 2024
RE: Danville Wastewater Treatment Facility Phosphorus Assessment: ANR Comment Response

As discussed, I have reviewed the Agency of Natural Resources (ANR) comments on the Town of Danville Wastewater Treatment Facility Ammonia and Phosphorus Assessment dated May 30, 2024.

Based on the comments regarding phosphorus, it appears that a significant amount of information regarding the discharge of phosphorus from the Danville Wastewater Treatment Facility (WWTF) was overlooked during ANR's review of the PER and are not consistent with outcome of previous litigations, the application of the Vermont Water Quality Standards, or NPDES Discharge Permits issued in Vermont for similar circumstances.

Danville WWTF Discharge & Nutrient Assessment Background Information

As part of the ANR's ongoing watershed assessment program, in 2010 and 2012 ANR conducted instream macroinvertebrate biota and fish population sampling of the Water Andric upstream and downstream of the Danville WWTF discharge. Both these sampling events indicated that the Water Andric downstream of the Danville WWTF discharge was compliance with the Vermont Water Quality Standards (VWQS) via the "nutrient response conditions" clause in Footnote 1, Table 2, Section 29-A-306 and the WWTF discharge did not cause or significantly contribute to an instream violation the VWQS.

2015 Instream Macroinvertebrate Sampling

In 2015, ANR conducted instream macroinvertebrate biota sampling in the Water Andric upstream and downstream of the Danville WWTF discharge. The results of this sampling indicated that the Water Andric downstream of the Danville WWTF discharge was no longer complied with the "nutrient response conditions" clause in Footnote 1, Table 2, Section 29-A-306 of the VWQS and that this reach of river was now in violation of this provision of the VWQS.

2016 Discharge Permit No. 3-1235 Renewal

Discharge Permit No. 3-1235 was reissued to the Danville WWTF by ANR on September 28, 2016, and became effective on October 1, 2016. The Reasonable Potential Analysis conducted as part of the permit renewal process concluded that the Water Andric did not meet Section 29-A-306 of the VWQS and the discharge from the Danville WWTF was causing or significantly contributing to this violation of the VWQS. Condition I.F of Discharge Permit No. 3-1235 required the Town to conduct instream macroinvertebrate sampling in September 2016 and in September 2018 and if the results of either of these sampling events indicated that that the Water Andric did not meet the VWQS, then the Town was required modified the treatment process at the Danville WWTF to optimize the removal of phosphorus.

Discharge Permit No. 3-1235 Appeal and Settlement

In October 2016, the Town appealed Discharge Permit No. 3-1235. (Environmental Court Docket No. 136-10-16 Vtec). The Town contested the finding in the Reasonable Potential Analysis that concluded the discharge of phosphorus from the Danville WWTF was causing or significantly contributing to a violation of Section 29-A-306 of the VWQS and the requirement that the Town be mandated to conduct additional instream macroinvertebrate sampling and potentially modify the WWTF.

During the litigation process the Town provided evidence that discharge from the WWTF had not measurably changed from 2010 through 2015 and could not be causing or significantly contributing the violations of Section 29-A-306 of the VWQS. The Town provided evidence that there was a new discharge in the watershed entering the Water Andric slightly upstream of the WWTF discharge plus there were nonpoint discharges from modified and expanded agricultural operations in the watershed that were causing the violation of Section 29-A-306 of the VWQS. Specifically, in 2012, a new stormwater detention basin was built by the Agency of Transportation (AOT) to treat the runoff from the Route 2 Improvement Project. The basin was built as part of the erosion control practices to treat and control the runoff from the construction phase of the Project and would also serve to provide treatment of the stormwater runoff from the roadway after construction was complete. This basin's discharge enters the Water Andric slightly upstream of the WWTF discharge. During the appeal process, the Town provided evidence that this basin had not been maintained after the construction of the Project was complete, was not operating properly, was causing observable eutrophication in the Water Andric, and was in violation of General Permit 3-9015, Permit Number 4144-9015. Also, the Town provided evidence that runoff from the agricultural operations in the watershed upstream of the of the WWTF discharge had been modified and additional agricultural runoff was being discharged into the Water Andric which was causing visible observations of eutrophication in the Water Andric.

During the appeal process, ANR concurred that the Town's argument had merit and ANR required AOT to maintain the stormwater basin to design standards and assessed the agricultural operations in the watershed. The Town and ANR then entered into a stipulated settlement of the appeal. ANR agreed to conduct macroinvertebrate sampling in the Water Andric in 2017 after the stormwater basin had been cleaned to design specifications. ANR and the Town agreed that if the results of this sampling indicated compliance with Section 29-A-306 of the VWQS, then the Danville WWTF discharge would be deemed to comply with the VWQS and the Town would not be required to take additional action. If the results of this sampling indicated that the Water Andric did not comply with the VWQS, then the Town would be required to conduct macroinvertebrate sampling in the Water Andric in 2019 and maybe subject to further actions.

2017 Instream Macroinvertebrate Sampling

AOT properly cleaned and maintained the "Route 2 Improvement Project" and in September 2017 ANR conducted macroinvertebrate sampling of the Water Andric upstream and downstream of the Danville WWTF discharge. This sampling concluded that the Water Andric downstream of the Danville WWTF discharge was in compliance with the VWQS via the "nutrient response conditions" clause in Footnote 1, Table 2, Section 29-A-306 of the VWQS and the that WWTF discharge did not cause or significantly contribute to an instream violation of the VWQS.

2020 Instream Macroinvertebrate Sampling

As part of the ANR's watershed assessment program, in the late summer of 2020 ANR conducted instream macroinvertebrate biota sampling of the Water Andric upstream and downstream of the Danville WWTF discharge. This sampling event concluded that the Water Andric downstream of the Danville WWTF discharge was compliance with the VWQS via the "nutrient response conditions" clause in Footnote 1, Table 2, Section 29-A-306 of the VWQS and that the WWTF discharge did not cause or significantly contribute to an instream violation of the VWQS.

Danville WWTF Discharge: 2017 – 2022 Assessment of Phosphorus Loading to the Water Andric
Discharge Permit No. 3-1235 requires the Town of Danville to monitor the WWTF discharge for total phosphorus at minimum frequency of once per month.

Phosphorus exerts its instream impact during the entire summer when water temperature and photoperiod are conducive for the algal growth which causes eutrophication. This chemical property is reflected in Section 29-A-306 of the VWQS which mandates that the phosphorus nutrient criteria be applied during summer low median flow conditions.

To further assess the phosphorus loadings from the Danville WWTF to the Water Andric which could impact eutrophication, the flow and total phosphorus discharged from the WWTF to the Water Andric were quantified for the months of May through October for a study period of 2017 through 2022. (See attached).

This study period is consistent with the procedure ANR has used to assess other discharges that were found to be causing or significantly contributing to violations Section 29-A-306 of the VWQS and typically corelates to eutrophication in most streams in Vermont. However, it should be noted that due to the location and elevation of Danville, there is often snowpack runoff still occurring in May which would suppress stream temperatures in the Water Andric and delay the eutrophication process.

During these time periods, the average flow discharged from the WWTF to the Water Andric ranged from 0.0249 MGD in 2022 to 0.0422 MGD in 2019 and averaged ~0.0334 MGD. A review of flow data collected from 2010 to 2016 indicates that the flow discharged from the WWTF has not measurably changed since 2010.

The monthly average total phosphorus concentrations discharged during these time periods ranged from a low of 2.20 mg/l in 2017 to a high of 3.47 mg/l in 2018 and averaged ~2.8 mg/l.

The monthly average total phosphorus mass discharged from the WWTF for that period ranged from a low of 0.67 lbs/day in 2017 and 2022 to a high of 0.88 lbs/day in 2018 and 2021 and averaged ~0.75 lbs/day. The average monthly average total phosphorus mass loading discharged from the WWTF during the macroinvertebrate sampling years were 0.67 lbs/day in 2017 and 0.70 lbs/day in 2020.

Therefore, it can be concluded that if the Danville WWTF can maintain these current mass loadings of total phosphorus discharged to the Water Andric, the WWTF discharge will not cause or significantly contribute to an instream violation of Section 29-A-306 of the VWQS.

However, as additional users are connected to the WWTF system this may become problematic. Currently the Danville WWTF is discharging at ~55% of its design capacity. The WWTF does not have any type of phosphorus removal treatment system and does not have the ability to reliably control the discharge of phosphorus. Consequently, as the WWTF approaches its design flow (0.060 MGD) the mass loading of phosphorus discharged to the Water Andric could double and there is a probability that this increased loading may cause or significantly contribute to a violation of Section 29-A-306 of the VWQS.

Therefore, incorporating features as part of this project which would provide the ability to easily install a phosphorus removal system in the future if flows significantly increase should be considered. Based on the total phosphorus loading currently being discharged from the WWTF (~0.75 lbs/day), an "in-lagoon chemical addition" treatment system would be sufficient to adequately control the total phosphorus loadings when the WWTF is at its design flow (0.060 MGD). Based on the long-term performance of these treatment systems at other Vermont WWTFs with an "in-lagoon chemical addition" phosphorus removal system, these treatment systems are capable of reliably producing a Total Phosphorus effluent concentration of 0.8 mg/l.

Using this type of treatment system at the Danville WWTF, which can reliably produce a total phosphorus effluent concentration of 0.8 mg/l, at a design flow (0.060) MGD, would result in a total phosphorus mass loading of 0.4 lbs/day being discharged to the Water Andric. This would be approximately 45% less than the current mass loading of total phosphorus being discharged which would ensure that the WWTF discharge would not cause or significantly contribute to a violation of Section 29-A-306 of the VWQS.

Regarding designing and constructing a phosphorus removal system capable of producing a total phosphorus effluent concentration of 0.2 mg/l at the Danville WWTF, there is no legal or scientific basis for installing this type of phosphorus removal system. The current total phosphorus loading from discharged from Danville WWTF complies with Section 29-A-306 of the VWQS and an "in-lagoon chemical addition" treatment system would produce a mass loading at design flows which would be ~45% less than the current loading.

Similar Cases in Vermont

The Town of Springfield WWTF (Discharge Permit No. 3-1154) and the Village of Ludlow WWTF (Discharge Permit No. 3-1208) were found to be discharging loadings of total phosphorus into the Black River which were causing or had the potential to significantly contribute to violations of the VWQS.

To address this problem ANR required phosphorus removal to be incorporated into the treatment process at these WWTFs and included seasonal "mass" (lbs/day) monthly average total phosphorus effluent limitations based on the design flow of the WWTFs at an effluent concentration of 0.8 mg/l in their discharge permits. These limitations have been proven adequate to ensure compliance with Section 29-A-306 of the VWQS in the Black River.

In addition, it should be noted that Village of Ludlow Discharge Permit was appealed to the Environmental Board (E. Board Docket #826) and was affirmed by the Environmental Board.

Additional Findings & Conclusions

1. As determined during the settlement of 2016 Discharge Permit appeal and via additional macroinvertebrate sampling, the current mass loading of total phosphorus discharged from the Danville WWTF into the Water Andric during the critical summer period complies with the VWQS via the "nutrient response conditions" clause in Footnote 1, Table 2, Section 29-A-306.

2. The current flow discharged from the Danville WWTF is approximately 55% of the WWTF's permitted design flow.

3. The current design of the Danville WWTF does not include phosphorus treatment.

4. In the future, as additional users connect to the system and flows measurably increase, the total phosphorus discharged from the WWTF will increase and there is a probability that this increased discharge could exceed the total phosphorus assimilative capacity of the Water Andric and could result in violations of Section 29-A-306 of the VWQS.

5. If in the future, the Danville WWTF discharge was determined to cause or significantly contribute to violation of Section 29-A-306 of the VWQS, an "in lagoon chemical addition phosphorus removal" system capable of reliably treating the WWTF discharge to an effluent phosphorus concentration of 0.8 mg/l would reduce the mass loading of total phosphorus discharged at design flows to significantly less than the mass loadings being discharged at the current flows from the WWTFs and would ensure compliance with the VWQS.

6. Based on instream eutrophication characteristics and similar permits which have been issued by ANR to address this issue, if necessary, in the future, a mass based (lbs/day) seasonal monthly average total phosphorus effluent limitation 0.4 lbs/day for the period of May or June through October would be appropriate for the Danville WWTF discharge. This mass limitation would be based on an effluent concentration of 0.8 mg/l from an "in lagoon chemical addition" treatment system for phosphorus removal at the WWTF design flow (0.060 MGD) and the limitation effective time period correlated to the water temperatures and photo period which are conducive for eutrophication in the Water Andric.

DANVILLE WWTF

Total Phosphorus Seasonal Loadings to Water Andric

Sample Date	Flow MGD	TP mg/l	TP lbs/day	
2017				
5/2/17	0.0535	2.0	0.89	
6/6/17	0.0345	2.2	0.63	
7/4/17	0.0383	2.3	0.73	
8/1/17	0.0366	2.8	0.85	
9/5/17	0.0366	1.7	0.52	
10/3/17	0.0219	2.2	0.40	
Average	**0.0369**	**2.20**	**0.67**	**VTWQS Nutrient Response Conditions Met**
2018	**Flow**	**mg/l**	**lbs/day**	
5/1/18	0.0593	1.3	0.64	
6/5/18	0.0252	3.2	0.67	
7/2/18	0.0327	4.8	1.31	
8/4/18	0.0284	3.6	0.85	
9/4/18	0.0238	4.5	0.89	
10/9/18	0.0318	3.4	0.90	
Average	**0.0335**	**3.47**	**0.88**	
2019		**mg/l**	**lbs/day**	
5/7/19	0.0571	1.20	0.57	
6/4/19	0.0575	1.6	0.77	
7/2/19	0.0543	1.9	0.86	
8/6/19	0.0238	4.5	0.89	
9/3/19	0.0332	2.6	0.72	
10/1/19	0.0275	2.0	0.46	
Average	**0.0422**	**2.30**	**0.71**	
2020	**Flow**	**mg/l**	**lbs/day**	
5/5/20	0.0349	0.79	0.23	
6/2/20	0.0190	1.3	0.21	
7/2/20	0.0760	1.7	1.08	
8/4/20	0.0279	3.4	0.79	
9/1/20	0.0145	4.1	0.50	
10/6/20	0.0368	4.6	1.41	
Average	**0.0348**	**2.65**	**0.70**	**VTWQS Nutrient Response Conditions Met**

2021	Flow	mg/l	lbs/day
5/4/21	0.0554	2.4	1.11
6/1/21	0.0218	2.2	0.40
7/6/21	0.048	4.6	1.84
8/3/21	0.0324	2.7	0.73
9/7/21	0.0191	2.1	0.33
10/5/21	0.0296	3.4	0.84
Average	**0.0344**	**2.90**	**0.88**

2022		mg/l	lbs/day
5/3/22	0.0361	3.7	1.11
6/7/22	0.0282	3.0	0.71
7/5/22	0.022	4.5	0.83
8/2/22	0.005	3.4	0.14
9/6/22	0.0239	2.3	0.46
10/4/22	0.0344	2.8	0.80
Average	**0.0249**	**3.28**	**0.67**

2023	Flow	mg/l	lbs/day
5/2/23	0.0363	3.2	0.97
6/6/23	0.0527	4.7	2.07
7/7/23	0.0393	4.3	1.41
8/1/23	0.0313	2.8	0.73
Sep		no sample	
Oct		no sample	
Average	**INC**	**INC**	**INC**

2024	Flow	mg/l	lbs/day
May		no sample	
6/12/24	0.029	5.1	1.23
7/9/24	0.044	4.9	1.80
Aug		pending	
Sep		pending	
Oct		pending	

