NITROGEN CONTROL PLAN
for the
TOWN OF EXETER

SEPTEMBER 2018

DRAFT SUBMITTAL

TOWN OF EXETER

NITROGEN CONTROL PLAN

SEPTEMBER 2018

DRAFT SUBMITTAL

Prepared by:

Wright-Pierce
230 Commerce Way, Suite 302
Portsmouth, NH 03801

Horsley Witten Group
113 R2 Water Street
Exeter, NH 03833

TOWN OF EXETER – NITROGEN CONTROL PLAN

TABLE OF CONTENTS

SECTION **DESCRIPTION** **PAGE**

TABLE OF CONTENTS (CONTINUED)

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

SECTION 1
INTRODUCTION

1.1 INTRODUCTION

EPA issued the Town a new NPDES permit in December 2012, which included treatment requirements that the existing WWTF is not able to accomplish. EPA then issued an Administrative Order on Consent (AOC) to the Town in June 2013. The AOC provides a framework and schedule for the Town to achieve compliance with the NPDES permit requirements. The AOC also requires the submittal of a Nitrogen Control Plan (Article D.4). This document was prepared to comply with this AOC requirement.

1.2 PURPOSE AND ORGANIZATION OF REPORT

The purpose of this report is to provide a technical basis upon which to make nitrogen management decisions and to satisfy the requirements of Article D.4 of the AOC. This report is divided into the following sections: 1) Introduction 2) Baseline Loadings; 3) Regulatory Framework; 4) Nitrogen Reduction Measures; 5) Adaptive Management Framework; and 6) Implementation Plan. A list of acronyms and abbreviations used in this report is provided in Table 1-1 at the end of this section.

1.3 RELEVANT WORK COMPLETED PREVIOUSLY

The following relevant work is cited in this document:

- Numeric Nutrient Criteria for the Great Bay Estuary. NHDES, June 2009.
- Preliminary Watershed Nitrogen Loading Thresholds for the Watersheds Draining to the Great Bay Estuary. NHDES, October 2009.
- State of Our Estuaries, PREP, 2009.
- Review of Numeric Nutrient Criteria for the Great Bay Estuary. Howarth, June 2010.
- Review of Numeric Nutrient Criteria for the Great Bay Estuary. Boynton, May 2010.
- Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Watershed. NHDES, Draft, December 2010.

- Squamscott River August-September 2011 Field Studies. HDR/HydroQual, March 20, 2012.
- Assessments of Aquatic Life Use Support in the Great Bay Estuary for Chlorophyll-a, Dissolved Oxygen, Water Clarity, Eelgrass Habitat, and Nitrogen. NHDES, April 2012.
- Model Stormwater Standards for Coastal Watershed Communities. Southeast Watershed Alliance, December 2012.
- State of Our Estuaries. PREP, 2013
- Joint Report of Peer Review Panel for Numeric Nutrient Criteria for the Great Bay Estuary. Bierman, Diaz, Kenworthy, Reckhow, February 2014.
- Great Bay Nitrogen Non-Point Source Study. NHDES, June 2014.
- Wastewater Facilities Plan. Wright-Pierce, March 2015.
- Water Integration for Squamscott Exeter (WISE), Preliminary Integrated Plan, Final Technical Report. Geosyntec, et.al., December 2015
- Piscataqua Region Environmental Planning Assessment. PREP, 2015
- Preliminary Design Report for the Town of Exeter WWTF & Main Pump Station Upgrade. Wright-Pierce, October 2015, Revised January 2016.
- State of Our Estuaries. PREP, 2018
- UNH, Eelgrass Survey Reports. UNH, multiple years
- UNH, Macroalgae Survey Reports. UNH, multiple years

TABLE 1-1
LIST OF COMMONLY USED ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order on Consent
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
GBNNPSS	*Great Bay Nitrogen Non-Point Source Study*, NHDES, June 2014.
GIS	Geographic Information System
lb/yr	Pounds Per Year
LOT	Limit of Technology
mgd	Million Gallons Per Day
mg/l	Milligrams Per Liter
MS4	Municipal Separate Storm Sewer System
NCP	Nitrogen Control Plan
NHDES	New Hampshire Department of Environmental Services
NPDES	National Pollutant Discharge Elimination System
NPS	Non-Point Source
PLER	Pollutant Load Export Rate
PREP	Piscataqua Region Estuaries Partnership
PTAPP	Pollutant Tracking and Accounting Pilot Project
SRF	State Revolving Fund (administered by New Hampshire Department of Environmental Services)
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids
t/yr	Tons per Year
UNH	University of New Hampshire
VRAP	Volunteer River Assessment Program
WLA	Waste Load Allocation
WQAL	Water Quality Analysis Laboratory
WWTF	Wastewater Treatment Facility

SECTION 2
BASELINE LOADINGS

The purpose of this section is to summarize the baseline nitrogen load contributions from the Town of Exeter to the various tributaries and to Great Bay.

2.1 DATA SET, PROJECT AREA AND MODELING APPROACH

The following studies and methods were used in developing the baseline conditions model:

- Great Bay Nitrogen Non-Point Source Study (GBNNPSS) (Trowbridge et al., 2014);
- Water Integration for the Squamscott Exeter (WISE) Preliminary Integrated Plan, Final Technical Report (Geosyntec Consultants, et.al., 2015)
- Wastewater Facilities Plan (Wright-Pierce, 2015); and
- New Hampshire 2017 Final Municipal Separate Storm Sewer System (MS4) Permit, Appendix F, Attachment 3, Draft (EPA, 2017).

Data sources associated with each of the nitrogen pollutant load model sources are summarized below:

- Stormwater Load Model (Unattenuated) (EPA, 2017);
- Septic System Load Model (GBNNPSS);
- Pollutant Load Export Rates (PLERs) (EPA, 2017);
- Wastewater Treatment Facility Load (Wright-Pierce, 2015); and
- Attenuation in pathways in groundwater and surface water (GBNNPSS).

The baseline model estimates the total load of nitrogen deposited on land surface. The initial load represents pollutants from the following sources:

- Atmospheric deposition;
- Human application of pesticides and fertilizers on agricultural land;
- Residential land and managed open space (e.g., golf courses and ball fields);
- Waste from both domestic and farm animals; and
- Natural deposition from leaf litter, grass clippings, wetlands and forests.

From these sources, a stormwater and groundwater load was estimated. The stormwater load represents the portion of the source load transported during a rain event from the land surface directly to a storm drain or receiving water. The stormwater load is based on pollutant load export rates (PLERs), which are derived from land use specific water quality data to determine an aggregate nitrogen export rate for all sources. The PLER approach is consistent with methodology used by EPA Region 1 for compliance under the MS4 permit. The groundwater load represents the portion of the load on the land surface which infiltrates during a rain event plus the human waste load from septic systems. The wastewater load represents the nitrogen load discharged from the wastewater treatment facility (WWTF).

The data for this modeling effort was collected from the period 2009 to 2011; accordingly, the "baseline year" is defined as 2010. This data set was selected because it is similar to and comparable with the NHDES 2014 GBNNPSS data set. This modeling approach is different from the approach used by NHDES for GBNNPSS; however, this modeling approach allows the community to calculate the existing and future stormwater baseline load by land use category and subsequently to use the TN BMP performance curves provided in the 2017 MS4 Appendix F in order to estimate TN removals. This modeling approach produced comparable results to the GBNNPS approach. Refer to Section 2.5 for additional information.

The impact of any particular source is dependent on how much nitrogen is removed or attenuated by natural processes along the transport pathway (e.g., bacterial action, vegetative uptake, etc.). The Great Bay Nitrogen Non-Point Source Study describes the distinction between the "input load" ("unattenuated load") to the watershed (i.e., the actual load generated by a particular source such as a roof, field, forest, parking lot, etc.) and the "delivered load" to the watershed (i.e., the load which ultimately reaches the receptor surface water after undergoing natural treatment processes along the transport pathway such as bacterial action, vegetative uptake, etc.). The delivered load is the most important parameter in terms of achieving the water quality goals.

Refer to Appendix C for additional information on the modeling approach.

2.2 TOWN BASELINE NITROGEN LOAD

The baseline nitrogen load was estimated via the nitrogen pollutant load models described previously along with existing regional studies. The baseline load was estimated for stormwater, groundwater (septic and non-septic), and wastewater source pathways. Each of these are described briefly below.

- Stormwater Load: Nitrogen load that flows over the land surface to a storm drain system or discharges directly to surface water.
- Groundwater Load (Septic): Nitrogen that leaches from septic systems to the groundwater.
- Groundwater Load (Non-Septic): All other nitrogen sources that make their way to groundwater (e.g., the portion of stormwater that infiltrates into soil, etc.).
- Wastewater Treatment Facility: Nitrogen that is discharged from a WWTF.

Exeter's land area falls within four subwatersheds: Exeter-Squamscott River, Lamprey River, Winnicut River and Hampton Harbor. Figure 2-1 shows the portions of Exeter that falls within each of the four subwatersheds. Figure 2-2 summarizes Exeter's baseline delivered nitrogen loads (in pounds/year). Table 2-1 summarizes Exeter's baseline delivered nitrogen load (in pounds/year) and population for each river basin. Refer to Appendix C for more information on baseline loadings.

FIGURE 2-1
EXETER SUBWATERSHEDS

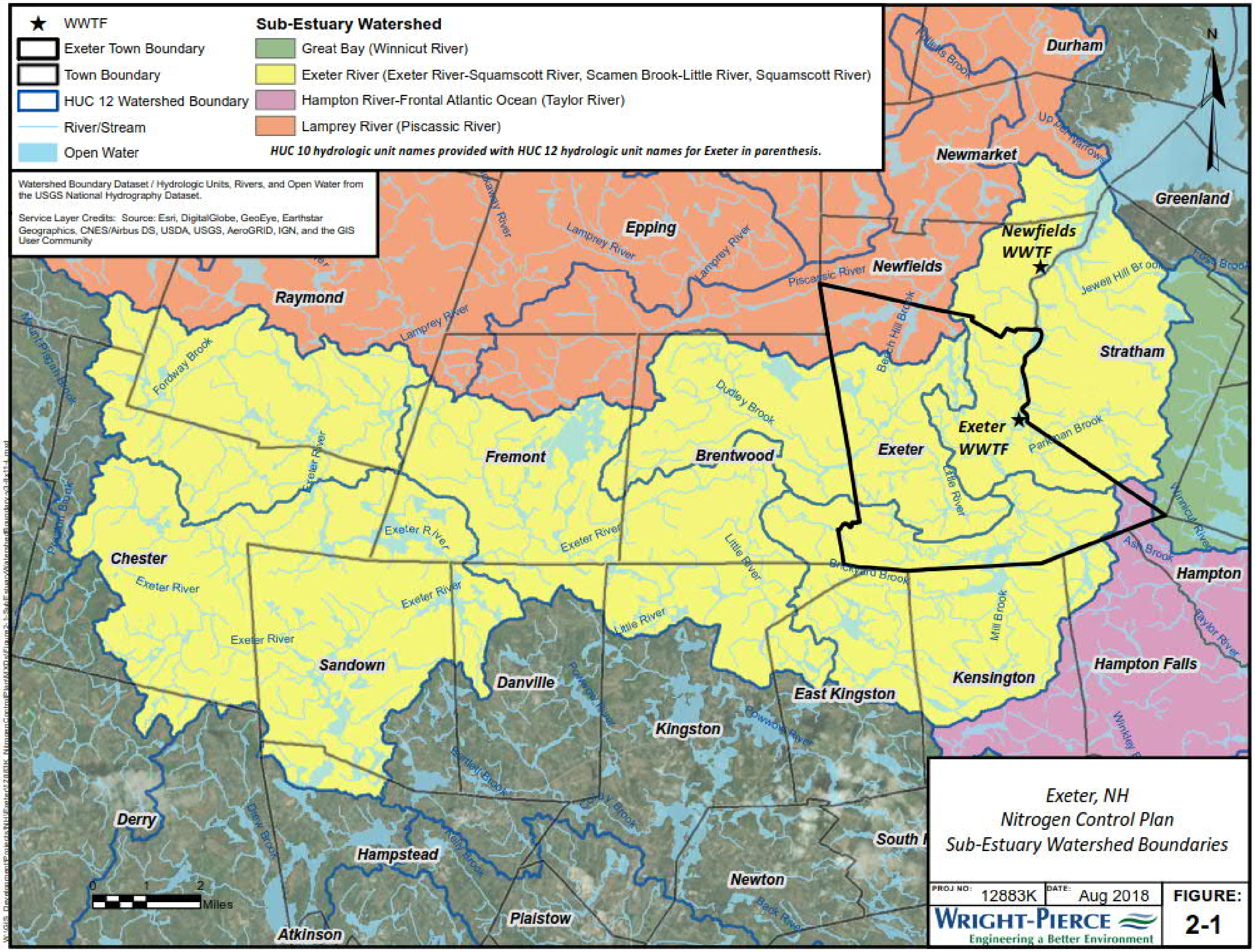


FIGURE 2-2
EXETER'S BASELINE NITROGEN DELIVERED LOAD

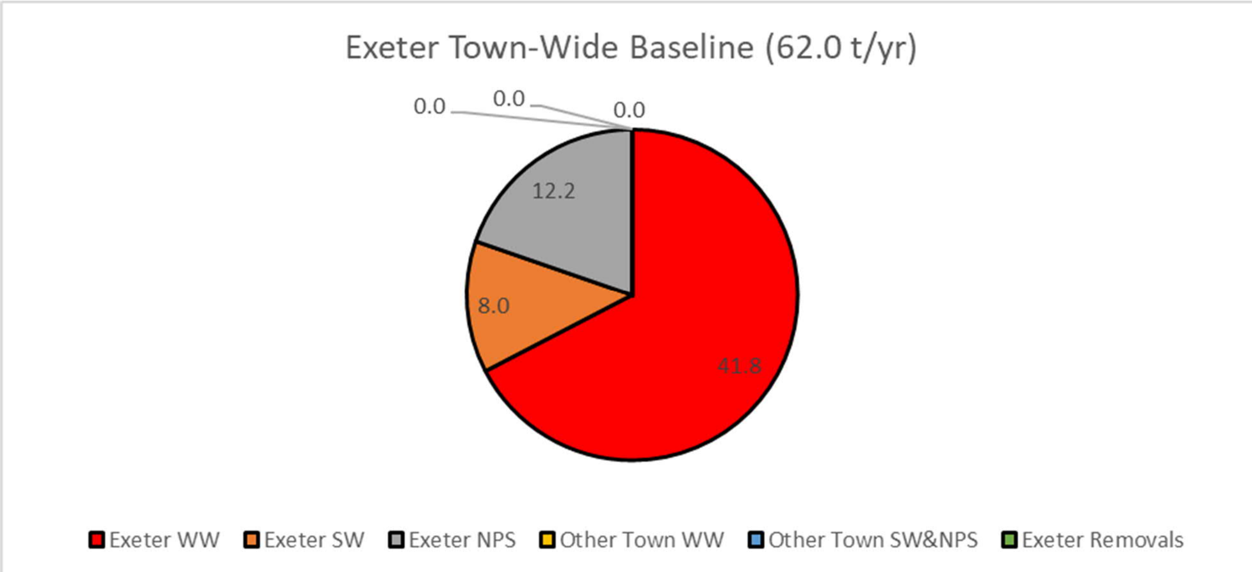


TABLE 2-1
EXETER'S BASELINE NITROGEN DELIVERED LOAD AND POPULATION BY RIVER BASIN

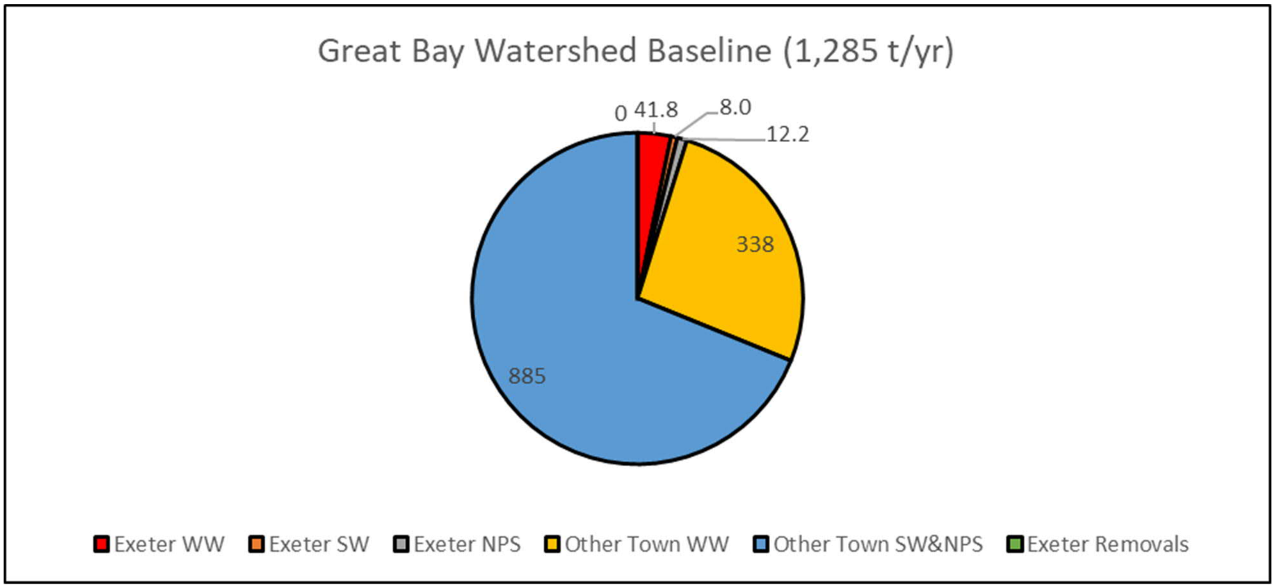
Category	River Basin				Town-Wide Total
	Exeter/ Squamscott	Lamprey	Winnicut	Hampton	
Exeter's Delivered Load					
Stormwater (t/yr)	7.2	0.55	0.03	0.25	8.0
Groundwater/Septic (t/yr)	3.5	0.56	0.02	0.35	4.5
Groundwater/Non-Septic (t/yr)	6.8	0.79	0.03	0.22	7.8
WWTF (t/yr)	41.8	-	-	-	41.8
Total (t/yr)	59.3	1.90	0.07	0.81	62.1
% of Exeter's Town-Wide Load	95.5%	3.1%	0.1%	1.3%	-
% of Watershed Load	35%	1.0%	0.3%	1.2%	-
Population					
Exeter's Population	13,294	411	22	582	14,311
Watershed Population	44,878	39,966	6,233	34,315	
% of Exeter's Population	92.9%	2.9%	0.2%	4.1%	-
% of Watershed Population	29.6%	1.0%	0.4%	1.7%	-
Baseline Delivered Load					
Exeter (pounds/capita)	8.9	9.2	6.0	2.7	8.7
Watershed (pounds/capita)	7.4	9.1	7.6	3.8	-

Notes: Refer to Appendix C for additional information

2.3 GREAT BAY BASELINE NITROGEN LOAD

The Great Bay Watershed is made up of 52 communities in New Hampshire and Maine. The Great Bay receives approximately 1,285 tons/year of nitrogen as delivered load (NHDES, 2010; Trowbridge, et.al. 2014) of which approximately 30% is from WWTFs and approximately 70% from non-point sources and stormwater (Figure 2-3). Exeter's baseline delivered load (62.1 tons/year) represents approximately 5% of the total delivered load to Great Bay (3.5% from the Exeter WWTF loads and 1.5% from Exeter NPS loads).

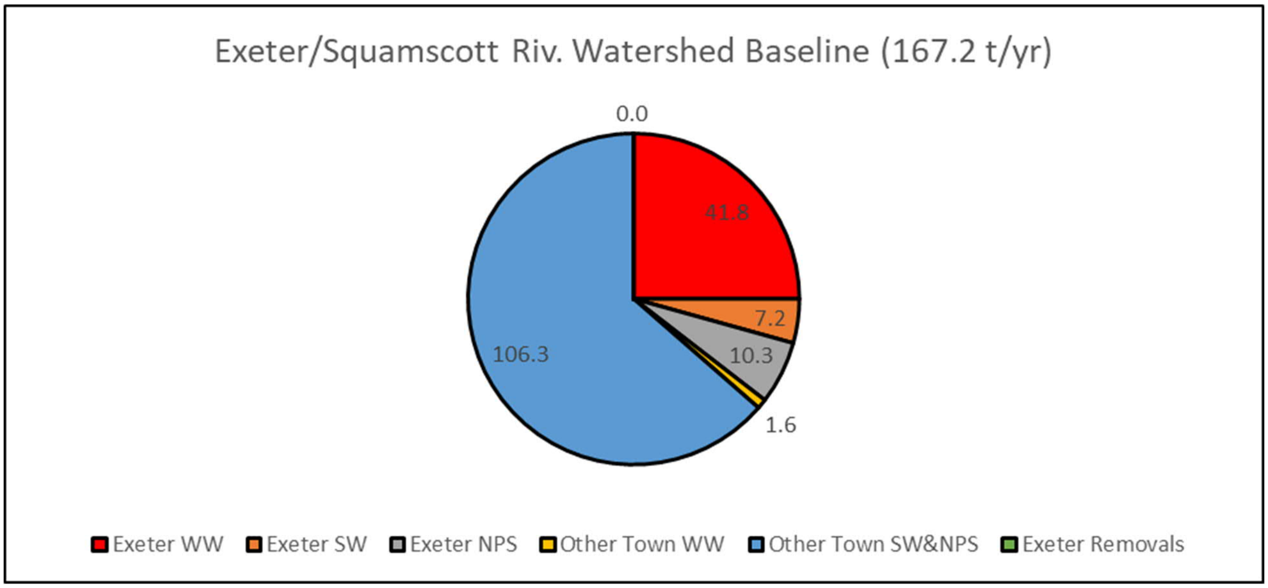
FIGURE 2-3
NITROGEN DELIVERED LOAD TO GREAT BAY BY SOURCE



2.4 EXETER-SQUAMSCOTT RIVER WATERSHED BASELINE NITROGEN LOAD

The Exeter-Squamscott River Watershed is made up of 19 communities (refer to Figure 2-1). The Exeter-Squamscott River receives approximately 167 tons/year of nitrogen as delivered load (NHDES, 2010; Trowbridge, et.al. 2014) of which approximately 26% is from WWTFs and approximately 74% from non-point sources (Figure 2-4). Exeter's baseline delivered load represents approximately 35% of the total delivered load to the Exeter-Squamscott River watershed.

FIGURE 2-4
EXETER-SQUAMSCOTT RIVER WATERSHED
NITROGEN DELIVERED LOAD BY SOURCE



Of the 19 communities in the Exeter-Squamscott River watershed, two contribute point source loads from wastewater treatment facilities (WWTF), Newfields and Exeter. Both the Newfields WWTF and Exeter WWTF are regulated under the National Pollution Discharge Elimination System (NPDES) program. Non-point sources are regulated through the NPDES Municipal Separate Storm Sewer System (MS4) program in some of the communities. Of the 19 communities, 10 are regulated MS4 communities, 8 received MS4 waivers from EPA, and the remaining 1 is “unregulated” because it is below the criteria for inclusion in the MS4 program. The baseline nitrogen delivered load by community is shown in Figure 2-5. The baseline NPS delivered load by community by MS4 regulatory status is shown in Figure 2-6. It is noteworthy that 34% of the baseline delivered load (56.5 tons/year) is not regulated by EPA or NHDES at present (i.e., unregulated or MS4 waiver granted).

FIGURE 2-5
EXETER-SQUAMSCOTT RIVER WATERSHED
BASELINE NITROGEN DELIVERED LOAD BY COMMUNITY

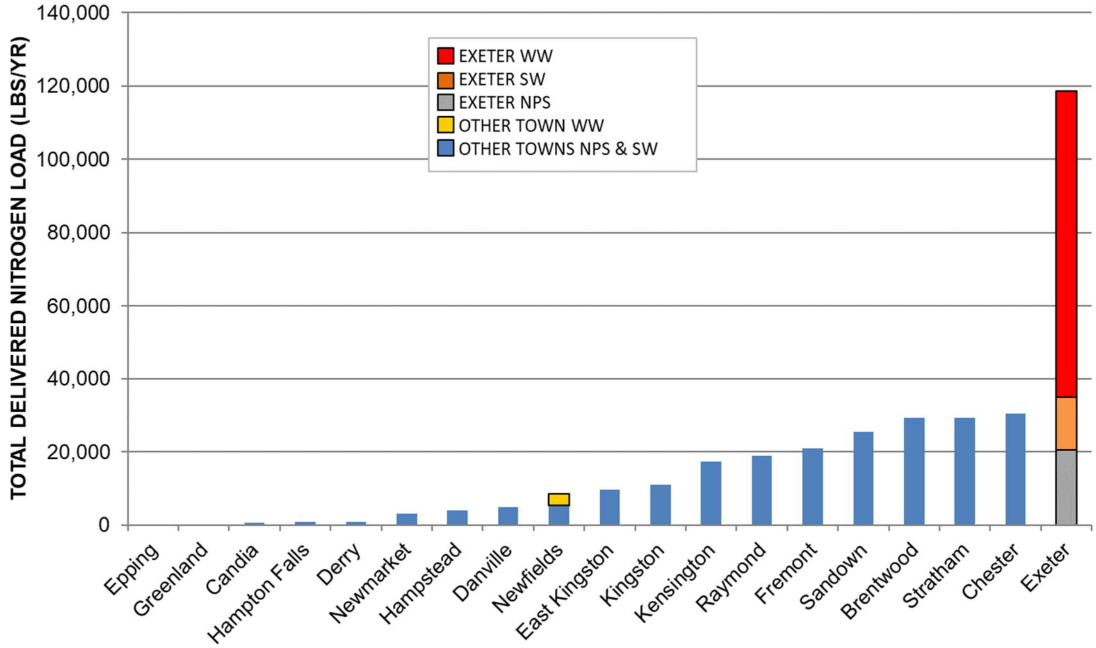
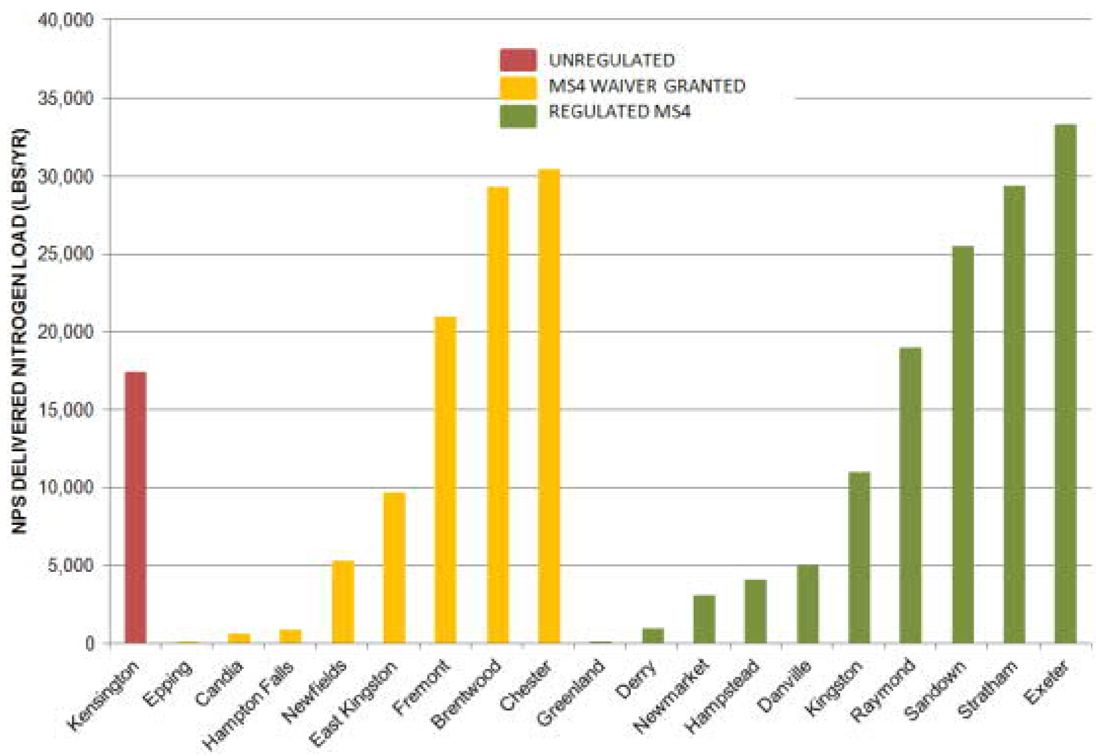


FIGURE 2-6
EXETER-SQUAMSCOTT RIVER WATERSHED
BASELINE NPS AND STORMWATER NITROGEN DELIVERED LOAD BY COMMUNITY AND BY MS4 DESIGNATION



2.5 COMPARISON OF GBNNPS TO NCP MODELING APPROACH

As noted previously, the Nitrogen Control Plan modeling approach was developed to be able to estimate the nitrogen load reduction associated with various nitrogen control measures. The modeling approach used in this report results in minor differences from the calculated baseline watershed load presented in GBNNPSS, as summarized below in Table 2-2. The differences between these two approaches are relatively minor and are appropriate for this planning-level assessment.

TABLE 2-2
NITROGEN NON-POINT SOURCE DELIVERED LOAD FOR GBNNPSS AND NCP

METRIC	GBNNPSS (t/yr)	NCP (t/yr)	DELTA
Exeter Town-Wide Load	19.3	20.2	4.7%
Exeter/Squamscott River Watershed	123.0	123.8	0.7%
Exeter’s Portion of Exeter/Squamscott River Watershed	16.7	17.5	4.8%

2.6 FUTURE NITROGEN LOADS

Development of vacant land and redevelopment of existing developed parcels has the potential to increase nitrogen loadings over the baseline condition described above. The future nitrogen load in Exeter was not projected in this plan; however, Exeter has recognized the importance of this element and has implemented several changes to its municipal planning and permitting processes to better track, monitor and control future nitrogen loadings to the watershed:

- Exeter has been an active participant in PTAPP (refer to Section 5 for additional information), which has developed an approach to track and monitor changes in proposed land use factors that will impact future nitrogen loadings.
- Exeter has promulgated updates to its Site Plan and Subdivision Regulations which incorporate many elements of the Southeast Watershed Alliance’s Model Stormwater Ordinance.

- Exeter is currently upgrading its WWTF to provide a high level of nitrogen removal. The upgraded facility includes allowance for future growth in the design capacity (refer to Section 4 for additional information).

Numerous other Exeter-Squamscott River watershed communities do not have a WWTF with enhanced nitrogen removal, are not in the NPDES MS4 program, and/or do not have site plan regulations or stormwater ordinances consistent with the Southeast Watershed Alliance's Model Stormwater Ordinance. Development/redevelopment in Exeter will have a lower nitrogen footprint than development elsewhere in the watershed. Accordingly, these communities have the potential to disproportionately impact future nitrogen loads in the Exeter/Squamscott River watershed. EPA and NHDES need to engage all the watershed communities, including Exeter, on this topic.

SECTION 3
REGULATORY FRAMEWORK

The purpose of this section of the report is to summarize the current regulatory framework for point source and non-point source load reductions.

3.1 NPDES AND ADMINISTRATIVE ORDER ON CONSENT

The WWTF effluent discharge must meet standards set forth in state and federal water quality legislation. These standards establish minimum effluent discharge requirements which must be satisfied at all times. In accordance with Section 402 of the Clean Water Act, the plant's effluent quality requirements are contained in a National Pollutant Discharge Elimination System (NPDES) permit which is issued to the Town by the Environmental Protection Agency (EPA). A copy of the Town's current NPDES permit (Permit No. NH0100871, issued December 2012) and related correspondence is contained in Appendix A. The NPDES permit requires a seasonal rolling average effluent total nitrogen of 3.0 mg/l.

As noted previously, EPA issued an Administrative Order on Consent (Docket No. 13-010). A copy of the AOC is also included in Appendix A. The AOC provides the Town with an interim seasonal rolling average effluent total nitrogen limit of 8.0 mg/l and provides a compliance schedule to achieve numerous specific tasks, as summarized below:

- *"…the Town shall begin tracking all activities [that the Town should reasonably be aware of, e.g., activities that involve a Town review/approval process or otherwise require a notification to the Town] within the Town that affect the total nitrogen load to Great Bay Estuary. This includes, but is not limited to, new/modified septic systems, decentralized wastewater treatment facilities, changes to the amount of effective impervious cover, changes to the amount of disconnected impervious cover [including pavement and buildings], conversion of existing landscape to lawn/turf and any new or modified Best Management Practices." [Article D.1]*
- *"…the Town shall begin coordination with the NHDES, other Great Bay communities, and watershed organizations in NHDES's efforts to develop and utilize a comprehensive*

subwatershed-based tracking/accounting system for quantifying the total nitrogen loading changes associated with all activities within the Town that affect the total nitrogen load to the Great Bay Estuary." [Article D.2]

- *"…the Town shall begin coordination with the NHDES to develop a subwatershed community-based total nitrogen allocation." [Article D.3]*
- *Nitrogen Control Plan - "By September 30, 2018, submit to EPA and the NHDES a total nitrogen non-point source and point source stormwater control plan ("Nitrogen Control Plan"), including a schedule of at least five years for implementing specific control measures as allowed by state law to address identified non-point source and stormwater Nitrogen loadings in the Town of Exeter that contribute total nitrogen to the Great Bay Estuary, including the Squamscott River. If any category of de-minimis non-point source loadings identified in the tracking and accounting program are not included in the Nitrogen Control Plan, the Town shall include an explanation of any such exclusions. The Nitrogen Control Plan shall be implemented in accordance with the schedules contained therein." [Article D.4]*
- *Engineering Evaluation - "By December 31, 2023, the Town shall submit an engineering evaluation that includes recommendations for the implementation of any additional measures necessary to achieve compliance with the NPDES Permit, or a justification for leaving the interim discharge limit set forth in Attachment 1.a in place (or lower the interim limit to a level below 8.0 mg/l but still above 3.0 mg/l) beyond that date. Such justification shall analyze whether:*
  - *a. Total nitrogen concentration in the Squamscott River and downstream waters are trending towards nitrogen targets (Footnote 3: The Town shall account for precipitation in the trend analysis and baseline measurement.);*
  - *b. Significant improvements in dissolved oxygen, chlorophyll a, and macroalgae levels have been documented; and*
  - *c. Non-point source and stormwater point source reduction achieved are trending towards allocation targets and appropriate mechanisms are in place to ensure continued progress." [Article E.2]*

3.2 NPDES PHASE II MS4 PERMIT

Exeter was previously covered by the 2003 Municipal Separate Storm Sewer System (MS4) permit. EPA issued the 2017 New Hampshire Small Municipal Separate Storm Sewer System permit on January 18, 2017 with an effective date of July 1, 2018 (NH MS4 Permit https://www.epa.gov/npdes-permits/new-hampshire-small-ms4-general-permit). The permit regulates stormwater discharges from the Town's urbanized area as defined by the 2010 Decennial Census by the Bureau of Census or a geographic area designed by EPA. Under the permit, the Town will be required to implement the six (6) minimum control measures (MCM):

- MCM 1 – Public Education and Outreach
- MCM 2 – Public Involvement and Participation
- MCM 3 – Illicit Discharge Detection and Elimination (IDDE)
- MCM 4 – Construction Site Stormwater Runoff Control
- MCM 5 – Stormwater Management in New Development and Redevelopment
- MCM 6 – Good Housekeeping and Pollution Prevention for Municipal Operations

The Town will also implement the necessary best management practices (BMPs) to meet the requirements in NPDES MS4 Permit Appendix H related to Water Quality Limited Waters.

