

**Agency of Natural Resources  
Department of Environmental Conservation**

**Watershed Management Division  
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**MEMORANDUM**

To: Dave DiDomenico, Wastewater Program (WWP)

From: Rick Levey, Monitoring, Assessment and Planning Program (MAPP) *Rick Levey 06/28/17*

Cc: Pete LaFlamme, Director, (WSMD)  
Jessica Bulova, Manager, (WWP)  
Neil Kamman, Manager, (MAPP)

Date: June 28, 2017

Subject: MAPP Reasonable Potential Determination for Shelburne FD#1 Crown Road Wastewater Treatment Facility (WWTF)

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***Facility:***

Shelburne FD#1 Crown Road WWTF  
Permit No. 3-1289  
NPDES No. VT0100331

***Hydrology for Shelburne FD#1 Crown Road WWTF:***

Design Flow: 0.4 MGD = 0.74 CFS

***Receiving Water:***

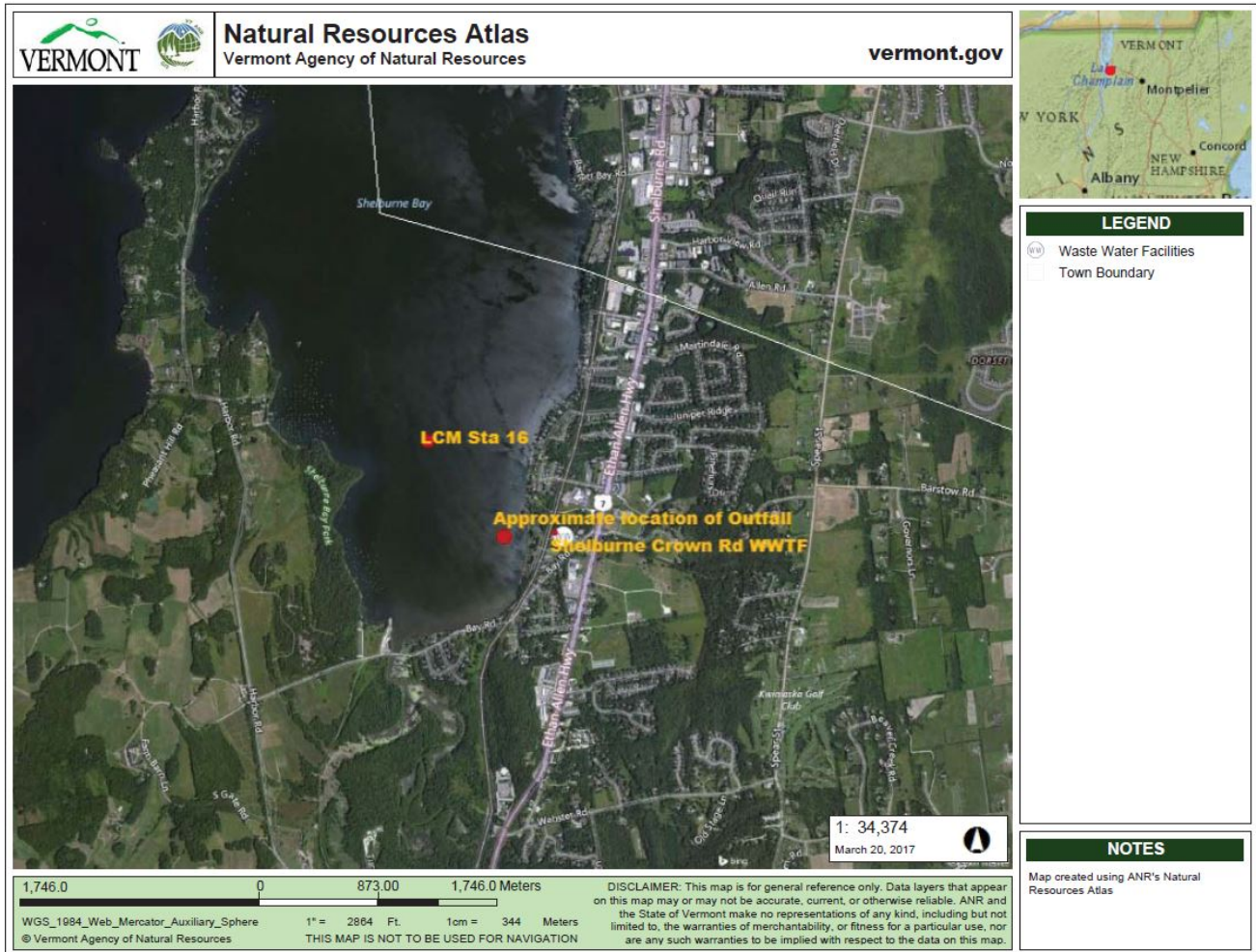
Lake Champlain, Shelburne Bay -Shelburne, Vermont

MAPP has evaluated the draft permit for the Shelburne Crown Road WWTF, in relation to available water quality monitoring data, to determine the protectiveness of the permit with respect to receiving water quality criteria. Figure 1 provides a graphical representation of the location of the outfall for this facility, relative to the most proximal location from which water quality monitoring data are available.