TP Effluent Loading @ 0.8 mg/l & Design Flow (0.060) **0.400 lbs/day**

APPENDIX F - RATES

Town of Danville Utility Billing
Rate Code Report

Code	Description	Type Method	Unit	Min Chg	Min Usage	Peak Season Base Chrg Lower Bound	Rate
SAH	Sewer Apartment House	Flat Standard		0.00	0		165.000000
SBB	Sewer Inn/B&B per unit	Flat Standard		0.00	0		41.250000
SBC	Sewer Base Commercial	Flat Standard		0.00	0		165.000000
SBK	Sewer Bank per Employee	Flat Standard		0.00	0		9.900000
SBS	Sewer Beauty Shop Chair	Flat Standard		0.00	0		108.900000
SCH	Sewer Church	Flat Standard		0.00	0		165.000000
SGR	Sewer Grocery/Mini-Mart	Flat Standard		0.00	0		275.550000
SHC	Sewer Health Center	Flat Standard		0.00	0		275.550000
SLB	Sewer Library	Flat Standard		0.00	0		145.200000
SLD	Sewer Laundramat Machines	Flat Standard		0.00	0		275.550000
SOF	Sewer Office Space	Flat Standard		0.00	0		54.890000
SPO	Sewer Post Office	Flat Standard		0.00	0		54.890000
SPT	SEWER PORTABLE TOILET	Flat Standard		0.00	0		275.550000
SRT	Sewer Restaurant Seats	Flat Standard		0.00	0		9.900000
SSC	Sewer School w/caf. & gym	Flat Standard		0.00	0		9.900000
SSF	Sewer Single Family	Flat Standard		0.00	0		165.000000
SSH	Sewer Senior housing	Flat Standard		0.00	0		107.250000
SSS	Sewer Service Stations	Flat Standard		0.00	0		275.550000
SST	Sewer Non-Food Retail	Flat Standard		0.00	0		54.890000
STG	Sewer Town Garage	Flat Standard		0.00	0		110.000000
STO	Sewer Town Office	Flat Standard		0.00	0		165.000000

8-15-24
current sewer
rate spreadsheet

Comparative Budget Report - Sewer

Revenue	Budget FY - 2022	Actual FY - 2022	Budget FY - 2023	Actual FY-2023	Budget FY-2024
Hookup Fees	$450.00	$450.00	$450.00	$0.00	$450.00
Sewer Application Fee	$0.00	$130.00	$100.00	$0.00	$130.00
Sewer Rents	$73,873.62	$68,054.96	$79,196.00	$66,978.20	$79,196.00
Delinquent Rents	$3,314.59	$5,573.00	$4,000.00	$9,286.84	$4,000.00
Delinquent Rent Interest	$100.00	$148.22	$100.00	$317.30	$100.00
Delinquent Collector Fee	$0.00	$0.00	$0.00	$453.92	$0.00
Bank Interest	$1,300.00	$1,332.83	$1,300.00	$2,488.99	$1,500.00
CD/Savings Int. Transfer	$0.00	$0.00	$0.00	$0.00	$0.00
Transfer In- Sludge Acct.	$2,300.00	$2,300.00	$2,300.00	$0.00	$2,300.00
Trans From Sewer Treat Acct.	$5,000.00	$5,000.00	$5,000.00	$0.00	$5,000.00
Trans From Closed CD	$0.00	$0.00	$0.00	$12,249.41	$0.00
Reimbursements	$0.00	$22,000.00	$0.00	$997.81	$0.00
Insurance Claim Payment	$0.00	$1,660.00	$0.00	$0.00	$0.00
Utility Partner Cap Refund	$0.00	$997.81	$0.00	$0.00	$0.00
Total Revenue	**$86,338.21**	**$107,646.82**	**$92,446.00**	**$92,772.47**	**$92,676.00**

Expenses	Budget FY - 2022	Actual FY - 2022	Budget FY - 2023	Actual FY-2023	Budget FY-2024
Legal Fees	$500.00	$0.00	$500.00	$128.00	$500.00
Plant Operations	$64,000.00	$84,807.32	$62,880.48	$69,191.59	$71,267.34
Depreciation Expense	$0.00	$0.00	$0.00	$0.00	$0.00
Rubbish Removal	$150.00	$156.00	$175.00	$169.00	$175.00
Line Maintenance	$0.00	$0.00	$0.00	$0.00	$0.00
Plant Maintenance	$0.00	$0.00	$0.00	$7,980.50	$0.00
Electricity	$11,500.00	$9,594.52	$11,500.00	$11,000.86	$11,500.00
Annual Fees	$750.00	$0.00	$500.00	$400.00	$500.00
Long Term Maintenance Transfer	$5,000.00	$5,000.00	$5,000.00	$0.00	$5,000.00
Sludge Removal Fund Transfer	$2,300.00	$2,300.00	$2,300.00	$0.00	$2,300.00
CD Redemption Transfer	$0.00	$12,249.41	$0.00	$0.00	$0.00
Transfer from LT Sewer Equip Fund	$0.00	$22,000.00	$0.00	$0.00	$0.00
Total Expenses	**$84,200.00**	**$136,107.25**	**$84,200.00**	**$88,869.95**	**$91,242.34**
Net Income / Expenses	**$2,138.21**	**($28,460.43)**	**$8,246.00**	**$3,902.52**	**$1,433.66**

Town of Danville - Delinquent Sewer Rent Report

2022 Balance Forward	$5,533.12	
Total amounts paid to Delinquent Tax Collector/Town:		
Delinquent Rents	$9,286.84	
Delinquent Interest	$317.30	
Delinquent Penalty	$0.00	
Total Paid	**$9,604.14**	**(includes current year delinquent payments)**
Balance due	**$4,259.92**	**(including interest & penalty) December 31, 2023**

Edward J. Ledo, Delinquent Tax Collector

APPENDIX G - LEMNA TREATMENT CAPABILITIES

LemTec™ Biological Treatment Process

Proposal For: Danville, VT

Prepared for: Mr. Stan Welch, PE

Prepared by: Jim Martin
President
LET

Proposal Number: 2246
Revision Number: 0
January 3, 2024

INTRODUCTION

Thank you for including Lemna in the planning of the Danville, VT wastewater treatment facility upgrade. Based on the information provided, we have developed a preliminary design and budget estimate for this project. The objective of our proposed system is to provide the best possible biological treatment solution capable of meeting or exceeding your requirements in the most efficient and cost-effective way possible.

This proposal has been prepared for Mr. Welch who is currently evaluating treatment alternatives and is interested in products/technologies that can provide cost effective waste water treatment for the municipality.

Lemna Environmental Technologies' proposed process design is based upon the following design parameters and site data.

DESIGN PARAMETERS

	Influent	Effluent Limits	
		Summer	Winter
Flow	0.060 MGD		
BOD	260 mg/L	30 mg/L	30 mg/L
TSS	233 mg/L	30 mg/L	30 mg/L
TKN	25 mg/L		
Ammonia N	25 mg/L	2.0 mg/L	2.0 mg/L
Phosphorus	6.0 mg/L	1.0 mg/L	1.0 mg/L

The proposed design described below will achieve the basic requirements and provide a number of advantages to the end user which are unmatched by alternative technologies. The LemTec™ process is capable of achieving year-round effluent limits of less than 10 mg/l BOD, 12 mg/l TSS and less than 1 mg/l NH3-N and 1 TP in the Summer/Winter Months at a fraction of the cost of other traditional wastewater treatment systems. With a reduced footprint, a process that is extremely reliable, and simple to operate, the LemTec™ process is the highest performance lagoon-based package in the world and offers numerous advantages over other systems, including lower capital and operating costs, expandability and low maintenance.

DESIGN OVERVIEW

This proposed design utilizes the two existing 10' deep lagoons to handle a total design flow of .060 MGD.

The first cell of the first lagoon is a complete mix cell, mixed and aerated by Lemna's fine bubble double high rate diffusers. The first lagoon has a total HRT of 13.1 days at design flow, with the complete mix zone utilizing 3.5 days of this overall detention time.

The complete mix zone of the Lemna Biological Treatment process is an aerated, aggressively mixed cell that establishes an environment suitable for the rapid removal of BOD_5 by heterotrophic bacteria. The reduction of BOD_5 is calculated using state-of-the-art "mechanistic" models that relate to the growth of bacteria and removal of BOD_5 in relation to detention time and wastewater temperature. Similar models are currently used for the design of activated sludge plants.

In addition to BOD_5 removal, ammonia is also removed by heterotrophic bacteria present in the complete mix cell. Ammonia is utilized by the bacteria to support its nitrogen requirement for growth. Also, nitrifier growth will occur in the complete mix cell resulting in additional (and significant) ammonia reduction. Aeration and mixing will be provided by diffused aeration.

Following the complete mix cell, water will flow through the window of a hydraulic baffle, which is used to create two discrete treatment zones within the pond. The second cell of the first lagoon has a total HRT of 9.6 days. The cell serves as a partial mix, settling zone, where solids will begin settling and digest through aerobic digestion before the wastewater enters the ammonia polishing stage.

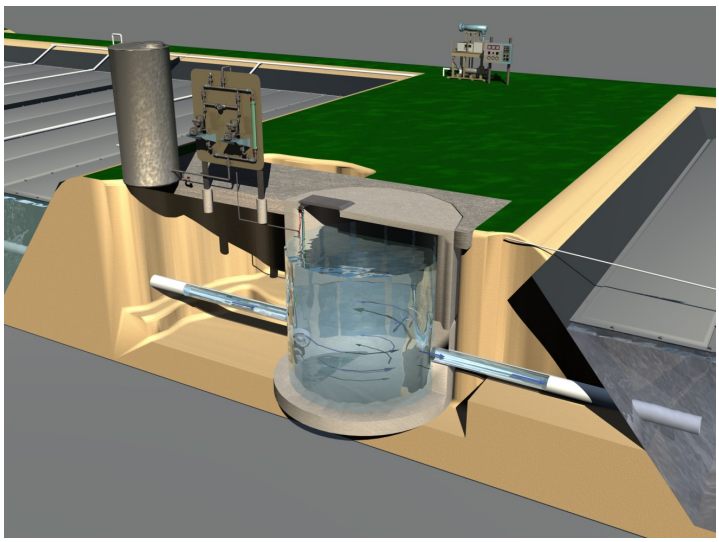
Following the first treatment lagoon, the LemTec™ Polishing Reactor will provide additional BOD polishing The LPR consists of submerged, attached-growth media modules used for maintaining an adequate population of bacteria. The LPR enhances the growth of nitrification bacteria to encourage conversion of ammonia to nitrates in an aerobic environment. Aeration is provided by rack-mounted coarse-bubble diffusers located under the media, which evenly distribute the air and shear coarse bubbles into very fine bubbles. The LPR produces BOD and TSS effluent levels less than 10 mg/l and NH_3-N as low as 1 mg/l. Typically housed in a concrete or metal structure near the effluent of the pond, the LPR is the final biological stage of the lagoon based LemTec Biological Treatment Process. The approximate size of the proposed LPR for this option is 7' x 15' x 12'.

Following the Lemna Polishing Reactor, flow will enter the second and final lagoon where phosphorus removal, and final settling will occur.

Phosphorus Removal:

The LemTec™ Phosphorus Reduction System is a well-established and proprietary technology developed by LET to achieve low phosphorus levels at minimum cost and maintenance within a lagoon-based treatment process. The system uses the addition of chemicals to form phosphorus precipitates that are removed along with waste biological sludge.

Chemicals, such as alum or ferric chloride, are added via a metering pump to into a specially sized rapid mixing zone placed between the Lemna Polishing reactor and the settling pond, as shown in the drawing. The feed system consists of a coagulant storage tank, metering pumps, pipes, fittings, and valves. After mixing, water flows out of the rapid mix zone into a flocculation zone located at the beginning of the settling pond. The flocculation zone is separated from the settling pond by a hydraulic baffle and contains slow speed surface mixers that produce the conditions to enable large particles to overtake smaller particles in order to form larger particles. The flocculation produces particles by aggregation that can be removed by sedimentation in the settling zone.



The settling pond will also serve as flow equalization/storage for metering effluent flows.

The oxygen requirements for the system will be met (2) 15 HP blowers, of which 1 will be in continuous operation. A schematic of the proposed design is attached for your reference.

DESIGN SUMMARY

Basin	Water Depth (ft)	Freeboard (ft)	Slope	Waterline Length (ft)	Waterline Width (ft)	Volume (MG)	Detention Time (days)
Basin # 1	10	2	3:1	197	96	0.8	13.1
Basin # 2	10	2	3:1	197	96	0.8	13.1

Cell	Process	Detention Time (days)	Winter Temp. (°C)	Diffusers (No.)	Mixers (No.)
1A	CM	3.5	9.4	6	
1B	PM	9.6	7.9	6	
2	SC	13.1	0.0	6	1

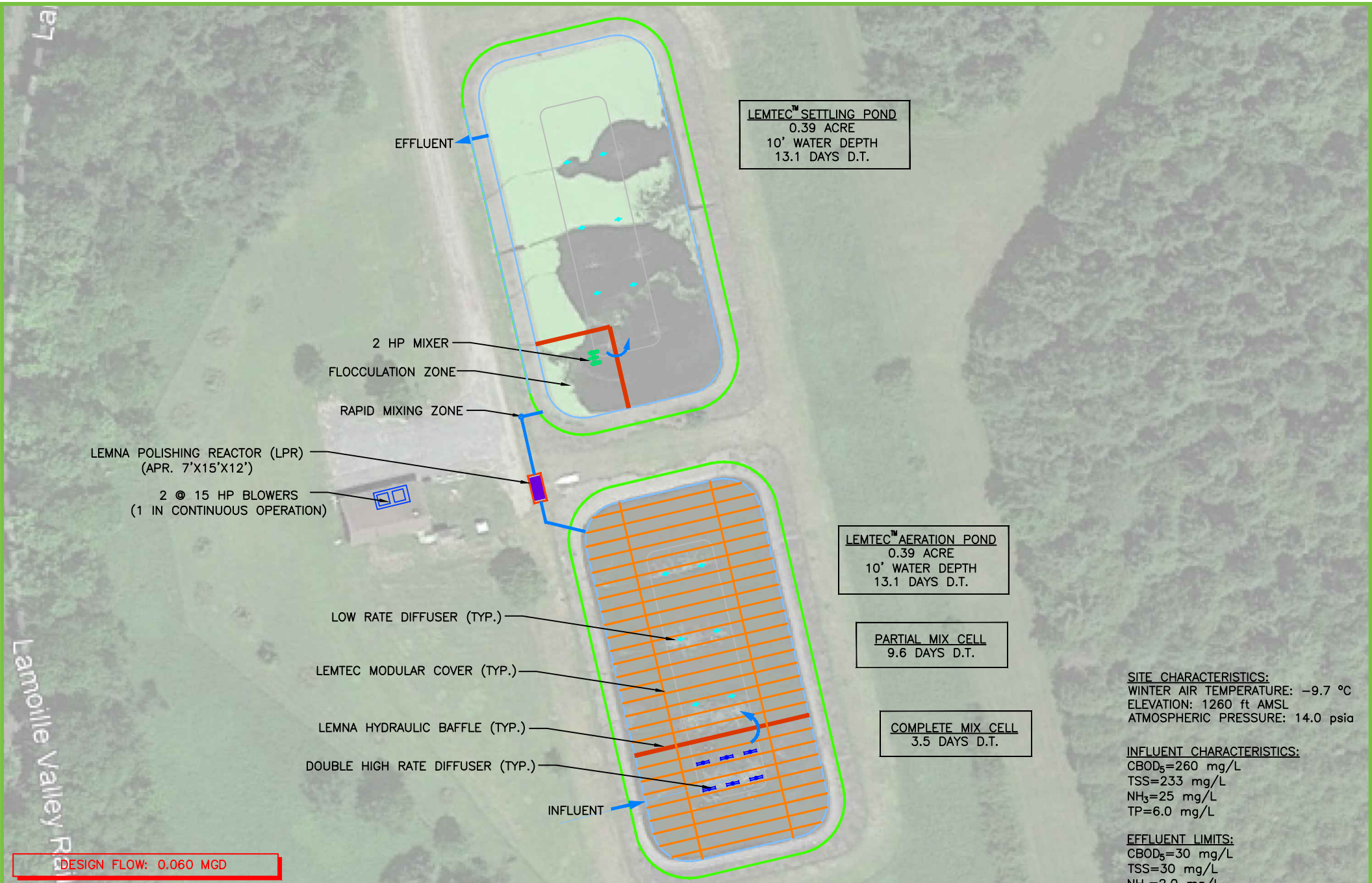
A summary of the equipment supplied is provided in the table below:

EQUIPMENT SUMMARY

	Cover	**Baffle**		**Mixer**		**Diffusers**	**Blower**		**LPR media**
	Sq. Ft.	**Qty.**	**Ft.**	**Qty.**	**HP**	**Qty.**	**Qty.**	**HP**	**Cu. Ft.**
Lagoon 1	18,912	1	100			12	2	15	
Lagoon 2		1	89	1	2	6			
LPR	98					3			576

DESIGN LAYOUT/DRAWINGS

Layout drawings are included.