3.3 NITROGEN LOAD REDUCTION TARGETS

There are no total nitrogen load reduction targets and no subwatershed community-based total nitrogen allocations at this time. Exeter will continue to coordinate with NHDES regarding development community-based total nitrogen allocations, as required by the AOC. Exeter will also continue to coordinate with NHDES and other Great Bay communities to develop and utilize a comprehensive tracking and accounting system to assess long-term trends in nitrogen loadings.

SECTION 4
NITROGEN REDUCTION MEASURES

The purpose of this section is to identify the point source and non-point source control measures which the Town will implement to reduce its baseline total nitrogen load to the Great Bay estuary, including the Exeter-Squamscott River, Lamprey River, and Winnicut River.

4.1 POINT SOURCE REDUCTION MEASURES

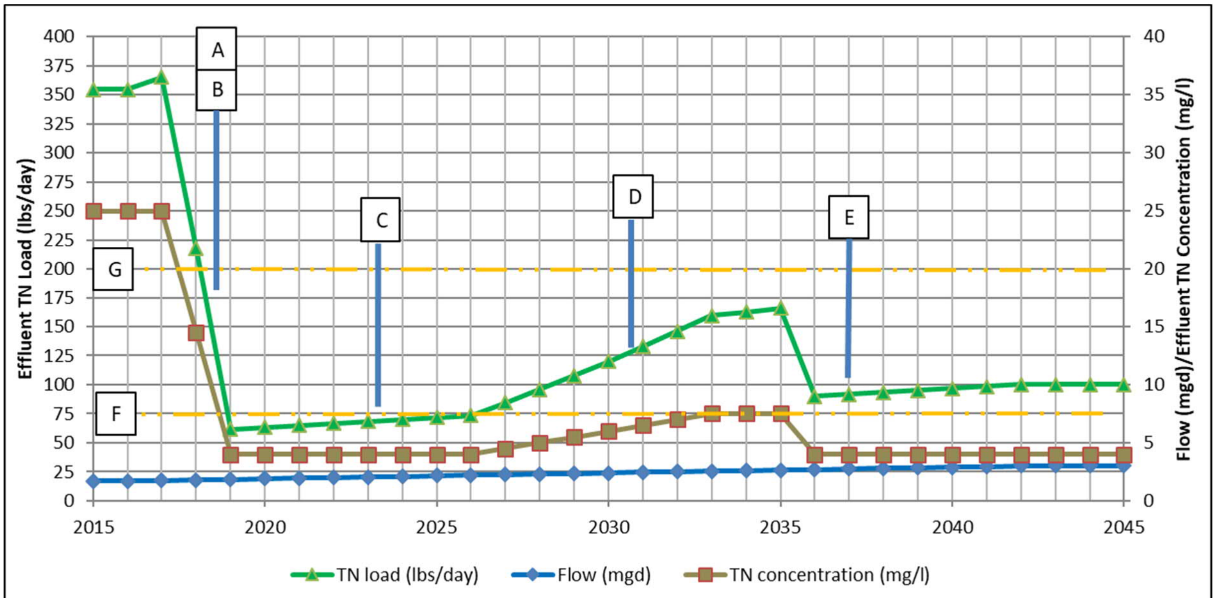
The 2010 Baseline Load for the Exeter WWTF was estimated at 83,600 pounds/year, or 41.8 tons/year (WP 2015 Wastewater Facilities Plan and the NHDES 2010 Draft Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Estuary Watershed). The 2010 Baseline Load for the Newfields WWTF is 3,300 pounds/year, or 1.65 tons/year. This load determination was based on a limited number of effluent total nitrogen grab samples. Together, the 2010 WWTF Baseline Load for the Exeter-Squamscott River is 43.5 tons/year.

As outlined in the WP 2015/2016 Preliminary Design Report, the Phase 1 facilities have an initial design capacity of 2.2-mgd in the 4-Stage Bardenpho configuration. This phased construction approach was presented to EPA and NHDES during the Preliminary Design phase and was approved at that time. The Town will construct an additional aeration tank, if/when needed, in order to allow for design capacity of 3.0-mgd in the 4-Stage Bardenpho configuratio. A graphical depiction of the conceptual wastewater flow (mgd), effluent TN concentration (mg/l) and effluent TN load (lbs/day) based on the phased construction of the design capacity is shown in Figure 4-1 below and is based on the following assumptions:

- Wastewater flow (blue line) increases by 50,000 gallons per year
- Effluent TN concentration (brown line) remains constant at a goal of 5-mg/l until the initial design capacity for 4-Stage Bardenpho process configuration is reached (2.2-mgd, 2026 assumed), then increases steadily to 7.5-mg/l for Modified Ludzack Ettinger process configuration is reached (2.65-mgd, 2035), and then decreases back to 5-mg/l after the third aeration tank is constructed and the full capacity is achieved for 4-Stage Bardenpho process configuration (3.0-mgd, assumed 2036).

- Wastewater effluent TN load (green line) is calculated based on the wastewater effluent flow and effluent TN concentration.
- Refer to the WP 2015/2016 Preliminary Design Report for additional information.

FIGURE 4-1
CONCEPTUAL EFFLUENT FLOW, EFFLUENT TN CONCENTRATION AND EFFLUENT TN LOADS OVER TIME



A - Complete Initial WWTF Upgrade (2019)
B - Complete Nitrogen Control Plan (2018)
C - Complete Engineering Evaluation (2023)
D - Hit "Trigger Flow", beginning planning for Phase 2 Upgrade (2030)
E - Complete Phase 2 Upgrade (2036)
F - NPDES Permit Limit (75 lbs/day) based on 3.0-mgd at 3-mg/l effluent TN. Superseded by AOC (8-mg/l, no mass limit).
G - AOC Limit (~200 lbs/day) based on 3.0-mgd at 8-mg/l effluent TN.

The Exeter WWTF annual average effluent flow for the 2015 to 2017 is 1.62-mgd. Therefore, using a start-up effluent flow of 1.7-mgd and an effluent TN concentration of 5-mg/l from the 4-Stage Bardenpho configuration which is under construction, the effluent TN load to the river is estimated to be 25,900 pound/year, or 12.9 tons/year, when the Phase 1 WWTF Upgrade is completed.

4.2 NON-POINT SOURCE NITROGEN REDUCTION MEASURES

A variety of non-point source (stormwater and groundwater) nitrogen reduction strategies were evaluated as part of the NCP, including:

- Atmospheric Deposition
- Agricultural Nutrient Management
- Residential Fertilizer Management
- Street/Pavement Cleaning
- Infrastructure Operations and Maintenance
- Organic Waste and Leaf Litter Collection
- Advanced On-Site Septic Systems
- Targeted Sewer Extensions
- Structural Stormwater BMPs

Given the significant expenditures related to the AOC-required, on-going wastewater infrastructure upgrades, the Town will implement the requirements of its existing fertilizer regulations and will implement the requirements of the 2017 Final NH MS4 permit (effective July 1, 2018) for the Nitrogen Control Plan. These measures are outlined in Section 6 of this plan. This approach is estimated to remove 3,160 lbs/year of delivered nitrogen load when compared to the baseline load.

4.3 SUMMARY OF SELECTED MEASURES

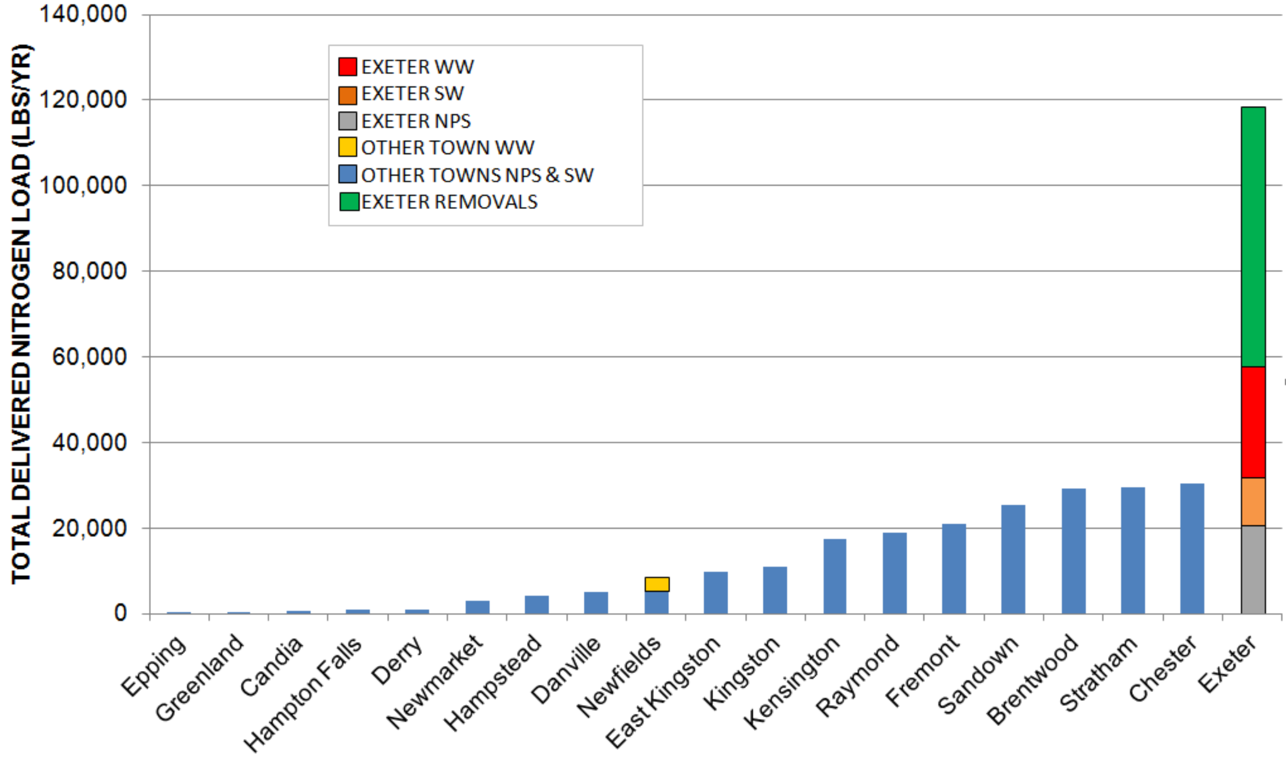
Based on the implementation of the selected measures, the town-wide baseline nitrogen delivered loads will be reduced as follows:

- The WWTF Upgrades are estimated to reduce Exeter's point source baseline nitrogen delivered load from 41.8 tons/year to 12.9 tons/year at start-up (i.e., 28.9 tons/year reduction).
    - These wastewater system upgrades have an estimated capital cost of $53.58M and an estimated 20-year life cycle cost of $78.8M (July 2018 dollars, ENR CCI 11110).

- The non-point source and stormwater measures are estimated to reduce Exeter's town-wide non-point source and stormwater baseline nitrogen delivered load from 20.3 tons/year to 18.7 tons/year (i.e., 1.6 tons/year reduction).
    - These non-point source and stormwater measures have an estimated 20-year life cycle cost of $5.6M (July 2018 dollars, ENR CCI 11110).
- Together, the point source and non-point source measures are estimated to reduce Exeter's town-wide baseline nitrogen delivered load from 62.0 tons/year to 31.6 tons/year (i.e., 30.5 tons/year reduction). Similarly, the point source and non-point source measures are estimated to reduce Exeter's baseline nitrogen delivered load to the Exeter-Squamscott River watershed from 59.3 tons/year to 28.8 tons/year (30.5 tons/year reduction).
- Exeter's "town-wide baseline nitrogen delivered load per capita" is estimated to be reduced from 8.7 lbs/capita to 4.4 lbs/capita. Similarly, Exeter's "baseline nitrogen delivered load per capita" for the Exeter-Squamscott River watershed is reduced from 8.9 lbs/capita to 4.3 lbs/capita. These values are approximately 43% lower than the aggregate value in the Exeter-Squamscott River watershed (7.4 lbs/capita as shown in Table 2-1).

These measures will be implemented in an adaptive management framework, as described in Section 5. A graphical depiction of the watershed delivered loads is shown in Figure 4-2 (NOTE: This figure only shows reductions for Exeter; estimation of load reductions in other watershed communities is beyond the scope of this effort).

FIGURE 4-2
ESTIMATED DELIVERED LOAD IN EXETER-SQUAMSCOTT RIVER WATERSHED BY COMMUNITY, WITH IMPLEMENTATION OF NITROGEN CONTROL PLAN



SECTION 5
ADAPTIVE MANAGEMENT FRAMEWORK

The purpose of this section is to summarize the Town's adaptive management approach to nitrogen control through reporting, tracking and accounting, water quality monitoring, and monitoring of progress by other Great Bay municipalities during the 5-year implementation plan period.

5.1 ADAPTIVE MANAGEMENT FRAMEWORK

The AOC provides an adaptive management framework for Exeter, as well as the other Great Bay municipalities more broadly. An adaptive management framework is appropriate for dealing with complex environmental problems that require substantial investments to address under an evolving regulatory framework. Adaptive management is the formulation and implementation of a plan that begins to solve the problem while further information is gained to guide later phases toward the best overall solution. The basic elements of a successful adaptive management plan are:

- Develop a solution that can be implemented in phases over time;
- Acquire data to show the effectiveness of the early phases of the solution; and
- Provide a mechanism to assess the plan and adjust it to reflect the information gathered.

The data acquisition program must be directed at answering the question: ***"What are the water quality trends in Great Bay and the Squamscott River, including nitrogen, dissolved oxygen, chlorophyll a, eelgrass, and macroalgae?"*** The data acquisition program identified herein has been developed such that this question can be analyzed and documented in the AOC reporting requirements.

Over the mid-term to long-term, it will be important to understand:

1. Are the water column nitrogen concentrations more or less sensitive to watershed load reductions than predicted by the NHDES models?
2. Are the eelgrass/macroalgae/benthic communities more or less sensitive to watershed load reductions than predicted in the NHDES models?

3. Given inter-annual variability, groundwater travel time and sediment content, what is the appropriate timeframe for changes in water quality and eelgrass/macroalgae/benthic communities to be observed in the environment?
4. Have the point source, non-point source nitrogen management measures been more or less effective than anticipated?
5. Have any pilot programs for non-traditional and/or non-structural measures conducted in other United States watersheds produced results which should be applied at pilot-scale or full-scale in the Great Bay watershed?

Exeter will continue to coordinate with EPA, NHDES and the other Great Bay watershed municipalities on these questions.

5.2 REPORTING

5.2.1 Annual Reporting

The Town has been submitting Total Nitrogen Control Plan Annual Reports since January 2014, as required by the AOC, and will continue to do so. The annual reporting process is an opportunity to assess the changes in Exeter's point source, non-point source watershed loadings as well as the effectiveness of the management elements. A core group of town officials should meet regularly to review the annual report and to provide input on possible modifications to the program.

5.2.2 AOC Engineering Evaluation Report

The AOC requires that: *"By December 31, 2023, the Town shall submit an engineering evaluation that includes recommendations for the implementation of any additional measures necessary to achieve compliance with the NPDES Permit, or a justification for leaving the interim discharge limit set forth in Attachment 1.a in place (or lower the interim limit to a level below 8.0 mg/l but still above 3.0 mg/l) beyond that date. Such justification shall analyze whether:*

a. Total nitrogen concentration in the Squamscott River and downstream waters are trending towards nitrogen targets (Footnote 3: The Town shall account for precipitation in the trend analysis and baseline measurement.);

b. *Significant improvements in dissolved oxygen, chlorophyll a, and macroalgae levels have been documented; and*

c. *Non-point source and stormwater point source reduction achieved are trending towards allocation targets and appropriate mechanisms are in place to ensure continued progress." [Article E.2]*

Items a) and b) will be addressed by the Water Quality Monitoring Plan identified below. Item c will be addressed by the Tracking & Accounting Approach identified below.

5.3 TRACKING AND ACCOUNTING

The Town began tracking and accounting in 2014, as required by the AOC. Initially, Exeter developed its own tracking and accounting system, which was used for the 2014 to 2018 Annual Report submittals.

Over the past several years Exeter has been coordinating with NHDES and other municipalities to track and account for nitrogen through its participation in Pollutant Tracking and Account Pilot Project (PTAPP). PTAPP started in 2015 and was been developed by NHDES and UNH, with significant input from EPA, Exeter and other Great Bay municipalities. Per the PTAPP website, PTAPP "will result in the creation of guidelines and recommendations for tracking and accounting systems and identify potential tools that will enable municipalities to perform a quantitative assessment of pollutant load reductions associated with nonpoint source management activities in the Great Bay region." (https://www.unh.edu/unhsc/ptapp). Exeter began utilizing the PTAPP system when it was completed by NHDES/UNH in February 2018. The Town has committed to using the PTAPP approach and PTAPP web-based tool to tracking and account for changes within the Town that affect the total nitrogen load to the Great Bay Estuary.

EPA and NHDES have indicated that groundwater travel time in the Great Bay watershed is "on the order of decades" and that the tracking and accounting is best way to determine changes in land use, nitrogen loadings, and progress towards the target load reductions.

5.4 WATER QUALITY MONITORING

5.4.1 Water Quality Monitoring Objectives

The objective of the water quality monitoring plan is to utilize historic and future monitoring data to document the trends identified in the AOC in an adaptive management framework.

5.4.2 Historic Water Quality Monitoring

As a part of developing this Nitrogen Control Plan, the NHDES OneStop Environmental Monitoring Database was queried to obtain the available grab sample and datasonde data for the Exeter River, Squamscott River and portions of Great Bay. Considerable data have been collected by numerous organizations (i.e., NHDES, UNH, PREP, EPA, etc.) over the past 10+ years. A summary of this information is provided in a memorandum in Appendix B.

5.4.3 Water Quality Monitoring Plan

Based on a review of the historic water quality monitoring data, for the purposes of assessing trends in Nitrogen and documenting improvements in Dissolved Oxygen (DO), chlorophyll a and macroalgae levels per the AOC, the existing water quality monitoring network provides sufficient information to assess the trends which are identified in the AOC as long as the current sampling programs, funded-by-others and implemented-by-others, continue. The Town will maximize the use of data being collected by other organizations (i.e., NHDES, UNH, PREP, EPA). Specifically:

- Great Bay Watershed eelgrass surveys provide information to assess trends in eelgrass coverage. Eelgrass surveys have been performed annually since at least 2010 by PREP/UNH.
- Great Bay Watershed macroalgae surveys provide information to assess trends in macroalgae. Macroalgae surveys have been performed annually since at least 2013 by PREP/UNH. The LC (Lubberland Creek) and DR (Depot Road) locations are relevant to Exeter.
- GRBGB provides information to assess trends for Nitrogen, DO, and chlorophyll a in the Squamscott River lower watershed ("North Assessment Unit"). These sampling locations have been monitored annually since at least 2000 by a combination of NHDES, UNH and

PREP. GRBGB is a "datasonde" and grab sampling location in the central portion of Great Bay.

- GRBSQ provides information to assess trends for Nitrogen, DO, and chlorophyll a in the Squamscott River lower watershed ("North Assessment Unit"). These sampling locations have been monitored annually since at least 2000 by a combination of NHDES, UNH and PREP. GRBSQ is a "datasonde" (continuous) and grab sampling location on the Squamscott River at the Railroad Bridge.
- GRBCL provides information to assess trends for Nitrogen, DO, and chlorophyll a in the Squamscott River lower watershed (at the end of the "South Assessment Unit"). This sampling location has been monitored annually since at least 2000 by a combination of NHDES, UNH and PREP. GRBCL is a sampling location on the Squamscott River at Route 108 Bridge/Chapman's Landing.
- 9-EXT provides information to assess trends for Nitrogen and DO at the end of the Exeter River (freshwater) just prior to the Squamscott River (brackish). This sampling location has been monitored annually since at least 2000s by a combination of NHDES (Volunteer River Assessment Program, Ambient River Monitoring Program), UNH and PREP. 09-EXT is on the Exeter River at the High Street Bridge.
- 14-EXT provides information to assess trends for DO at the Exeter/Brentwood town line. This sampling location has been monitored annually since at least 2000s by a combination of NHDES (VRAP, Ambient River Monitoring Program). 14-EXT is on the Exeter River at the Cross Road Bridge.
- 15-EXT provides information to assess trends for Nitrogen and DO from the upper watershed. This sampling location has been monitored annually since 2007 under the NHDES VRAP (Volunteer River Assessment Program). 15-EXT is on the Exeter River in Brentwood ("NHDES Trend Station").

The Town will reach out to UNH and to the VRAP contacts annually to confirm that sampling is funded for the upcoming season and then to collect the data the preceding season. These data will be used to assess trends in nitrogen, dissolved oxygen, chlorophyll a and macroalgae, as required by the AOC.

The Town WWTF currently reports local precipitation data based on the AccuWeather website: (https://www.accuweather.com/en/us/exeter-nh/03833/August-weather/334461?monyr=08/1/2018&view=table). These data will be used to assess trends in precipitation, as required by the AOC.

EPA has deployed two datasondes in the Squamscott River for 2018 and 2019. These datasondes will be rotated through the Newfields-TL, 07-SQR and 08-SQR sampling locations in accordance with the EPA Squamscott River Monitoring Project Sampling and Analysis Plan (SAP) dated July 11, 2018. EPA is deploying these datasondes to collect baseline information on the Squamscott River proximate to the Exeter WWTF prior to the WWTF upgrades being completed. When this data is available (presumably in the Winter 2019/2020 timeframe, it will be assessed to determine whether one of these designated locations should be established as longer-term datasonde location or whether these locations would be more appropriate to be included in a spatial survey (similar to the 2011 Field Studies described in the March 2012 HydroQual technical memorandum) in support of a calibrated water quality model.

The Water Quality Monitoring Plan is outlined below in Table 5-1. See Appendix B for additional information on specific water quality parameters.

TABLE 5-1
WATER QUALITY MONITORING PLAN

	Great Bay Eelgrass	Great Bay Macroalgae	GRBGB	GRBSQ	GRBCL	9-EXT	9-EXT	14-EXT	15-EXT
Program	UNH	UNH	UNH	UNH	UNH	UNH	VRAP	VRAP	VRAP
Contact	Matso	Matso	Matso	Matso	Matso	Matso	Murphy	Murphy	Murphy
Frequency	Annual	Annual	Monthly	Monthly	Monthly	Monthly	Intermittent	Intermittent	Intermittent
From	n/a	n/a	April	April	April	March	March	March	March
To	n/a	n/a	December	December	December	December	December	December	December
Samples/Year	n/a	n/a	9	9	9	10	4	4	4
Datasonde	n/a	n/a	Yes	Yes	No	No	No	No	No
Habitat									
Eelgrass	X	-	-	-	-	-	-	-	-
Macroalgae	-	X	-	-	-	-	-	-	-
Water Quality									
Carbon	-	-	X	X	X	X	-	-	-
Chlorophyll	-	-	X	X	X	-	-	-	-
CDOM	-	-	X	X	X	-	-	-	-
DO	-	-	X	X	X	X	X	X	X
DO Saturation	-	-	X	X	X	X	X	X	X
Nitrogen	-	-	X	X	X	X	-	-	X
pH	-	-	X	X	X	X	X	X	X
Pheophytin	-	-	X	X	X	-	-	-	-
Phosphorus	-	-	-	X	X	X	-	-	X
Salinity	-	-	X	X	X	-	-	-	-
Solids	-	-	X	X	X	X	-	-	-
Spec. Conductance	-	-	X	X	X	X	X	X	X
Temperature (Water)	-	-	X	X	X	X	X	X	X
Tide Stage	-	-	X	X	X	-	-	-	-
Turbidity	-	-	X	X	X	-	X	X	X
Precipitation			Recorded by WWTF staff on a daily basis (AccuWeather)						

5.5 MONITORING OF PROGRESS BY OTHER GREAT BAY MUNICIPALITIES

Over the past five years and over the upcoming several years, there has been or will be significant reductions in the day-to-day nitrogen loadings to the Great Bay watershed from municipal publicly owned treatment works (POTWs). A preliminary summary of this progress is provided in the Table 5-2 below. Exeter will continue to monitor the progress of other municipalities.

TABLE 5-2
PROGRESS TOWARDS EFFLUENT TN REDUCTION BY MUNICIPAL POTWS
[STILL WORKING ON THIS TABLE]

Municipality	Nitrogen Load Baseline 2010 (tons/year) Note 2	Approximate Year Upgrade Completed Note 3	Average Daily Flow (mgd) Note 3	Approximate Nitrogen Load After Upgrades (tons/year) Note 3
Portsmouth Peirce Island WWTF	15.9	2019	##	##
Portsmouth Pease WWTF	In above	##	##	In above
Newington WWTF	1.1	2017	0.10	0.8
Rochester WWTF	127.3	2017	##	35
Dover WWTF	101.3	2016	##	20
Durham WWTF	11.4	2017	##	5.0
Newmarket WWTF	28.7	2017	0.49	4.4
Exeter WWTF	41.8	2019	1.70	12.9
TOTAL	327.5	-	-	##

Notes:

1) This table shows the 8 POTWs that are closest to Great Bay; however, there are 18 POTWs in the Great Bay watershed as a whole.
2) 2010 Nitrogen Loads taken from NHDES "Analysis of Nitrogen Loading Reductions for Wastewater Treatment Facilities and Non-Point Sources in the Great Bay Watershed", App A, December 2010. Note the values for Portsmouth Peirce Island and Pease WWTFs seems low.
3) Approximate year upgrade complete and approximate total nitrogen load after upgrades based on personal communications with _______ (Portsmouth); Newington Plant Manager (2017-2018 data); _____ (Dover); _____(Durham); Newmarket Superintendent (2017 data); ______ (Rochester). Approximate year upgrade complete and approximate total nitrogen load after upgrades based on _______ NEWEA Journal (Rochester, 2.9-mgd @ 8-mg/l).

SECTION 6

IMPLEMENTATION PLAN

The purpose of this section is to outline a 5-year schedule of specific control measures and activities for the Town to implement to address point source, non-point source and stormwater loading from the Town of Exeter to the Great Bay, including the Squamscott River. This implementation plan includes those items that the Town has already completed since 2013 when the AOC was issued. The implementation schedule is presented in Table 6-1 at the end of this section.

6.1 IMPLEMENTATION PLAN COMPONENTS/POINT SOURCE

The following point source control measures have been or will be completed as a part of the implementation plan.

6.1.1 Complete Wastewater Treatment Facility Upgrades

Exeter initiated construction of the WWTF Upgrades in March 2017. The contract is a comprehensive upgrade to the WWTF and calls for substantial completion of Interim Milestone No. 3 (i.e., all AOC-related items) by June 2019. When Interim Milestone No. 3 is completed, the WWTF is expected to achieve an effluent total nitrogen of 5-mg/l.

6.1.2 Complete Main Pump Station Upgrades

Exeter initiated construction of the Main Pump Station Upgrades in August 2017. The contract is a comprehensive upgrade of the pump station which conveys all sewage to the WWTF and calls for substantial completion by December 2018. When completed, the Main Pump Station will have increased pumping capacity (i.e., will pump to a higher hydraulic gradeline for the new WWTF and will pump at a higher rate when the Forcemain Upgrades are completed).

6.1.3 Complete Forcemain Upgrades

The Town and NHDOT are coordinating on the final sewage forcemain alignment along Newfields Road (Route 85) as well as a potential water main alignment, storm drain upgrades and location of the Urban Compact Zone line. The contract will replace the existing 16" diameter cast iron forcemain with two new 16" diameter HDPE forcemains. When the Forcemain Upgrades are completed, the Main Pump Station peak pumping capacity will increase from approximately 5-mgd to 9-mgd which will significantly reduce, and is expected to eliminate, combined sewer overflows from the Main Pump Station location (Outfall #003). Pending final coordination with the Town and NHDOT, the project is targeted for completion between 2019 and 2020.

6.1.4 WWTF Operational Strategies

Once the WWTF Upgrades are completed, the Town will closely monitor influent flows and loads as well as effluent parameters to optimize BOD, TSS and TN removal. If performance declines below the target of 5 mg/l effluent total nitrogen, the Town will investigate operational alternatives.

6.2 IMPLEMENTATION PLAN COMPONENTS/NON-POINT SOURCE

The following non-point source control measures have been or will be completed as a part of the implementation plan.

6.2.1 Implement MS4 Program Requirements

The Town will implement the non-point source and stormwater point source strategies identified in 2017 MS4 permit which reduce nitrogen, as summarized below.

STRATEGY	DESCRIPTION OF IMPLEMENTATION
Public Education and Outreach	The Town will distribute an annual message in the spring timeframe that encourages proper use and disposal of grass clippings and encourages use of slow-release fertilizer. The Town will distribute an annual message in the summer timeframe encouraging the proper disposal of leaf litter.
Good Housekeeping and Pollution Prevention	The Town will establish requirements for use of slow release fertilizers on Town owned properties currently using fertilizer, in addition to reducing and managing fertilizer use. The Town will establish procedures to properly manage grass cuttings and leaf litter on Town property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces.
Infrastructure Maintenance Program	The Town will develop and implement a program detailing the activities and procedures to maintain the MS4 infrastructure in a timely manner. The program will include routine inspections, cleaning and maintenance of catch basins to maintain 50% free-storage capacity in the catch basin sump. The Town will continue to subcontract catch basins cleaning services to maintain 50% storage capacity.
Street/ Pavement Cleaning Program	The Town will develop and implement an enhanced sweeping program to clean all curbed impervious cover (i.e., directly connected impervious cover) two times per year (spring and fall). The Town will use a high-efficiency regenerative air-vacuum sweeper to implement the program.
Identify Stormwater Structural BMP Sites	The Town will develop a list of Town owned properties and infrastructure that could be retrofitted with BMPs designed to reduce the frequency, volume and pollutant loads of stormwater discharges. The Town will continue to evaluate opportunities on existing capital improvement projects where stormwater BMPs can be installed to reduce the frequency, volume and pollutant loads of stormwater discharges.

6.2.2 Implement Leaf Litter and Organic Waste Collection Program

The Town will continue to implement their leaf litter and organic waste collection program which includes collection of up to 12 bags of waste at the roadside during the fall and spring per household. Further, residents are able to bring leaf litter and organic waste to the transfer station at any point during the spring, summer and fall.

6.2.3 Implement Shoreland Protection and Land Conservation

The Town has attained greater than 70% of the protective standards recommended by PREP for shoreland protection (2015 PREPA Report) and exceeds the PREP goal of 20% of land in conservation (2018 PREP State of the Estuaries Report).

6.2.4 Develop Preliminary Storm Drain Asset Management Plan

The Town will develop a preliminary storm drain asset management plan in 2019 to 2020.

6.2.5 Removal of Great Dam

After several years of planning and design, the Great Dam Removal was completed in Fall 2016. Restoring the free flow of the river will have environmental benefits upstream and downstream of the former dam location. The Exeter River Great Dam Removal Feasibility and Impact Study (Vanasse Hangen Brustlin, Inc., 2013) indicates that removal of the dam would reduce thermal gain (smaller surface area for thermal absorption) and result in improved dissolved oxygen concentrations.

6.3 IMPLEMENTATION PLAN COMPONENTS/MANAGEMENT STRATEGIES

The following management strategies and/or evaluation items have been or will be completed as a part of the implementation plan.

6.3.1 Implement Tracking and Accounting/Coordinate with PTAPP

Exeter began tracking and accounting in 2014, as required by the AOC. Exeter developed its own tracking and accounting system for use in the Total Nitrogen Annual Reports required by the AOC. In addition, over the past few years, Exeter has participated with NHDES/UNH in the development of the PTAPP system. Exeter began utilizing the PTAPP system in 2018 following its release by NHDES/UNH in February 2018. Exeter will utilize this database for its future Total Nitrogen Annual Reporting. Refer to Section 5 for additional information. Exeter will continue to coordinate with PTAPP.

6.3.2 Implement Fertilizer Regulations

Exeter enacted changes to its Zoning Regulation related to fertilizer use in 2009 and 2016. These changes prohibit fertilizer use in the Wetlands Conservation Overlay District (2009), Aquifer Protection Zone (2016), Exeter Shoreland Protection District (2016) and are expected to result in modest reductions in fertilizer use in these Districts. The Town plans to evaluate whether additional revisions to the fertilizer regulations are appropriate.

6.3.3 Implement Site Plan and Subdivision Regulations

Exeter enacted changes to its Site Plan and Subdivision Regulations in April 2018. These changes require developers to implement low impact design (LID) techniques and stormwater best management practices (BMPs) optimized for nitrogen removal for new development and redevelopment projects, to develop Stormwater Management Plans and Stormwater Pollution Prevention Plans, to undertake long-term inspection and maintenance of BMPs, and to input the relevant project information into the PTAPP tracking and accounting system.

6.3.4 Monitor Water Quality

Exeter will obtain the water quality data collected by others for select monitoring locations in the Exeter-Squamscott River subwatershed (refer to Section 5 for additional information). This data will be used to assess trends in nitrogen, dissolved oxygen, chlorophyll a and macroalgae, as required by the AOC. Exeter will coordinate with NHDES/UNH/PREP on an annual basis to obtain the data that was collected in the preceding year.

6.3.5 Review EPA Water Quality Monitoring Data

EPA will be collecting supplemental water quality data in the Squamscott River from 2018 to 2019. Exeter will review this data once it becomes available and determine whether a supplemental water quality monitoring station should be included in the network of water quality monitoring stations that Exeter will track to assess the trends required by the AOC.

6.3.6 Coordinate with NHDES/Watershed Allocations

Exeter will continue to coordinate with NHDES on the development of a watershed allocation of nitrogen, as required by the AOC. Exeter's focus will be primarily on the Exeter-Squamscott River subwatershed, but will also include the Winnicut River, Lamprey River and Hampton Harbor subwatersheds. Establishment of a watershed allocation is a regulatory function that must be led by NHDES and/or EPA. As noted in Section 2 of this report, a significant component of the delivered load in the Exeter-Squamscott River watershed comes from the other watershed communities and a significant portion of that load comes from unregulated communities. The Town will work with NHDES and UNH to understand how levels of nitrogen from atmospheric deposition are changing over time.

6.3.7 Submit AOC Engineering Evaluation

The Town will prepare and submit the AOC Engineering Evaluation in December 2023. The scope of work for this evaluation should be developed in Summer 2022.