***Phosphorus: Lake Champlain TMDL – Shelburne Bay Segment.***

The ultimate receiving water for this facility is the Shelburne Bay Segment of Lake Champlain, a phosphorus-impaired segment of Lake Champlain subject to the 2016 Lake Champlain TMDLs promulgated by USEPA. That TMDL establishes a wasteload allocation for this facility not to exceed 0.122 MT/year, a reduction of 0.226 MT from the prior limitation in the 2002 TMDL to which this facility was permitted previously. Although the new waste load allocation is based on an effluent TP concentration of 0.2 mg/L, this permit maintains the previous TP effluent limit of 0.8 mg/L, monthly average, which allows for TP discharge concentrations to fluctuate above 0.20 mg/L while holding the annual limit at a mass (total pounds) based on 0.20 mg/L. Effluent limitations in the draft permit reflect the TMDL. The Lake Champlain TMDL also contains a reasonable assurance analysis and accountability

framework demonstrating that the Main Lake Segment will achieve standards following implementation of the TMDL.



**Figure 1. Approximate location of outfall pipe, relative to the Lake Champlain Long-term Biological and Chemical Monitoring Program station.**

Review of Shelburne FD#1 Crown Road facility monitoring records indicate that the average effluent TP concentrations in 2016 was 0.27 mg/L. At these conditions, and presuming effectiveness of these high-quality treatment practices for phosphorus at higher flows, the TP concentration within the Waste Management Zone (WMZ) which is designated as a 200-foot radius around outfall (1:35 Dilution), would be 7.7 µg/L-TP were the facility to be operating at full design flow (0.4 MGD).

Monitoring records for 2016 indicate that the facility has been operating at about ½ design flow, at these conditions the TP concentration within the WMZ would be 3.8 µg/L-TP. These are conservative calculations and do not represent the significant dilution available outside of the WMZ.

Lake Champlain Water quality monitoring data are available from the [Lake Champlain Long-term Biological and Chemical Monitoring Program](#), from a monitoring station located approximately 2,800 feet west by southwest of the outfall and mixing zone centroid. Results from this station indicate that total phosphorus concentrations in the Shelburne Bay segment for the period 2015-2016 averaged 12.2

ug/L, and that long-term trends suggest that the average concentration in this segment has been declining slightly since 2012 (Figure 2). Pursuant to the Vermont Water Quality Standards, this location is an appropriate location to determine compliance with the relevant water quality criterion for this segment.

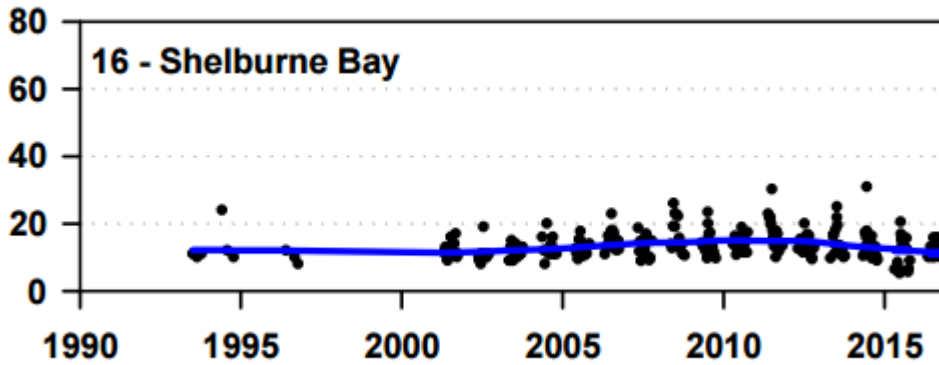


Figure 2. Long-term total phosphorus concentration monitored by the Lake Champlain Long-term Biological and Chemical Monitoring Program. Y-axis shows total phosphorus in ug/L.

***Nitrogen:***

While total nitrogen is not a causal pollutant of designated uses in Lake Champlain, we evaluated the prospective load of total nitrogen in the mixing zone as a further validation of the sufficiency of treatment for the facility.