DESIGN FLOW: 0.060 MGD

NOTE: DESIGN BASED ON MINIMUM INFLUENT TEMPERATURE OF 10°C

SITE CHARACTERISTICS:
WINTER AIR TEMPERATURE: −9.7 °C
ELEVATION: 1260 ft AMSL
ATMOSPHERIC PRESSURE: 14.0 psia

INFLUENT CHARACTERISTICS:
$CBOD_5$=260 mg/L
TSS=233 mg/L
NH_3=25 mg/L
TP=6.0 mg/L

EFFLUENT LIMITS:
$CBOD_5$=30 mg/L
TSS=30 mg/L
NH_3=2.0 mg/L
TP= 1.0 mg/L

DRAWN BY:	DAP
APPROVED BY:	JAM
SCALE:	NOT TO SCALE
DATE:	JANUARY 2023
SHEET NO:	1 OF 1

LEMTEC™ BIOLOGICAL TREATMENT PROCESS
DANVILLE, VT

L·E·T
LEMNA ENVIRONMENTAL TECHNOLOGIES, INC.
4215 WHITE BEAR PARKWAY, SUITE 200 • VADNAIS HEIGHTS, MN 55110
PHONE: 612-253-2000 FAX: 612-253-2003 WWW.LEMNATECHNOLOGIES.COM

Facility Name: CONSOLIDATED KOSHKONONG SANITARY DIST WWTF
Contact Address: 328 East Ellendale Road
Edgerton, WI 53534
Facility Contact: David Houfe, Jr, Field Operations
Phone Number: 608-868-7191
Reporting Period: 08/01/2024 - 08/31/2024
Form Due Date: 09/21/2024
Permit Number: 0021059

For DNR Use Only

Date Received:	
DOC:	554697
FIN:	5884
FID:	154001980
Region:	South Central Region
Permit Drafter:	BetsyJo M Howe
Reviewer:	Ashley J Brechlin
Office:	Fitchburg

Sample Point(s) active?

Yes - 701 sample point (INFLUENT)
Yes - 001 sample point (EFFLUENT)

Facility Name: CONSOLIDATED KOSHKONONG SANITARY DIST WWTF
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Reviewer:	Ashley J Brechlin
Office:	Fitchburg

	Sample Point	701	701	701	701	001
	Description	INFLUENT	INFLUENT	INFLUENT	INFLUENT	EFFLUENT
	Parameter	211	66	649	457	649
	Description	Flow Rate	BOD5, Total	CBOD5	Suspended Solids, Total	CBOD5
	Units	MGD	mg/L	mg/L	mg/L	mg/L
	Sample Type	CONTINUOUS	24 HR FLOW PROP	24 HR FLOW PROP	24 HR FLOW PROP	24 HR FLOW PROP
	Frequency	CONTINUOUS	WEEKLY	WEEKLY	WEEKLY	WEEKLY
Sample Results	Day 1	.7980				
	2	.8230				
	3	.8270				
	4	.8150				
	5	.7550				
	6	.8920	65.4	57.3	110	1.5
	7	.7830				
	8	.7490				
	9	.7680				
	10	.7570				
	11	.7670				
	12	.6970				
	13	.6680	79.3	71.4	144	3.1
	14	.6510				
	15	.7460				
	16	.7490				
	17	.7710				
	18	.7510				
	19	.6600				
	20	.6530	88.3	78.2	114	2.1
	21	.6270				
	22	.6210				
	23	.6280				
	24	.6650				
	25	.6750				
	26	.6090				
	27	.5930				
	28	.5850	73.8	68.4	134	1.2
	29	.5880				
	30	.7110				
	31	.7750				

	Sample Point	101	101	101	101	001
	Description	INFLUENT	INFLUENT	INFLUENT	INFLUENT	EFFLUENT
	Parameter	211	66	649	457	649
	Description	Flow Rate	BOD5, Total	CBOD5	Suspended Solids, Total	CBOD5
	Units	MGD	mg/L	mg/L	mg/L	mg/L
Summary Values	Monthly Avg	0.714741935	76.7	68.825	125.5	1.975
	Daily Max	0.892	88.3	78.2	144	3.1
	Daily Max - Variable					
	Daily Min	0.585	65.4	57.3	110	1.2
	Geometric Mean -					
	Geometric Mean -					
	Week 1 Avg					1.5
	Week 2 Avg					3.1
	Week 3 Avg					2.1
	Week 4 Avg					1.2
Limit(s) in Effect	Monthly Avg					25 / 0
	Daily Max					
	Daily Max - Variable					
	Daily Min					
	Geometric Mean -					
	Geometric Mean -					
	Weekly Avg					40 / 0
QA/QC Information	LOD					
	LOQ					
	QC Exceedance	N	N	N	N	N
	Lab Certification		154001980	154001980	154001980	154001980

	Sample Point	001	001	001	001	001
	Description	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT
	Parameter	211	457	457	377	789
	Description	Flow Rate	Suspended Solids, Total	Suspended Solids, Total	pH Field	Nitrogen, Ammonia (NH3-N) Total
	Units	MGD	mg/L	lbs/day	su	mg/L
	Sample Type	CONTINUOUS	24 HR FLOW PROP	CALCULATED	GRAB	24 HR FLOW PROP
	Frequency	CONTINUOUS	WEEKLY	WEEKLY	WEEKLY	WEEKLY
Sample Results	Day 1	.7900			7.3	
	2	.8100			7.4	
	3	.8050				
	4	.8030				
	5	.7730			7.2	
	6	1.0640	.3	2.67	7.3	8.6
	7	.8270			7.3	
	8	.7720			7.2	
	9	.7810			7.3	
	10	.7790				
	11	.7680				
	12	.7320			7.2	
	13	.6800	3	17.2	7.2	8.23
	14	.6560			7.2	
	15	.8730			7.2	
	16	.8090			7.2	
	17	.7940				
	18	.7730				
	19	.7080			7.3	
	20	.6600	1.7	9.36	7.2	8.44
	21	.6460			7.2	
	22	.6300			7.2	
	23	.6380			7.2	
	24	.6560				
	25	.6660				
	26	.6220			7.2	
	27	.5970			7.2	
	28	.5920	1.7	14.18	7.2	7.22
	29	.5840			7.1	
	30	.8770			7.1	
	31	.7150				

	Sample Point	001		001		001		001		001	
	Description	EFFLUENT		EFFLUENT		EFFLUENT		EFFLUENT		EFFLUENT	
	Parameter	211		457		457		377		789	
	Description	Flow Rate		Suspended Solids, Total		Suspended Solids, Total		pH Field		Nitrogen, Ammonia (NH3-N) Total	
	Units	MGD		mg/L		lbs/day		su		mg/L	
Summary Values	Monthly Avg	0.738064516		1.675		10.8525		7.222727273		8.1225	
	Daily Max	1.064		3		17.2		7.4		8.6	
	Daily Max - Variable									8.6	
	Daily Min	0.584		0.3		2.67		7.1		7.22	
	Geometric Mean -										
	Geometric Mean -										
	Week 1 Avg					2.67				8.6	
	Week 2 Avg					17.2				8.23	
	Week 3 Avg					9.36				8.44	
	Week 4 Avg					14.18				7.22	
Limit(s) in Effect	Monthly Avg			60	0	294	0			60	0
	Daily Max							9	0		
	Daily Max - Variable									0	0
	Daily Min							6	0		
	Geometric Mean -										
	Geometric Mean -										
	Weekly Avg					360	0			60	0
QA/QC Information	LOD									0.022	
	LOQ									0.073	
	QC Exceedance	N		N		N		N		N	
	Lab Certification			154001980						154001980	

	Sample Point	001	001	001	001
	Description	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT
	Parameter	320	204	388	388
	Description	Nitrogen, Ammonia Variable Limit	Fecal Coliform	Phosphorus, Total	Phosphorus, Total
	Units	mg/L	#/100ml	mg/L	lbs/day
	Sample Type	24 HR FLOW PROP	GRAB	24 HR FLOW PROP	CALCULATED
	Frequency	WEEKLY	WEEKLY	WEEKLY	WEEKLY
Sample Results	Day 1				
	2				
	3				
	4				
	5				
	6	46		.408	3.62
	7		0		
	8				
	9				
	10				
	11				
	12				
	13	52		.417	2.37
	14		0		
	15				
	16				
	17				
	18				
	19				
	20	52		.299	1.65
	21		0		
	22				
	23				
	24				
	25				
	26				
	27				
	28	52	0	.110	.55
	29				
	30				
	31				

	Sample Point	001	001	001	001
	Description	EFFLUENT	EFFLUENT	EFFLUENT	EFFLUENT
	Parameter	320	204	388	388
	Description	Nitrogen, Ammonia Variable Limit	Fecal Coliform	Phosphorus, Total	Phosphorus, Total
	Units	mg/L	#/100ml	mg/L	lbs/day
Summary Values	Monthly Avg	50.5	0	0.3085	2.0475
	Daily Max	52	0	0.417	3.62
	Daily Max - Variable				
	Daily Min	46	0	0.11	0.55
	Geometric Mean -		1		
	Geometric Mean -		1		
	Week 1 Avg				
	Week 2 Avg				
	Week 3 Avg				
	Week 4 Avg				
Limit(s) in Effect	Monthly Avg			3.4	0
	Daily Max				
	Daily Max - Variable				
	Daily Min				
	Geometric Mean -		400	0	
	Geometric Mean -		656	0	
	Weekly Avg				
QA/QC Information	LOD			0.064	
	LOQ			0.212	
	QC Exceedance	N	N	N	N
	Lab Certification			154001980	

Footnotes (DNR Use Only; Instructions for completing this form that are unique for your facility may be displayed here.)

General Remarks

Added an estimated 66,960 gallons to the August 31st influent total. this is for the Applewood area pressure sewer.

Laboratory Quality Control Comments

8-13-24 Blank was .3 high and out of range.

Consolidated Koshkonong Sanitarty District

Aug 2024

DATE	DAY	FLOW	P.H. RAW	P.H. FINAL	TEMP. RAW	TEMP. FINAL	CKSD REMARKS
1			7.0	7.3	16	19	
2			7.1	7.4	16	19	
3							
4							
5			7.2	7.2	17	19	
6			7.1	7.3	17	19	
7			7.2	7.3	17	19	
8			7.1	7.2	17	19	
9			7.2	7.3	17	18	
10							
11							
12			7.3	7.2	16	19	
13			7.1	7.2	17	19	
14			7.2	7.2	17	18	
15			7.1	7.2	17	19	
16			7.3	7.2	17	19	
17							
18							
19			7.2	7.3	16	18	
20			7.3	7.2	16	19	
21			7.3	7.2	16	18	
22			7.3	7.2	17	19	
23			7.3	7.2	16	18	
24							
25							
26			7.3	7.2	16	19	
27			7.3	7.2	17	20	
28			7.3	7.2	17	19	
29			7.3	7.1	17	19	
30			7.1	7.1	17	19	
31							
TOTAL							
AVG.							

Danville Comps

Smithton, IL Reference & Case Study

REFERENCE CONTACT INFORMATION

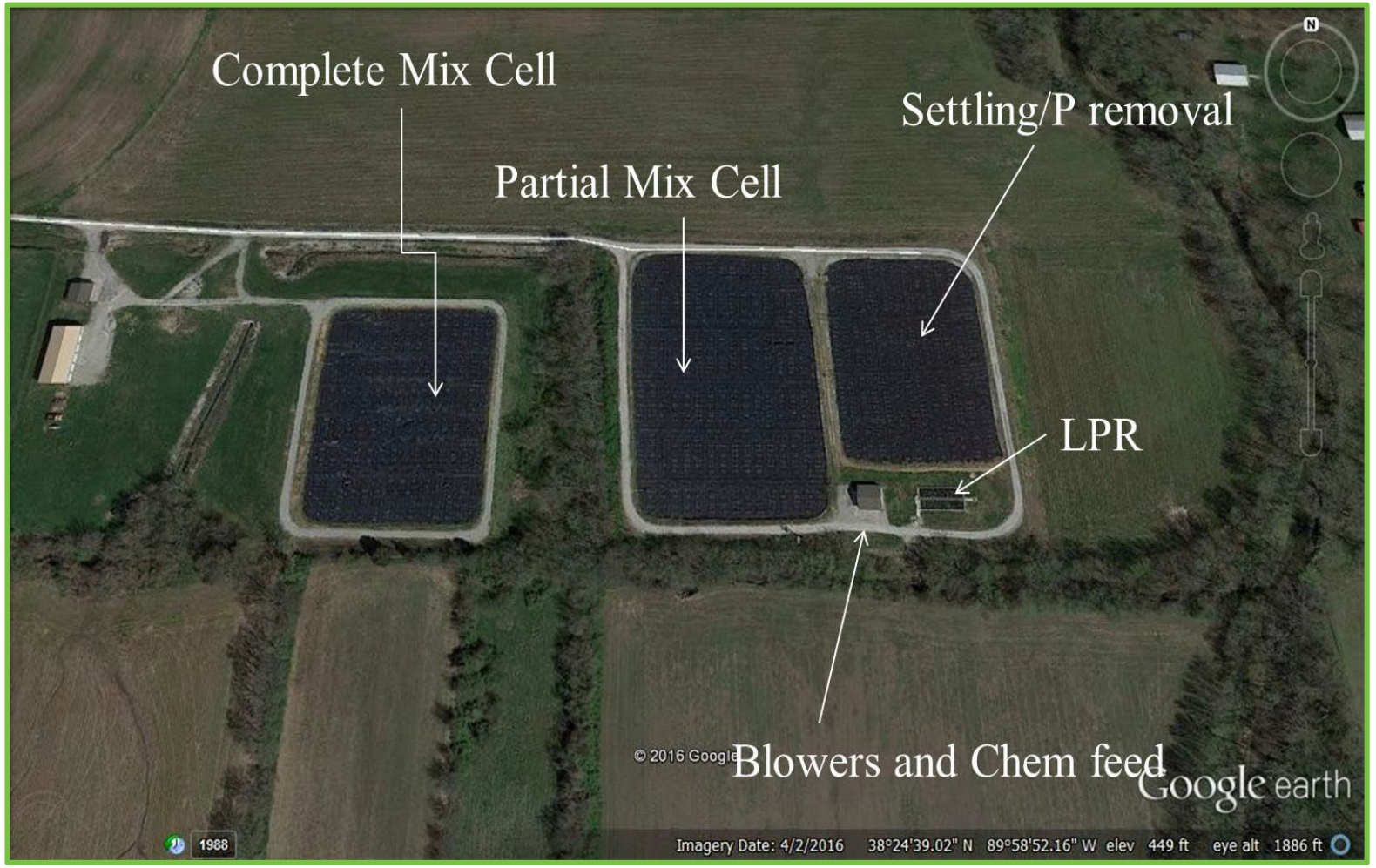
Chad Rhutasel, Plant Operator: (618) 920-1124