TABLE 6-1
IMPLEMENTATION PLAN

X=Issued; C=Completed; O=On-going; P=Planning; I=Implementation	2012	2013	2014	2015	2016	2017	2018				2019				2020				2021				2022				2023			
							Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
NPDES and Administrative Order on Consent																														
NPDES Permit	X																													
Administrative Order on Consent		X																												
Point Source Structural Measures																														
Wastewater Facilities Study and Design			C	C	C	C			P	P	P																			
Town Meeting Approval/ CWSRF Loand/ Water & Wastewater Rate Study				C	C	C																								
WWTF, Pump Station & Forcemain Design					C	C			P	P	P																			
Complete WWTF Upgrades						O	O	O	O	O	O	O	O	O	O	O														
Complete Main Pump Station Upgrades						O	O	O	O	O																				
Complete Forcemain Upgrades												P	P	P	P	P	P	P												
WWTF Operational Strategies													I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Non-Point Source Structural Measures																														
Implement MS4 Program Requirements	C	C	C	C	C	C	O	O	O	O																				
Public Education and Outreach									I			I	I			I	I			I	I			I	I			I	I	
Good Housekeeping and Pollution Prevention													P	P	P	P	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Infrastructure Maintenance Program													P	P	P	P	I			I	I			I	I			I	I	
Street/Pavement Cleaning Program											P	P	P	P	P	P	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Identify Stormwater Structural BMP Sites																					P	P	P	P						
Implement Leaf Litter and Organic Waste Program									I			I	I			I	I			I	I			I	I			I	I	
Implement Shoreland Protection and Land Conservation	C	C	C	C	C	C																								
Develop Storm Drain Asset Management Plan											P	P	P	P																
Removal of Great Dam					C																									
Management Strategies																														
Implement Tracking and Accounting/ Coordinate with PTAPP																														
Annual TN Report			C	C	C	C	C				P				P				P				P				P			
Participate in PTAPP				C	C	C	C	C	C	P	P	P	P	P	P	P	P	P												
Implement PTAPP Tracking Approach								I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Implement Fertilizer Regulations					C																									
Implement Site Plan and Subdivision Regulations							C																							
Monitor Water Quality								C	C					P				P				P				P				
Review EPA Monitoring Data in Squamscott River								O	O			O	O	P	P	P														
Coordinate with NHDES/ Watershed Allocations		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Submit AOC Engineering Evaluation																									P	P	P	P	P	P

<u>Appendix A</u>

Permits and Related Correspondence

A-1: Letter from Bisbee to Wagner (June 25, 2013)

A-2: Administrative Order on Consent (June 24, 2013)

A-3: NPDES Permit No. NH0100871, excerpts (December 12, 2012)

DEVINE MILLIMET

ATTORNEYS AT LAW

June 25, 2013

GEORGE DANA BISBEE
T 603.695.8626
F 603.669.8547
DBISBEE@DEVINEMILLIMET.COM

Michael Wagner, Esq.
USEPA Region 1 – New England
5 Post Office Square
Mail Code: OES
Boston, MA 02109-3912

Re: Town of Exeter -- NPDES Permit No. NH0100871

Dear Mr. Wagner:

We would like to thank you and your colleagues at EPA for working with the Town of Exeter over the last few weeks to finalize an agreed-upon compliance order to address the limit for Total Nitrogen in the Town's Final NPDES Permit. As you fully appreciate, the Town disputes the legal validity of the discharge limit for Total Nitrogen of 3 mg/l and its underlying scientific basis. The Town has, nevertheless, agreed to enter into an Administrative Order on Consent (AOC) as a compromise on the nitrogen limit, and to avoid the cost of a legal challenge on this issue.

In this letter, the Town requests your acknowledgement of and concurrence with the two related issues set forth below.

1. As we have discussed, the Town reserves the right to challenge the underlying basis of EPA's decision in this Permit to require a nitrogen discharge limit of 3 mg/l in (1) other permitting proceedings (*e.g.*, subsequent NPDES permits for its WWTF, and storm water permits, if any), (2) any other EPA enforcement proceedings, and (3) any context or proceeding other than those relating to this AOC.

2. The second issue relates to Section IV. E. 2 of the AOC that allows the Town to submit by the deadline of December 31, 2023 a justification to extend the effective period of the interim limit of 8 mg/l. We seek here EPA's concurrence that the analysis that EPA would undertake, when and if the Town submits such a justification, will likely take into account (1) how well the treatment facility is performing relative to the interim limit set forth in Attachment 1.a, and (2) how quickly the new wastewater treatment facilities were completed and operating, as mitigating factors weighing in favor of extending the effective date of the interim discharge limit set forth in Attachment 1.a (or extending and lowering the interim limit).

Thank you for your consideration of these issues.

Very truly yours,

George Dana Bisbee

GDB:aec

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

JUN 24 2013

Mr. Russell Dean
Town Manager
10 Front Street
Exeter, NH 03833

Re: NPDES Permit No. NH0100871
Administrative Order on Consent Docket No. 13-010

Dear Mr. Dean:

Enclosed is the executed Administrative Order on Consent in the matter of the Town of Exeter, New Hampshire.

Sincerely,

Susan Studlien

Susan Studlien, Director
Office of Environmental Stewardship

Enclosure

cc: Attorney Dana Bisbee
Tracy Wood, NHDES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I

IN THE MATTER OF:	)	DOCKET NO. 13-010
	)	
Town of Exeter, New Hampshire NPDES Permit No. NH0100871	)	FINDINGS OF VIOLATION
	)	AND
Proceedings under Sections 308 and 309(a)(3) of the Clean Water Act, as amended, 33 U.S.C. §§ 1318 and 1319(a)(3)	)	ADMINISTRATIVE ORDER ON CONSENT

I. STATUTORY AUTHORITY

The following FINDINGS are made and ORDER on CONSENT ("Order") issued pursuant to Sections 308(a) and 309(a)(3) of the Clean Water Act, as amended (the "Act"), 33 U.S.C. §§ 1318 and 1319(a)(3). Section 309(a)(3) of the Act grants to the Administrator of the U.S. Environmental Protection Agency ("EPA") the authority to issue orders requiring persons to comply with Sections 301, 302, 306, 307, 308, 318, and 405 of the Act and any permit condition or limitation implementing any of such sections in a National Pollutant Discharge Elimination System ("NPDES") permit issued under Section 402 of the Act, 33 U.S.C. § 1342. Section 308(a) of the Act, 33 U.S.C. § 1318(a), authorizes EPA to require the submission of any information required to carry out the objectives of the Act. These authorities have been delegated to the EPA, Region I Administrator, and in turn, to the Director of the EPA, Region I Office of Environmental Stewardship ("Director").

The Order herein is based on findings of violation of Section 301 of the Act, 33 U.S.C. § 1311, and the conditions of NPDES Permit No. NH0100871 and is issued with the consent of the Town of Exeter, New Hampshire. Pursuant to Section 309(a)(5)(A) of the Act, 33 U.S.C. § 1319(a)(5)(A), the Order provides a schedule for compliance that the Director has determined to be reasonable.

II. DEFINITIONS

Unless otherwise defined herein, terms used in this Order shall have the meaning given to those terms in the Act, 33 U.S.C. § 1251 *et seq.*, the regulations promulgated thereunder, and any applicable NPDES permit. For the purposes of this Order, "NPDES Permit" means the Town of Exeter's NPDES Permit, No. NH0100871, and all amendments or modifications thereto and renewals thereof as are applicable and in effect at the time.

III. FINDINGS

The Director makes the following findings of fact:

1. The Town of Exeter, New Hampshire ("Exeter" or "Town") is a municipality, as defined in Section 502(4) of the Act, 33 U.S.C. § 1362(4), established under the laws of the State of New Hampshire.
2. The Town is a person under Section 502(5) of the Act, 33 U.S.C. § 1362(5). The Town is the owner and operator of a Publicly Owned Treatment Works ("POTW"), which includes a wastewater collection system ("Collection System") and a wastewater treatment facility ("WWTF"), from which pollutants, as defined in Section 502(6) and (12) of the Act, 33 U.S.C. §§ 1362(6) and (12), are discharged to the Squamscott River.
3. The WWTF is a 3.0 million gallons per day ("MGD") secondary treatment facility that serves a population of approximately 10,000.
4. Section 301(a) of the Act, 33 U.S.C. § 1311(a), makes unlawful the discharge of pollutants to waters of the United States except, among other things, in compliance with the terms and conditions of an NPDES permit issued pursuant to Section 402 of the Act, 33 U.S.C. § 1342.
5. On December 12, 2012, the Town was issued the NPDES Permit by EPA under the authority of Section 402 of the Act, 33 U.S.C. § 1342. The NPDES Permit became effective on March 1, 2013 and superseded a permit issued on July 5, 2000. The NPDES Permit expires on March 1, 2018.
6. The NPDES Permit authorizes the Town to discharge pollutants from WWTF Outfall 001, a point source as defined in Section 502(14) of the Act, 33 U.S.C. § 1362(14), to the Squamscott River subject to the effluent limitations, monitoring requirements and other conditions specified in the NPDES Permit.
7. The Squamscott River flows into Great Bay, which drains into the Piscataqua River, which flows into to the Atlantic Ocean. All are waters of the United States under Section 502(7) of the Act, 33 U.S.C. § 1362(7), and the regulations promulgated thereunder.
8. Part I.A.1.a. of the NPDES Permit requires that total nitrogen in the discharges from WWTF Outfall 001 not exceed 3.0 milligrams per liter (mg/l).
9. Nitrogen is a pollutant as defined in Sections 502(6) and (12) of the Act, 33 U.S.C. §§ 1362(6) and (12).
10. The Town routinely discharges effluent from WWTF Outfall 001 containing total nitrogen in excess of 3.0 mg/l.

11. The Town's routine discharges of effluent from WWTF Outfall 001 containing total nitrogen in excess of 3 mg/l occur in violation of the NPDES Permit and Section 301(a) of the Act, 33 U.S.C. § 1311(a).

12. In accordance with Exeter's town charter, the funding for the new wastewater treatment facilities referenced in Section IV.A below must be approved by the Exeter Town Meeting. The Exeter Board of Selectmen will pursue that approval at the earliest possible date.

IV. ORDER

Accordingly, pursuant to Sections 308 and 309(a)(3) of the Act, it is hereby ordered that the Town shall:

A. WASTEWATER TREATMENT FACILITIES

1. By June 30, 2016, in accordance with New Hampshire Department of Environmental Services (NHDES) approval, the Town shall initiate construction of the wastewater treatment facilities necessary to achieve interim effluent limits set forth in Attachment 1.a of this Order.

2. By June 30, 2018, achieve substantial completion of construction of the WWTF in accordance with NHDES approval.

B. INTERIM EFFLUENT LIMITATIONS

1. From the effective date of this Order until the total nitrogen concentration limit included in Attachment 1.a of this Order becomes effective pursuant to Paragraph IV.B.2., below, the Town shall comply with the interim total nitrogen effluent limitations and monitoring requirements contained in Attachment 1 of this Order.

2. By June 30, 2019 or until 12 months after substantial completion of construction pursuant to Paragraph IV.A.2., above, whichever is sooner, the Town shall comply with the interim total nitrogen effluent limit and monitoring requirements contained in Attachment 1.a of this Order.

3. The interim limits in Attachment 1.a shall be in effect unless and until EPA determines that the Town has not complied with the milestones set forth in this Order. If and when EPA determines that the interim limits shall no longer remain in effect, the Town shall fund, design, construct and

operate additional treatment facilities to meet the NPDES Permit limit of 3.0 mg/l as soon as possible, and no later than 5 years from EPA's determination.

4. The Town shall operate the WWTF in a manner so as to maximize removal efficiencies and effluent quality, using all necessary treatment equipment available at the facility for optimization at the flow and load received but not requiring methanol or other carbon addition.

C. REPORTING (WASTEWATER TREATMENT FACILITIES)

1. Until July 15, 2018, the Town shall submit quarterly reports to EPA and the NHDES summarizing its compliance with the provisions of Paragraphs IV.A and IV.B of this Order. Progress reports shall be submitted on, or before, April 15th, July 15th, October 15th, and January 15th of each year. Each progress report submitted pursuant to this paragraph shall: a) describe activities undertaken during the reporting period directed at achieving compliance with this Order; b) identify all plans, reports, and other deliverables required by this Order that have been completed and submitted during the reporting period; and c) describe the expected activities to be taken during the next reporting period in order to achieve compliance with this Order.

D. NON-POINT SOURCE AND STORMWATER POINT SOURCE ACTIVITIES

1. Upon the effective date of this Order, the Town shall begin tracking all activities[1] within the Town that affect the total nitrogen load to the Great Bay Estuary. This includes, but is not limited to, new/modified septic systems, decentralized wastewater treatment facilities, changes to the amount of effective impervious cover, changes to the amount of disconnected impervious cover[2], conversion of existing landscape to lawns/turf and any new or modified Best Management Practices.

2. Upon the effective date of this Order, the Town shall begin coordination with the NHDES, other Great Bay communities, and watershed organizations in NHDES's efforts to develop and utilize a comprehensive subwatershed-based tracking/accounting system for quantifying the total nitrogen

[1] Pertains to activities that the Town should reasonably be aware of, e.g., activities that involve a Town review/approval process or otherwise require a notification to the Town.
[2] Impervious cover includes pavement and buildings.

loading changes associated with all activities within the Town that affect the total nitrogen load to the Great Bay Estuary.

3. Upon the effective date of this Order, the Town shall begin coordination with the NHDES to develop a subwatershed community-based total nitrogen allocation.

4. By September 30, 2018, submit to EPA and the NHDES a total nitrogen non-point source and point source stormwater control plan ("Nitrogen Control Plan"), including a schedule of at least five years for implementing specific control measures as allowed by state law to address identified non-point source and stormwater Nitrogen loadings in the Town of Exeter that contribute total nitrogen to the Great Bay estuary, including the Squamscott River. If any category of de-minimis non-point source loadings identified in the tracking and accounting program are not included in the Nitrogen Control Plan, the Town shall include in the Plan an explanation of any such exclusions. The Nitrogen Control Plan shall be implemented in accordance with the schedules contained therein.

E. REPORTING

1. Beginning January 31, 2014 and annually thereafter, the Town shall submit Total Nitrogen Control Plan Progress Reports to EPA and the NHDES that address the following:
   a. The pounds of total nitrogen discharged from the WWTF during the previous calendar year;
   b. A description of the WWTF operational changes that were implemented during the previous calendar year;
   c. The status of the development of a total nitrogen non-point source and storm water point source accounting system;
   d. The status of the development of the non-point source and storm water point source Nitrogen Control Plan,
   e. A description and accounting of the activities conducted by the Town as part of its Nitrogen Control Plan; and
   f. A description of all activities within the Town during the previous year that affect the total nitrogen load to the Great Bay Estuary. The annual report shall include sufficient information such that the nitrogen loading change to the watershed associated with these

activities can be quantified upon development of the non-point source/point source storm water accounting system.

2. By December 31, 2023, the Town shall submit an engineering evaluation that includes recommendations for the implementation of any additional measures necessary to achieve compliance with the NPDES Permit, or a justification for leaving the interim discharge limit set forth in Attachment 1.a in place (or lower the interim limit to a level below 8.0 mg/l but still above 3.0 mg/l) beyond that date. Such justification shall analyze whether:
    a. Total nitrogen concentrations in the Squamscott River and downstream waters are trending towards nitrogen targets;[3]
    b. Significant improvements in dissolved oxygen, chlorophyll a, and macroalgae levels have been documented; and
    c. Non-point source and storm water point source reductions achieved are trending towards allocation targets and appropriate mechanisms are in place to ensure continued progress.

V. NOTIFICATION PROCEDURES

1. Where this Order requires a specific action to be performed within a certain time frame, the Town shall submit a written notice of compliance or noncompliance with each deadline. Notification must be mailed within fourteen (14) calendar days after each required deadline. The timely submission of a required report shall satisfy the requirement that a notice of compliance be submitted.
2. If noncompliance is reported, notification shall include the following information:
    a. A description of the noncompliance.
    b. A description of any actions taken or proposed by the Town to comply with the lapsed schedule requirements.
    c. A description of any factors that explain or mitigate the noncompliance.
    d. An approximate date by which the Town will perform the required action.
3. After a notification of noncompliance has been filed, compliance with the past-due requirement shall be reported by submitting any required documents or providing EPA and NHDES with a written report indicating that the required action has been achieved.

[3] The Town shall account for precipitation in the trend analysis and baseline measurement.

4. Submissions required by this Order shall be in writing and shall be mailed to the following addresses:

United States Environmental Protection Agency
Region I – New England
5 Post Office Square - Suite 100
Boston, MA 02109-3912
Attn: Joy Hilton, Water Technical Unit (Mail Code: OES04-3)

New Hampshire Department of Environmental Services
Water Division
Wastewater Engineering Bureau
P.O. Box 95 - 29 Hazen Drive
Concord, NH 03302-0095
Attn: Tracy L. Wood, P.E.

VI. GENERAL PROVISIONS

1. The Town may, if it desires, assert a business confidentiality claim covering part or all of the information requested, in the manner described by 40 C.F.R. § 2.203(b). Information covered by such a claim will be disclosed by EPA only to the extent set forth in 40 C.F.R. Part 2, Subpart B. If no such claim accompanies the information when it is received by EPA, the information may be made available to the public by EPA without further notice to the Town. The Town should carefully read the above-cited regulations before asserting a business confidentiality claim since certain categories of information are not properly the subject of such a claim. For example, the Act provides that "effluent data" shall in all cases be made available to the public. See Section 308(b) of the Act, 33 U.S.C. § 1318(b).
2. This Order does not constitute a waiver or a modification of the terms and conditions of the NPDES Permit. The NPDES Permit remains in full force and effect. EPA reserves the right to seek any and all remedies available under Section 309 of the Act, 33 U.S.C. § 1319, as amended, for any violation cited in this Order.
3. The Town waives any and all claims for relief and otherwise available rights or remedies to judicial or administrative review which the Town may have with respect to any issue of fact or law set forth in this Order on Consent, including, but not limited to, any right of judicial review of the Section 309(a)(3) Compliance Order on Consent under the Administrative Procedure Act, 5 U.S.C. §§ 701-708.

4. This Order shall become effective upon receipt by the Town.

06/20/13
Date

Susan Studlien
Susan Studlien, Director
Office of Environmental Stewardship
U.S. Environmental Protection Agency, Region I

6/11/13
Date

Russell
Russell Dean, Town Manager
Town of Exeter, New Hampshire

ATTACHMENT 1

Interim Effluent Limits and Monitoring Requirements

	Mass		Concentration			
	Average Monthly (lbs/day)	Daily Maximum (lbs/day)	Average Monthly (mg/l)	Daily Maximum (mg/l)	Frequency	Type
Total Nitrogen[1]	Report	Report	Report	Report	1/Week	24-hour composite

[1] Total Nitrogen shall be calculated by adding the total kjeldahl nitrogen (TKN) to the total nitrate (NO_3-N) and nitrite (NO_2-N).

ATTACHMENT 1.a.

Interim Effluent Limits and Monitoring Requirements

	Mass		Concentration			
	Average Monthly (lbs/day)	Daily Maximum (lbs/day)	Average Monthly (mg/l)	Daily Maximum (mg/l)	Frequency	Type
Total Nitrogen[1] November 1st through March 31st	Report	Report	Report	Report	1/Week	24-hour composite
Total Nitrogen[1] April 1st through October 31st	Report	Report	8 mg/l[2]	Report	1/Week	24-hour composite

[1] Total Nitrogen shall be calculated by adding the total kjeldahl nitrogen (TKN) to the total nitrate (NO_3-N) and nitrite (NO_2-N). The permittee shall optimize the operation of the treatment facility for the removal of total nitrogen during the period but not requiring methanol or other carbon addition.

[2] Calculated on a 214 day seasonal rolling average.

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCAHRGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §1251 et seq.; the "CWA"),

The Town of Exeter, New Hampshire

is authorized to discharge from the Town of Exeter Wastewater Treatment Plant located at

13 Newfields Road
Exeter, New Hampshire 03833

to the receiving water named:

Squamscott River (Hydrologic Basin Code: 01060003)

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

The permit will become effective on the first day of the calendar month immediately following sixty days after signature.

This permit and the authorization to discharge expire at midnight, five (5) years from the effective date.

This permit supersedes the permit issued on July 5, 2000.

This permit consists of 18 pages in Part I including effluent limitations, monitoring requirements, etc., Attachments A (Marine Acute Toxicity Test Procedure and Protocol dated July 2012)**,** Attachment B (List of Combined Sewer Overflows), Sludge Compliance Guidance, and Part II including General Conditions and Definitions.

Signed this 12th day of December, 2012.

/S/ SIGNATURE ON FILE
____
Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency
Region I
Boston, Massachusetts

PART I.A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge treated domestic and industrial wastewater from Outfall Serial Number 001 to the Squamscott River. Such discharges shall be limited and monitored by the permittee as specified below. Samples taken in compliance with the monitoring requirements specified below shall be taken at the end of all processes, including disinfection, or at an alternative representative location approved by the EPA and NHDES-WD.

Effluent Parameter	Effluent Limit			Monitoring Requirement	
	Average Monthly	Average Weekly	Maximum Daily	Frequency	Sample Type
Flow, MGD	Report	---	Report	Continuous	Recorder[1]
BOD_5; mg/l (lb/d)	30 (751)	45 (1126)	50 (1251)	2/Week[2]	Grab[13]
TSS; mg/l (lb/d)	30 (751)	45 (1126)	50 (1251)	2/Week[2]	Grab[13]
pH Range[3]; Standard Units	6.0 to 9.0 (See Section I.H.5.)			1/Day	Grab[13]
Fecal Coliform[3,4]; Colonies/100 ml	14	---	Report	1/Day	Grab
Fecal Coliform[3,4]; percent	---	---	Report	1/Day	Grab
Enterococci Bacteria[3,5]; Colonies/100ml	Report	---	Report	2/Week	Grab
Total Residual Chlorine[6]; mg/l	0.19	---	0.33	2/Day	Grab
Total Nitrogen[7] mg/l (lb/d) Applicable November 1 – March 31	Report	---	---	1/Week	Grab[13]
Total Nitrogen[7,8], mg/l (lb/d) Applicable April 1 – October 31	3.0 (75)	---	---	1/Week	Grab[13]
Whole Effluent Toxicity					
LC50[9,10,12]; Percent Effluent	---	---	100	2/Year	Grab[13]
Ammonia Nitrogen as N[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Aluminum[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Cadmium[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Chromium[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Copper[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Lead[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Nickel[11]; mg/l	---	---	Report	2/Year	Grab[13]
Total Recoverable Zinc[11]; mg/l	---	---	Report	2/Year	Grab[13]

* **SEE PAGES 4 AND 5 FOR FOOTNOTES.**

PART I.A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

2. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge stormwater and wastewaters from Combined Sewer Outfall Number 003 into Clemson Pond. These discharges are authorized only during wet weather. Such discharges shall be limited to the outfall listed, and shall be monitored by the permittee as specified below. Samples specified below shall be taken at a location that provides a representative analysis of the effluent.

Effluent Characteristic	**Discharge Limitation**	**Monitoring Requirement**	
	Wet Weather Event Maximum	**Measurement Frequency**	**Sample Type**
Escherichia coli Bacteria[3, 5, 14] (colonies/100 ml)	1000	1/Year	Grab

EXPLANATION OF FOOTNOTES APPLICABLE TO PART I.A.1 on page 2

1. The effluent flow shall be continuously measured and recorded using a flow meter and totalizer.

2. Influent concentrations of both BOD_5 and TSS shall be monitored two (2) days per month.

3. State certification requirement.

4. Fecal coliform shall be tested using an EPA approved test method (see 40 C.F.R. Part 136).

   The average monthly value for fecal coliform shall be determined by calculating the geometric mean using the daily sample results. Not more than 10 percent of the collected samples shall exceed a most probable number (MPN) of 43 per 100 ml for a 5-tube decimal dilution test. Furthermore, all fecal coliform data collected must be submitted with the monthly discharge monitoring reports (DMRs).

   The permittee is required to report two (2) statistics each month. One is the geometric mean fecal coliform value expressed in terms of "MPN per 100 ml" (reported as average monthly), and the second is the percentage of collected samples each month that exceeds an MPN of 43 per 100 ml for the 5-tube decimal dilution test referenced above. The latter statistic will be used to judge compliance with that part of the limit that reads "Not more than 10 percent of the collected samples shall exceed a most probably number (MPN) of 43 per 100 ml for a 5-tube decimal dilution test."

5. Enterococci and Escherichia coli bacteria shall be tested using an EPA approved test method (see 40 C.F.R. Part 136).

6. Total Residual Chlorine shall be tested using an EPA approved test method (see 40 C.F.R. Part 136). The method chosen to test total residual chlorine shall have a minimum level of detection of at least the total chlorine residual permit limit specified on page 2 of the permit.

7. Total nitrogen shall be calculated by adding the total kjeldahl nitrogen (TKN) to the total nitrate (NO_3) and nitrite (NO_2).

   The permittee shall report the monthly average mass and concentration each month.

8. The nitrogen limit is a rolling seasonal average limit, which is effective from April 1 – October 31 of each year. The first value for the seasonal average will be reported after an entire April through October period has elapsed following the effective date of the permit (results do not have to be from the same year). For example, if the permit becomes effective on May 1, 2013, the permittee will calculate the first seasonal average from samples collected during the months of May through October 2013 and April 2014, and report this average on the April 2014 DMR. For each subsequent month that the seasonal limit is in effect, the seasonal average shall be calculated using samples from that month and the previous six months that the limit was in effect.

The permittee shall optimize the operation of the treatment facility for the removal of total nitrogen during the period November 1 through March 31. All available treatment equipment in place at the facility shall be operated unless equal or better performance can be achieved in a reduced operational mode. The addition of a carbon source that may be necessary in order to meet the total nitrogen limit from April 1 through October 31 is not required during the period November 1 through March 31.

9. The permittee shall conduct acute toxicity tests on effluent samples using two species, mysid shrimp (*Mysidopsis bahia*) and inland silverside (*Menidia beryllina*), following the protocol in Attachment A (Marine Acute Toxicity Test Procedure and Protocol dated July 2012). Toxicity testing shall be performed two (2) times each year during the first quarter (January 1 – March 31) and third quarter (July 1 – September 30) of each year. Toxicity test results are to be submitted by the 15th day of the month following the end of the quarter sampled.

10. LC50 is defined as the percent of effluent (treated wastewater) that causes mortality to 50 percent of the test organisms. The permit limit of 100 percent is defined as a sample composed of 100 percent effluent.

11. For each whole effluent toxicity test the permittee shall report on the appropriate discharge monitoring report (DMR) the concentrations of ammonia nitrogen as nitrogen and total recoverable aluminum, cadmium, copper, chromium, lead, nickel, and zinc found in the 100 percent effluent sample. All these aforementioned chemical parameters shall be determined to at least the minimum quantification level (ML) show in Attachment A or as amended.

12. The permit shall be modified, or alternatively revoked and reissued, to incorporate additional toxicity testing requirements, including chemical specific limits, if the results of the toxicity tests indicate the discharge causes an exceedance of any State water quality criterion. Results from these toxicity tests are considered "New Information" and the permit may be modified as provided in 40 C.F.R. § 122.62(a)(2).

13. If the treatment plant is upgraded during the life of this permit to a treatment process that does not utilize lagoon treatment as the primary treatment technology, the effluent sample type shall change to a 24 hour composite sample upon completion of the upgrade.

14. The permittee shall sample the discharge from the combined sewer outfall listed in Attachment B at least once per year. All attempts must be made to begin sampling during the first one half hour after the outfall starts discharging. When this is not possible, a sample shall be collected as soon as possible after the beginning of the outfall starting to discharge. The "event maximum" value for Escherichia coli shall be reported on the appropriate DMR for the month sampled. Report a no discharge code of "E" (analysis not conducted) on the DMR for <u>all other months</u>.

    The permittee shall also perform CSO and receiving water sampling as described in Part I.F.3. below.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIRMENTS (Continued)

3. The discharge shall not cause a violation of the water quality standards of the receiving water.

4. The discharge shall be adequately treated to ensure that the surface water remains free from pollutants in concentrations or combinations that settle to form harmful deposits, float as foam, debris, scum, or other visible pollutants. It shall be adequately treated to ensure that the surface waters remain free from pollutants which produce odor, color, taste, or turbidity in the receiving waters which is not naturally occurring and would render it unsuitable for its designated uses.

5. The permittee's treatment facility shall maintain a minimum of 70 percent removal for BOD_5 and 65 percent for TSS. The percent removal shall be calculated based on average monthly influent and effluent concentrations. If the treatment plant is upgraded during the life of this permit to treatment process that does not utilize lagoon treatment as the primary treatment technology, the facility shall maintain a minimum of 85 percent removal for BOD_5 and TSS upon completion of the upgrade.

6. When the effluent discharged for a period of three consecutive months exceeds 80 percent of the 3.0 mgd design flow, 2.4 mgd, the permittee shall submit to the permitting authorities a projection of loadings up to the time when the design capacity of the treatment facility will be reached and a program for maintaining satisfactory treatment levels consistent with approved water quality management plans. Before the design flow will be reached, or whenever the treatment necessary to achieve permit limits cannot be assured, the permittee may be required to submit plans for facility improvements.

7. All publicly owned treatment works (POTWs) must provide adequate notice to both EPA-New England and the New Hampshire Department of Environmental Services – Water Division (NHDES-WD) of the following:

    a. Any new introduction of pollutants into the POTW from an indirect discharger in a primary industrial category (see 40 C.F.R. §122 Appendix A as amended) discharging process water;

    b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit; and

    c. For the purpose of this paragraph, adequate notice shall include information on:

        i. The quantity and quality of effluent introduced into the POTW; and

        ii. Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW

8. The permittee shall not discharge into the receiving waters any pollutant or combination of pollutants in toxic amounts.

B. UNAUTHORIZED DISCHARGES

The permit only authorizes discharges in accordance with the terms and conditions of this permit and only from the outfalls listed in Part 1.A.1 and Part 1.A.2 (see Attachment B) of this permit. Discharges of wastewater from any other point source are not authorized under this permit. Dry weather overflows are prohibited. All dry weather sanitary and/or industrial discharges from any CSO must be reported to EPA-New England and the State within 24 hours in accordance with the reporting requirements for plant bypass (see Paragraph D.1.e. of Part II of this permit).

C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system shall be in compliance with the General Requirements of Part II and the following terms and conditions. The permittee is required to complete the following activities on its collection system:

1. Maintenance Staff

   The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit.

2. Preventative Maintenance Program

   The permittee shall maintain an ongoing preventative maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges.

3. Infiltration/Inflow

   The permittee shall control infiltration and inflow (I/I) into the sewer system as necessary to prevent high flow related unauthorized discharges from their collection systems and high flow related violations of the wastewater treatment plant's effluent limitations.

4. Collection System Mapping

Within 30 months of the effective date of the permit, the permittee shall prepare a map of the sewer collection system it owns. The map shall be on a street map of the community, with sufficient detail and at a scale to allow easy interpretation. The collection system information shown on the map shall be based on current conditions. Such map(s) shall include, but not be limited to the following:

   a. All sanitary sewer lines and related manholes;

b. All combined sewer lines and related manholes;
c. All combined sewer regulators and any known or suspected connections between the sanitary sewer and storm drain system (e.g. combined manholes);
d. All outfalls, including the treatment plant outfall(s), CSOs, combined manholes, and any known or suspected SSOs;
e. All pump stations and force mains;
f. The wastewater treatment facility(ies);
g. All surface waters (labeled);
h. Other major appurtenances such as inverted siphons and air release valves;
i. A numbering system which uniquely identifies overflow points, regulators and outfalls;
j. The scale and a north arrow; and
k. The pipe diameter, age and type of pipe, the length of pipe between manholes, the direction of flow, and the pipe rim and invert elevations.

5. Collection System O&M Plan

The permittee shall develop and implement a collection system operation and maintenance plan. The plan shall be submitted to EPA and NHDES **within six months of the effective date of this permit** (see page 1 of this permit for the effective date). The plan shall describe the permittee's programs for preventing I/I related effluent limit violations and all unauthorized discharges of wastewater, including overflows and by-passes.

The plan shall include:

a. A description of the overall condition of the collection system including a list of recent studies and construction activities;
b. A preventative maintenance and monitoring program for the collection system;
c. Recommended staffing to properly operate and maintain the sanitary sewer collection system;
d. The necessary funding level and the source(s) of funding for implementing the plan;
e. Identification of known and suspected overflows, including combined manholes. A description of the cause of the identified overflows, and a plan for addressing the overflows consistent with the requirements of this permit;
f. An ongoing program to identify and remove sources of I/I. The program shall include an inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts; and
g. An educational public outreach program for all aspects of I/I control, particularly private inflow.

For each of the above activities that are not completed and implemented as of the submittal date, the plan shall provide a schedule for its completion.

D. ALTERNATE POWER SOURCE

In order to maintain compliance with the terms and conditions of this permit, the permittee shall provide an alternate power source with which to sufficiently operate the publicly owned treatment works, as defined at 40 C.F.R. § 122.2, which references the definition at 40 C.F.R. § 403.3(o).

E. SLUDGE CONDITIONS

1. The permittee shall comply with all existing Federal and State laws and regulations that apply to sewage sludge use and disposal practices and with the Clean Water Act (CWA) Section 405(d) technical standards.

2. The permittee shall comply with the more stringent of either State (Env-Wq 800) or Federal (40 C.F.R. Part 503) requirements.

3. The technical standards (Part 503 regulations) apply to facilities which perform one or more of the following use or disposal practices.

    a. Land Application – The use of sewage sludge to condition or fertilize the soil.
    b. Surface Disposal – The placement of sewage sludge in a sludge only landfill.
    c. Fired in a sewage sludge incinerator.

4. The 40 C.F.R. Part 503 conditions do not apply to facilities that place sludge within a municipal solid waste landfill (MSWLF). Part 503 relies on 40 C.F.R. Part 258 criteria, which regulates landfill disposal, for sewage sludge disposed of in a MSWLF. These conditions also do not apply to facilities which do not dispose of sewage sludge during the life of the permit, but rather treat the sludge (lagoon, reed beds), or are otherwise excluded under 40 C.F.R. Part 503.6.

5. The permittee shall use and comply with the attached Sludge Compliance Guidance document to determine appropriate conditions. Appropriate conditions contain the following items:

    a. General Requirements
    b. Pollutant Limitations
    c. Operational Standards (pathogen reduction and vector attraction reductions requirements)
    d. Management Practices
    e. Record Keeping
    f. Monitoring
    g. Reporting

    Depending on the quality of material produced by a facility all conditions may not apply to the facility.

6. If the sludge disposal method requires monitoring, the permittee shall monitor the pollutant concentrations, pathogen reduction, and vector attraction reduction at the following frequency. The frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year.

   a. Less than 290……………………………………1/Year
   b. 290 to less than 1,500…………………………1/Quarter
   c. 1,500 to less than 15,000………………………6/Year
   d. 15,000 plus………………………………………1/Month

7. The permittee shall perform all required sewage sludge sampling using the procedures detailed in 40 C.F.R. Part 503.8.

8. When the permittee is responsible for an annual report containing the information specified in the regulations, the report shall be submitted by February 19th of each year. Reports shall be submitted to the address contained in the reporting section of the permit.

9. Sludge monitoring is not required by the permittee when the permittee is not responsible for the ultimate sludge use or disposal or when the sludge is disposed of in a MSWLF. The permittee must be assured that any third party contractor is in compliance with appropriate regulatory requirements. In such cases, the permittee is required only to submit an annual report by February 19th of each year containing the following information:

   a. Name and address of the contractor responsible for sludge use and disposal.
   b. Quantity of sludge in dry metric tons removed from the facility.

   Reports shall be submitted to the address contained in the reporting section of the permit.