Annual constituent monitoring records for the last few years indicate that the average effluent TN concentration is about 13.0 mg/L-TN. This concentration would account for a 0.37 mg/L-TN increase in the mixing zone surrounding the diffuser. This is 93% lower than the total allowable NO<sub>3</sub> criteria of 5 mg/L, and is highly-conservative, presuming that all nitrogen measured was in the form of NO<sub>3</sub>-N.

Water quality monitoring data available from the [Lake Champlain Long-term Biological and Chemical Monitoring Program](#) indicates that total nitrogen concentrations in the Shelburne Bay segment for the period 2015-2016 average 0.37 mg/L, and long-term trends suggest that the average concentration in this segment is flat to slightly declining over the period of record (Figure 3).

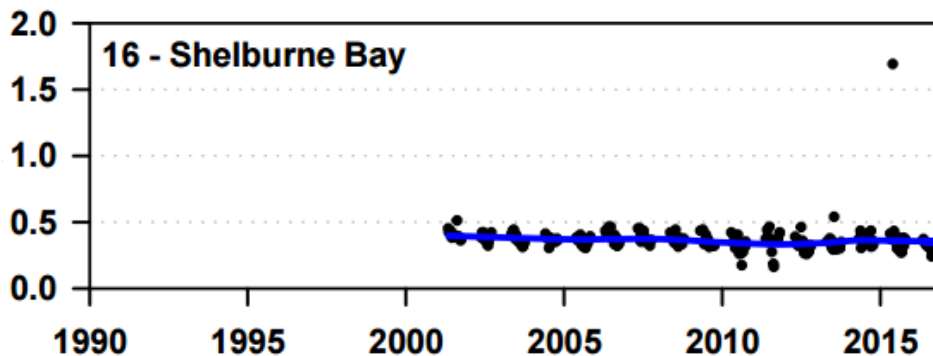


Figure 3. Long-term total nitrogen concentration monitored by the Lake Champlain Long-term Biological and Chemical Monitoring Program. Y-axis shows total nitrogen in mg/L.

***Whole Effluent Toxicity (WET) and Priority Pollutant Testing:***

40 CFR Part 122.44(d)(1) requires the Agency to assess whether the discharge causes, or has the reasonable potential to cause or contribute to an excursion above any narrative or numeric water quality criteria. The goal of the Vermont Toxic Discharge Control Strategy is to assure that the state water quality standards and receiving water classification criteria are maintained. Review of the most recent WET Test from 2009, a 2-species acute test, indicated that there was no effluent toxicity, even at 100% effluent for *Ceriodaphnia dubia*. The A-NOEC for *Pimephalas promelas* was 50% and the A-LC50 was 100%. These results pass the WET criteria and do not pose a risk to the receiving water. The draft permit requires a two-species 48-hour acute and 96-hour chronic WET test be conducted during August or September 2019 and 2021 and January or February 2018 and 2020. If the results of this test indicate a reasonable potential to cause an instream toxic impact, the Department may require additional WET testing, establish a WET limit, or require a Toxicity Reduction Evaluation.

***Ammonia Monitoring:***

Shelburne FD#1 Harbor Rd. WWTF effluent ammonia data is lacking, however the 35:1 available dilution provides significant dilution, an ammonia effluent concentration of 14 mg TAN/L would be necessary to exceed the chronic criteria RWC of 0.40 mg/L TAN, based on a pH of 8.3, and a 30-day average measured daytime temperature of 23 degrees C (data derived from the Lake Champlain Long-term Monitoring Program). Presuming that effluent TAN concentration remain below this level there would be no reasonable potential for VWQS excursion. We further note that total N averages 13 mg/L for this facility, and that TAN is only one component of total N, suggesting an unlikelihood of exceeding 14mg/L TAN, especially during summer months when total N and TAN are at lower concentrations in effluent generally. Owing to the lack of data to verify this, a monitoring requirement for effluent ammonia concentration is recommended to complement the total N requirement.

***Metals:***

Effluent characterization does not include metals data, but to help illustrate that it is very unlikely that metals would exceed WQS due to available dilution within the mixing zone, we will use nickel as an example. The chronic WQ standard for nickel at hardness 63 mg/L-CaCO<sub>3</sub> is 35µg/L-Ni, the effluent concentration of nickel would need to be 1225µg/L-Ni, a very high and unlikely concentration. Similar WWTFs that screen for priority metals are typically below the detection limit of 5µg/L-Ni.

***Conclusion:***

These analyses help to illustrate the de-minimis impact phosphorus, nitrogen, metals, or other pollutants within this discharge would pose to receiving waters. Considering this, MAPP has determined that this WWTF and its discharge quality pursuant to the draft permit does not have the potential to cause measurable change in the receiving water outside of the mixing zone.