Engineer: Rhutasel & Associates

PROJECT BACKGROUND

- Rural community in St. Clair County, Illinois
- Existing Facultative/PM Lagoon System
- Population of 2,248
- Faced with the decision to upgrade or replace its existing system
- More stringent effluent requirements
- Land is expensive
- Large variations in seasonal flow
- Cold weather ammonia treatment required

Smithton, IL


Complete Mix Cell
Partial Mix Cell
Settling/P removal
LPR
Blowers and Chem feed
© 2016 Google
Google earth
1988
Imagery Date: 4/2/2016 38°24'39.02" N 89°58'52.16" W elev 449 ft eye alt 1886 ft

Smithton, IL Design Parameters

- Total Flow: 0.950 MGD
  - Influent BOD: 200 mg/l
  - Influent TSS: 204 mg/l
  - Influent NH3: 25 mg/l
  - Influent P: 6 mg/l
- Effluent Limits
  - BOD: 10 mg/l
  - TSS: 12 mg/l
  - NH3: 1.5 mg/l
  - P: 1 mg/l

Average Cold Temperature in Coldest Month: 24

Lagoon Design: CM/PM/PM/SC

LPR: 28 cubes, 98 lbs NH3/Day

Phosphorus Reduction: 48 lbs P/Day

Smithton, IL Site Photos

Blowers

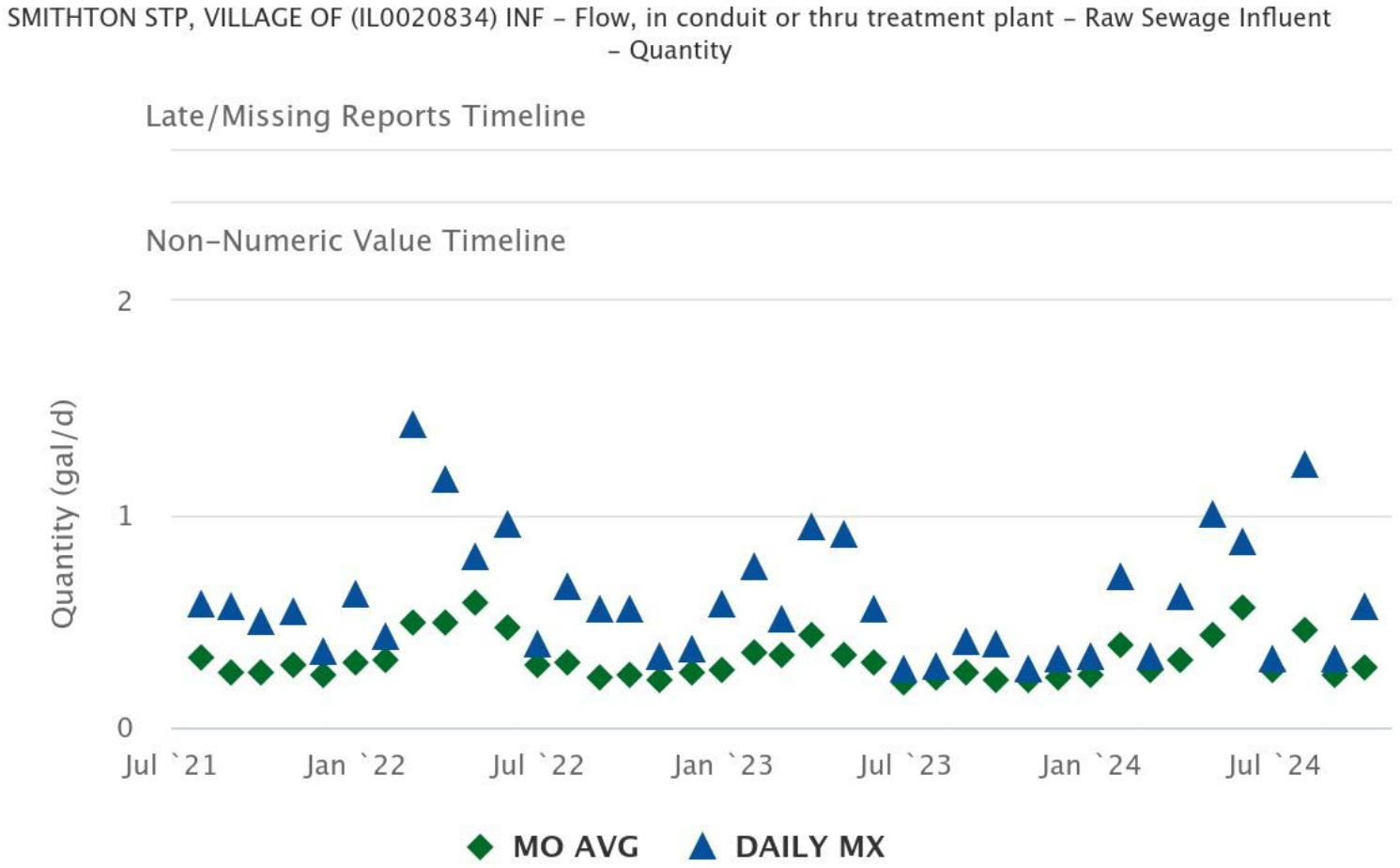
Controls

Lemna Polishing Reactor (LPR)