F. COMBINED SEWER OVERFLOW CONDITIONS

1. Effluent Limitations

   a. During wet-weather periods, the permittee is authorized to discharge stormwater/wastewater from combined sewer overflows (CSOs) to receiving water (see Attachment B), subject to the following effluent limitations

      i. The discharges may not cause or contribute to violations of Federal or State water quality standards.

      ii. The discharges shall receive treatment at a level providing Best Practicable Control Technology Currently Available (BPT), Best Conventional Pollutant Control Technology (BCT) to control and abate conventional pollutants and Best Available Technology Economically Achievable (BAT) to control and abate non-conventional and toxic pollutants. EPA-New England has made a Best Professional Judgment

(BPJ) determination that BPT, BCT, and BAT for CSOs include the implementation of the nine Minimum Technology Based Limitations (MTBLs) specified below otherwise known as Nine Minimum Controls (NMC):

1. Proper operation and regular maintenance programs for the sewer system and the combined sewer overflow points;

2. Maximum use of the collection system for storage;

3. Review and modification of industrial pretreatment program requirements to assure CSO impacts are minimized;

4. Maximization of flow to the POTW for treatment;

5. Prohibition of dry weather overflows from CSOs;

6. Control of solid and floatable materials in CSO discharges;

7. Pollution prevention programs that focus on contaminant reduction activities;

8. Public notification to ensure that the public receives adequate notification of CSO occurrences and CSO impacts; and

9. Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls.

iii. Implementation of these nine minimum controls is required by the effective date of this permit. The permittee shall implement these controls in accordance with Part I.F.2 of this permit. Within one year from permit issuance, the permittee shall submit to EPA and NHDES-WD a report titled “Report on Nine Minimum Control Measures”. This document must include a detailed analysis of specific activities the permittee has undertaken and will undertake to implement the nine minimum controls and additional controls beyond the nine minimum controls the permittee can feasibly implement. The specific activities included in the documentation must include the minimum requirements set forth in Part I.F.2 of the permit and additional activities the permittee can reasonably undertake.

2. Nine Minimum Controls – Minimum Implementation Levels

a. The Permittee must implement the nine minimum controls in accordance with their nine minimum controls documentation and with any revisions to that documentation that may be required. This implementation must include the following controls plus other controls the permittee can feasibly implement as set forth in the documentation.

b. Each CSO structure/regulator, pumping station and/or tidegate shall be routinely inspected, at a minimum of once per month, to insure that they are in good working condition and adjusted to minimize combined sewer discharges and tidal surcharging (Nine Minimum Control Numbers 1, 2, and 4). The following inspection results shall be recorded: date and time of the inspection, the general condition of the facility, and whether the facility is operating satisfactorily. If maintenance is necessary, the permittee shall record: the description of the necessary maintenance, the date the necessary maintenance was performed, and whether the observed problem was corrected. The permittee shall maintain all records of inspections for at least three years.

Annually, not later than January 15th, the permittee shall submit a certification to EPA and the NHDES-WD which states that the previous calendar year's monthly inspections were conducted, results recorded, and records maintained.

EPA and the NHDES-WD have the right to inspect any CSO related structure or outfall at any time without prior notification to the permittee

c. Discharges to the combined system of septage, holding tank wastes, or other material which may cause a visible sheen or containing floatable material are prohibited during wet weather when CSO discharge may be active (Nine Minimum Control Numbers 3, 6, and 7).

d. Dry weather overflows are prohibited (Nine Minimum Control Number 5). All dry weather sanitary and/or industrial discharges from CSOs must be reported to EPA and the NHDES-WD within 24 hours in accordance with the reporting requirements for plant bypass (paragraph D.1.e of Part II of this permit).

e. The permittee shall quantify and record all discharges from combined sewer outfalls (Nine Minimum Control Number 9). Quantification may be through direct measurement or estimation. When estimating, the permittee shall make reasonable efforts (i.e. gaging, measurement) to verify the validity of the estimation technique. The following information must be recorded for each combined sewer outfall for each discharge event:

- Estimated duration (hours) of discharge;
- Estimated volume (gallons) of discharge: and
- National Weather Service precipitation data from the nearest gage where precipitation is available at daily (24-hour) intervals and the nearest gage where precipitation is available at one-hour intervals. Cumulative precipitation per discharge event shall be calculated.

The permittee shall maintain all records of discharges for at least six years after the effective date of this permit.

Annually, no later than January 15th, and in conjunction with the requirement in Part I.F.2.b. of this permit, the permittee shall submit a certification to EPA and the NHDES-WD which states that all discharges were recorded and records maintained for the previous calendar year.

f. The permittee shall install and maintain identification signs for all combined sewer outfall structures (Nine Minimum Control Number 8). The signs must be located at or near the combined sewer outfall structures and easily readable by the public. These signs shall be a minimum of 12 x 18 inches in size, with white lettering against a green background, and shall contain the following information:

TOWN OF EXETER
WET WEATHER
SEWAGE DISCHARGE
OUTFALL #

g. The permittee shall provide immediate notification to the NHDES-WD in the event of a CSO discharge.

h. The permittee shall provide notification to the public of CSO discharges and impacts on recreational uses of Clemson Pond and, if necessary, the Squamscott River.

3. CSO and Clemson Pond Monitoring

During the first full calendar year of the permit, the permittee shall perform sampling on the CSO inflow to Clemson Pond and at the outlet of Clemson Pond once per quarter. The permittee shall use NHDES Shellfish Monitoring Program stations to perform these samples. Influent samples to Clemson Pond shall be collected at Shellfish Monitoring Station SQMPS009 (42^o 59' 4.92" N, 70^o 56' 55.2" W). Samples at the outlet of Clemson Pond shall be collected just inside the tide gate and Shellfish Monitoring Station SQMPS010 (42^o 59' 12.9" N, 70^o 57' 1.98" W).

This sampling shall be performed once per quarter for a CSO event of at least 40,000 gallons. Samples shall be taken at each sampling station, SQMPS009 and SQMPS010 twice per day (2/day) for three (3) consecutive days. The first samples shall be collected as soon as practicable after the start of the CSO discharge.

Each sample collected shall be tested for Fecal Coliform Bacteria (MPN – 5 tube test), Enterococci Bacteria, salinity, and temperature.

At the end of the one year sampling period, the permittee shall submit the monitoring results to EPA and the NHDES by January 15th of the following year. If the monitoring data reveals the need to add additional limits or conditions the permit may be modified or alternatively revoked and reissued.

G. MONITORING AND REPORTING

Monitoring results shall be summarized for each calendar month and reported on separate Discharge Monitoring Report Form(s) (DMRs) postmarked no later than the 15th day of the month following the completed reporting period.

Signed and dated original DMRs and all other reports or notifications required herein or in Part II shall be submitted to the Director at the following address:

U.S. Environmental Protection Agency
Water Technical Unit (SMR-04)
5 Post Office Square - Suite 100
Boston, MA 02109-3912

Duplicate signed copies (original signature) of all written reports or notifications required herein or in Part II shall be submitted to the State at:

New Hampshire Department of Environmental Services (NHDES)
Water Division
Wastewater Engineering Bureau
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095

All verbal reports or notifications shall be made to both EPA and NHDES.

H. STATE PERMIT CONDITIONS

1. The permittee shall not at any time, either alone or in conjunction with any person or persons, cause directly or indirectly the discharge of waste into the said receiving water unless it has been treated in such a manner as will not lower the legislated water quality classification or interfere with the uses assigned to said water by the New Hampshire Legislature (RSA 485-A:12).

2. This NPDES Discharge Permit is issued by EPA under Federal and State law. Upon final issuance by EPA, the New Hampshire Department of Environmental Services-Water Division (NHDES-WD) may adopt this permit, including all terms and conditions, as a State permit pursuant to RSA 485-A:13.

3. EPA shall have the right to enforce the terms and conditions of this Permit pursuant to federal law and NHDES-WD shall have the right to enforce the Permit pursuant to state law, if the Permit is adopted. Any modification, suspension or revocation of this Permit shall be effective only with respect to the Agency taking such action, and shall not affect the validity or status of the Permit as issued by the other Agency.

4. Pursuant to New Hampshire Statute RSA 485-A:13,I(c), any person responsible for a bypass or upset at a wastewater treatment facility shall give immediate notice of a bypass or upset to all public or privately owned water systems drawing water from the same receiving water and located within 20 miles downstream of the point of discharge regardless of whether or not it is on the same receiving water or on another surface water to which the receiving water is a tributary. The permittee shall maintain a list of persons, and their telephone numbers, who are to be notified immediately by telephone. In addition, written notification, which shall be postmarked within 3 days of the bypass or upset, shall be sent to such persons.

5. The pH range of 6.5 to 8.0 Standard Units (S.U.) must be achieved in the final effluent unless the permittee can demonstrate to NHDES-WD: (1) that the range should be widened due to naturally occurring conditions in the receiving water or (2) that the naturally occurring receiving water pH is not significantly altered by the permittee's discharge. The scope of any demonstration project must receive prior approval from NHDES-WD. In no case, shall the above procedure result in pH limits outside the range of 6.0 – 9.0 S.U., which is the federal effluent limitation guideline regulation for pH for secondary treatment and is found in 40 CFR 133.102(c).

6. Pursuant to New Hampshire Code of Administrative Rules, Env-Wq 703.07(a):

   (a) Any person proposing to construct or modify any of the following shall submit an application for a sewer connection permit to the department:

   (1) Any extension of a collector or interceptor, whether public or private, regardless of flow;

   (2) Any wastewater connection or other discharge in excess of 5,000 gpd;

   (3) Any wastewater connection or other discharge to a WWTP operating in excess of 80 percent design flow capacity based on actual average flow for 3 consecutive months;

   (4) Any industrial wastewater connection or change in existing discharge of industrial wastewater, regardless of quality or quantity; and

   (5) Any sewage pumping station greater than 50 gpm or serving more than one building.

7. For each new or increased discharge of industrial waste to the POTW, the permittee shall submit, in accordance with Env-Ws 904.14(e) an "Industrial Wastewater Discharge Request Application" approved by the permittee in accordance with 904.13(a). The "Industrial Wastewater Discharge Request Application" shall be prepared in accordance with Env-Ws 904.10.

8. Pursuant to Env-Ws 904.17, at a frequency no less than every five years, permittees are required to submit:

a. A copy of its current sewer use ordinance. The sewer use ordinance shall include local limits pursuant to Env-Ws 904.04 (a).

b. A current list of all significant indirect discharges to the POTW. As a minimum, the list shall include for each industry, its name and address, the name and daytime telephone number of a contact person, products manufactured, industrial processes used, existing pretreatment processes, and discharge permit status.

c. A list of all permitted indirect dischargers; and

d. A certification that the municipality is strictly enforcing its sewer use ordinance and all discharge permits it has issued.

9. If chlorine is used for disinfection, a recorder which continuously records the chlorine residual prior to dechlorination shall be provided. The minimum, maximum and average daily residual chlorine values, measured prior to dechlorination, shall be submitted with monthly Discharge Monitoring Reports. Charts from the recorder, showing the continuous chlorine residual shall be maintained by the permittee for a period no less than (5) years.

10. The Exeter Public Works Department/Wastewater Treatment Facility is responsible for immediately notifying the New Hampshire Department of Environmental Services, Watershed Management Bureau, Shellfish Section of possible high bacteria/virus loading events from the facility or its sewage collection infrastructure. Such events include:

a. Any lapse or interruption of normal operation of the Wastewater Treatment Plant's disinfection system, or other event that results in the discharge of sewage from the Wastewater Treatment Plant or sewer infrastructure (pump stations, manholes, combined sewer overflows, etc.) that has not undergone full treatment as specified in the NPDES permit, or

b. Daily flows in excess of the 3.0 MGD design flow for the facility, or

c. Daily post-disinfection effluent sample result of 43 fecal coliform/100ml or greater. Notification shall also be made for instances where NPDES-related bacteria sampling is not completed, or where the results of such sampling are invalid.

"Immediate" notification with respect to reporting daily post-disinfection effluent sample results shall mean "as soon as the laboratory tests are completed".

The notification requirement also applies to all incidents of combined sewer overflow discharges. Notification to the NHDES Shellfish Program shall be made using the program's 24-hour pager. Upon initial notification of a possible high bacteria/virus loading event, NHDES Shellfish Program staff will determine the most suitable interval for continued notification and updates on an event-by-event basis.

11. In addition to submitting DMRs, monitoring results shall also be summarized for each calendar month and reported on separate Monthly Operating Report Form(s) (MORs) postmarked no later than the 15th day of the month following the completed reporting period. Signed and dated MORs shall be submitted to:

New Hampshire Department of Environmental Services (NHDES)
Water Division
Wastewater Engineering Bureau
P.O. Box 95, 29 Hazen Drive
Concord, New Hampshire 03302-0095

I. SPECIAL CONDITIONS

1. pH Limit Adjustment

The Permittee may submit a written request to the EPA requesting a change in the permitted pH limit range to be not less restrictive than 6.0 to 9.0 Standard Units found in the applicable National Effluent Limitation Guideline (Secondary Treatment Regulations in 40 C.F.R. Part 133) for this facility. The Permittee's written request must include the State's letter containing an original signature (no copies). The State's approval letter shall state that the Permittee has demonstrated to the State's satisfaction that as long as discharges to the receiving water from a specific outfall are within a specific numeric pH range, the naturally occurring receiving water pH will be unaltered. The letter must specify for each outfall the associated numeric pH limit range. Until written notice is received by certified mail from the EPA indicating the pH limit range has been changed, the Permittee is required to meet the permitted pH limit range in the respective permit.

2. Requirements for POTWs with Effluent Diffusers

a) Effluent diffusers shall be maintained when necessary to ensure proper operation. Proper operation means that the plumes from each port will be balanced relative to each other and that they all have unobstructed flow. Maintenance may include dredging in the vicinity of the diffuser, cleaning out of solids in the diffuser header pipe, removal of debris and repair/replacement of riser ports and pinch valves.

b) Any necessary maintenance dredging must be performed only during the marine construction season authorized by the New Hampshire Fish and Game Department and only after receiving all necessary permits including those from the NHDES Wetlands Bureau, U.S. Coast Guard, and the U.S. Army Corps of Engineers.

c) To determine if maintenance will be required, the permittee shall have a licensed diver or licensed marine contractor inspect and videotape the operation of the diffuser. The inspections and videotaping shall be performed once every two years with the first inspection required during the first calendar year following final permit issuance.

d) Copies of a report summarizing the results of each diffuser inspection shall be submitted to EPA and NHDES-WD by December 31st of the year the inspection occurred. Where it is determined that maintenance will be necessary, the permittee shall also provide the proposed schedule for the maintenance.

3. Nonpoint Source Nitrogen Reductions

In order to achieve water quality standards in the Squamscott River significant reductions in non-point sources of total nitrogen are necessary in conjunction with achieving the total nitrogen limitations in this discharge permit. Achieving the necessary nonpoint source reductions will require collaboration between the State of New Hampshire and public, private, and commercial stakeholders within the watershed to: (1) complete nonpoint source loading analyses; (2) complete analyses of the costs for controlling sources; and (3) developing control plans that include:

a. A description of appropriate financing and regulatory mechanisms to implement the necessary reductions;

b. An implementation schedule to achieve reductions (this schedule may extend beyond the term of this permit); and

c. A monitoring plan to assess the extent to which the reductions are achieved.

Following issuance of the final permit, EPA will review the status of the activities described above in items (1), (2), and (3) at 12 month intervals from the date of issuance. In the event the activities described above are not carried out within the timeframe of this permit (5 years), EPA will reopen the permit and incorporate any more stringent total nitrogen limit required to assure compliance with applicable water quality standards.

Appendix B

Technical Memoranda, Wright-Pierce

B-1: Summary of Historic Water Quality Monitoring Data; Wright-Pierce, August 14, 2018

WRIGHT-PIERCE
Engineering a Better Environment™

MEMORANDUM

TO:	Paul Vlasich, PE – Town of Exeter	**DATE:**	8/14/2018
FROM:	Vishwa Raval, Ed Leonard	**PROJECT NO.:**	12883K
SUBJECT:	Nitrogen Control Plan Summary of Historic Water Quality Monitoring Data		

BASELINE SQUAMSCOTT RIVER AND EXETER RIVER DATA COLLECTION

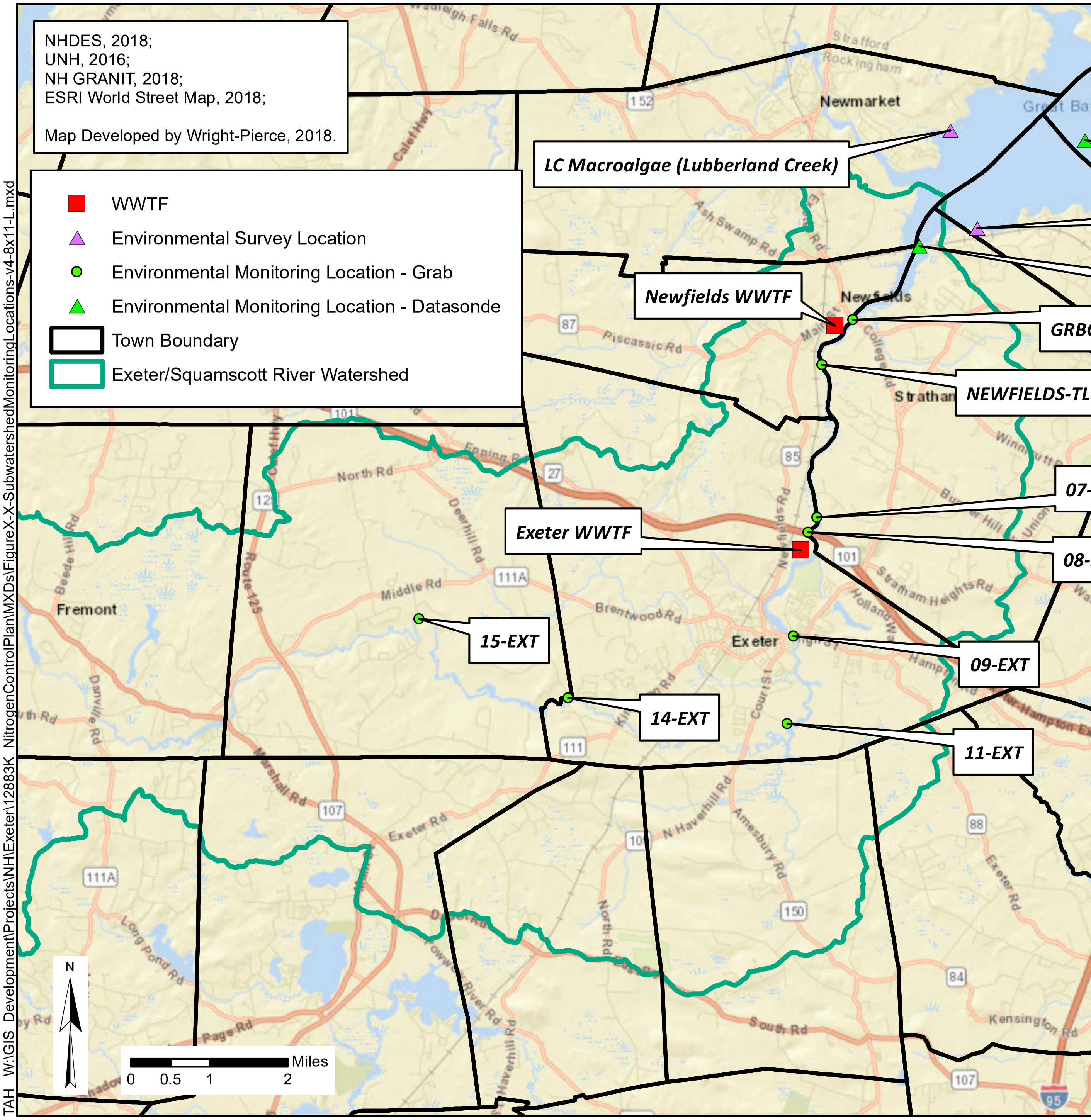
In order to document water quality trends in the Squamscott River and the Exeter River, baseline measurements (pre-WWTF-upgrade) must be taken for the various parameters of interest to be monitored as a part of the water quality monitoring program. New Hampshire Department of Environmental Services (NHDES), University of New Hampshire (UNH), Piscataqua Region Estuaries Partnership (PREP) have been collecting data on the Squamscott River and Exeter River since the mid-1990s. We obtained available historical data from the NHDES Environmental Monitoring Database. A map showing these locations can be seen at the end of this memorandum, as well as a summary of data collected. Graphs of some of the relevant parameters as monitored downstream of the Newfields and Exeter WWTFs (at the GRBGB, GRBSQ, and GRBCL stations), downstream of the Exeter WWTF (at the NEWFIELDS-TL, 07-SQR, and 08-SQR stations) and upstream of the Exeter WWTF (at the 09-EXT, 09-EXT-DAMMED, 11-EXT, and 14-EXT stations) are also attached.

ADDITIONAL REPORTS AND INFORMATION

The following additional reports have technical information relevant to historic water quality monitoring in the Great Bay watershed and the Exeter/Squamscott River watershed.

- UNH Eelgrass Survey reports (multiple years)
- UNH Macroalgae Survey reports (multiple years)
- PREP State of Our Estuaries 2013
- PREP State of Our Estuaries 2018
- HydroQual, Squamscott River August-September 2011 Field Studies, March 20, 2012
- HydroQual, Estimation of DIN Loads to the Great Bay Estuary System, January 16, 2012
- HydroQual, Review of Proposed Numeric Nutrient Criteria for Great Bay, June 14, 2010
- PREP State of Our Estuaries 2009

PREP information can be found on the PREP website (https://prepestuaries.org/). In addition, UNH hosts a library of technical publications related to Great Bay watershed (https://scholars.unh.edu/prep/)



Exeter, NH

Nitrogen Control Plan

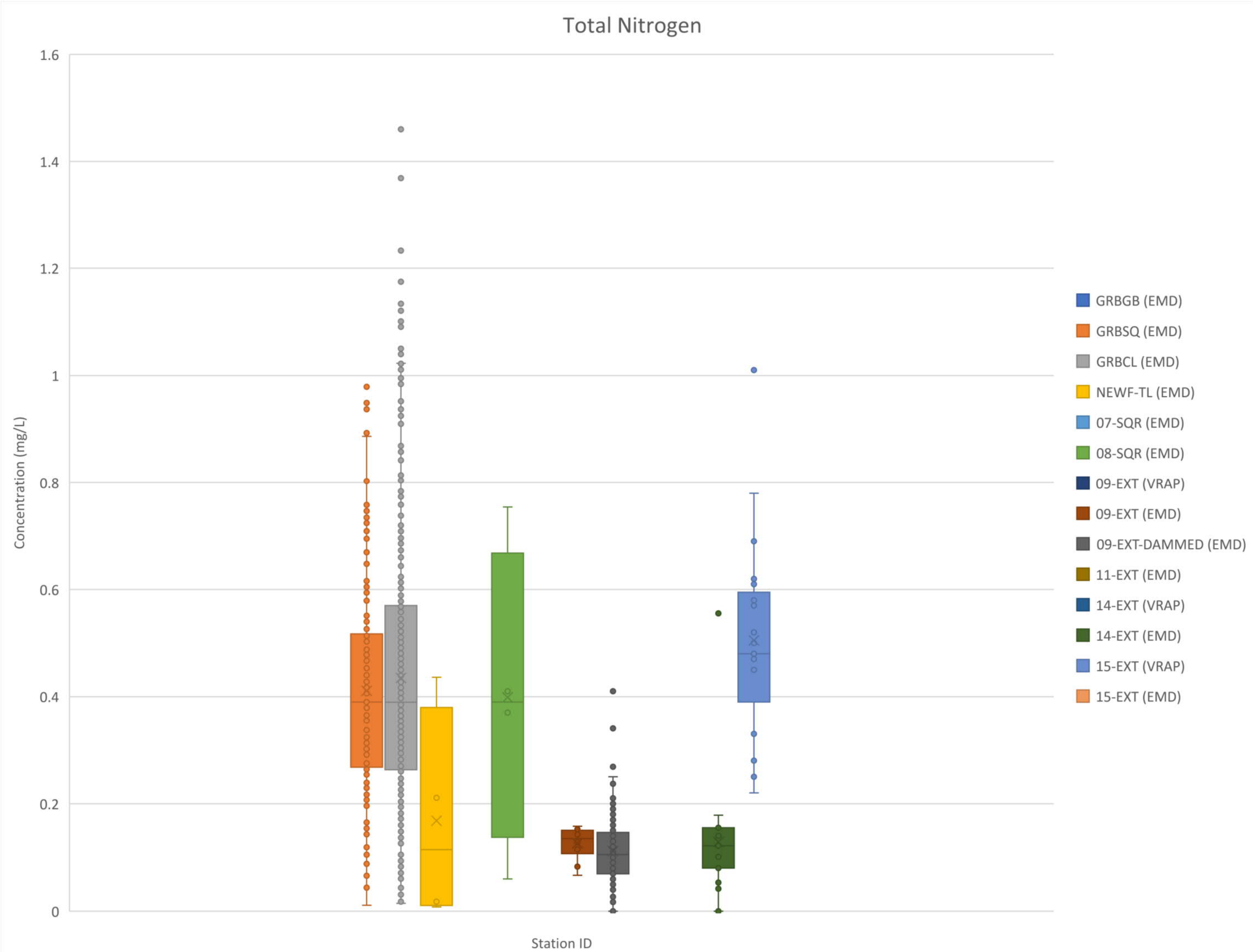
Subwatershed Monitoring Locations

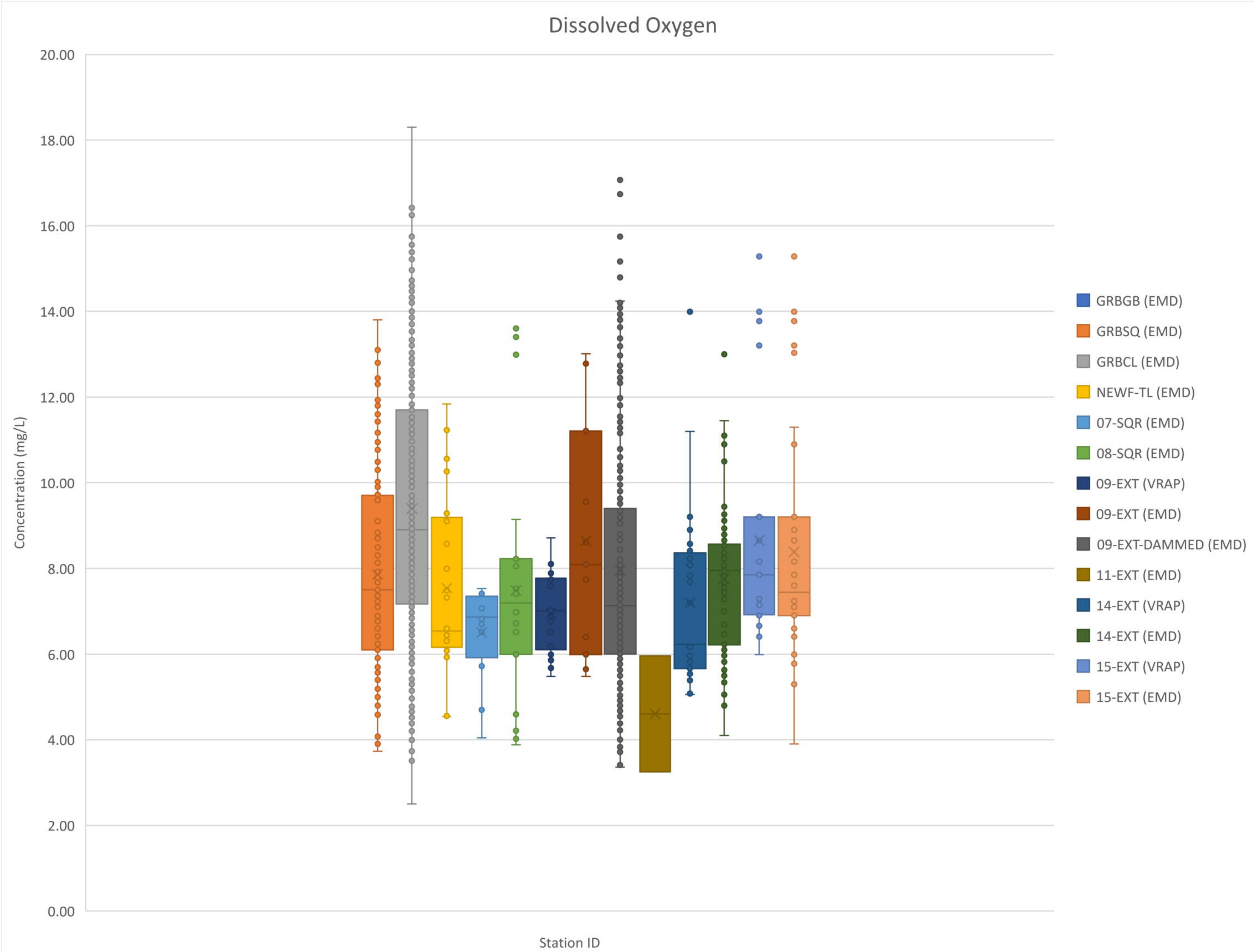
PROJ NO:	DATE:
12883K-1034	7/30/2018

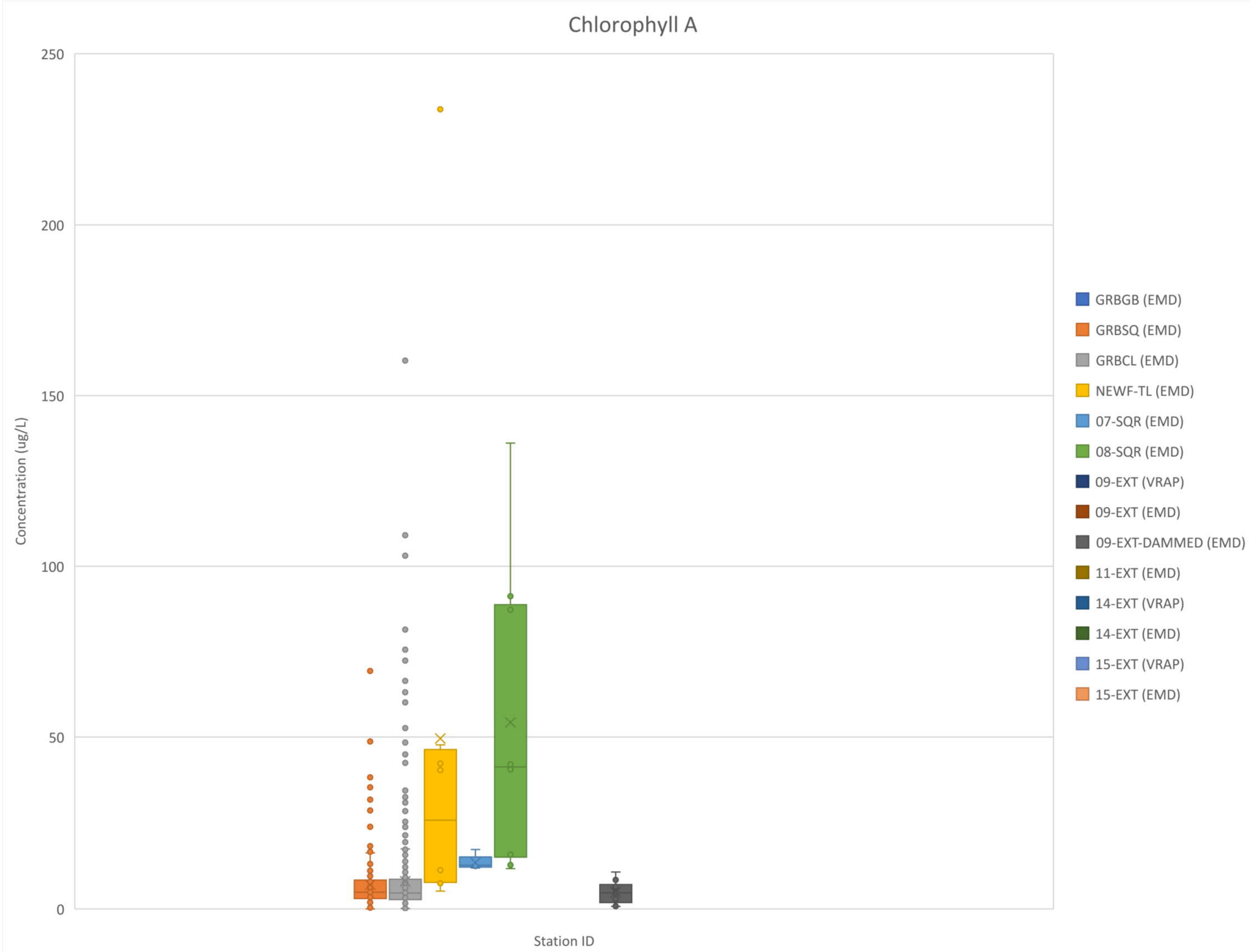
WRIGHT-PIERCE
Engineering a Better Environment