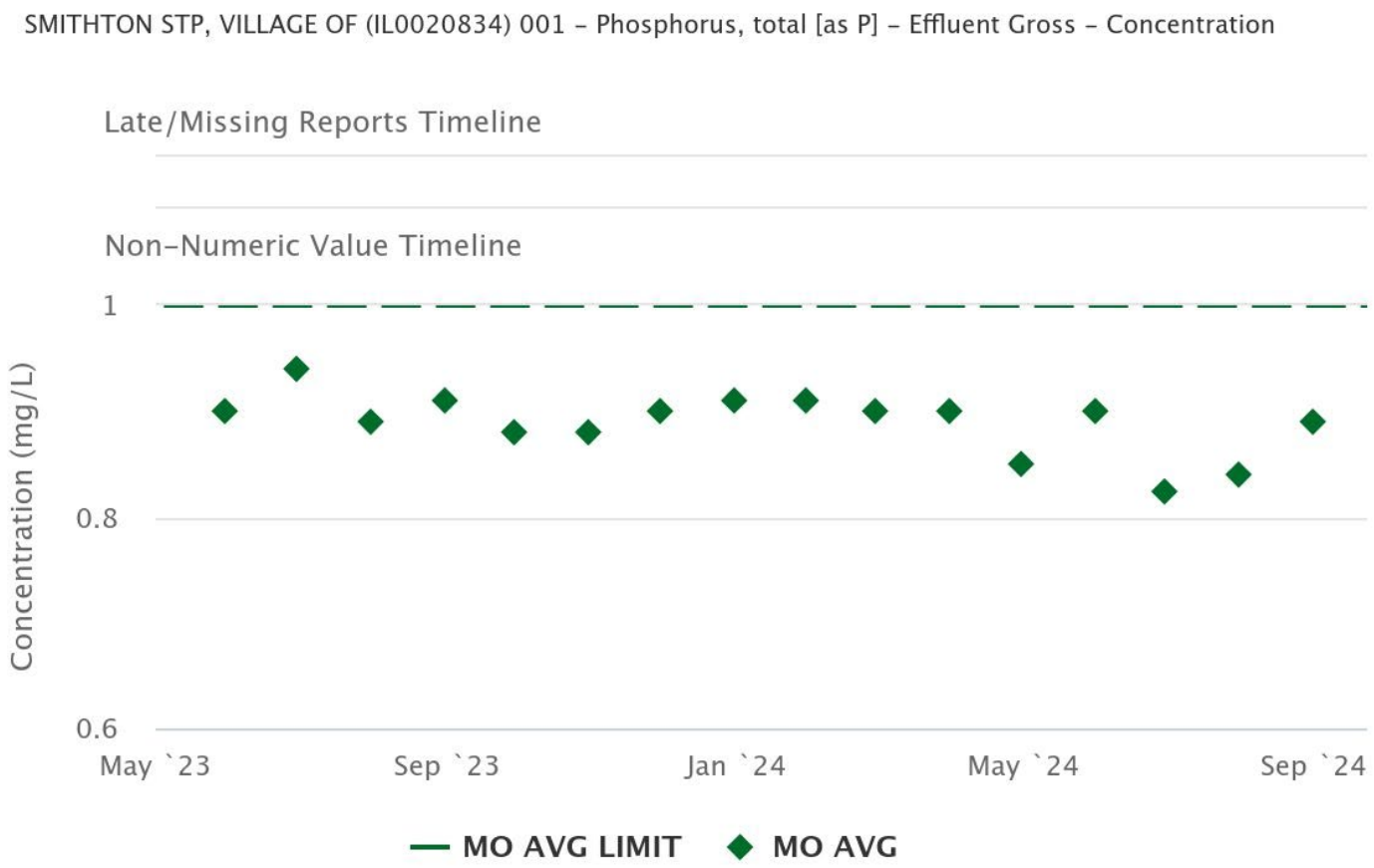
Cover

Aeration & Mixing

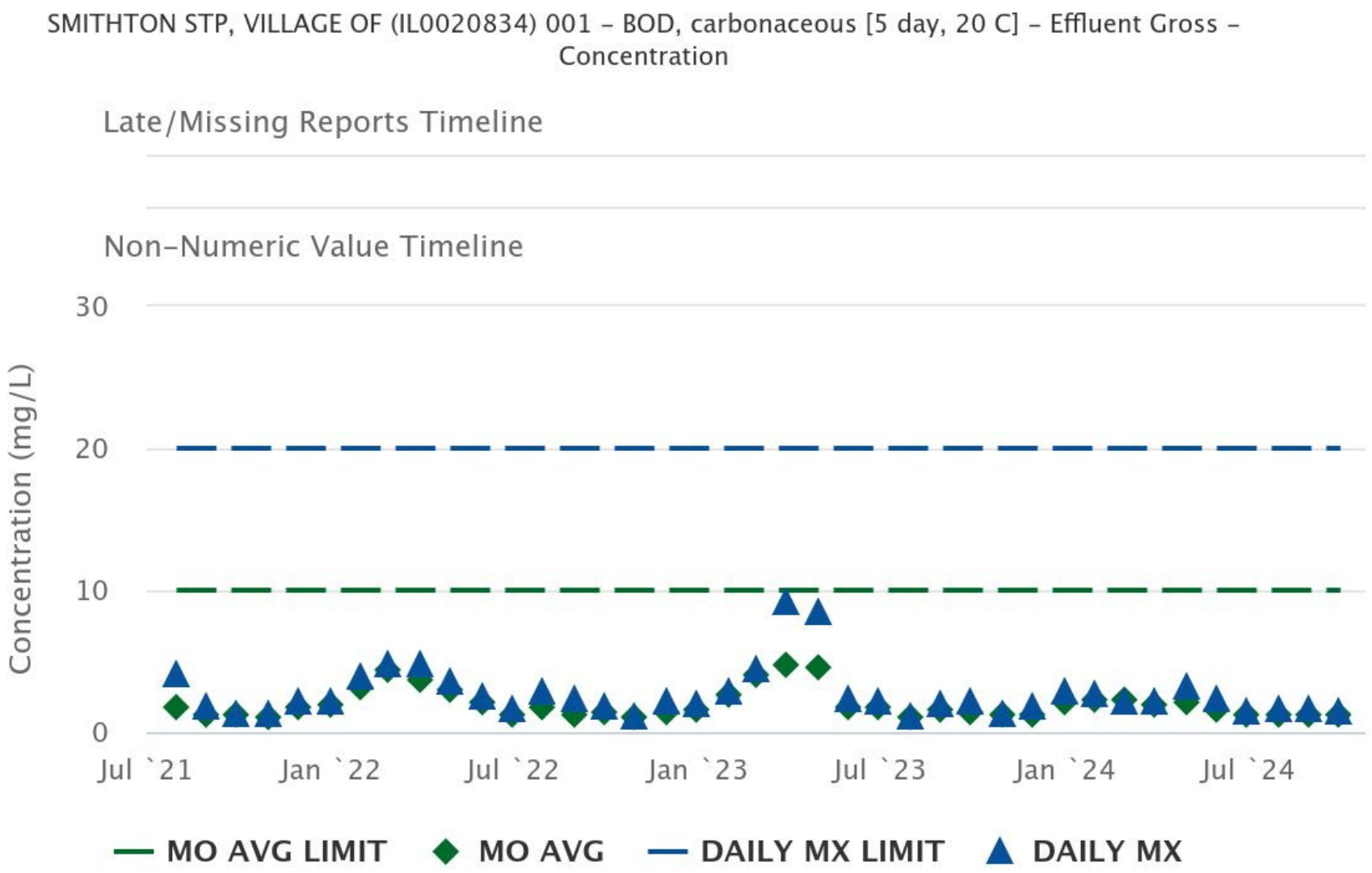
Smithton, IL Flow



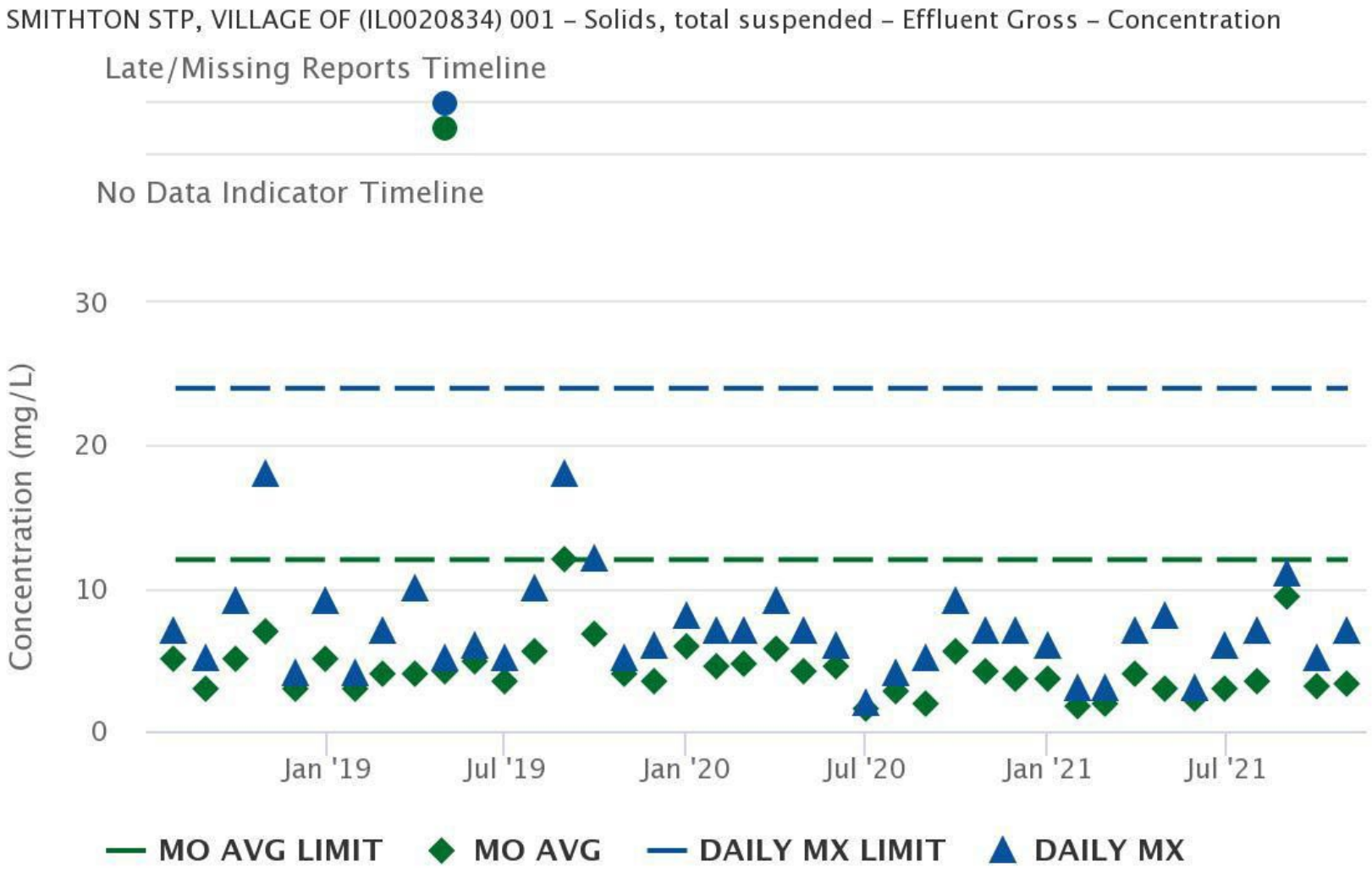
Smithton, IL Phosphorus



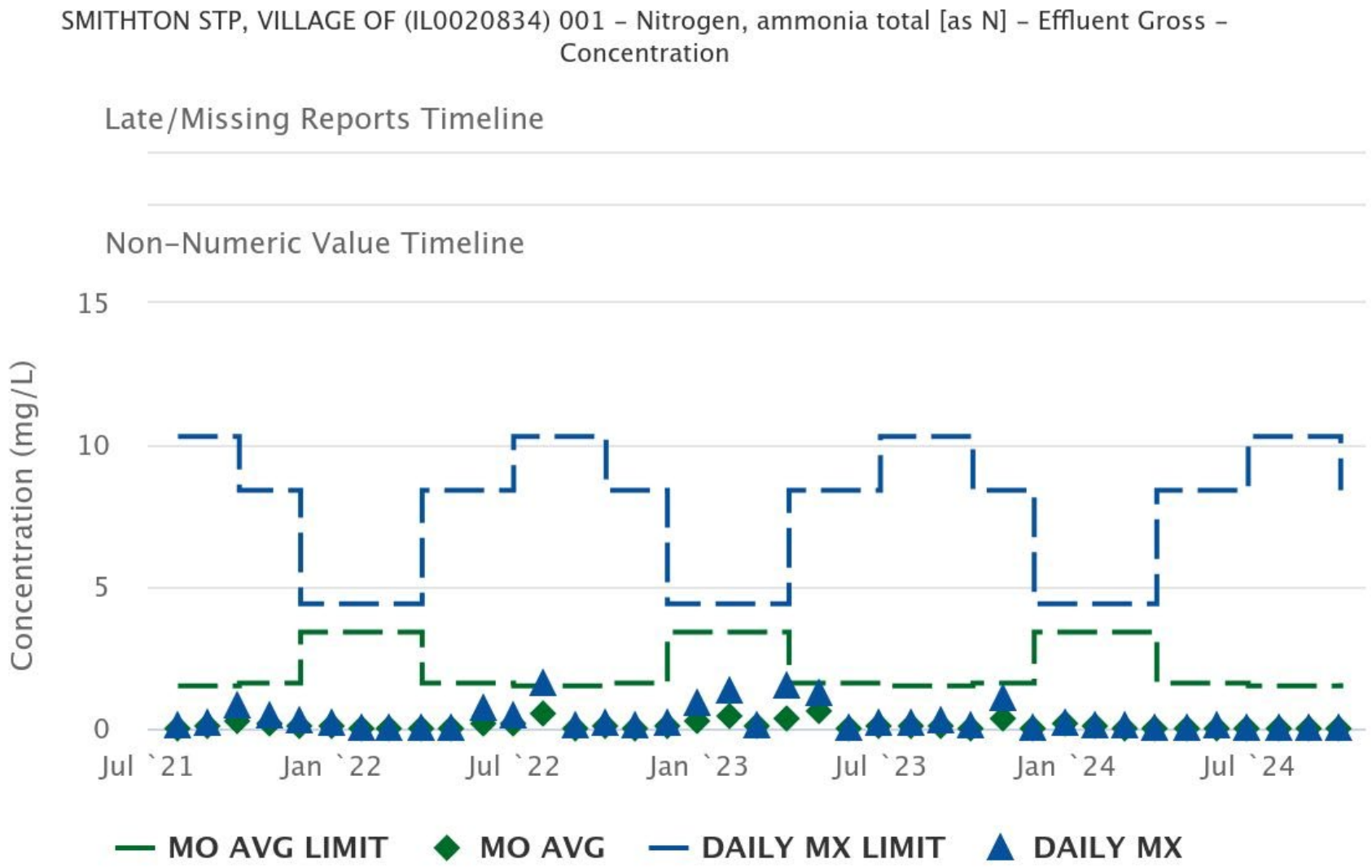
Smithton, IL Effluent BOD



Smithton, IL Effluent TSS



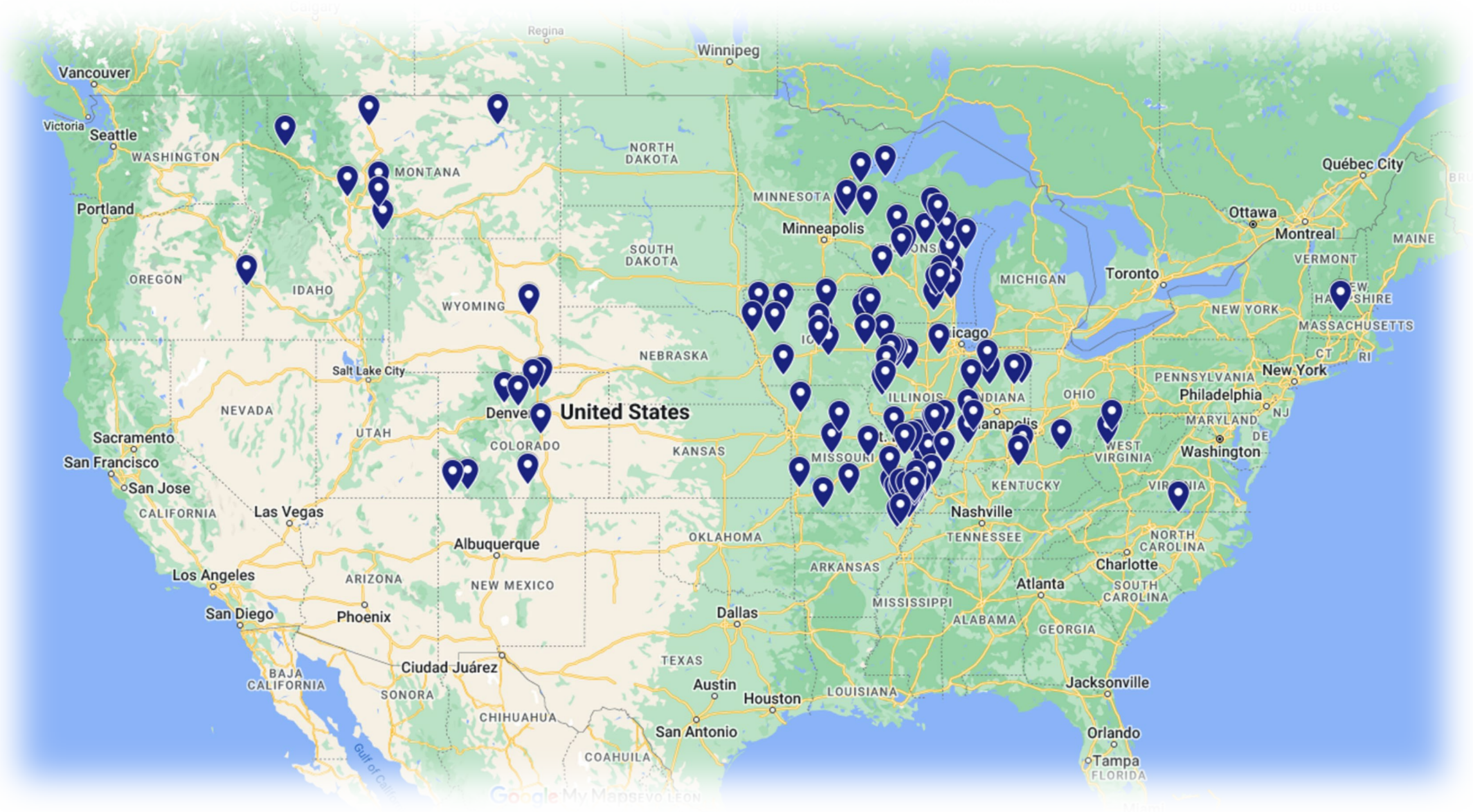
Smithton, IL Effluent NH3



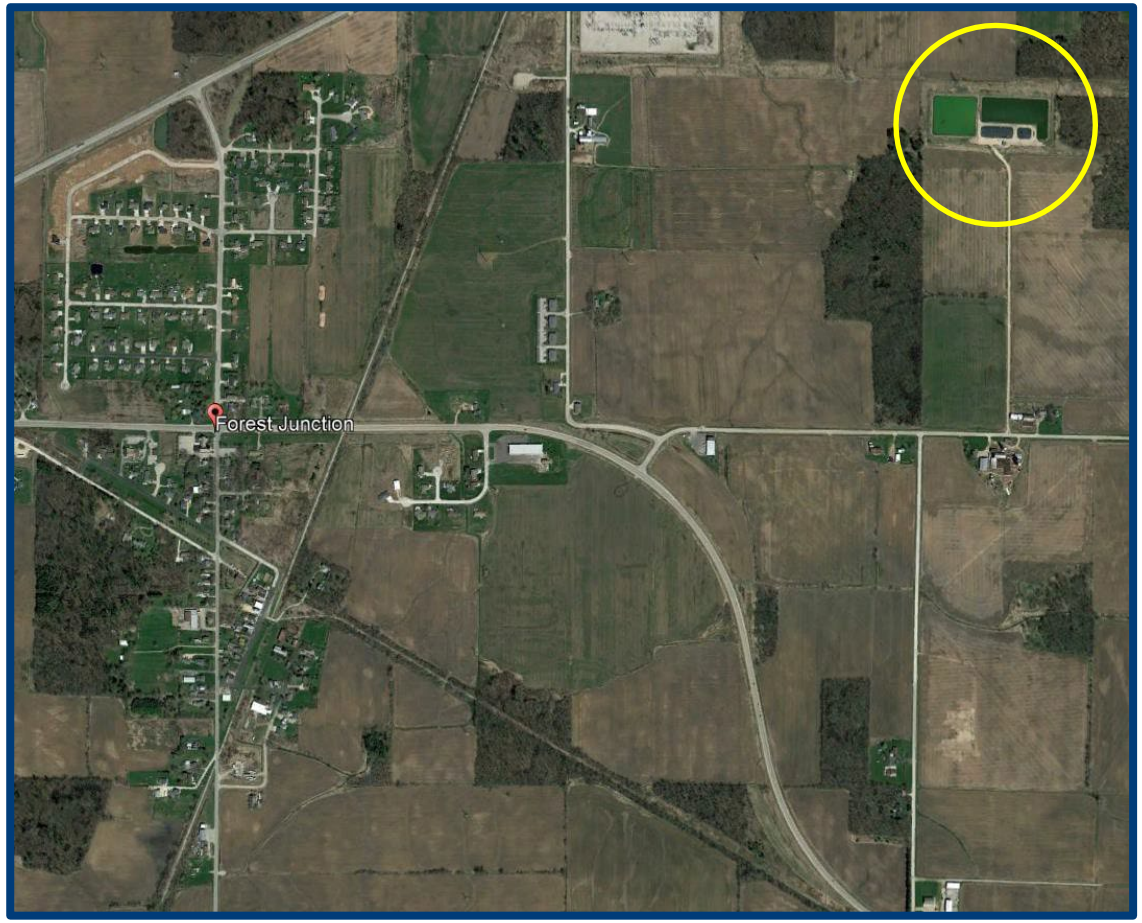
Smithton, IL Conclusion

- System capable of achieving year-round effluent limits as low as 10 mg/l BOD, 10 mg/l TSS and 1 mg/l NH3-N
- Fraction of the cost of a mechanical system
- Low capital and operating costs, expandability and low maintenance
- Operational simplicity
- The City is now able to confidently meet their permit requirements while protecting their natural resources now and in the future

Over 120 Cold Weather Projects



Forest Junction, WI Reference & Case Study



REFERENCE CONTACT INFORMATION

Todd Weyenburg, Plant Operator: (920) 609-3008

Engineer: Robert E. Lee and Associates

PROJECT BACKGROUND

- Rural community in Calumet County
- Existing Facultative Lagoon System
- Population of 616
- Faced with the decision to upgrade or replace its existing system
- More stringent effluent requirements
- Land is expensive
- Large variations in seasonal flow
- Cold weather ammonia treatment required

Forest Junction, WI

Forest Junction, WI

- Total Flow: 0.056 MGD
  - Influent BOD: 240 mg/L
  - Influent TSS: 300 mg/L
  - Influent NH3: 30 mg/L
  - Influent P: 6 mg/L
- Effluent Limits
  - BOD: 20 mg/L
  - TSS: 20 mg/L
  - NH3 Summer: 1.3 mg/L; Winter: 4.5 mg/L
  - P: 1 mg/L

Average Coldest Temperature in Coldest Month: 7^{o} F

Lagoon Design: CM/PM/PM/SC

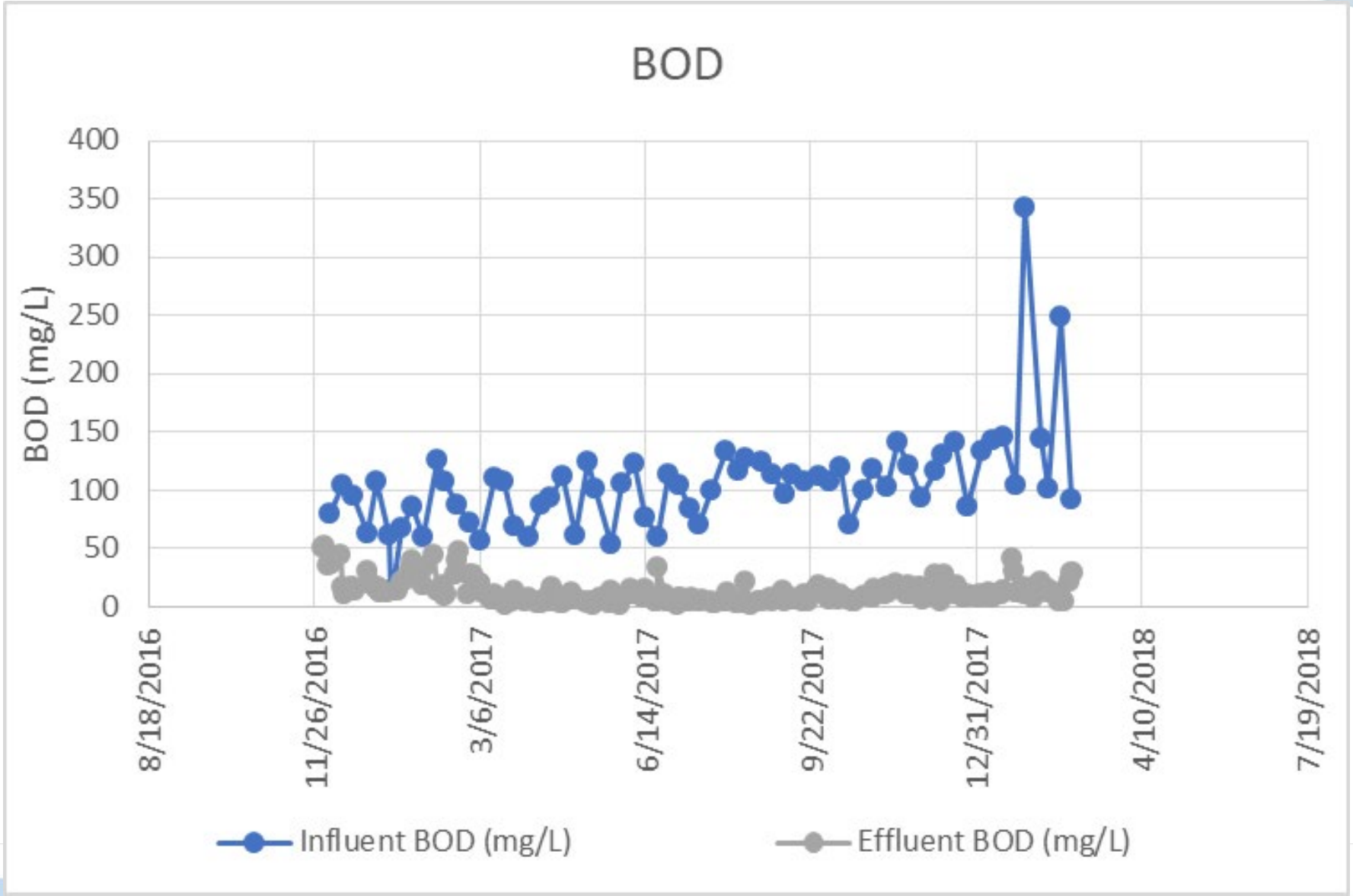
Forest Junction, WI

Cover

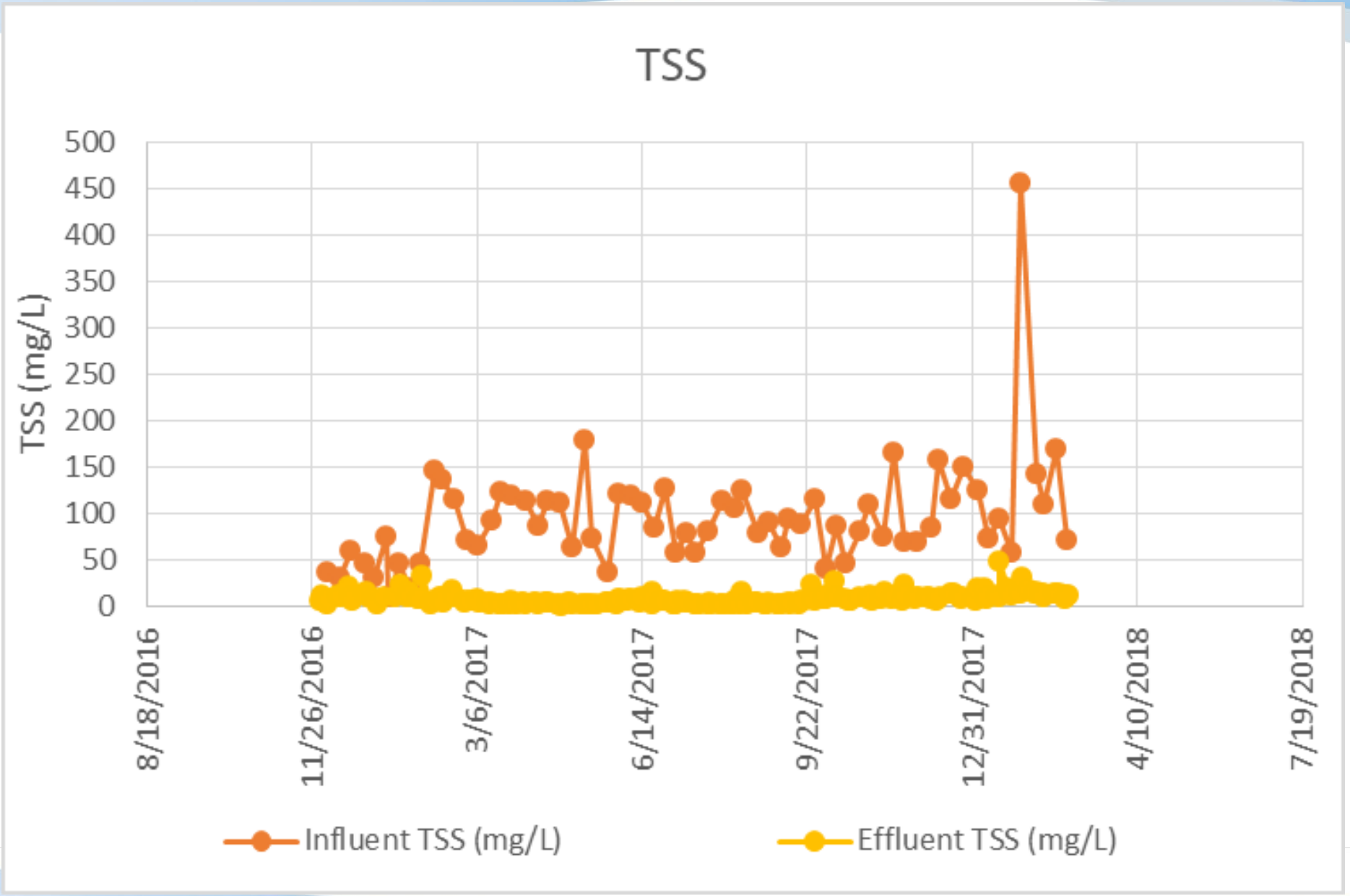
Aeration

LPR & Mixing

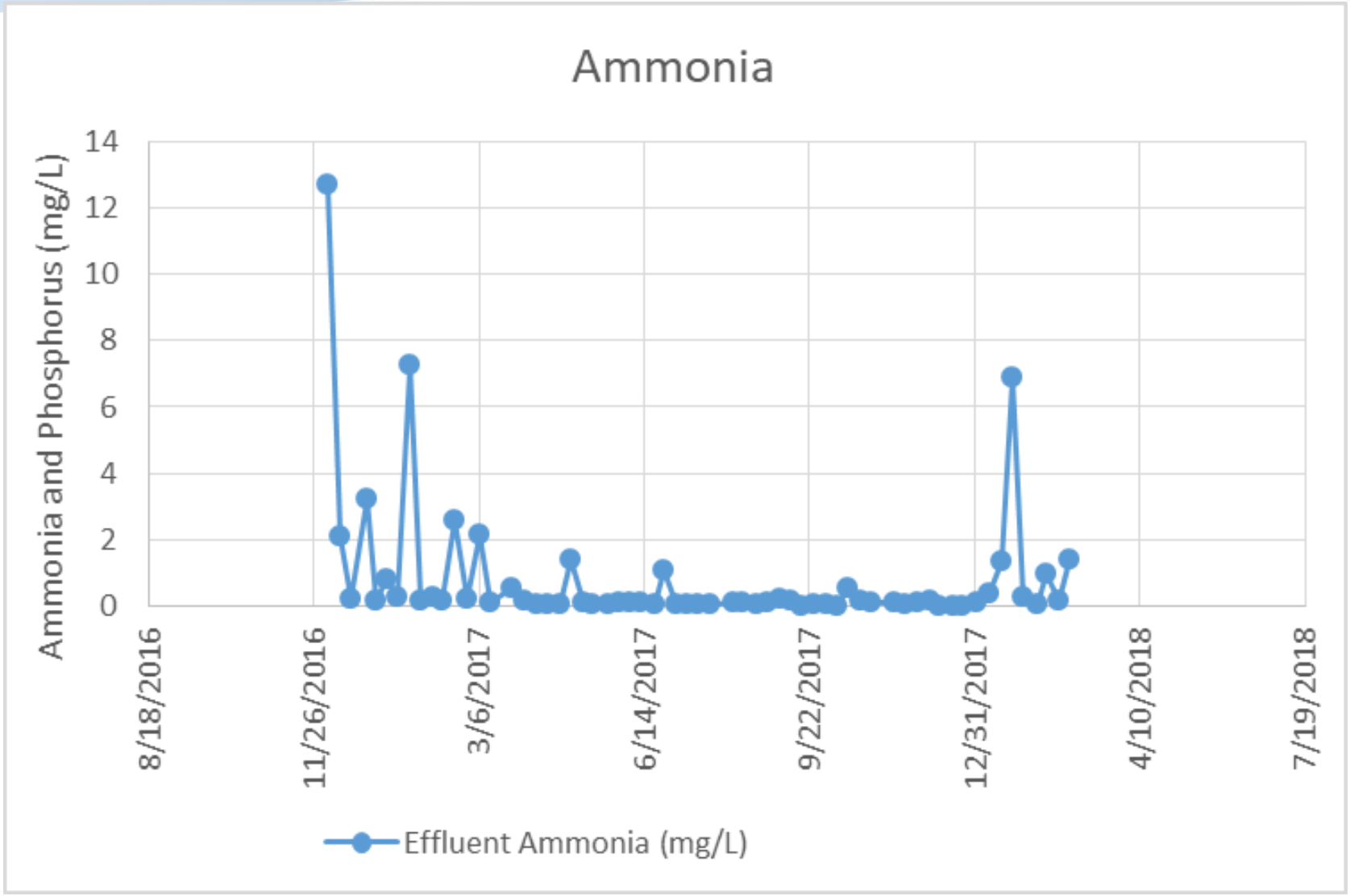
Forest Junction, WI Effluent Results BOD