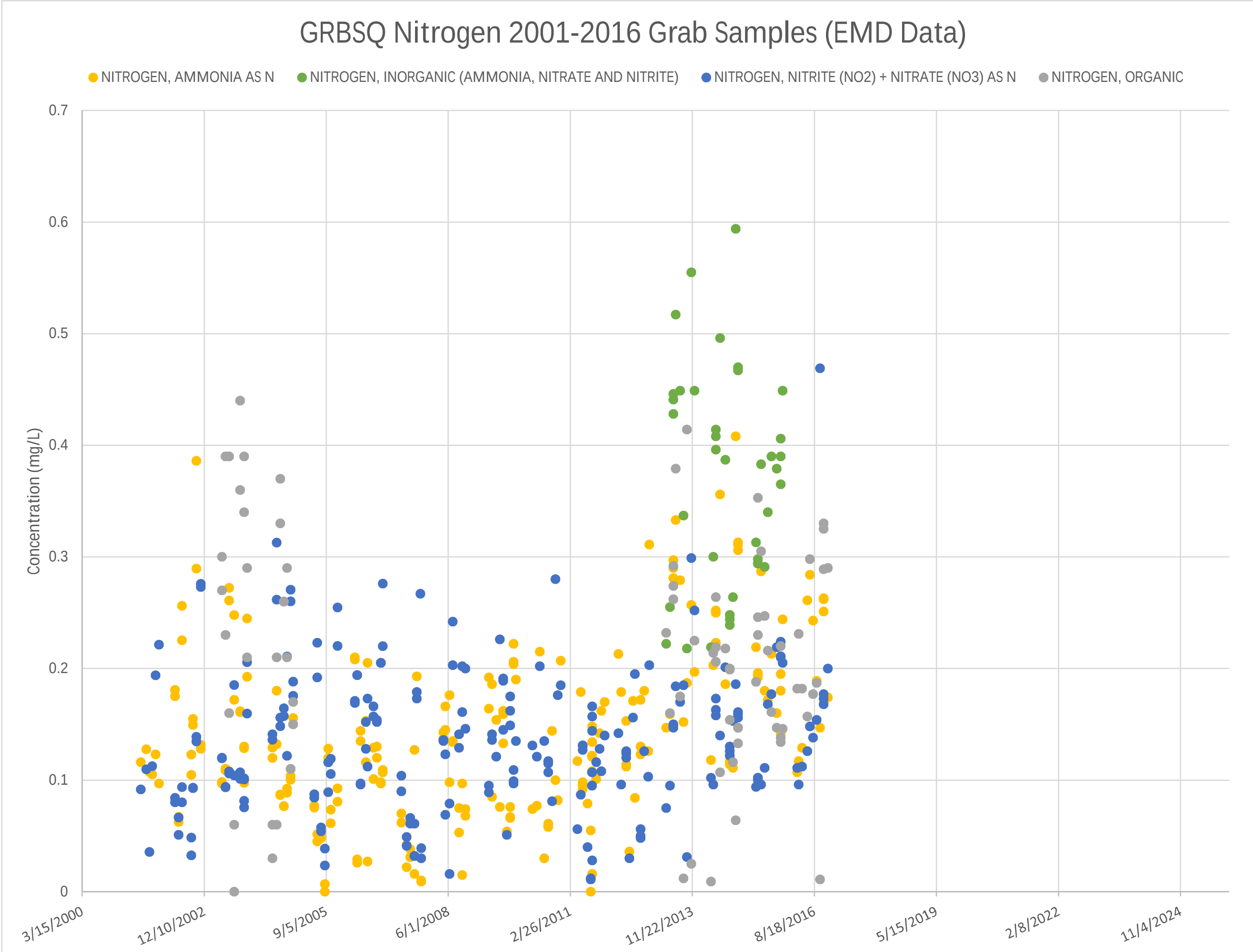
FIGURE: 1

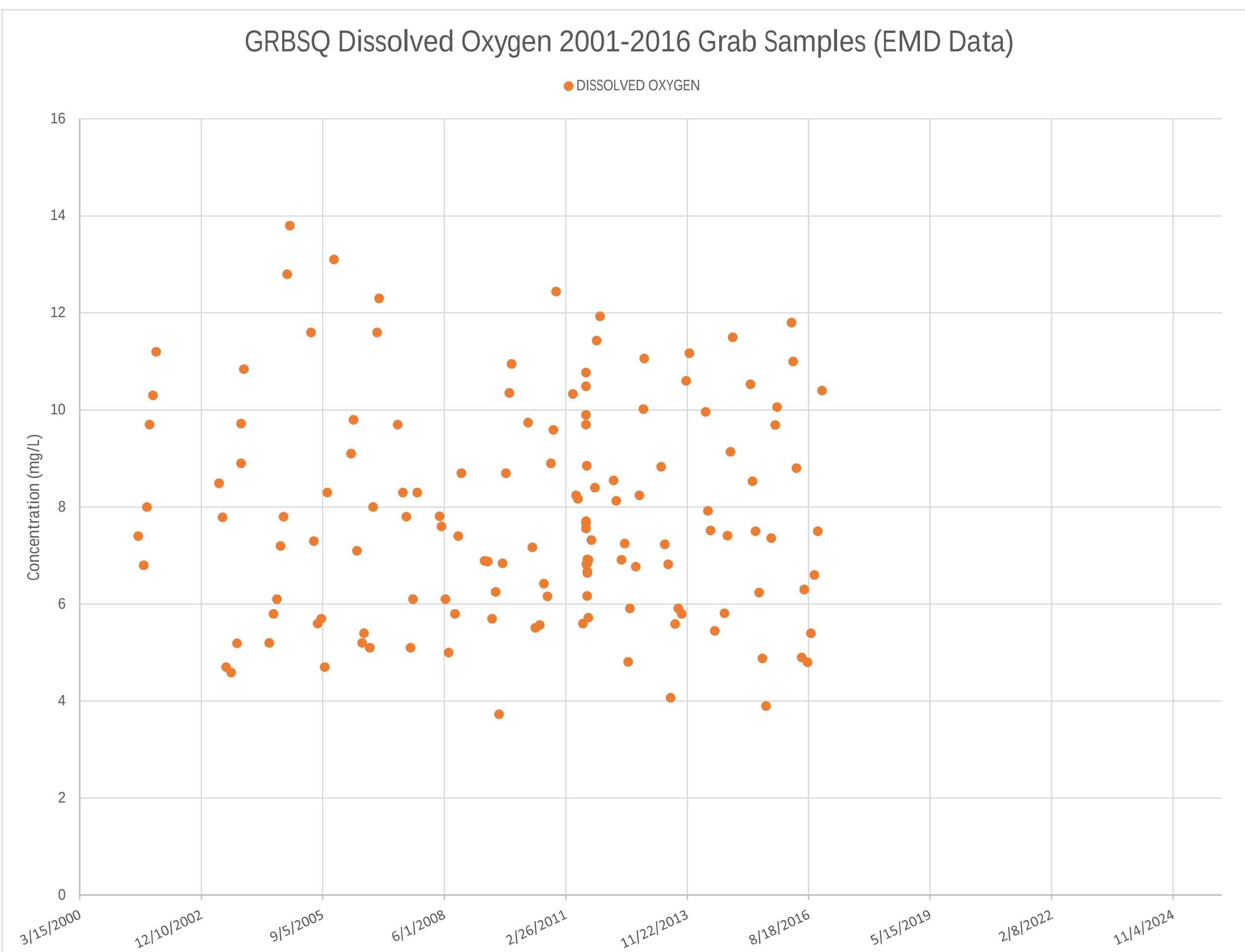
TAH W:\GIS_Development\Projects\NH\Exeter\12883K_NitrogenControlPlan\MXDs\FigureX-X-SubwatershedMonitoringLocations-v4-8x11-L.mxd

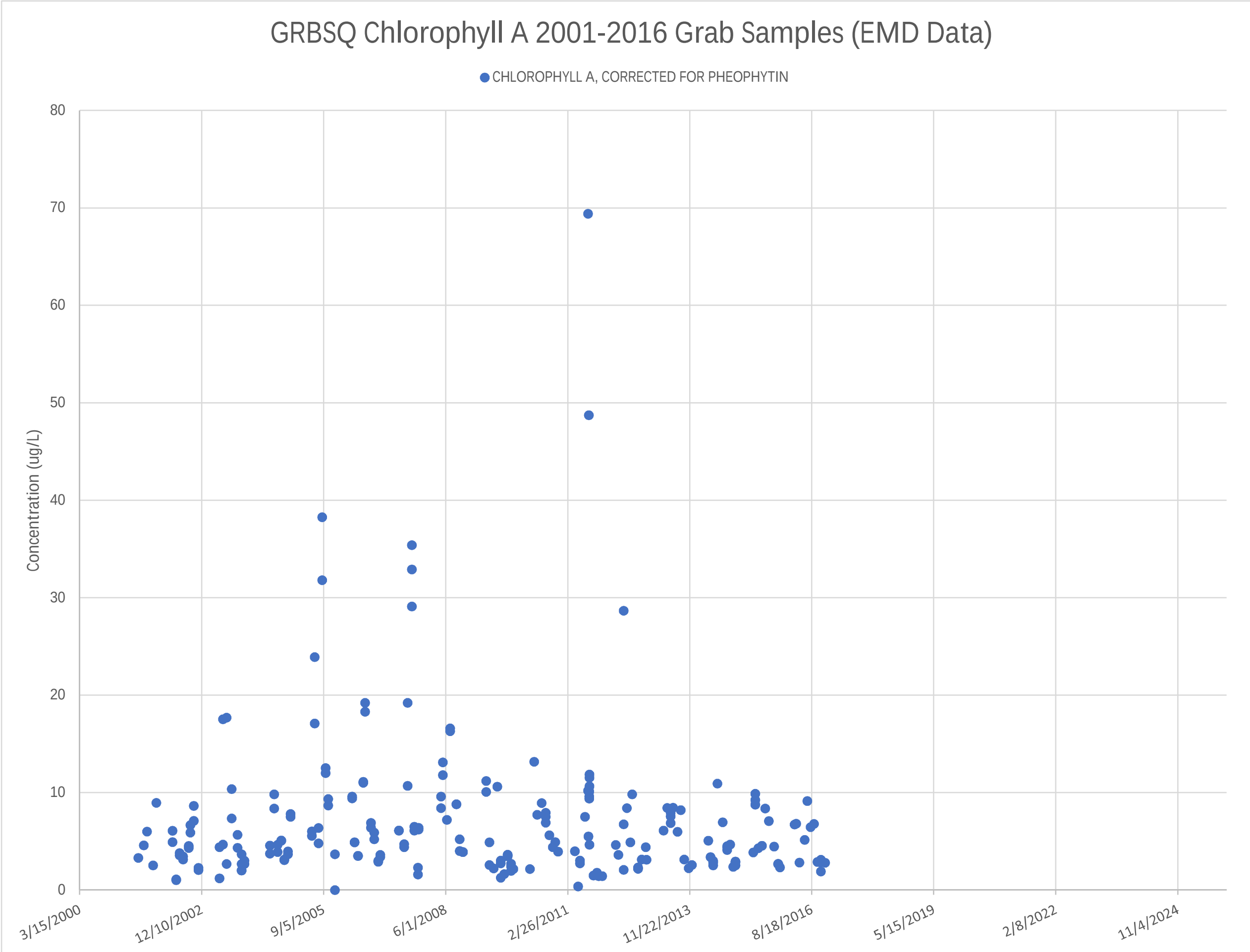

Total Nitrogen
Concentration (mg/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Station ID
GRBGB (EMD)
GRBSQ (EMD)
GRBCL (EMD)
NEWF-TL (EMD)
07-SQR (EMD)
08-SQR (EMD)
09-EXT (VRAP)
09-EXT (EMD)
09-EXT-DAMMED (EMD)
11-EXT (EMD)
14-EXT (VRAP)
14-EXT (EMD)
15-EXT (VRAP)
15-EXT (EMD)

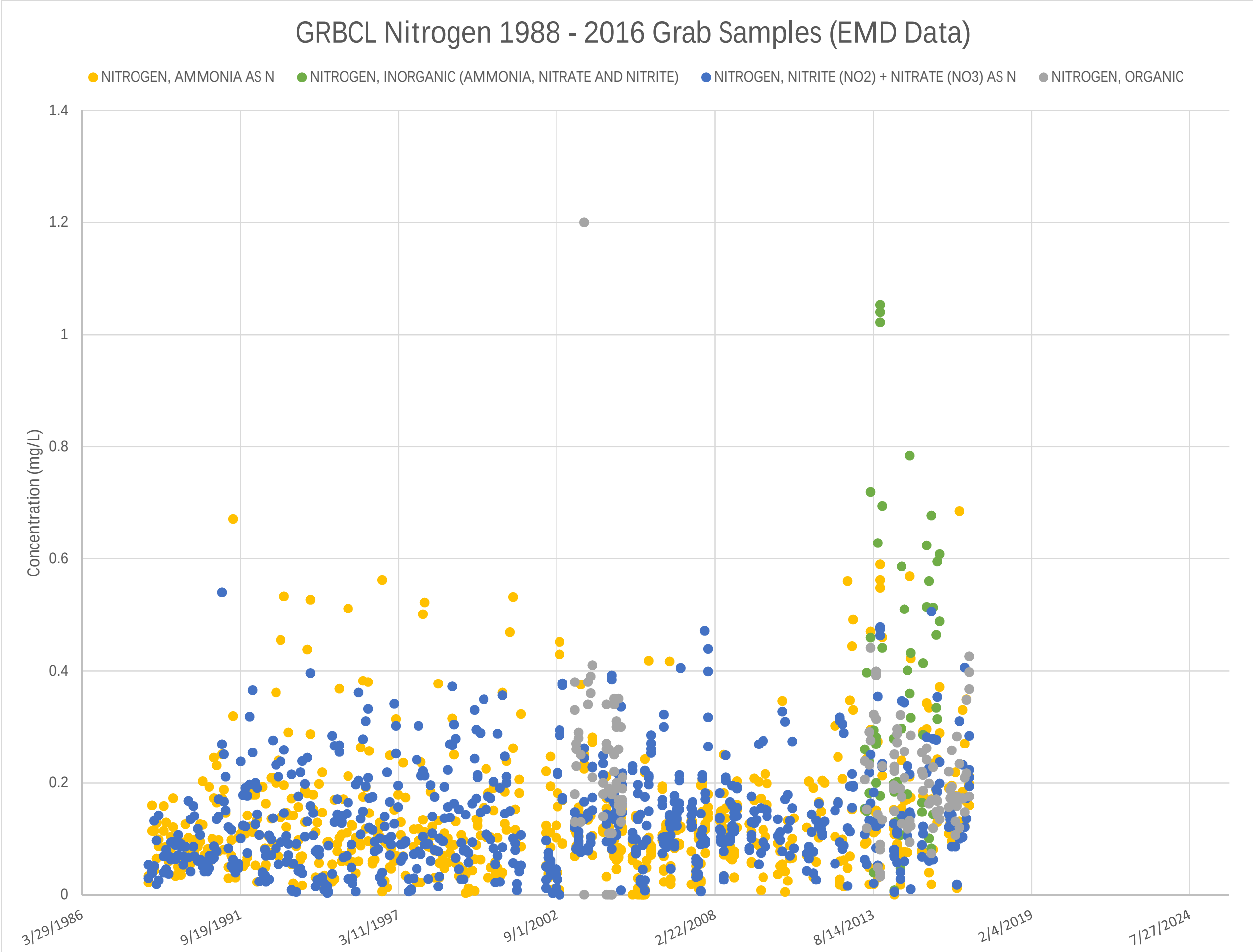

Dissolved Oxygen
Concentration (mg/L)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Station ID
GRBGB (EMD)
GRBSQ (EMD)
GRBCL (EMD)
NEWF-TL (EMD)
07-SQR (EMD)
08-SQR (EMD)
09-EXT (VRAP)
09-EXT (EMD)
09-EXT-DAMMED (EMD)
11-EXT (EMD)
14-EXT (VRAP)
14-EXT (EMD)
15-EXT (VRAP)
15-EXT (EMD)

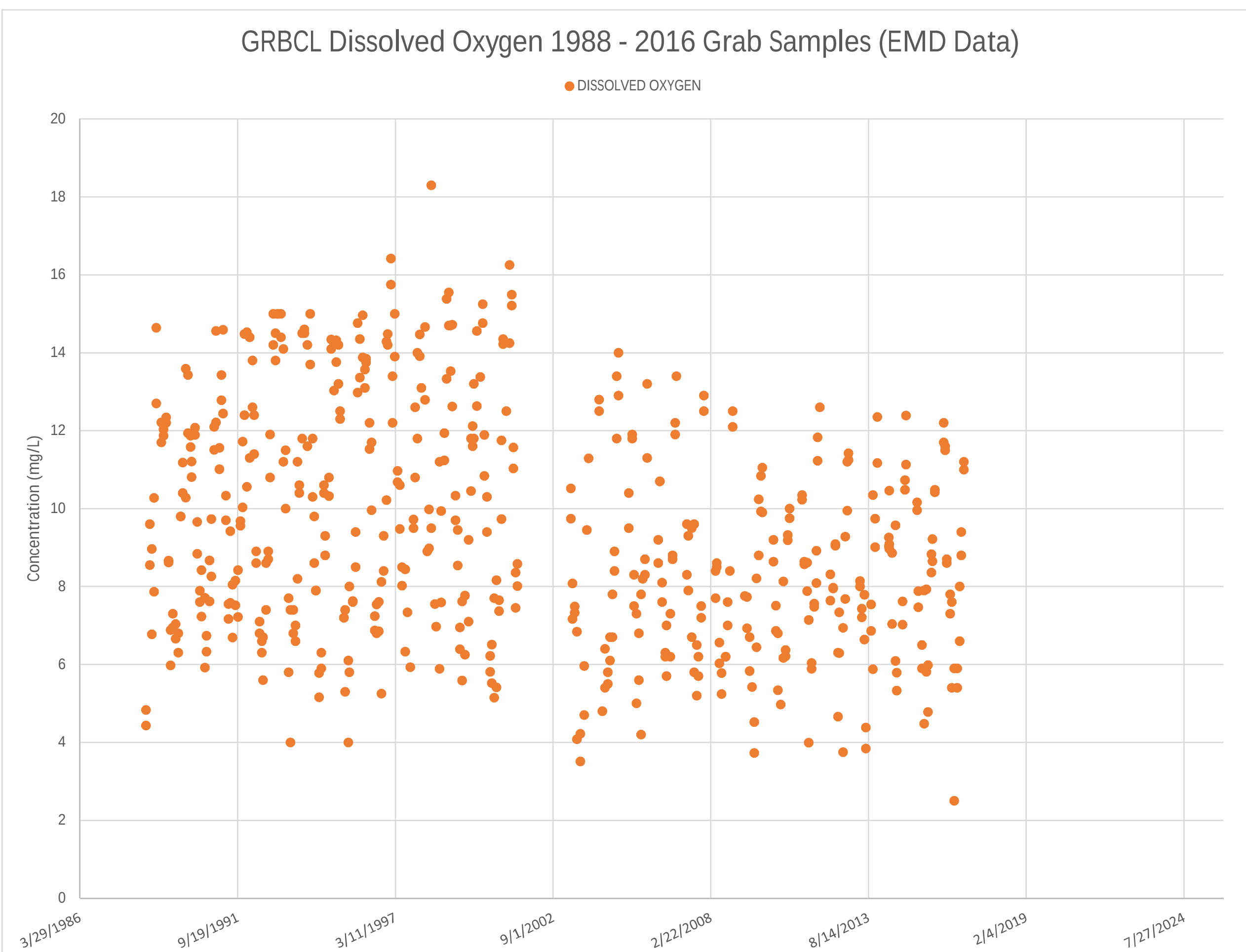

Chlorophyll A
Concentration (ug/L)
250
200
150
100
50
0
Station ID
GRBGB (EMD)
GRBSQ (EMD)
GRBCL (EMD)
NEWF-TL (EMD)
07-SQR (EMD)
08-SQR (EMD)
09-EXT (VRAP)
09-EXT (EMD)
09-EXT-DAMMED (EMD)
11-EXT (EMD)
14-EXT (VRAP)
14-EXT (EMD)
15-EXT (VRAP)
15-EXT (EMD)

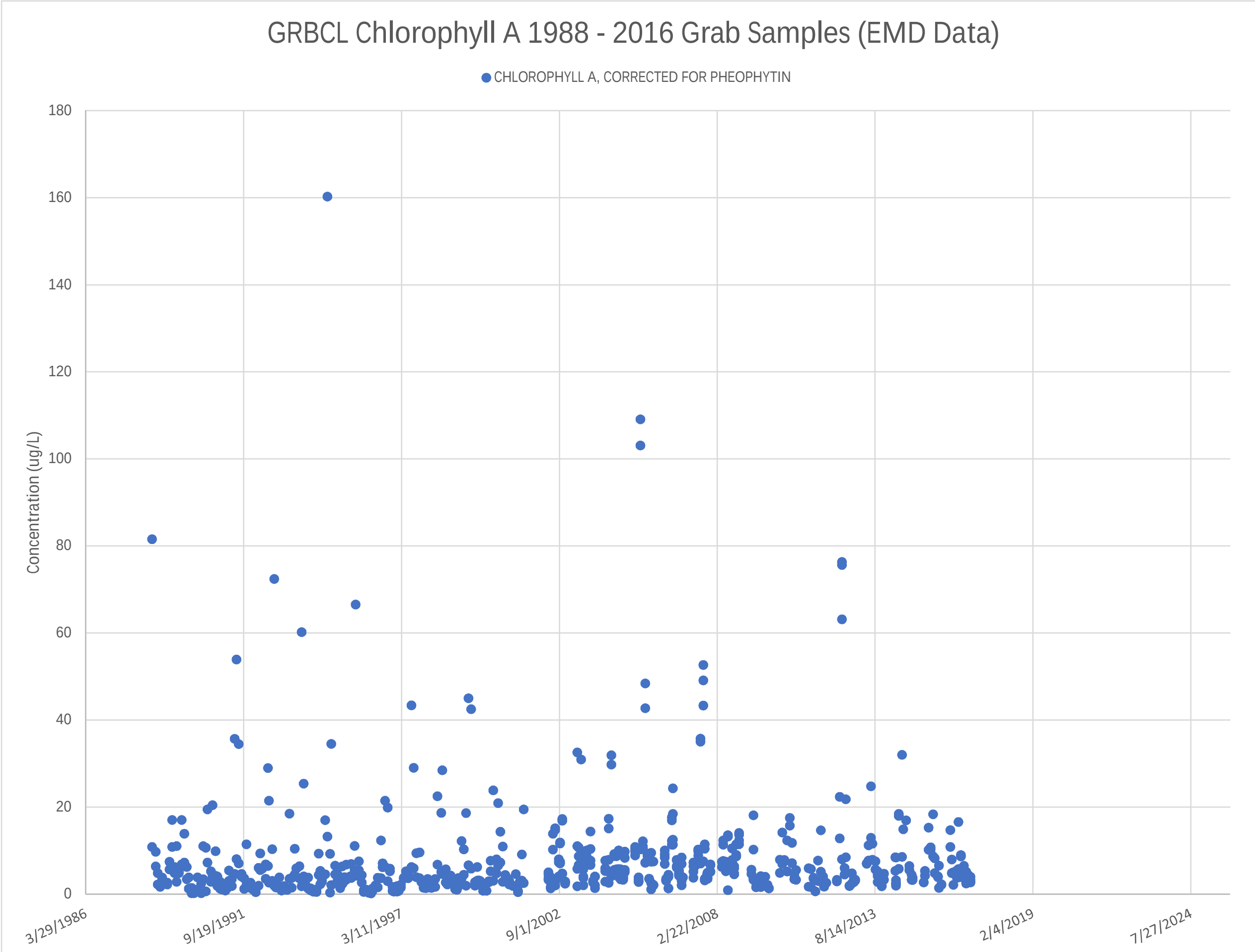

GRBSQ Nitrogen 2001-2016 Grab Samples (EMD Data)
NITROGEN, AMMONIA AS N
NITROGEN, INORGANIC (AMMONIA, NITRATE AND NITRITE)
NITROGEN, NITRITE (NO2) + NITRATE (NO3) AS N
NITROGEN, ORGANIC
Concentration (mg/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
3/15/2000
12/10/2002
9/5/2005
6/1/2008
2/26/2011
11/22/2013
8/18/2016
5/15/2019
2/8/2022
11/4/2024

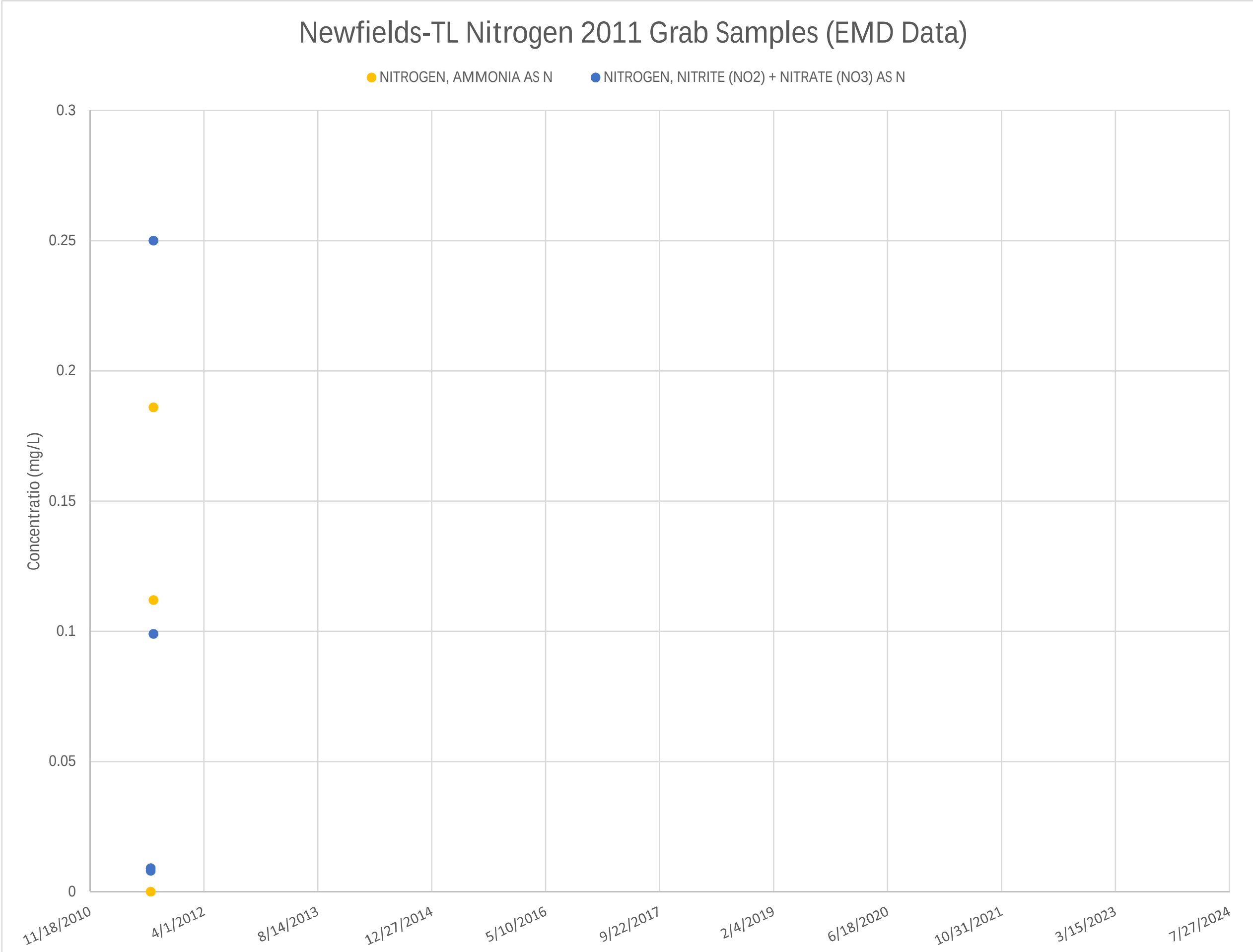

GRBSQ Dissolved Oxygen 2001-2016 Grab Samples (EMD Data)
DISSOLVED OXYGEN
Concentration (mg/L)
16
14
12
10
8
6
4
2
0
3/15/2000
12/10/2002
9/5/2005
6/1/2008
2/26/2011
11/22/2013
8/18/2016
5/15/2019
2/8/2022
11/4/2024


GRBSQ Chlorophyll A 2001-2016 Grab Samples (EMD Data)
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN
Concentration (ug/L)
80
70
60
50
40
30
20
10
0
3/15/2000
12/10/2002
9/5/2005
6/1/2008
2/26/2011
11/22/2013
8/18/2016
5/15/2019
2/8/2022
11/4/2024

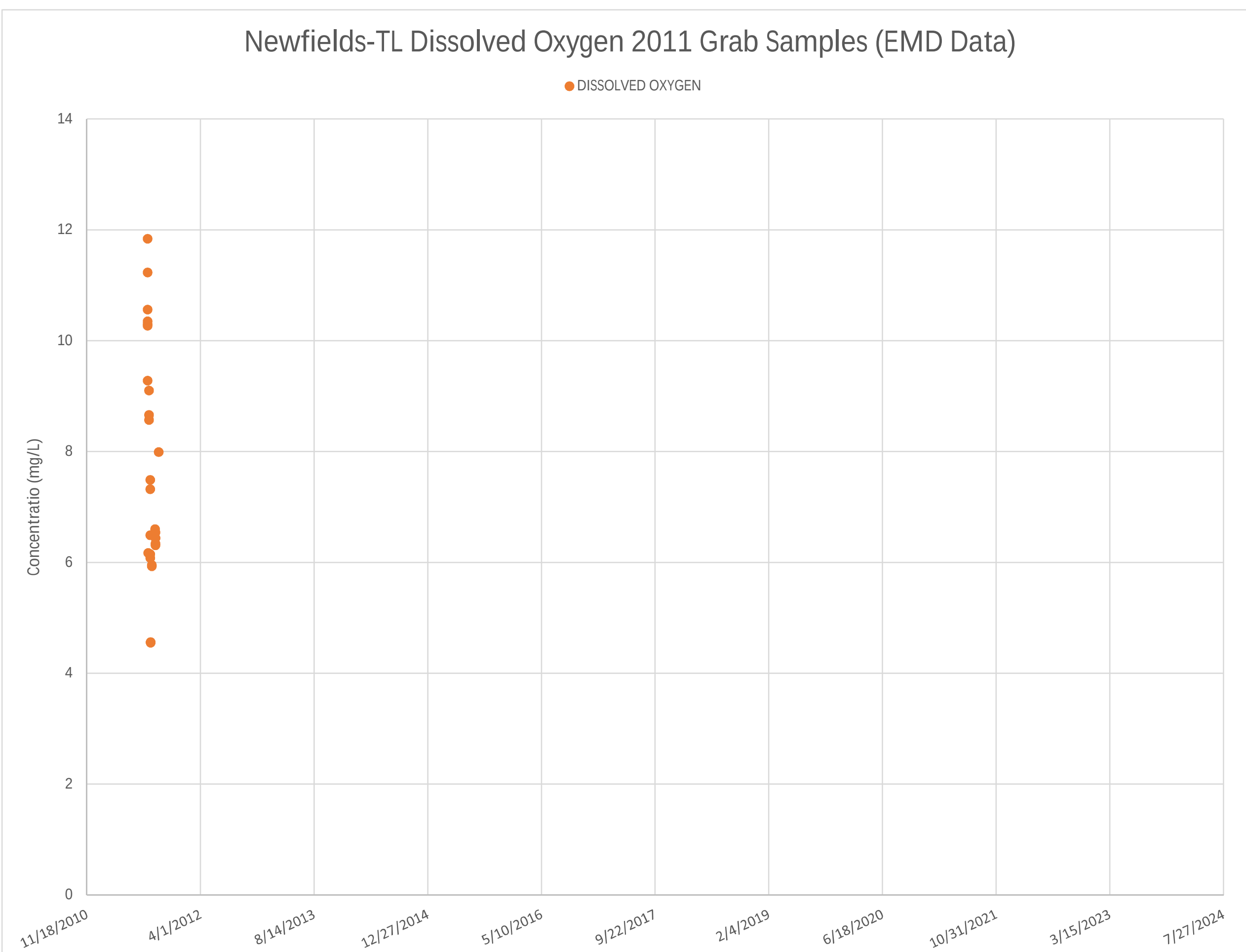

GRBCL Nitrogen 1988 - 2016 Grab Samples (EMD Data)
NITROGEN, AMMONIA AS N
NITROGEN, INORGANIC (AMMONIA, NITRATE AND NITRITE)
NITROGEN, NITRITE (NO2) + NITRATE (NO3) AS N
NITROGEN, ORGANIC
Concentration (mg/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
3/29/1986
9/19/1991
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019
7/27/2024


GRBCL Dissolved Oxygen 1988 - 2016 Grab Samples (EMD Data)
DISSOLVED OXYGEN
Concentration (mg/L)
20
18
16
14
12
10
8
6
4
2
0
3/29/1986
9/19/1991
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019
7/27/2024

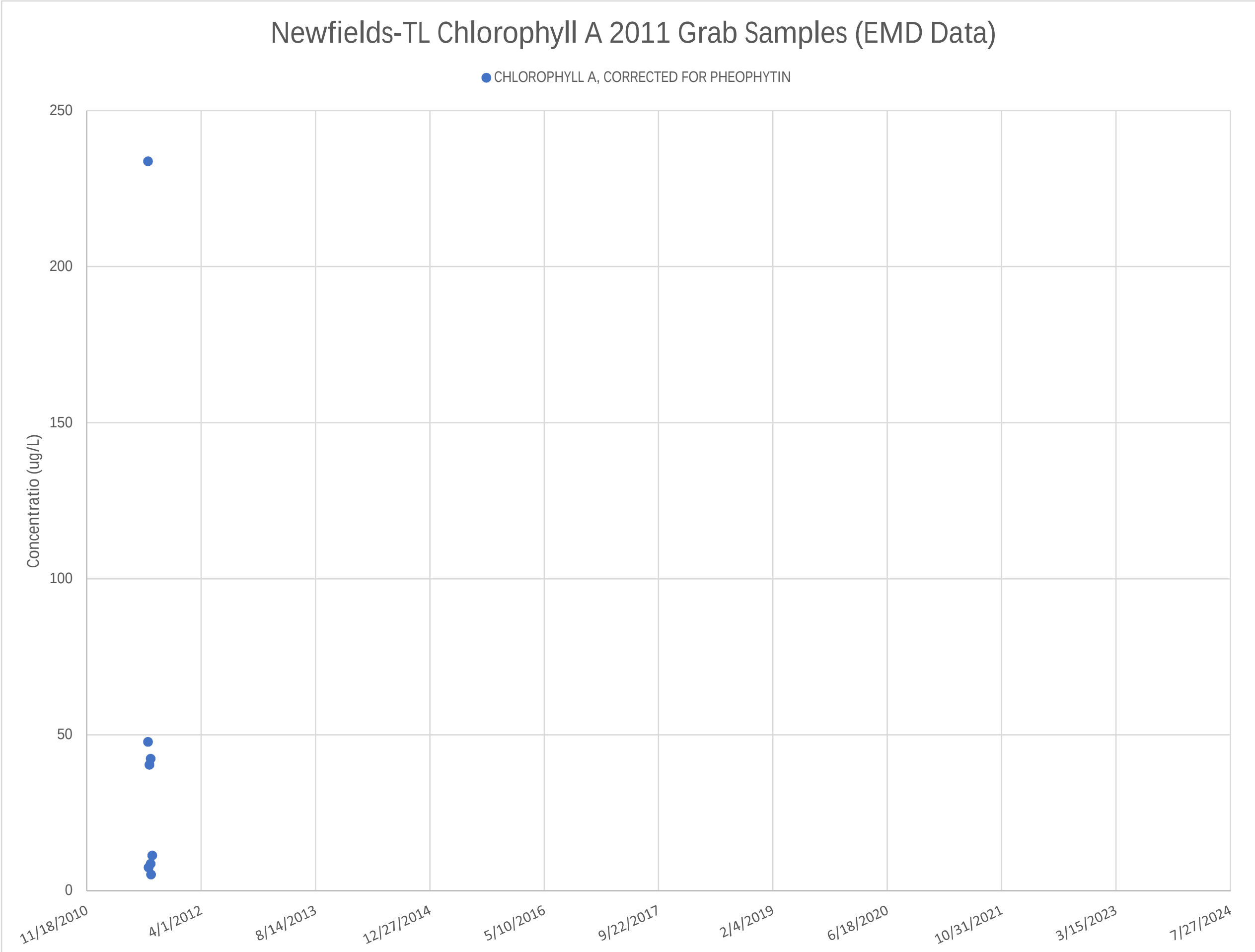

GRBCL Chlorophyll A 1988 - 2016 Grab Samples (EMD Data)
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN
Concentration (ug/L)
180
160
140
120
100
80
60
40
20
0
3/29/1986
9/19/1991
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019
7/27/2024