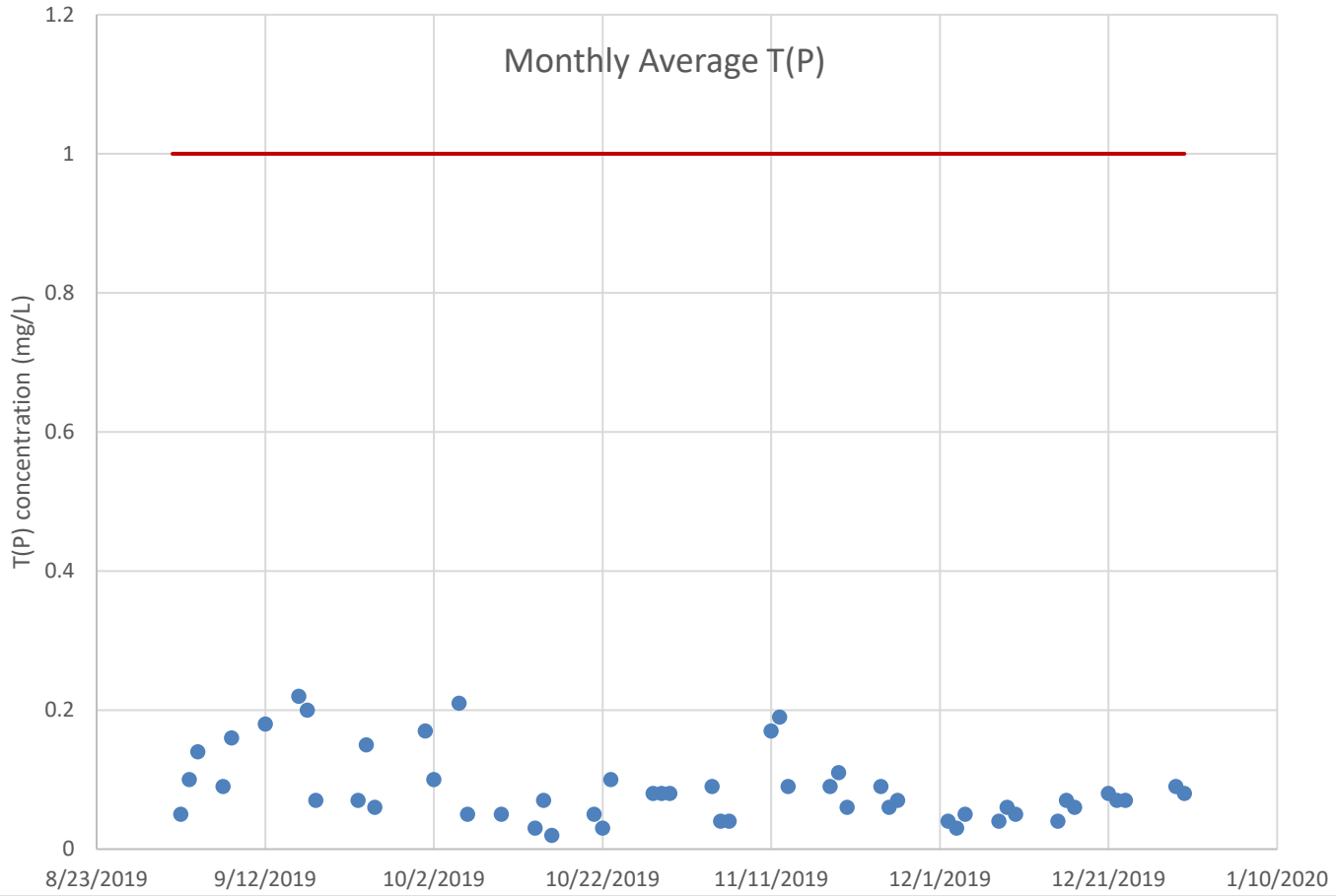
Forest Junction, WI Results TSS



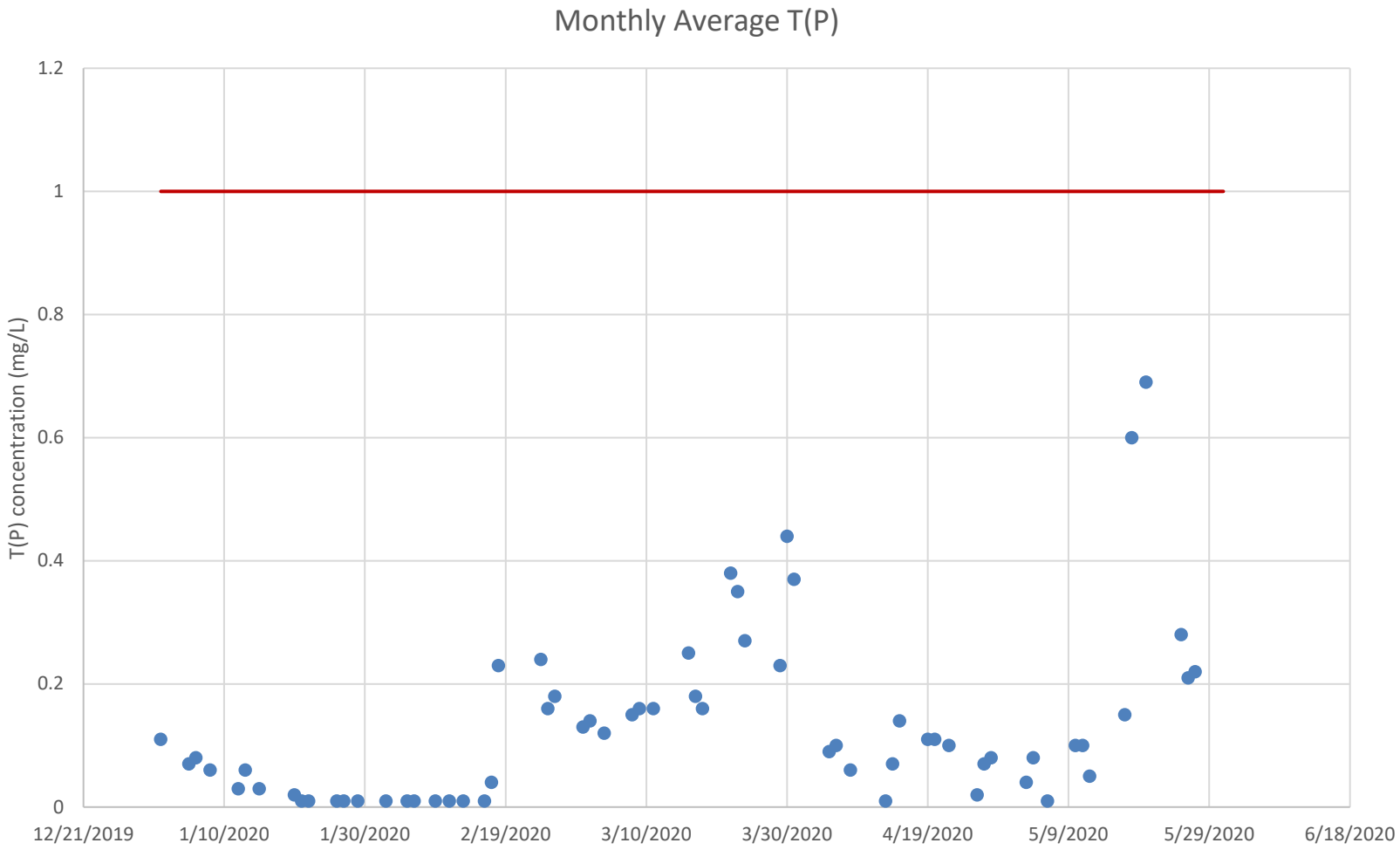
Forest Junction Effluent Results NH3



Forest Junction Effluent Results Phos 2019



Forest Junction Effluent Results Phos 2020



Koshkonong, WI Reference & Case Study

REFERENCE CONTACT INFORMATION

David Houfe, Plant Operator: (608-868-7191)

Engineer: Rhutasel & Associates

PROJECT BACKGROUND

- Rural community in Jefferson County, WI
- Existing Facultative/PM Lagoon System
- Population of 3,763
- Faced with the decision to upgrade or replace its existing system
- More stringent effluent requirements
- Land is expensive
- Large variations in seasonal flow

Koshkonong, WI Design Parameters

	Influent Summer	Influent Winter		Effluent Summer	Effluent Winter	
Flow	0.769	0.901	MGD			
$CBOD_5$	154	159	mg/L	15	15	mg/L
TSS	170	178	mg/L	15	15	mg/L
Ammonia	34	34	mg/L	1.0	1.0	mg/L
Nitrogen	-	-	mg/L	-	-	mg/L
Phosphorus	5.0	5.0	mg/L	1.0	1.0	mg/L