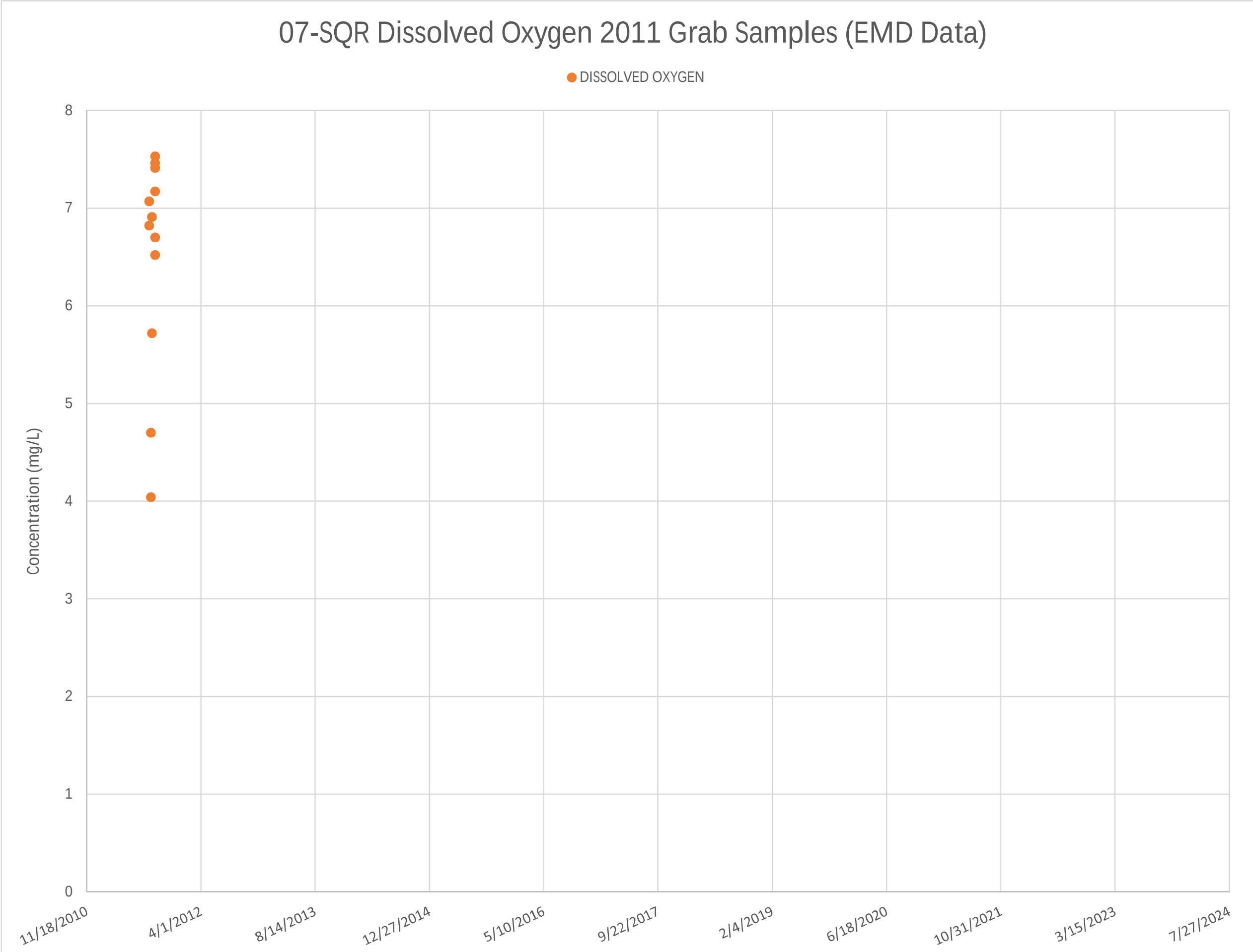
Newfields-TL Nitrogen 2011 Grab Samples (EMD Data)
NITROGEN, AMMONIA AS N
NITROGEN, NITRITE (NO2) + NITRATE (NO3) AS N
Concentratio (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
3/15/2023
7/27/2024

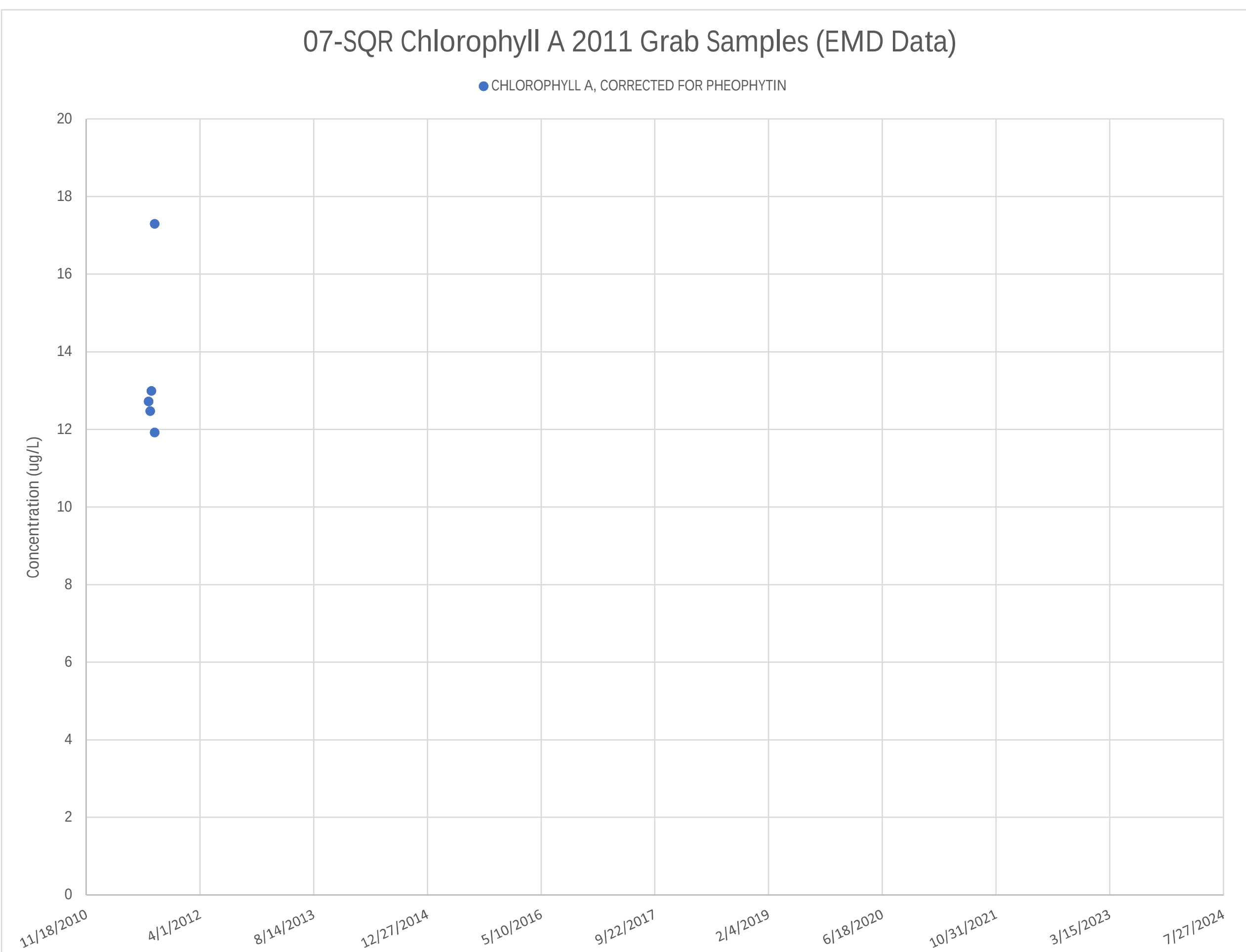


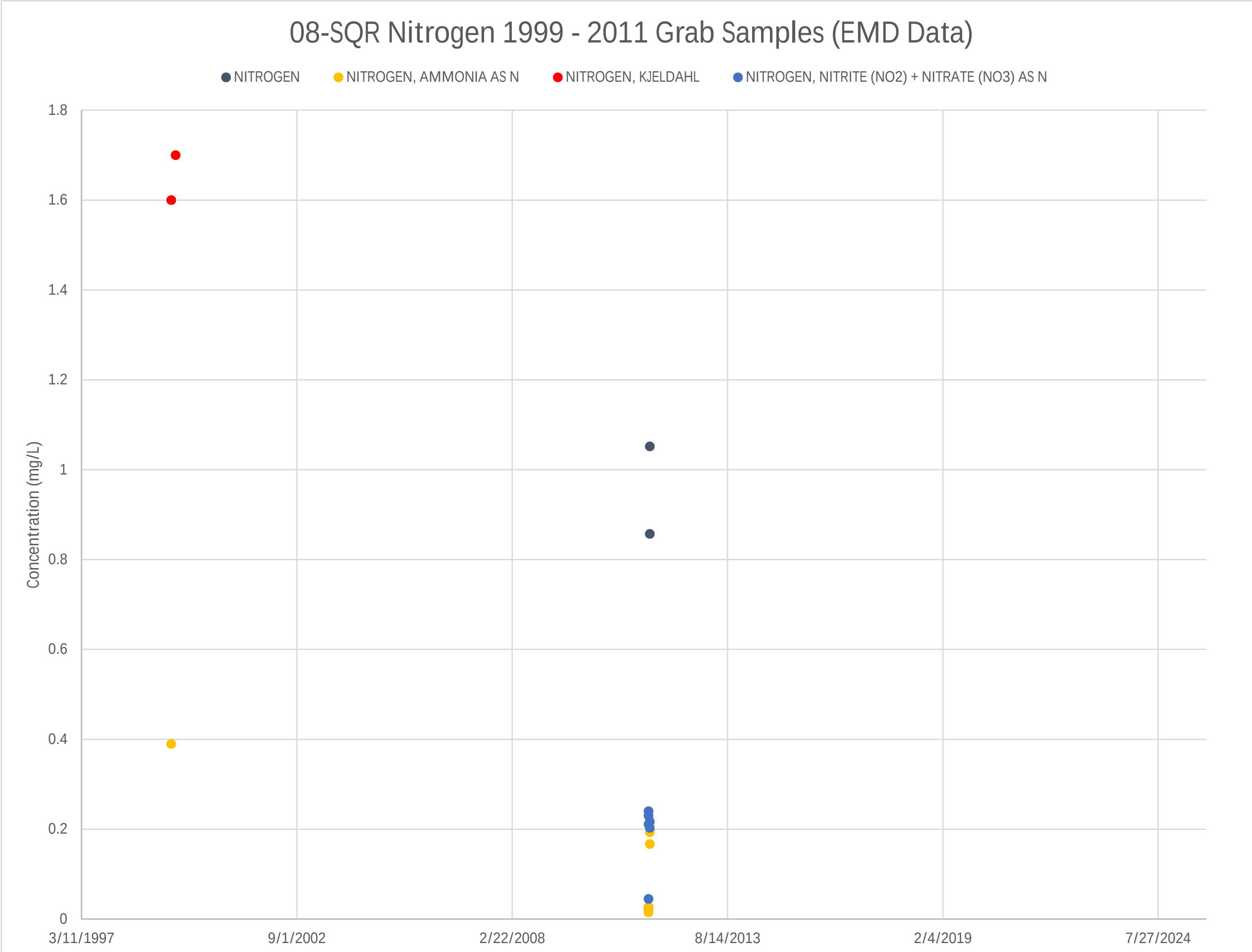
Newfields-TL Dissolved Oxygen 2011 Grab Samples (EMD Data)
DISSOLVED OXYGEN
Concentratio (mg/L)
14
12
10
8
6
4
2
0
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
3/15/2023
7/27/2024

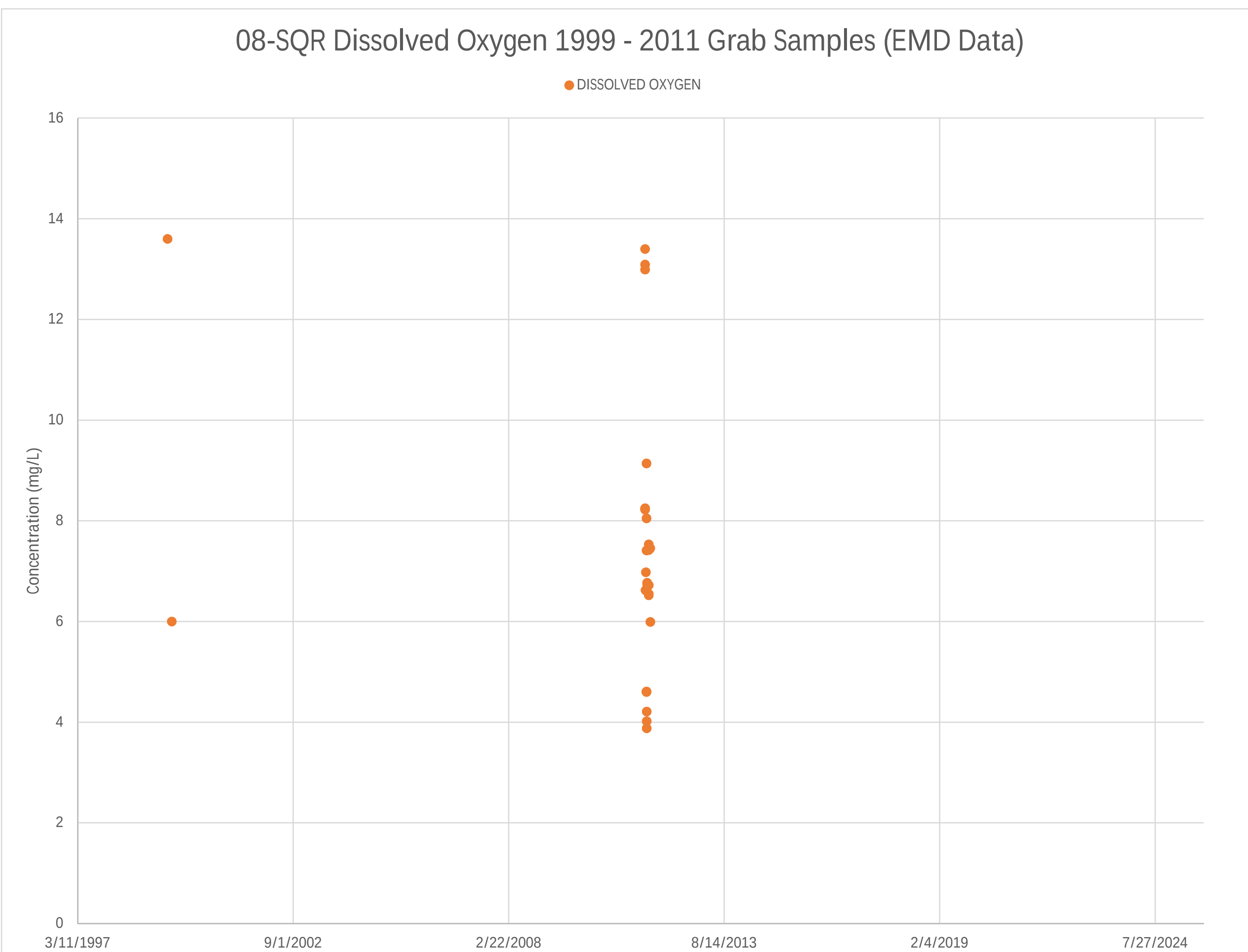


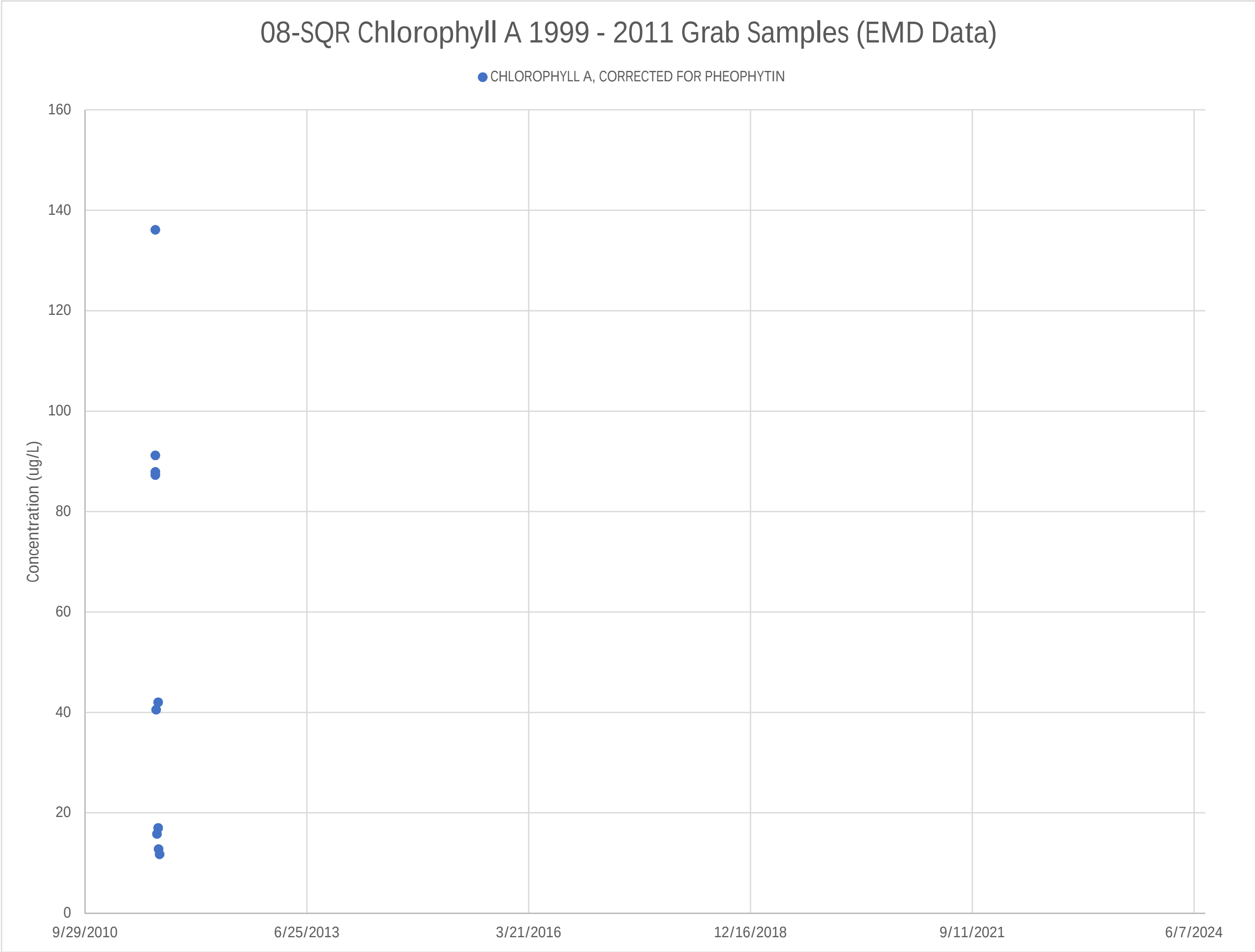
Newfields-TL Chlorophyll A 2011 Grab Samples (EMD Data)
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN
Concentratio (ug/L)
250
200
150
100
50
0
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
3/15/2023
7/27/2024

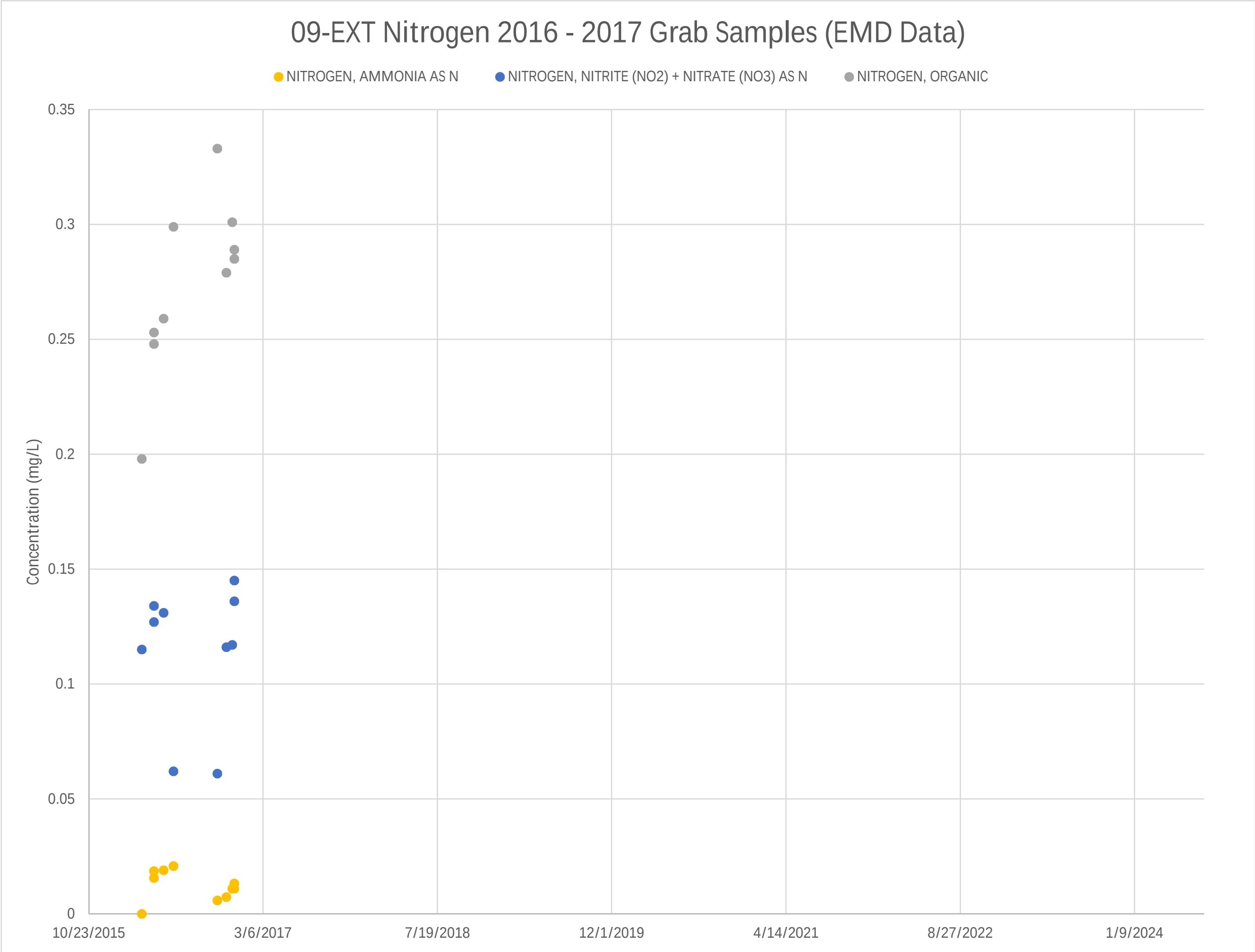

07-SQR Dissolved Oxygen 2011 Grab Samples (EMD Data)
DISSOLVED OXYGEN
Concentration (mg/L)
0
1
2
3
4
5
6
7
8
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
3/15/2023
7/27/2024

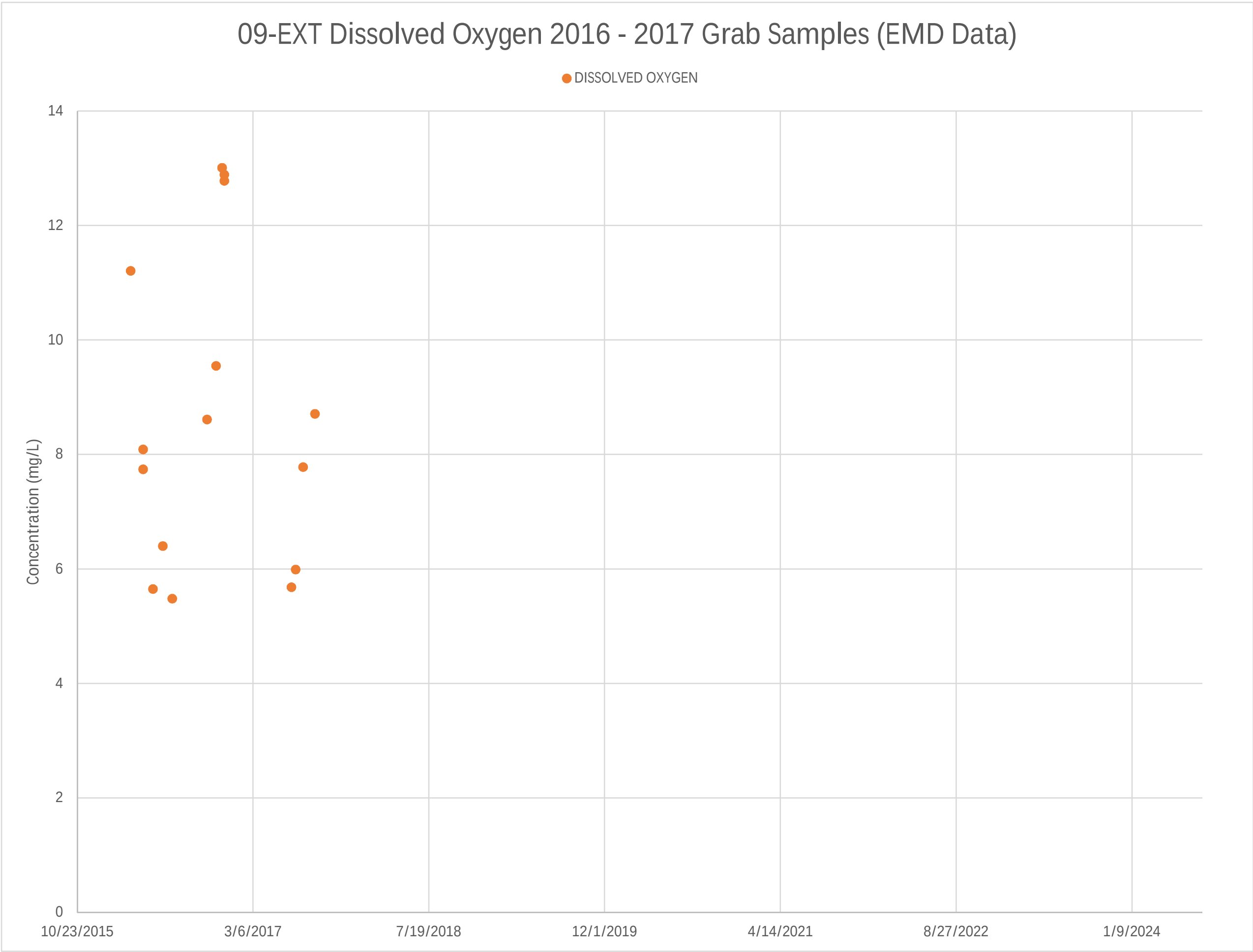

07-SQR Chlorophyll A 2011 Grab Samples (EMD Data)
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN
Concentration (ug/L)
0
2
4
6
8
10
12
14
16
18
20
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
3/15/2023
7/27/2024

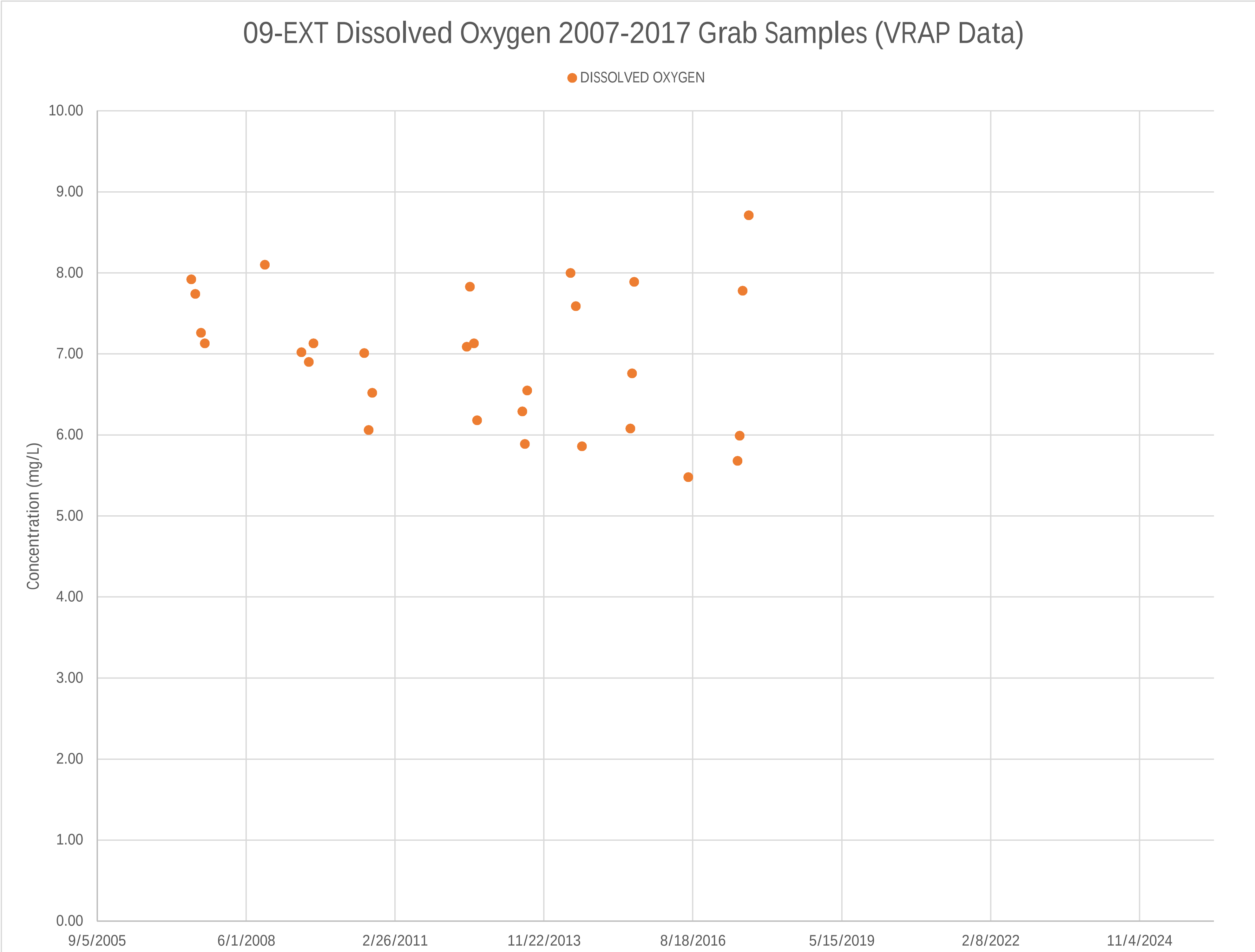

08-SQR Nitrogen 1999 - 2011 Grab Samples (EMD Data)
NITROGEN
NITROGEN, AMMONIA AS N
NITROGEN, KJELDAHL
NITROGEN, NITRITE (NO2) + NITRATE (NO3) AS N
Concentration (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019
7/27/2024

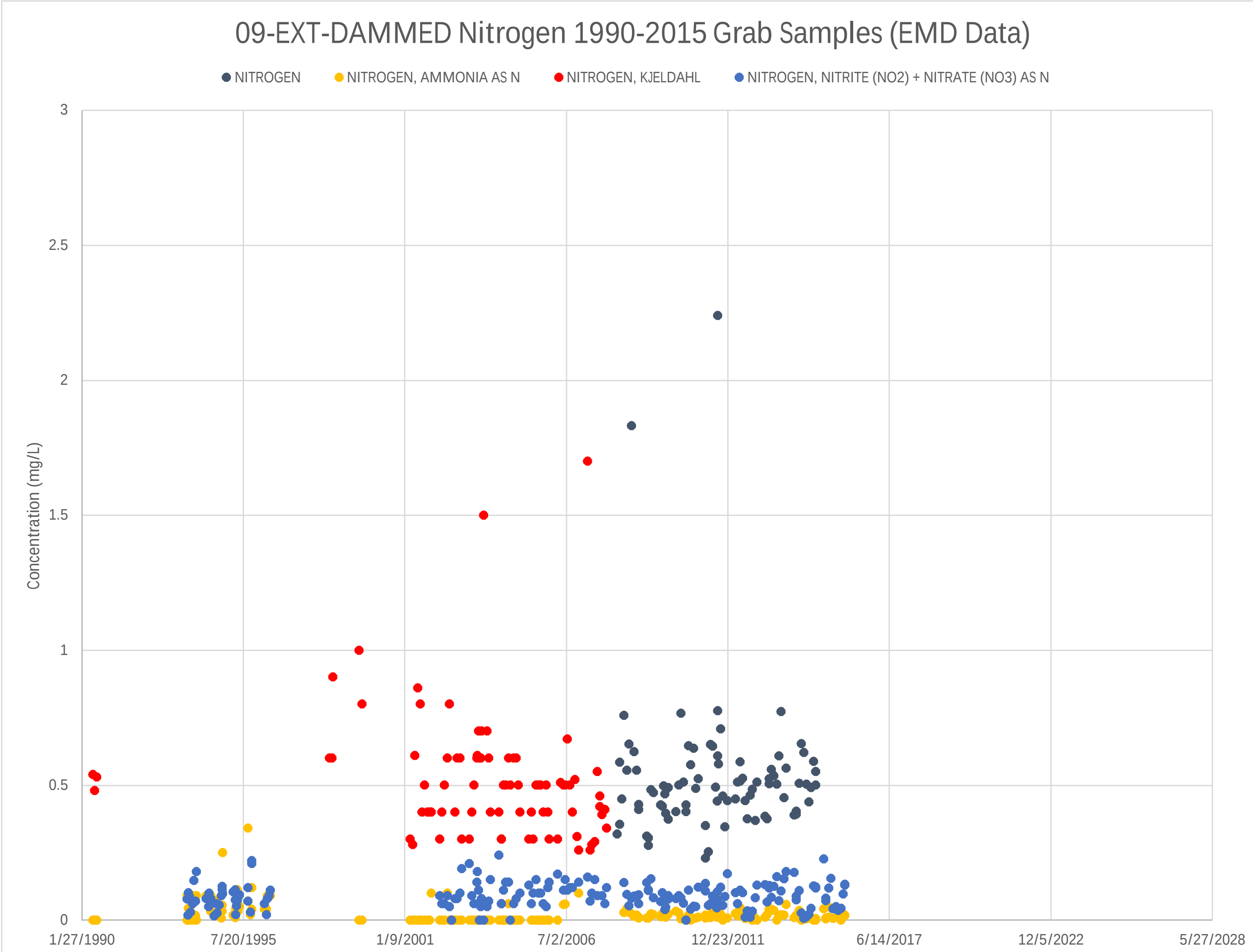

08-SQR Dissolved Oxygen 1999 - 2011 Grab Samples (EMD Data)
DISSOLVED OXYGEN
Concentration (mg/L)
16
14
12
10
8
6
4
2
0
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019
7/27/2024

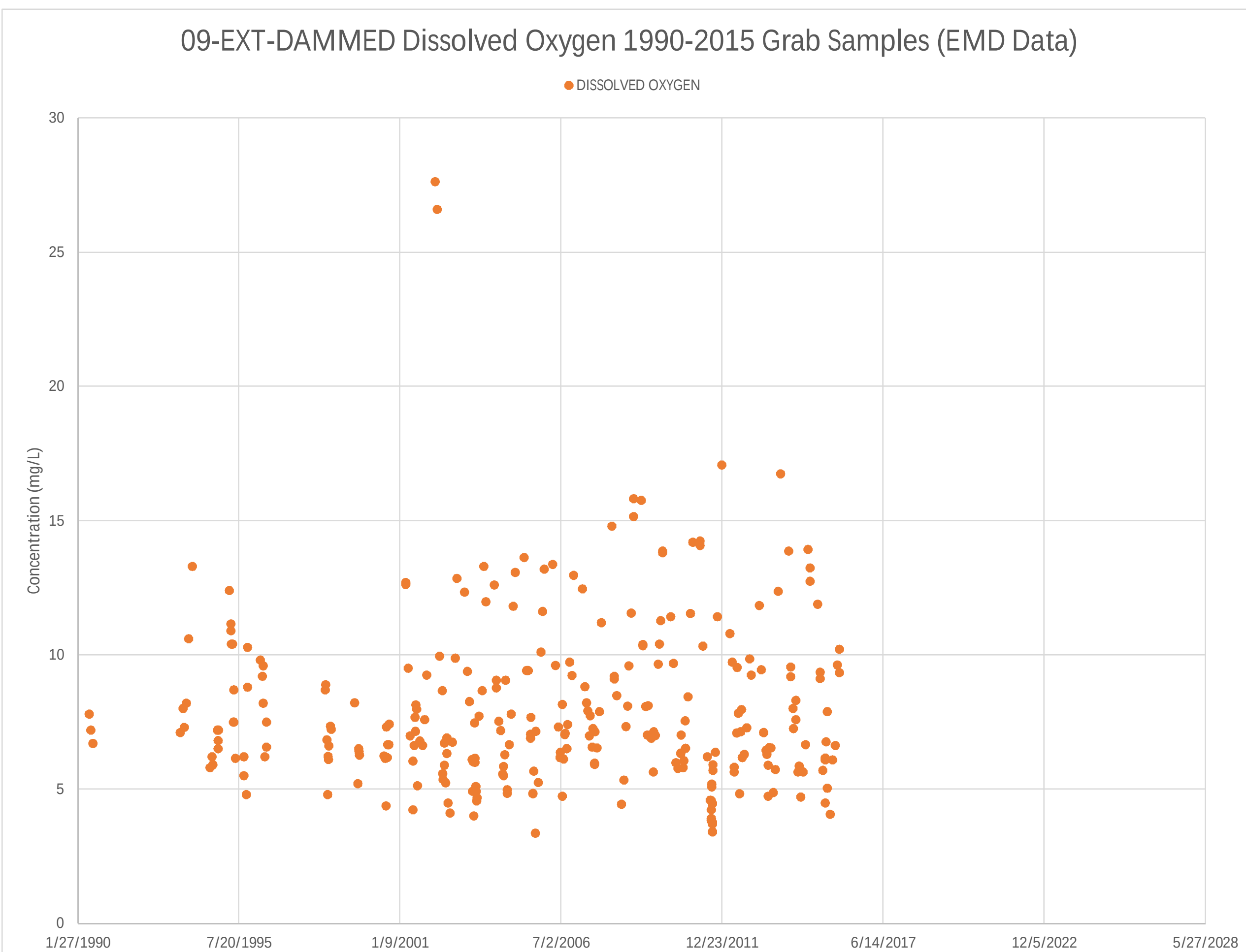

08-SQR Chlorophyll A 1999 - 2011 Grab Samples (EMD Data)
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN
Concentration (ug/L)
160
140
120
100
80
60
40
20
0
9/29/2010
6/25/2013
3/21/2016
12/16/2018
9/11/2021
6/7/2024

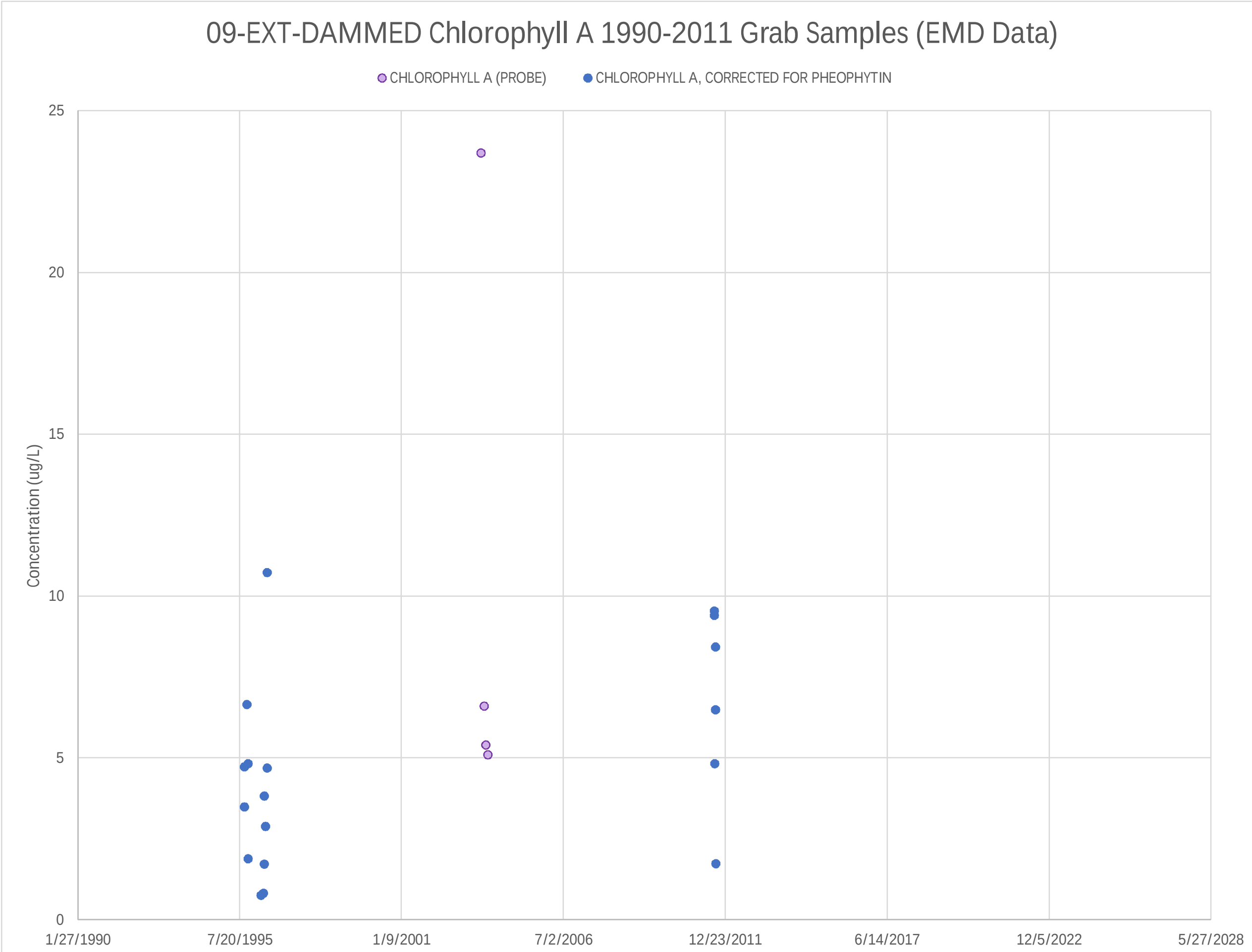

09-EXT Nitrogen 2016 - 2017 Grab Samples (EMD Data)
NITROGEN, AMMONIA AS N
NITROGEN, NITRITE (NO2) + NITRATE (NO3) AS N
NITROGEN, ORGANIC
Concentration (mg/L)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
10/23/2015
3/6/2017
7/19/2018
12/1/2019
4/14/2021
8/27/2022
1/9/2024

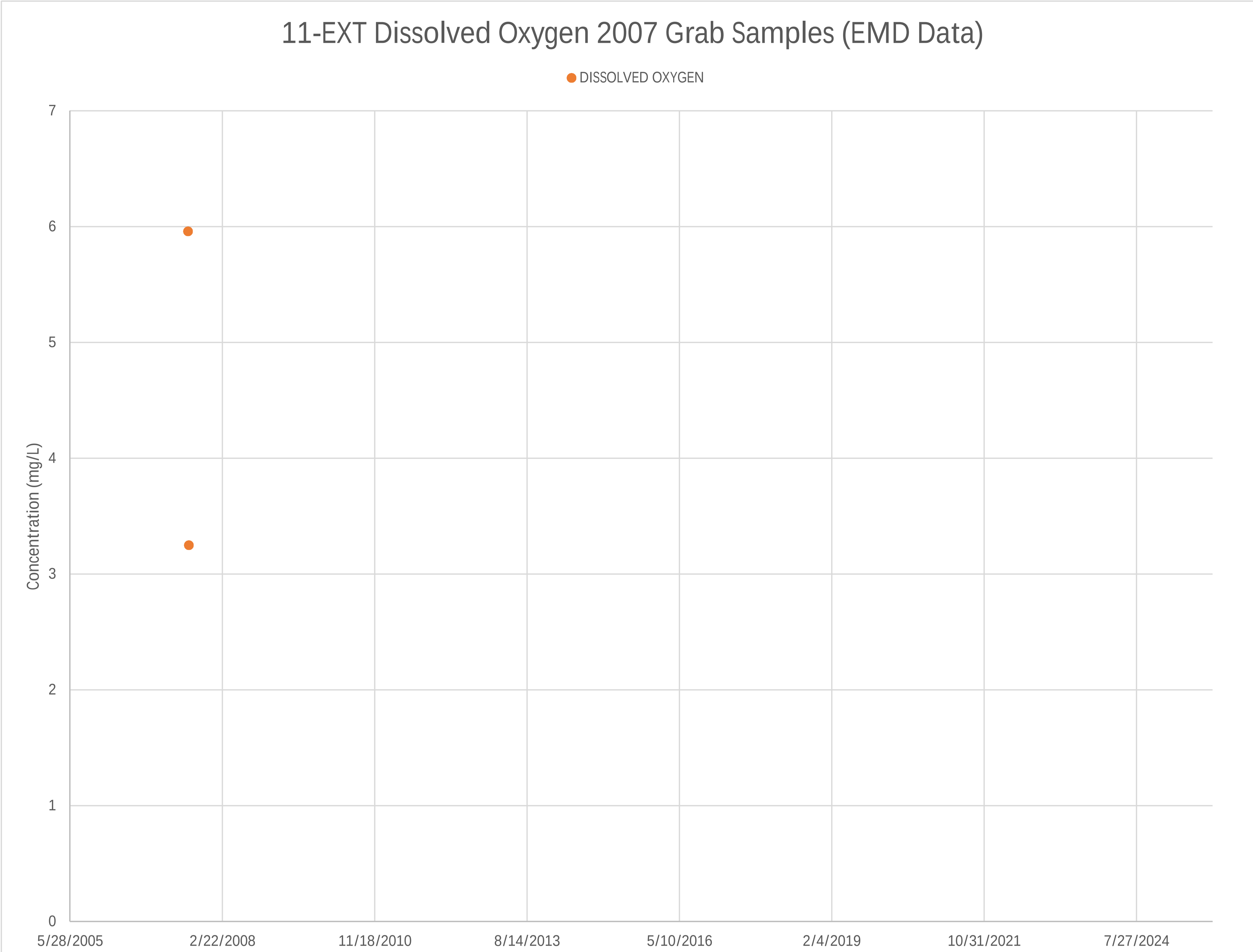

09-EXT Dissolved Oxygen 2016 - 2017 Grab Samples (EMD Data)
DISSOLVED OXYGEN
Concentration (mg/L)
14
12
10
8
6
4
2
0
10/23/2015
3/6/2017
7/19/2018
12/1/2019
4/14/2021
8/27/2022
1/9/2024

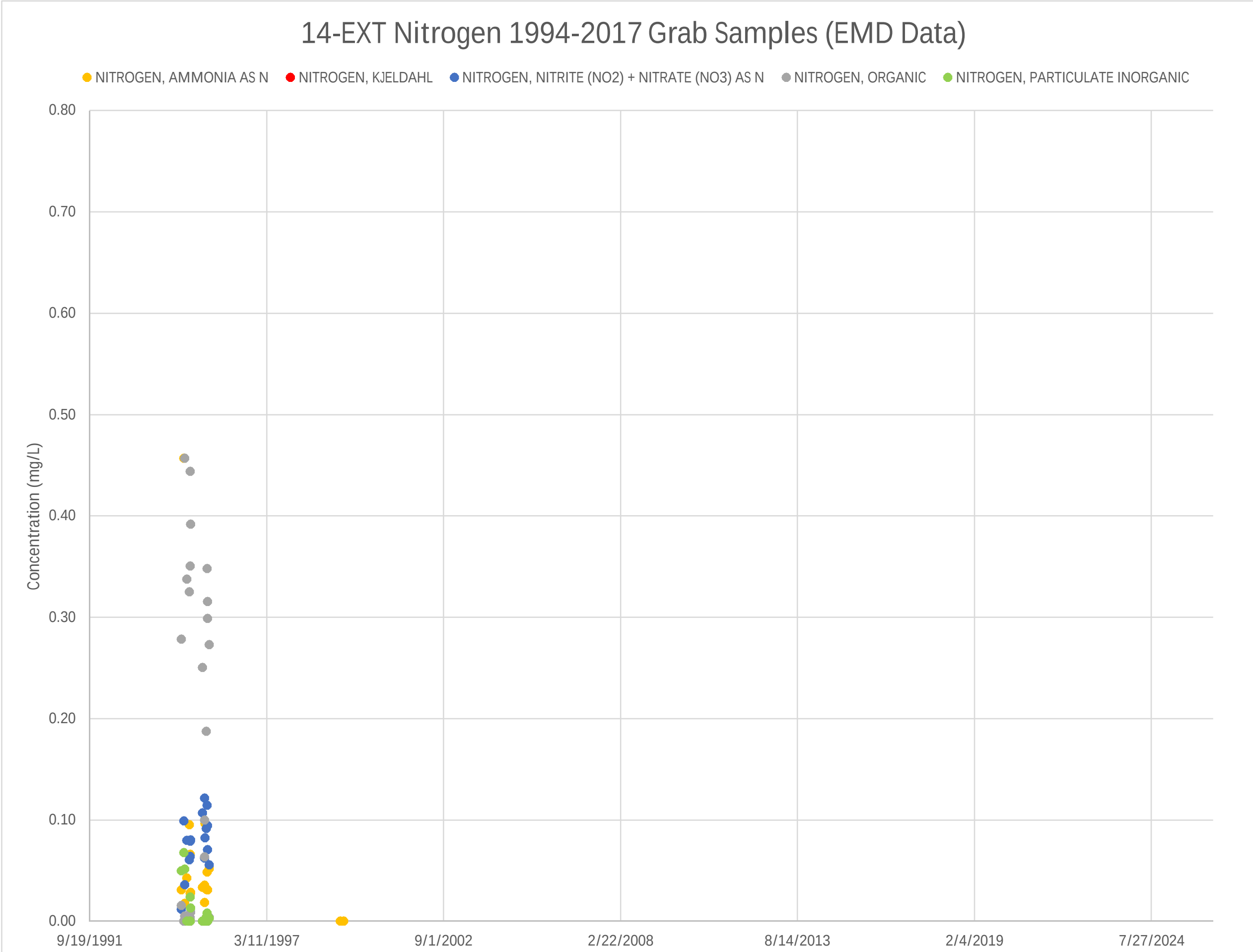

09-EXT Dissolved Oxygen 2007-2017 Grab Samples (VRAP Data)
DISSOLVED OXYGEN
Concentration (mg/L)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
9/5/2005
6/1/2008
2/26/2011
11/22/2013
8/18/2016
5/15/2019
2/8/2022
11/4/2024

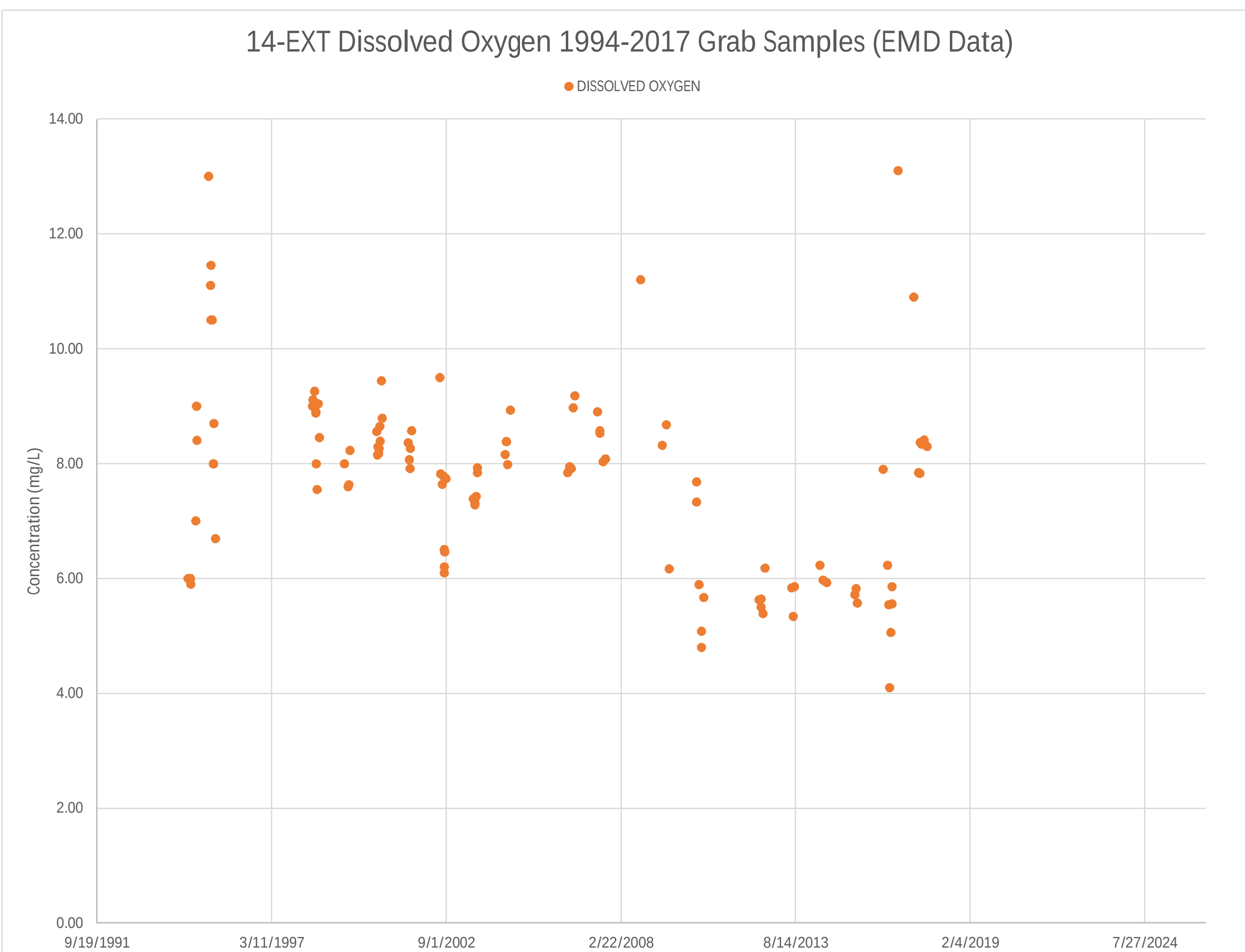

09-EXT-DAMMED Nitrogen 1990-2015 Grab Samples (EMD Data)
NITROGEN
NITROGEN, AMMONIA AS N
NITROGEN, KJELDAHL
NITROGEN, NITRITE (NO2) + NITRATE (NO3) AS N
Concentration (mg/L)
3
2.5
2
1.5
1
0.5
0
1/27/1990
7/20/1995
1/9/2001
7/2/2006
12/23/2011
6/14/2017
12/5/2022
5/27/2028

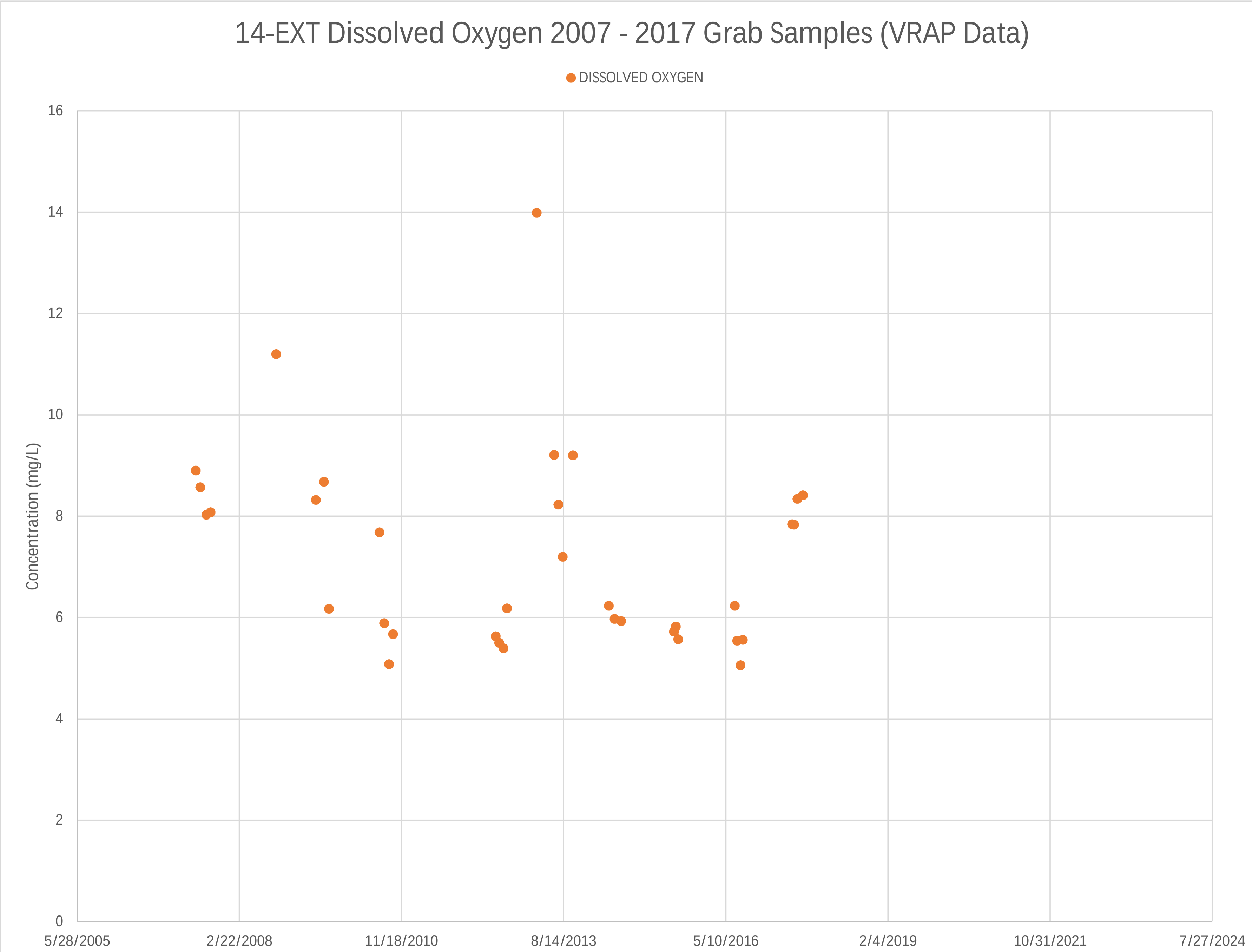

09-EXT-DAMMED Dissolved Oxygen 1990-2015 Grab Samples (EMD Data)
DISSOLVED OXYGEN
Concentration (mg/L)
30
25
20
15
10
5
0
1/27/1990
7/20/1995
1/9/2001
7/2/2006
12/23/2011
6/14/2017
12/5/2022
5/27/2028

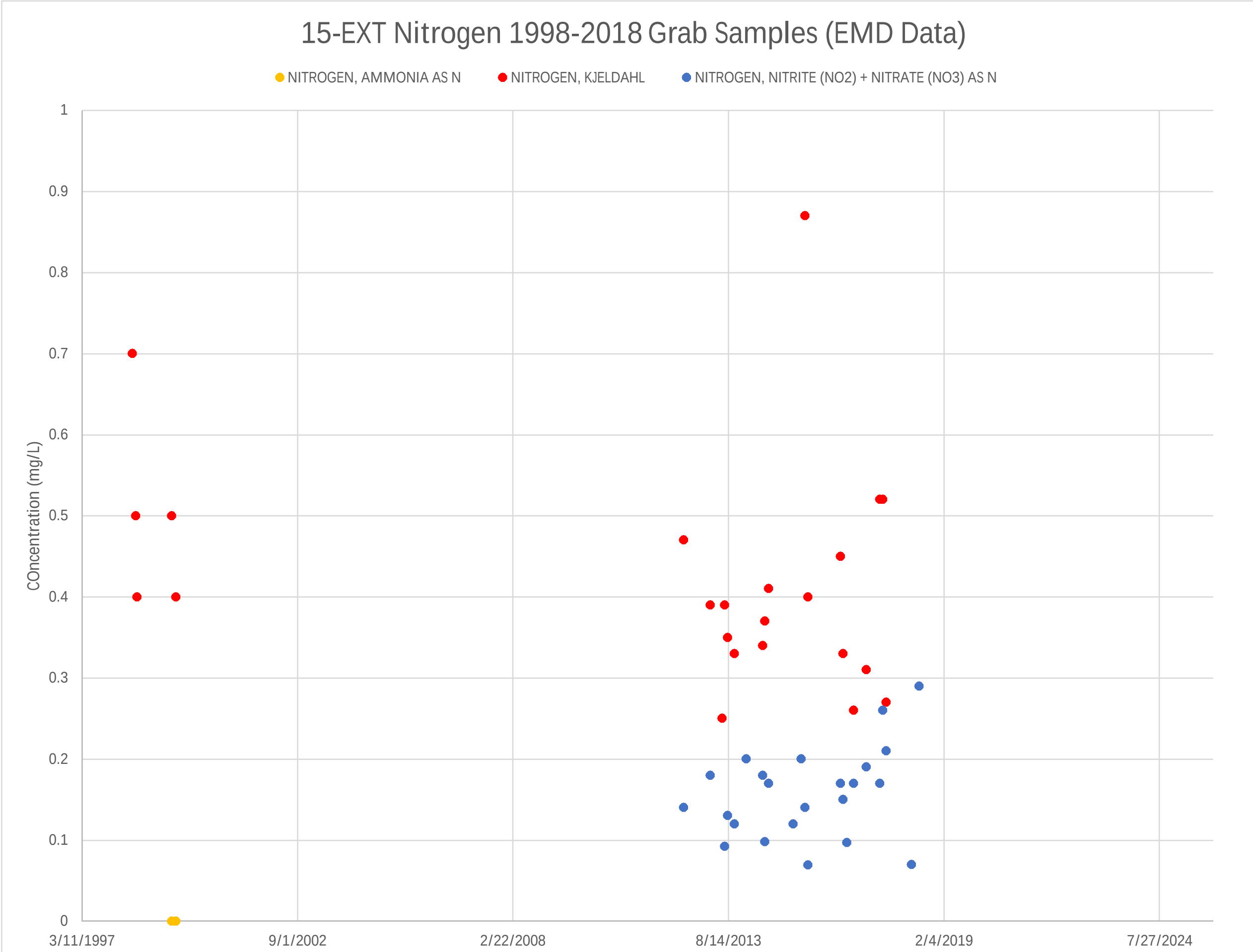

09-EXT-DAMMED Chlorophyll A 1990-2011 Grab Samples (EMD Data)
CHLOROPHYLL A (PROBE)
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN
Concentration (ug/L)
0
5
10
15
20
25
1/27/1990
7/20/1995
1/9/2001
7/2/2006
12/23/2011
6/14/2017
12/5/2022
5/27/2028

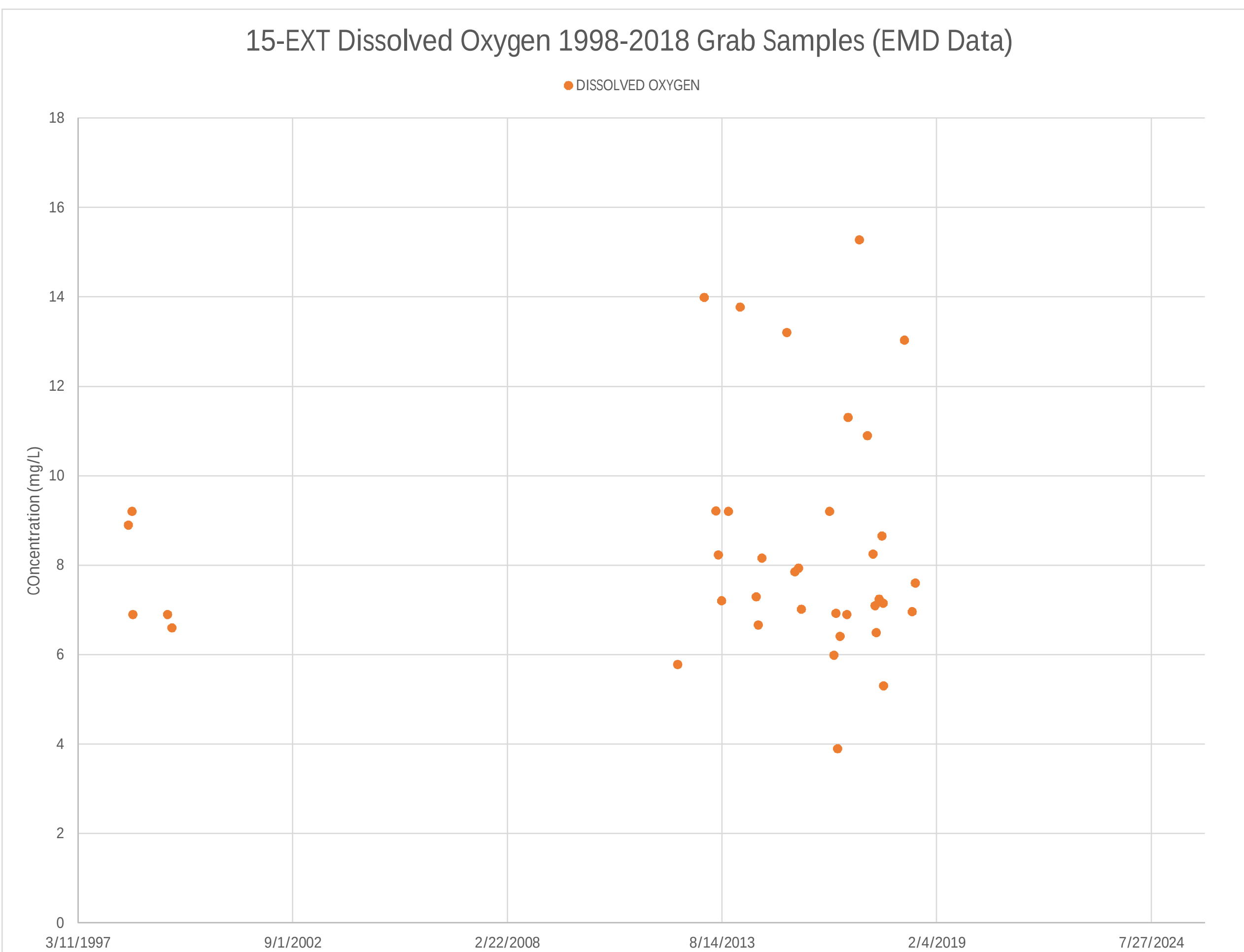

11-EXT Dissolved Oxygen 2007 Grab Samples (EMD Data)
DISSOLVED OXYGEN
Concentration (mg/L)
0
1
2
3
4
5
6
7
5/28/2005
2/22/2008
11/18/2010
8/14/2013
5/10/2016
2/4/2019
10/31/2021
7/27/2024

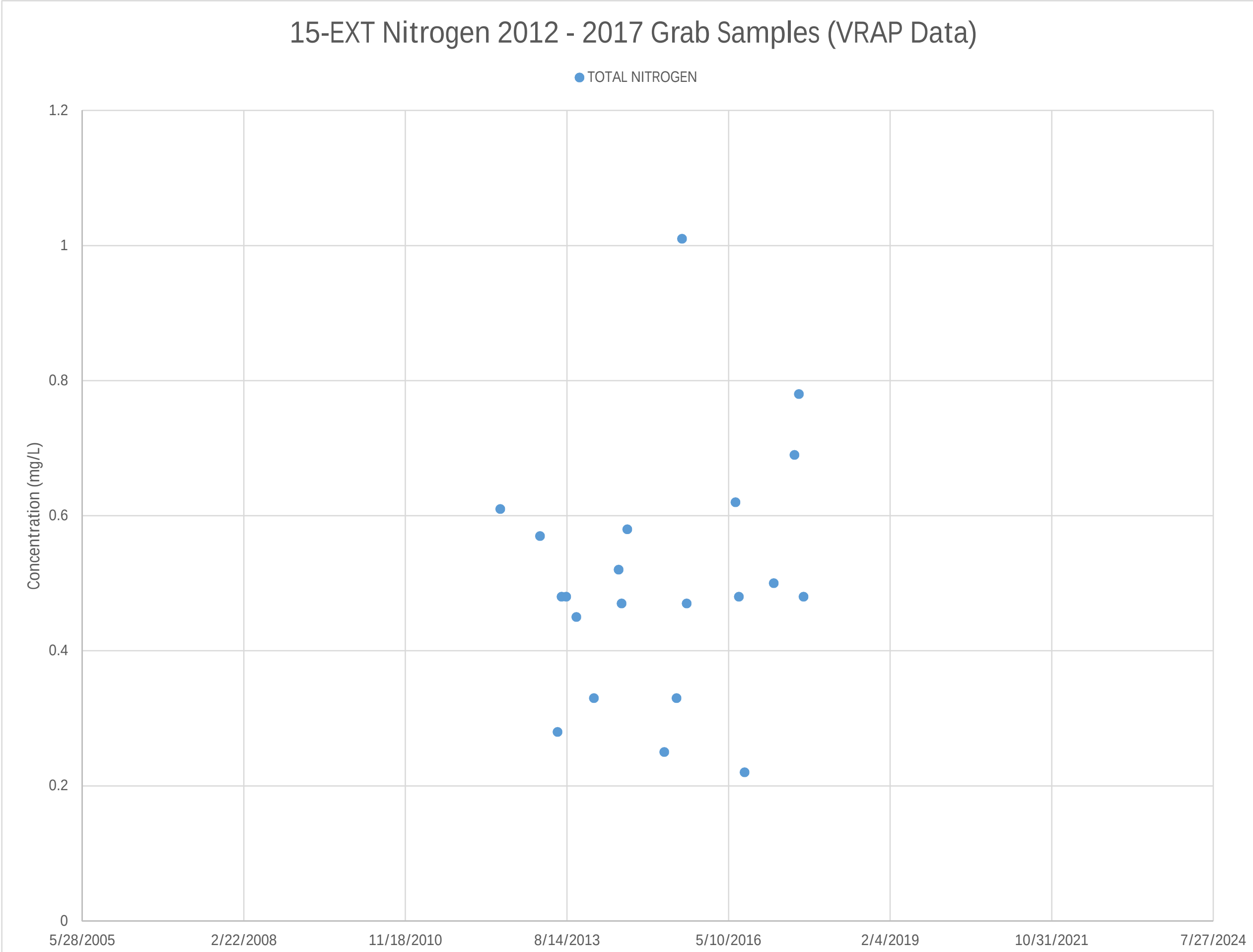

14-EXT Nitrogen 1994-2017 Grab Samples (EMD Data)
NITROGEN, AMMONIA AS N
NITROGEN, KJELDAHL
NITROGEN, NITRITE (NO2) + NITRATE (NO3) AS N
NITROGEN, ORGANIC
NITROGEN, PARTICULATE INORGANIC
Concentration (mg/L)
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
9/19/1991
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019
7/27/2024