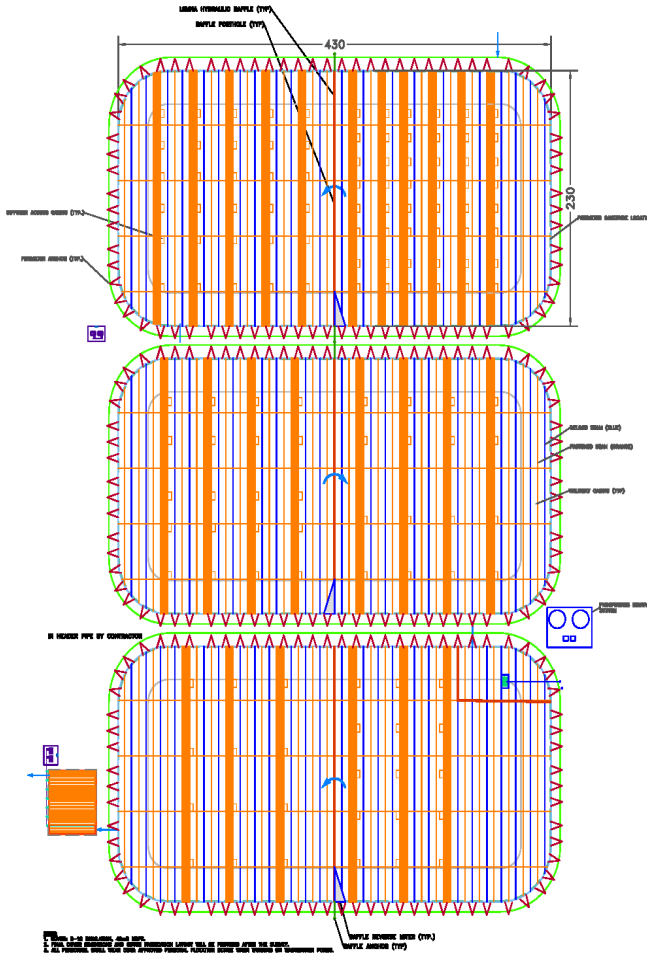
Winter Air Temperature: 10

Lagoon Design: CM/PM/PM/SC

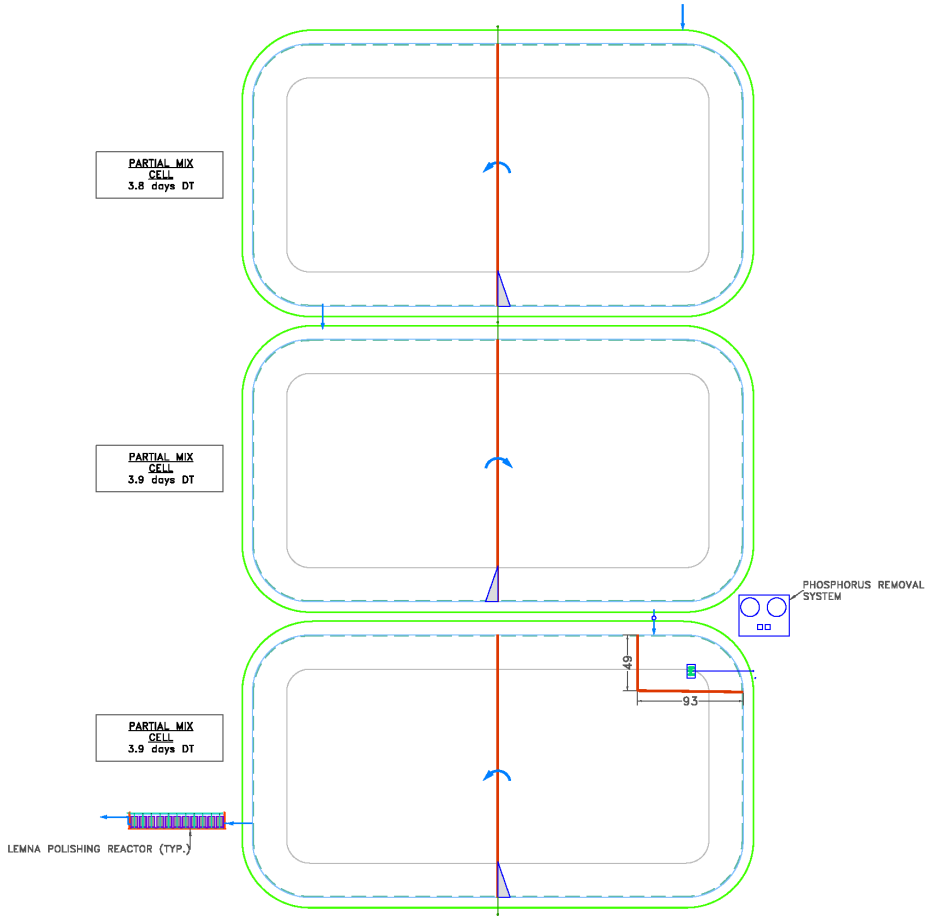
LPR: 44 cubes, 1003 lbs NH3/Day

Koshkonong, WI Layout

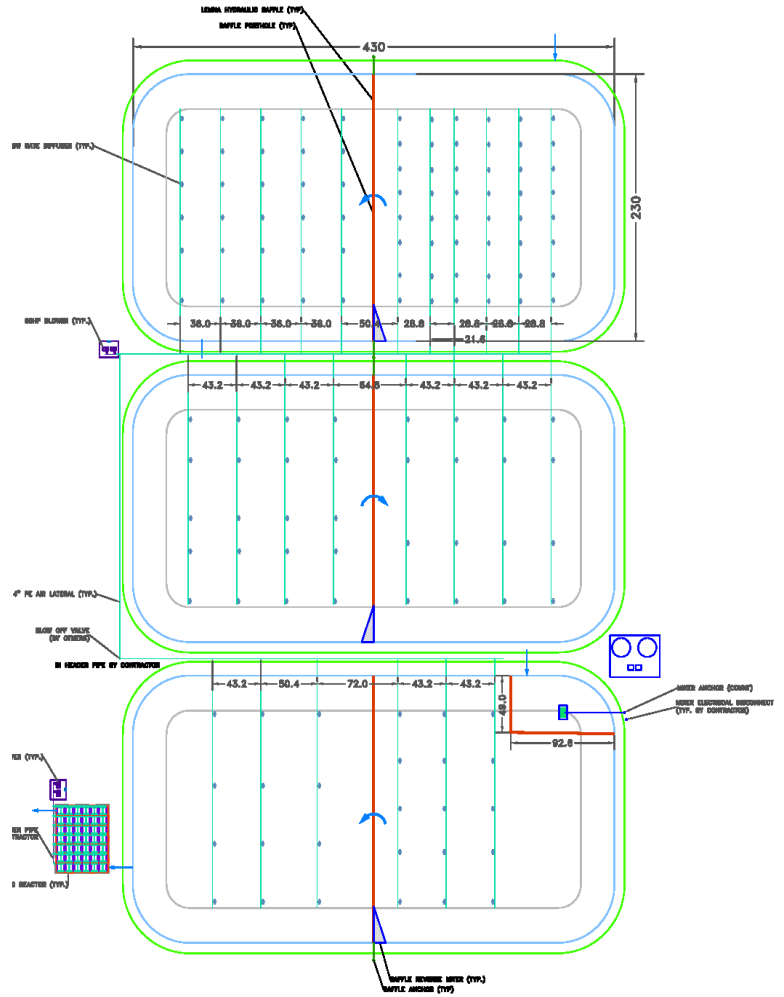
Cover Layout



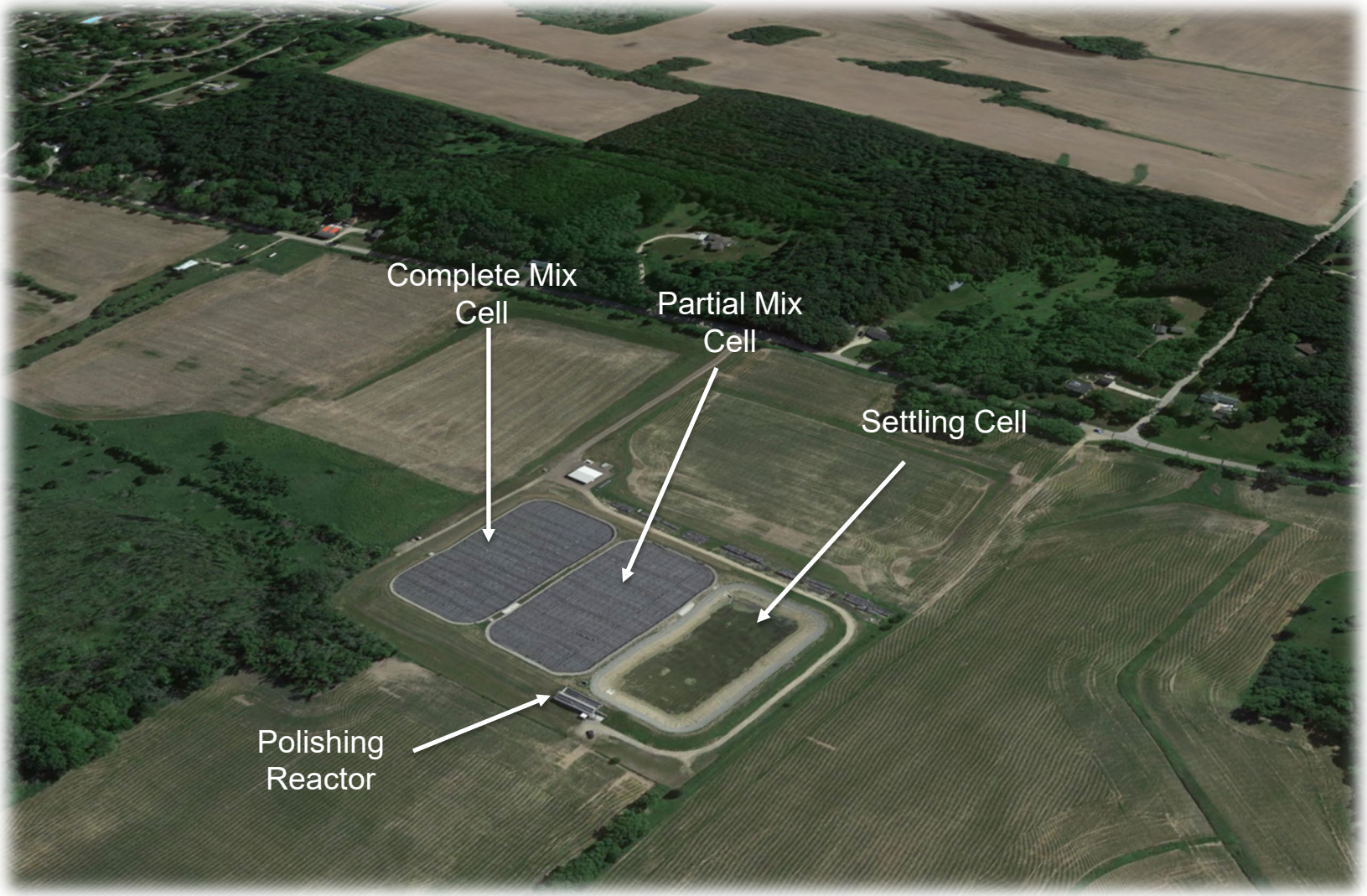
Cell Layout



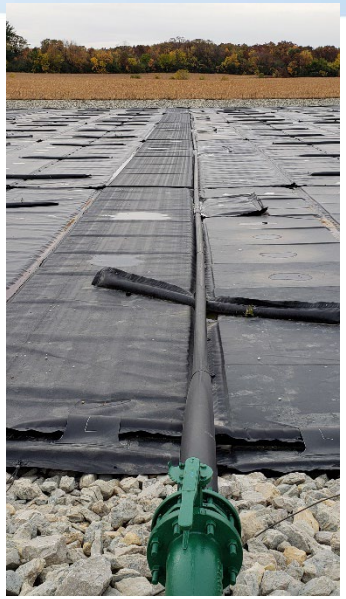
Aeration Layout



Koshkonong, WI Layout



Koshkonong Site Photos



Aeration

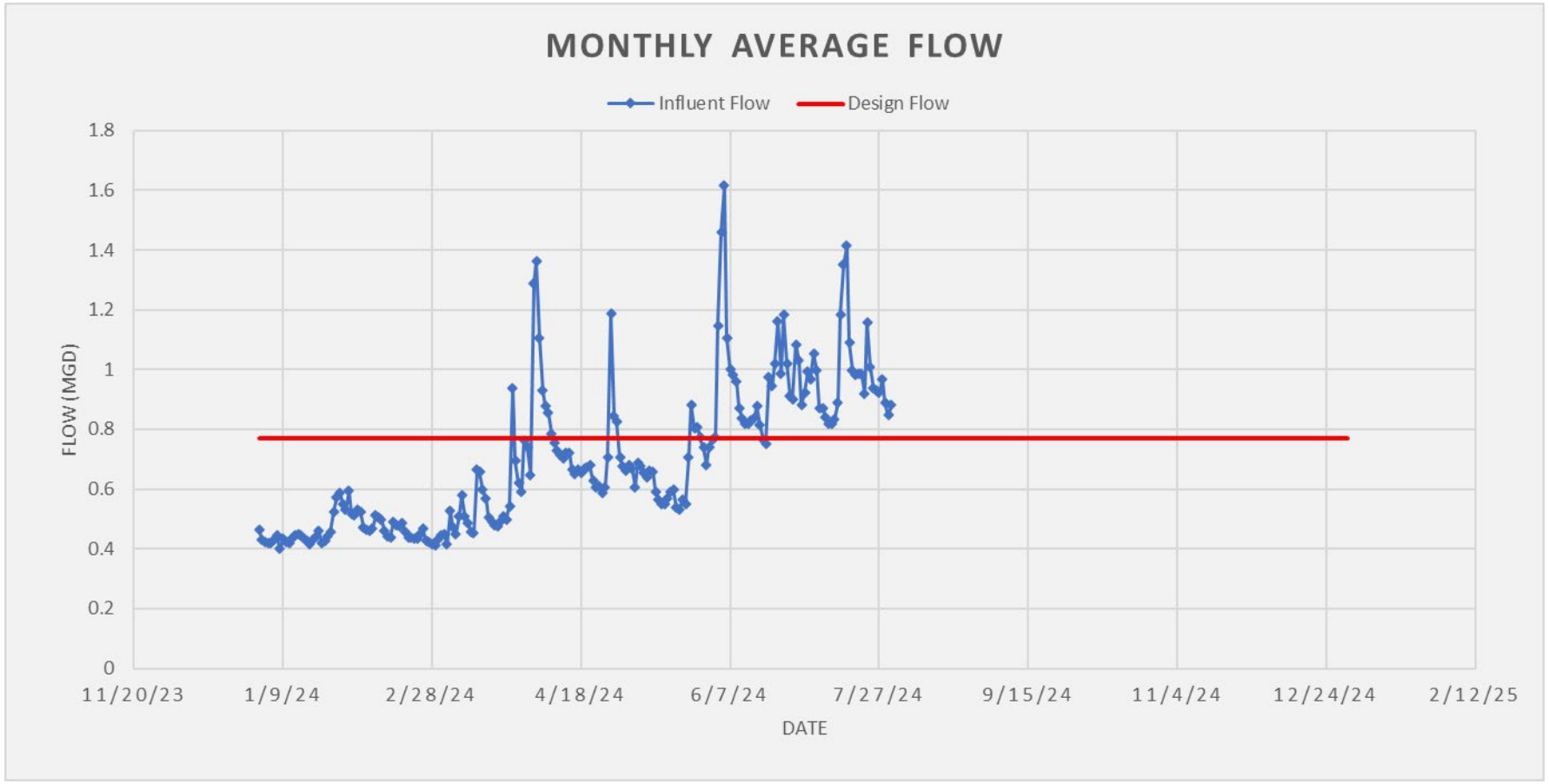
Blowers

Lemna Polishing Reactor (LPR)

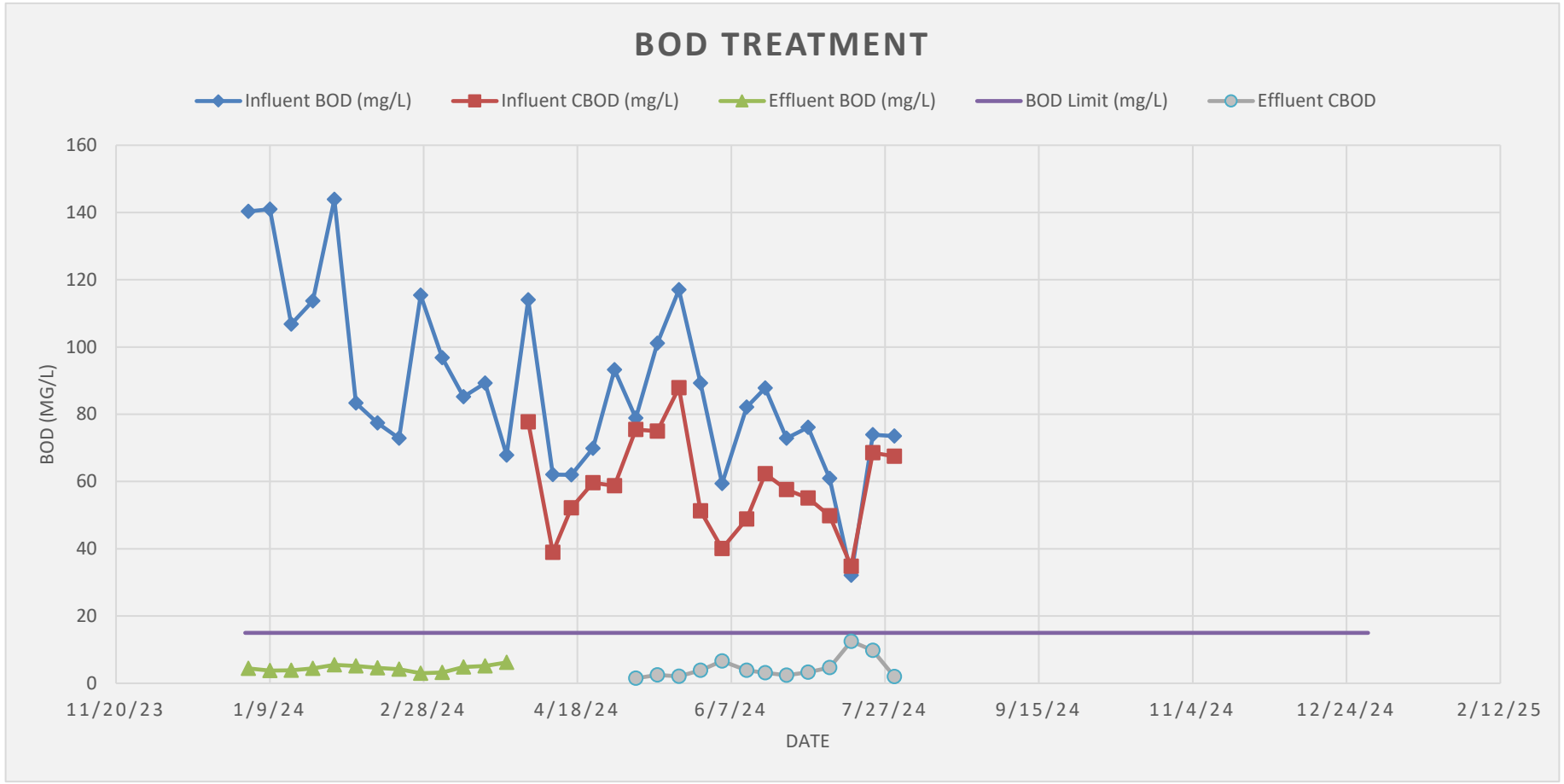
Cover

Gauges

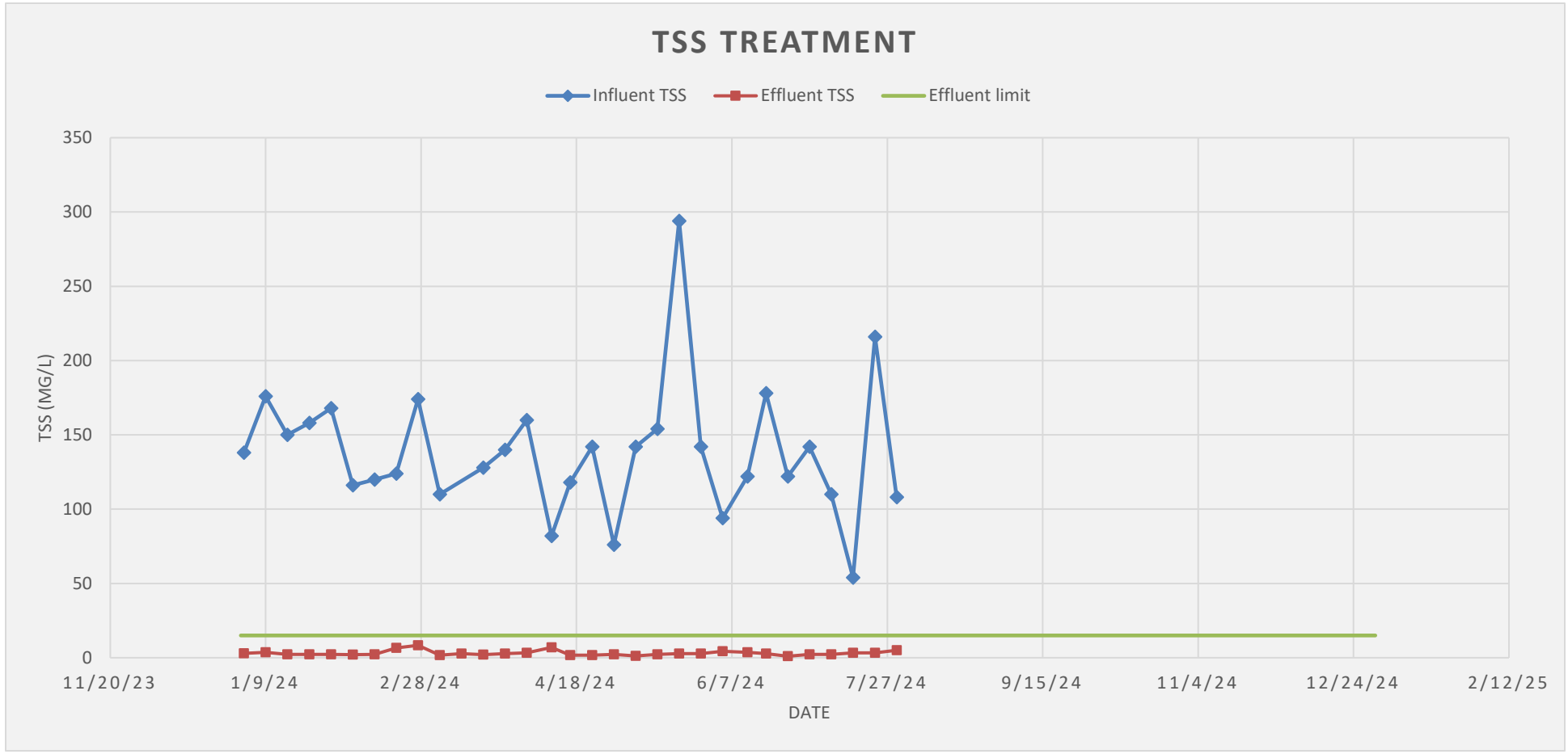
Koshkonong,WI Flow



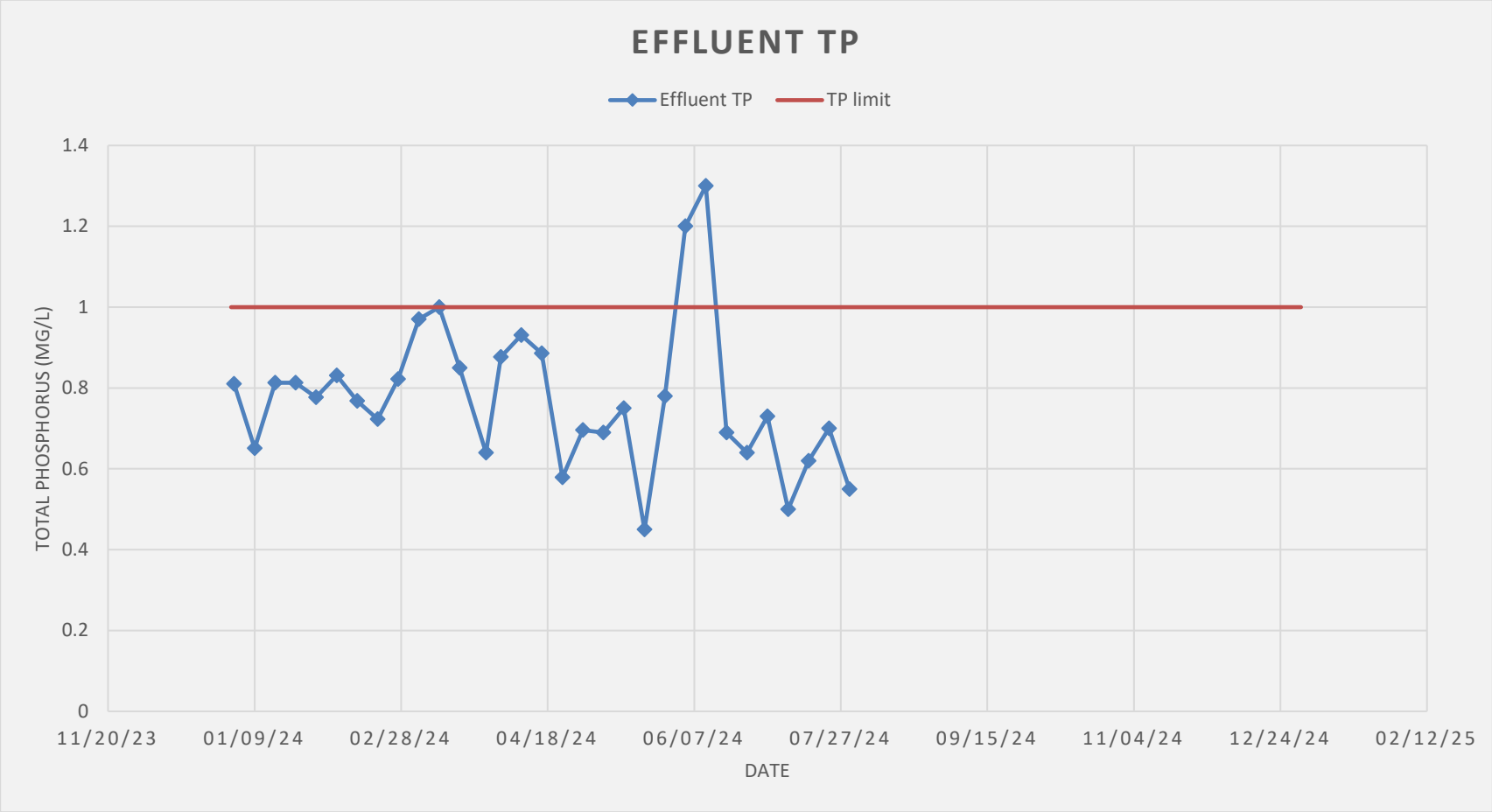
Koshkonong, WI Effluent BOD



Koshkonong, WI Effluent TSS



Koshkonong, WI Effluent TP



Koshkonong, WI Conclusion

- System capable of achieving year-round effluent limits as low as 10 mg/l BOD, 10 mg/l TSS and 1 mg/l NH3-N
- Fraction of the cost of a mechanical system
- Low capital and operating costs, expandability and low maintenance
- Operational simplicity
- The City is now able to confidently meet their permit requirements while protecting their natural resources now and in the future