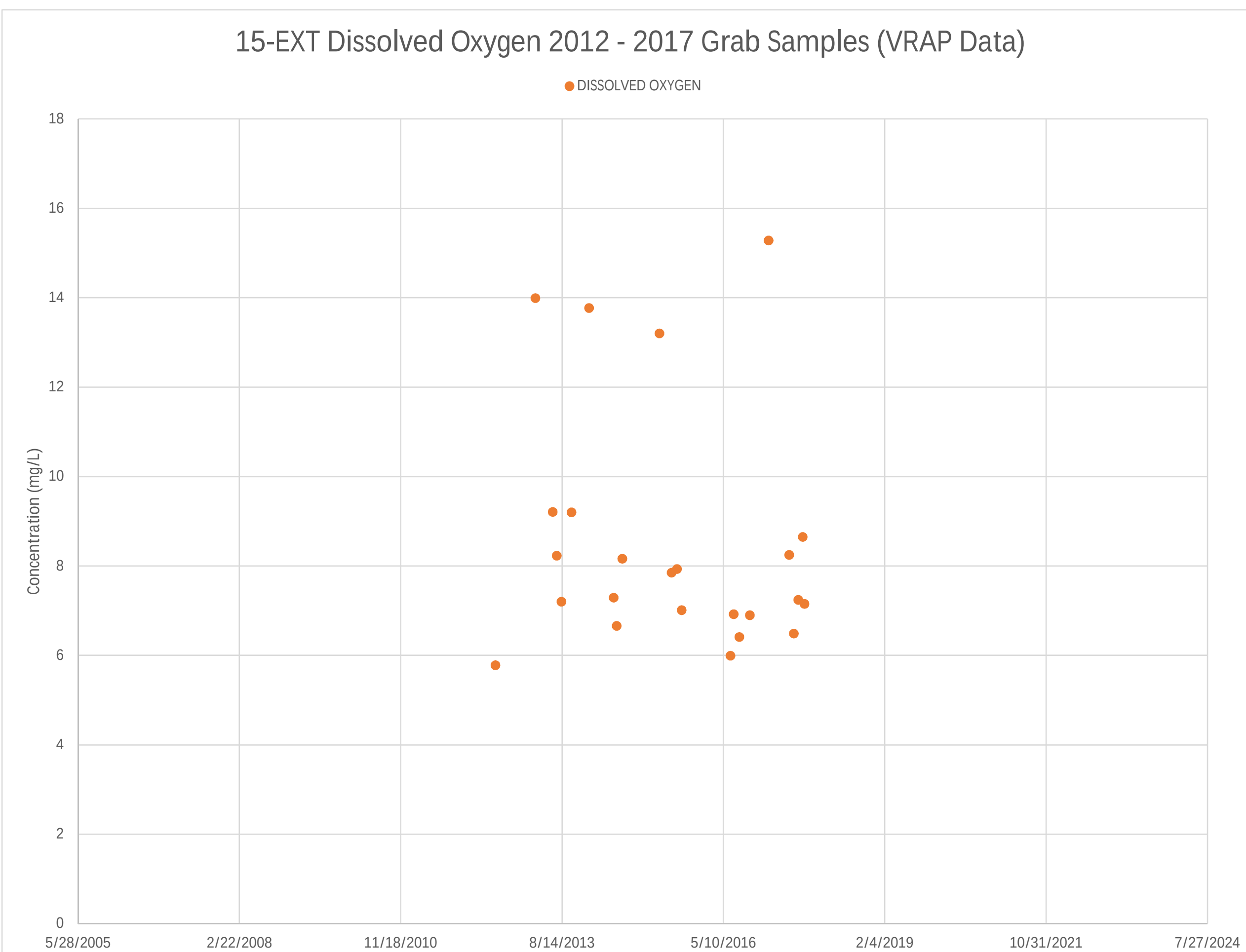

14-EXT Dissolved Oxygen 1994-2017 Grab Samples (EMD Data)
DISSOLVED OXYGEN
Concentration (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
9/19/1991
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019
7/27/2024


14-EXT Dissolved Oxygen 2007 - 2017 Grab Samples (VRAP Data)
DISSOLVED OXYGEN
Concentration (mg/L)
0
2
4
6
8
10
12
14
16
5/28/2005
2/22/2008
11/18/2010
8/14/2013
5/10/2016
2/4/2019
10/31/2021
7/27/2024


15-EXT Nitrogen 1998-2018 Grab Samples (EMD Data)
NITROGEN, AMMONIA AS N
NITROGEN, KJELDAHL
NITROGEN, NITRITE (NO2) + NITRATE (NO3) AS N
COncentration (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019
7/27/2024


15-EXT Dissolved Oxygen 1998-2018 Grab Samples (EMD Data)
DISSOLVED OXYGEN
COncentration (mg/L)
18
16
14
12
10
8
6
4
2
0
3/11/1997
9/1/2002
2/22/2008
8/14/2013
2/4/2019
7/27/2024


15-EXT Nitrogen 2012 - 2017 Grab Samples (VRAP Data)
TOTAL NITROGEN
Concentration (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
5/28/2005
2/22/2008
11/18/2010
8/14/2013
5/10/2016
2/4/2019
10/31/2021
7/27/2024


15-EXT Dissolved Oxygen 2012 - 2017 Grab Samples (VRAP Data)
DISSOLVED OXYGEN
Concentration (mg/L)
18
16
14
12
10
8
6
4
2
0
5/28/2005
2/22/2008
11/18/2010
8/14/2013
5/10/2016
2/4/2019
10/31/2021
7/27/2024

Appendix C

Technical Memoranda, Horsley Witten

C-1: Baseline Nitrogen Modeling Methodology and Results

Horsley-Witten; June 15, 2017; Rev July 18, 2017 and August 27, 2017

MEMORANDUM

To: Paul Vlasich, Town of Exeter

From: Renee L. Bourdeau, Horsley Witten Group

Date: June 15, 2017, Revised July 18, 2017 and August 27, 2018

Re: Nitrogen Control Plan - Baseline Nitrogen Modeling Methodology and Results

cc: Ed Leonard, Wright-Pierce

1.0 PURPOSE

The purpose of this memorandum is to summarize the methodology and results for establishing the baseline nitrogen load condition (Tasks1-1) for the Town of Exeter (Town) and its six subwatersheds (i.e., Squamscott River, Piscassic River, Winnicut River, Little River, Great Brook-Exeter River, and Taylor River-Hampton River). This memorandum also discusses target regulatory thresholds for future load reduction scenarios. We used nitrogen pollutant load models along with existing regional studies to estimate the baseline nitrogen load from stormwater, groundwater (septic and non-septic) and wastewater source pathways.

2.0 OVERVIEW

HW developed the nitrogen pollutant load model to account for surface water and groundwater loads to the Town's receiving waters and ultimately to the Great Bay estuary. We used the following studies and methods in developing the model:

- Great Bay Nitrogen Non-Point Source Study (GBNNPSS) (Trowbridge et al., 2014);
- Water Integration for the Squamscott Exeter (WISE) Preliminary Integrated Plan, Final Technical Report (Geosyntec Consultants et al., 2015); and
- New Hampshire 2017 Final Municipal Separate Storm Sewer System (MS4) Permit, Appendix F, Attachment 3, Draft (EPA, 2017).

Data sources associated with each of the nitrogen pollutant load model sources are summarized below:

- Stormwater Load Model (Unattenuated) (WISE);
- Septic System Load Model (GBNNPSS);
- Pollutant Load Export Rates (PLERs) (EPA, 2017);
- Wastewater Treatment Plant Load (Wright-Pierce, 2015); and
- Attenuation in pathways in groundwater and surface water (GBNNPSS).

The model estimates the total load of nitrogen deposited on land surface. The initial load represents pollutants from the following sources:

- Atmospheric deposition;
- Human application of pesticides and fertilizers on agricultural land;
- Residential land and managed open space (e.g., golf courses and ball fields);
- Pet waste from both domestic and farm animals; and
- Natural deposition from leaf litter, grass clippings, wetlands and forests.

From the source load, we estimated a stormwater load and a groundwater load. The stormwater load represents the portion of the source load transported during a rain event from the land surface directly to a storm drain or receiving water. The stormwater load is based on a pollutant load export rate (PLER) which is derived from land use specific water quality data to determine an aggregate nitrogen export rate for all sources. The PLER approach is consistent with methodology used by Region 1 EPA for compliance under the MS4 permit and varies from the methodology used in the GBNNPSS. This modeling approach allows the community to calculate the existing and future stormwater baseline load by land use category and use the TN BMP performance curves provided in the 2017 MS4 Appendix F. The groundwater load represents the portion of the load on the land surface which infiltrates during a rain event plus the human waste load from septic systems. The wastewater load represents the nitrogen load discharged from the wastewater treatment facility (WWTF).

2.1 Data Set

The data for this modeling effort was collected from the period 2009 to 2011; accordingly, the “baseline year” is defined at 2010±. The baseline data will be utilized for comparison to proposed scenarios under a future task. This data set was selected because it similar to and comparable with GBNNPSS.

2.2 Subject Area

The Town of Exeter is located in seacoast New Hampshire and includes 12,812 acres in land area. Land use in the Town is divided as follows: 45% forested, 19% residential, 16% wetland, 5% transportation/communications/utilities, 3% commercial/services/institutional, 3% agriculture, 3% transitional (i.e., brush between open land and forested), 2% outdoor (i.e., parks, cemeteries, etc), 2% water, and less than or equal to 1% of industrial, barren, industrial and commercial complexes, and mixed use developments (Figure 1).

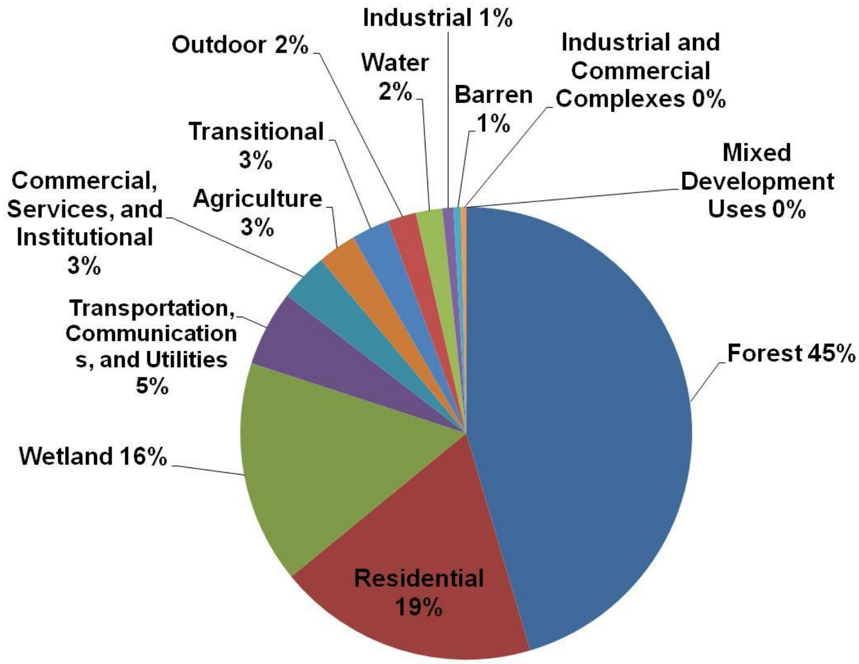


Figure 1: Town of Exeter Land Use.

Based on 2010 impervious area data from the New Hampshire Geographic Information Clearinghouse (GRANIT), 9% of the watershed is impervious (1,157 acres of impervious area out of 12,812 total acres). Of the estimated 1157 acres of impervious area, approximately 34% is residential, 31% transportation (i.e., roads), communications and utilities, and 22% represents commercial, services, and institutional. Each of the remaining land use categories makes up less than 4% of the impervious area. Refer to Figure 2 for a summary of impervious area by land use. In previous studies, specifically the Piscataqua Region Estuaries Partnership (PREP) State of the Estuaries 2013 report (PREP, 2013), the impervious cover percentage for the Town was estimated at 15.6%. The PREP report used the 2010 Impervious Cover data set for coastal New Hampshire which was developed using a combination of subpixel and traditional image classification techniques applied to Landsat 5 Thematic Mapper (TM) imagery. Whereas for this memorandum the impervious cover was hand digitized by Rockingham Planning Commission (RPC) and represents a more accurate assessment of the actual impervious cover on the land surface.

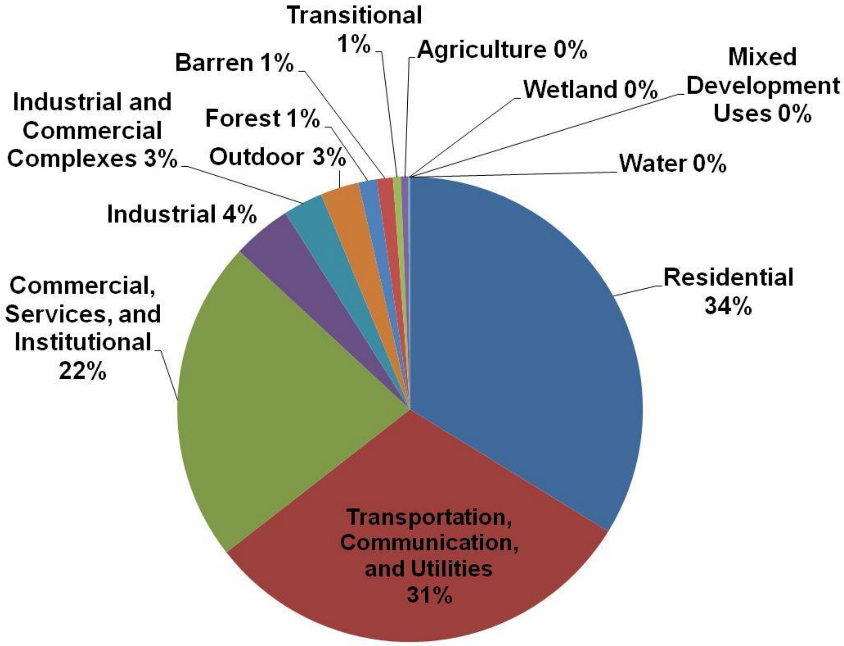


Figure 2: Town of Exeter Impervious Area.

3.0 STORMWATER LOAD

The purpose of the stormwater model is to use pollutant load export rates (PLERs) to calculate an annual pollutant load from the land uses within the Town. The model used the methodology developed as part of the WISE project (Geosyntec Consultants, 2015), which uses a hydrologic response units (HRUs) approach. PLERs from EPA (2017) were used to calculate an annual baseline load. The baseline load is calculated as both an initial and delivered load. The initial load, or unattenuated load, represents available pollutant load on the land surface. Following a rain event, a portion of the initial load is transported via stormwater from the land surface. When stormwater is transported over pervious or natural surfaces attenuation or uptake may occur. To account for attenuation, a delivery factor is multiplied by the initial load and a delivered load is calculated. The delivered load represents the actual pollutant load that would be expected to reach a receiving water body following a storm event.

3.1 Hydrologic Response Units (HRUs)

A HRU is a unique combination of land use, hydrologic group soil category (A-D), and impervious cover in the Town (e.g., residential pervious land underlain by hydrologic soil group A soils or residential land use underlain by D soils with impervious cover). Table 1 presents the area of each HRU within the Town. To quantify the area of each HRU within the watershed, the following geospatial data layers were used:

- 2010 Land Use Data, prepared by Rockingham Planning Commission (RPC);
- USDA/NRCS SSURGO-Certified Soils; and
- 2010 Impervious Cover, provided by New Hampshire GRANIT.

Hydrologic soil groups are defined by the following characteristics (NRCS, 2007):

- *Group A soils* – have low runoff potential when thoroughly wet. Soils typically have less than 10 percent clay and more than 90 percent sand or gravel. The saturated hydraulic conductivity of the soil layers typically exceeds 5.67 inches per hour.
- *Group B soils* – have moderately low runoff potential when thoroughly wet. Soils typically have between 10 and 20 percent clay and 50 to 90 percent sand and have loamy sand or sandy loam textures. The saturated hydraulic conductivity of the soil layers typically ranges from 1.42 to 5.67 inches per hour.
- *Group C soils* – have moderately high runoff potential when thoroughly wet. Soils typically have between 20 and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, silty clay, or sandy clay textures. The saturated hydraulic conductivity of the soil layers typically ranges from 0.14 to 1.42 inches per hour.
- *Group D soils* – have high runoff potential when thoroughly wet. Soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. The saturated hydraulic conductivity of the soil layers is less than or equal to 0.14 inches per hour.

HRU characteristics are summarized in Table 1. Within the Town, Group D soils are most common (61% of pervious area), followed by Group B soils (32% of pervious area). The most prevalent HRU is forested underlain by D soils (24% of total area), followed by forested underlain by B soils (18% of total area). When assessing only the developed portion of the watershed, the most common HRU is residential pervious land use underlain by D soils (8% of total area).

Table 1: Area of Hydrologic Response Units within the Town of Exeter.

Land Use Type	Pervious Areas				Total Impervious Area (ac)	Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)			
DEVELOPED SOURCES							
Agriculture	43	70	5	230	6	0	**354**
Commercial, Services, and Institutional	8	52	0	125	259	1	**445**
Industrial and Commercial Complexes	0	3	0	11	32	0	**46**
Industrial	9	19	0	26	48	0	**102**
Mixed Development Uses	0	0	0	0	0	0	**0**
Outdoor	12	30	0	189	31	1	**263**
Residential	214	757	29	997	391	3	**2,392**
Transportation, Communications, and Utilities	21	137	0	147	355	34	**693**
TOTAL DEVELOPED SOURCES	**307**	**1,068**	**34**	**1,726**	**1,121**	**39**	**4,294**
UNDEVELOPED SOURCES							
Barren	7	22	0	28	13	0	**69**
Forest	364	2,290	30	3,102	15	19	**5,820**
Transitional	38	69	1	231	6	1	**346**
Water	4	4	0	85	0	149	**242**
Wetland	18	209	0	1,777	1	34	**2,040**
TOTAL UNDEVELOPED SOURCES	**432**	**2,594**	**32**	**5,222**	**35**	**203**	**8,518**
TOTAL	**739**	**3,662**	**66**	**6,948**	**1,156**	**242**	**12,812**

3.1.1 Impervious Surface Disconnection

Impervious surface disconnection allows for some runoff volume and pollutant load generated on impervious surfaces to infiltrate as it passes overland onto down gradient pervious surfaces. Impervious cover that is not directly connected to receiving waters (via storm sewers, gutters, or other impervious drainage pathways) results in a reduced stormwater pollutant load due to attenuation and infiltration as runoff moves across pervious surfaces. To account for this decrease in pollutant load, we used the Sutherland equations (EPA, 2014) to estimate the area of directly connected impervious area (DCIA) based on total impervious area for each land use type in Exeter (Table 2).

EPA provides guidance on the use of the Sutherland equations for prediction of the level of DCIA specific to each type of developed land use.

Table 2: Equations Used to Calculate Directly Connected Impervious Cover (DCIA).

Land Use Category	Sutherland Equation for DCIA (EPA, 2014)
Commercial/Services/Institutional Industrial Industrial and Commercial Complexes Mixed Use Developments Outdoor Residential (medium density) Transportation/Communications/Utilities	DCIA = 0.1(TIA)^1.5
Agriculture Barren Forest Transitional	DCIA = 0.01(TIA)^2

As part of this modeling exercise, we recalculated the HRUs factoring in DCIA; the revised calculations are provided in Table 3. As one would expect, pervious areas increase and impervious area decreases as DCIA is transferred from the impervious to pervious category. When the Sutherland equations are used for the Town the total impervious area decreases from 1,157 acres (9% of total area) to 348 acres (3% of total area); which is consistent with the fact that much of the Town, outside of downtown has country drainage (uncurbed) and is therefore considered to be disconnected.

Table 3: Area of Hydrologic Response Units with Directly Connected Impervious Cover (DCIA) within the Town.

Land Use Type	PERVIOUS (including Disconnected IA)				DCIA				Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)		
DEVELOPED SOURCES										
Agriculture	45	73	5	231	0	0	0	0	0	**354**
Commercial, Services, and Institutional	13	85	0	225	4	20	0	97	1	**445**
Industrial and Commercial Complexes	0	6	0	22	0	2	0	16	0	**46**
Industrial	11	34	0	36	1	13	0	7	0	**102**
Mixed Development Uses	0	0	0	0	0	0	0	0	0	**0**
Outdoor	12	35	0	212	0	2	0	1	1	**263**
Residential	247	867	33	1,212	2	6	0	21	3	**2,392**
Transportation, Communications and Utilities	34	209	0	260	13	42	2	99	34	**693**
Total Developed Sources	**362**	**1,309**	**38**	**2,198**	**20**	**85**	**2**	**241**	**39**	**4,295**
UNDEVELOED SOURCES										
Barren	7	26	0	35	0	0	0	0	0	**69**
Forest	366	2,295	30	3,110	0	0	0	0	19	**5,820**
Transitional	39	70	1	235	0	0	0	0	1	**346**
Water	4	4	0	85	0	0	0	0	149	**242**
Wetland	18	209	0	1,779	0	0	0	0	34	**2,040**
Total Undeveloped Sources	**434**	**2,605**	**32**	**5,243**	**0**	**0**	**0**	**0**	**203**	**8,518**
TOTAL	**796**	**3,914**	**70**	**7,441**	**20**	**85**	**2**	**241**	**242**	**12,812**

3.2 Initial (Unattenuated) Stormwater Load

To quantify the initial (unattenuated) annual stormwater pollutant load washed from the land surface, the HRU land area is multiplied by a pollutant load export rate (PLER). The PLERs for total nitrogen were developed by EPA under the NH 2017 Final MS4 Permit (EPA, 2017). Table 4 presents the total nitrogen unattenuated stormwater pollutant load by land use for the Town. Stormwater runoff from land uses within the Town generates approximately 18,423 pounds (9.2 tons) of total nitrogen per year. The developed portion of the watershed contributes approximately 77% of the annual uattenuated total nitrogen load, with residential land use contributing the greatest pollutant load, followed by transportation, communications and utilities, and commercial, services, and institutional.

Table 4: Initial (Unattenuated) Total Nitrogen Stormwater Pollutant Load by Land Use for Town.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTAL (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	13	87	12	832	0	**945**
Commercial, Services, and Institutional	4	102	0	811	1,803	**2,721**
Industrial	0	7	0	78	281	**366**
Industrial and Commercial Complexes	3	40	0	131	315	**490**
Mixed Development Uses	0	0	0	0	2	**3**
Outdoor	4	41	0	764	34	**844**
Residential	74	1,040	80	4,365	407	**5,966**
Transportation, Communications, and Utilities	10	251	0	938	1,634	**2,833**
					TOTAL DEVELOPED LAND LOAD:	**14,165**
UNDEVELOPED LAND						
Barren	2	31	0	125	23	**181**
Forest	183	1,148	15	1,555	0	**2,901**
Transitional	19	35	1	117	1	**174**
Water	0	0	0	0	0	**0**
Wetland	9	105	0	889	0	**1,003**
					TOTAL UNDEVELOPED LAND LOAD:	**4,258**
					TOTAL INITIAL LOAD:	**18,423**

3.3 Delivered Stormwater Load

When stormwater falls on the land surface, natural attenuation of nitrogen occurs as water travels across pervious surfaces and vegetated buffers, through streams and natural waterways. Attenuation is caused by particulate settling, filtering, and biological uptake. By accounting for natural attenuation, the pollutant load which ultimately arrives to the receiving water, or the delivered load can be estimated. As part of the GBNNPSS (Trowbridge et al., 2014), approximately 87% of nitrogen traveling in stormwater through surface water pathways will be transported from its origin to the receiving waters, and 13% is attenuated along the way. The delivered stormwater load is presented in Table 5.

Approximately 16,028 pounds (8.0 tons) per year of nitrogen is delivered in stormwater to the receiving waters in the Town of Exeter. Of the delivered stormwater nitrogen load, approximately 23% is from natural or undeveloped sources (i.e., barren, forested, transitional, water, and wetlands). The remaining 77% is from developed sources with the largest load from residential development, which is 42% of the total developed load. Commercial, services and institutional land use and transportation land uses contribute approximately 19% and 20% of the total developed load, respectively.

Table 5: Stormwater Delivered Total Annual Nitrogen Load.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTAL (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	12	76	10	724	0	**822**
Commercial, Services, and Institutional	3	89	0	705	1,569	**2,367**
Industrial	0	6	0	67	244	**318**
Industrial and Commercial Complexes	3	35	0	114	274	**426**
Mixed Development Uses	0	0	0	0	2	**2**
Outdoor	3	36	0	665	30	**734**
Residential	65	905	69	3,797	354	**5,190**
Transportation, Communications, and Utilities	9	218	0	816	1,422	**2,464**
TOTAL DEVELOPED LAND LOAD:						**12,324**
UNDEVELOPED LAND						
Barren	2	27	0	109	20	**157**
Forest	159	999	13	1,353	0	**2,524**
Transitional	17	31	1	102	1	**151**
Water	0	0	0	0	0	**0**
Wetland	8	91	0	774	0	**873**
TOTAL UNDEVELOPED LAND LOAD:						**3,705**
TOTAL DELIVERED LOAD:						**16,028**

4.0 SUBWATERSHED SUMMARY

The Town was subdivided based on USGS hydrologic unit code (HUC) 12 into six subwatersheds in order to gain a better understanding of the relative contribution of each area to the overall nitrogen load. The subwatersheds are shown in Figure 3 and include: Great Brook-Exeter River, Little River, Piscassic River, Squamscott River, Taylor River-Hampton River, and Winnicut River. Tables showing the area of HRUs and the area of HRUs with DCIA for each sub-watershed are provided in Attachment A.

Table 6 provides the total, unattenuated (initial) nitrogen stormwater pollutant load by land use for each subwatershed. To quantify the unattenuated annual stormwater pollutant load washed from the land surface, the HRU land area was multiplied by the PLERs for total nitrogen developed as part of the WISE Project (Geosyntec, 2015). In addition, Table 6 shows the total unattenuated load for each subwatershed, as well as the percentage each subwatershed contributes towards the total unattenuated load in the Town.

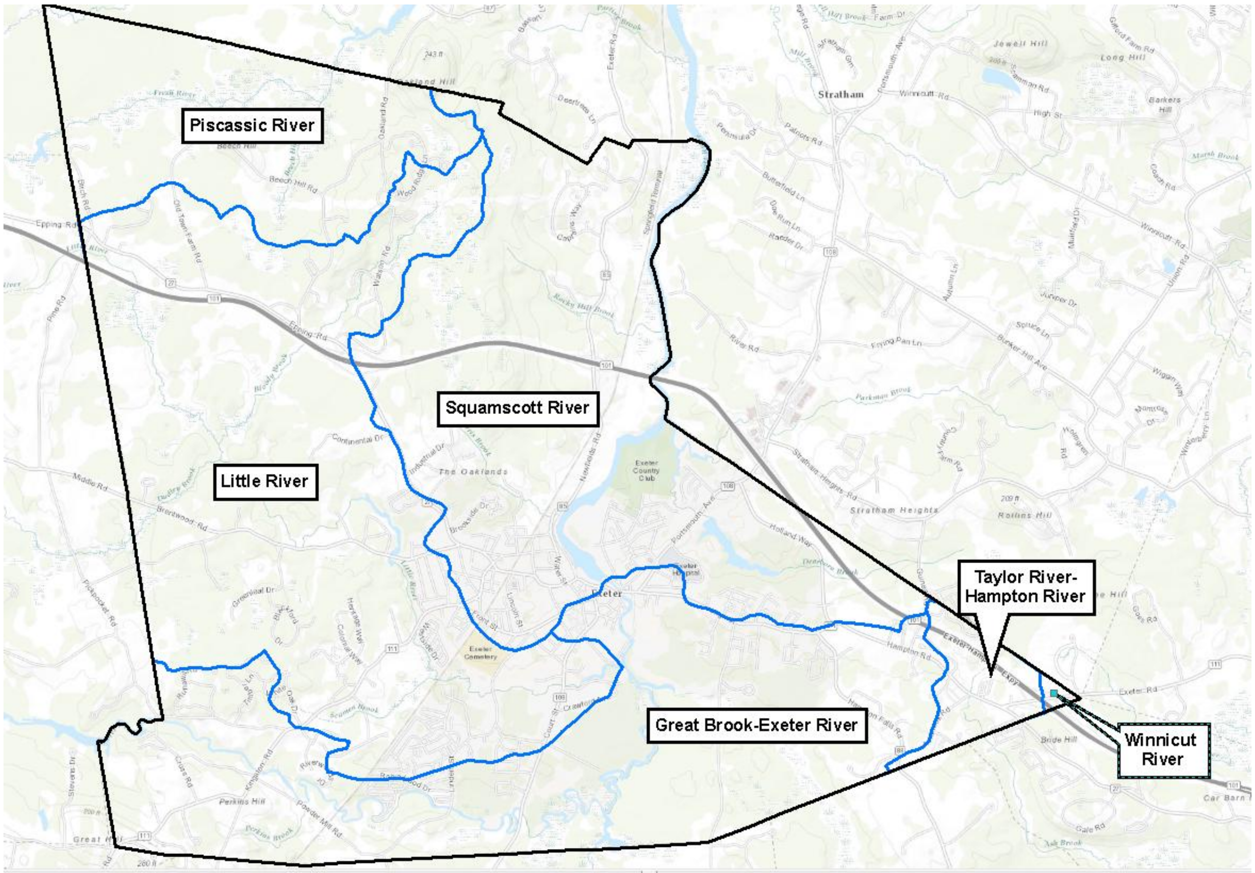


Figure 3. Subwatersheds in Exeter*

*Notes:

1) Piscassic River is contributory to the Lamprey River watershed
2) Winnicut River is contributory to the Great Bay Drainage watershed.
3) Taylor River/Hampton River is contributory to the Coastal Drainage watershed (Hampton Harbor).
4) Little River and Great Brook-Exeter River are contributory to the Squamscott River.

Table 7 provides the total delivered nitrogen stormwater pollutant load by land use for each subwatershed. As noted above, the GBNNPSS was used to estimate that approximately 87% of nitrogen traveling in stormwater through surface water pathways will be delivered from its origin to the receiving waters (Trowbridge et al., 2014). Table 7 also shows the total delivered load for each subwatershed, as well as the percentage each sub-watershed contributes towards the total delivered load in the Town.

Figure 4 illustrates the relative contribution that each subwatershed has to the overall nitrogen load (unattenuated or delivered). The Squamscott River, Little River, and Great Brook-Exeter River Sub-Watersheds are responsible for 35%, 31%, and 24% of the load, respectively. While the Piscassic River, Taylor River-Hampton River, and Winnicut River Sub-Watersheds contribute significantly less to the overall nitrogen load within the Town (7%, 3%, and less than 1%, respectively).

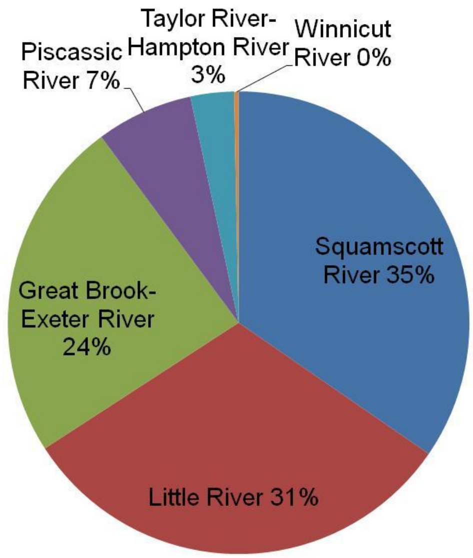


Figure 4: Relative contribution of delivered nitrogen by subwatersheds in the Town.

Table 6: Unattenuated Total Nitrogen Stormwater Pollutant Load by Land Use for Each Subwatershed.

Land Use Type	Unattenuated Load (lbs/yr)						TOTAL
	Great Brook-Exeter River	Little River	Piscassic River	Squamscott River	Taylor River-Hampton River	Winnicut River	
DEVELOPED LAND							
Agriculture	276	313	54	302	0	0	**945**
Commercial, Services, and Institutional	609	714	84	1,281	33	0	**2,721**
Industrial	17	51	0	202	57	38	**365**
Industrial and Commercial Complexes	56	72	0	361	0	0	**489**
Mixed Development Uses	3	0	0	0	0	0	**3**
Outdoor	305	221	89	229	0	0	**844**
Residential	1,546	2,084	259	1,845	230	1	**5,965**
Transportation, Communications, and Utilities	648	892	95	1,018	164	16	**2,833**
SUBTOTAL	**3,460**	**4,348**	**579**	**5,238**	**484**	**56**	**14,165**
UNDEVELOPED LAND							
Barren	5	57	27	72	21	0	**182**
Forest	677	921	439	821	41	1	**2,900**
Transitional	45	63	11	49	6	0	**174**
Water	0	0	0	0	0	0	**0**
Wetland	238	367	193	195	8	1	**1,002**
SUBTOTAL	**966**	**1,408**	**670**	**1,137**	**76**	**2**	**4,259**
TOTAL UNATTENUATED LOAD	**4,426**	**5,756**	**1,249**	**6,375**	**560**	**58**	**18,423**
Percent of Total Load for Town	**24%**	**31%**	**7%**	**35%**	**3%**	**0%**	**-**

Table 7: Stormwater Delivered Total Nitrogen Load for Each Subwatershed.

Land Use Type	Delivered Nitrogen Load (lbs/yr)						TOTAL
	Great Brook-Exeter River	Little River	Piscassic River	Squamscott River	Taylor River-Hampton River	Winnicut River	
DEVELOPED LAND							
Agriculture	240	272	47	263	0	0	**822**
Commercial, Services, and Institutional	529	621	73	1,115	29	0	**2,367**
Industrial	15	45	0	176	49	33	**318**
Industrial and Commercial Complexes	48	63	0	314	0	0	**426**
Mixed Development Uses	2	0	0	0	0	0	**2**
Outdoor	266	192	77	199	0	0	**734**
Residential	1,345	1,813	225	1,605	200	1	**5,190**
Transportation, Communications, and Utilities	564	776	82	885	142	14	**2,464**
SUBTOTAL	**3,009**	**3,782**	**504**	**4,557**	**420**	**48**	**12,324**
UNDEVELOPED LAND							
Barren	4	49	23	62	18	0	**157**
Forest	589	801	382	714	36	1	**2,524**
Transitional	39	55	9	43	5	0	**151**
Water	0	0	0	0	0	0	**0**
Wetland	207	319	168	170	7	1	**873**
SUBTOTAL	**839**	**1,224**	**582**	**989**	**66**	**2**	**3,705**
TOTAL DELIVERED LOAD	**3,848**	**5,006**	**1,086**	**5,546**	**486**	**50**	**16,028**
Percentage of Total Load for Town	**24%**	**31%**	**7%**	**35%**	**3%**	**0%**	**-**

5.0 GROUNDWATER NITROGEN LOAD

The amount of the initial nitrogen load deposited on the pervious land surface which makes its way to groundwater is quantified as the “groundwater non-septic system load.” Nitrogen that leaches from septic systems is quantified as the “groundwater septic system load.” The nitrogen load estimation methodology and the estimated total nitrogen loads for groundwater (both unattenuated and delivered) are described in the following sections.

5.1 Unattenuated Groundwater Nitrogen Load

5.1.1 Septic System Load

The estimated annual nitrogen load derived from the use of septic systems is based on estimates from GBNNPSS. The estimated direct load to the receiving water from septic systems is based on the distance of the septic system to the receiving water body. GBNNPSS quantifies population and associated septic systems within 200 meters of a 5^{th} order stream and the number of systems located beyond that distance. Scientific literature suggests that systems within 200 meters of a 5^{th} order stream contribute a greater proportion of nitrogen to the Great Bay Estuary than those septic systems located outside of 200 meters (NHDES, 2014).

Table 8 presents the unattenuated nitrogen load estimates for septic systems from the GBNNPSS for the Town as a whole and for each subwatershed (refer to Figure 3 for a map of the subwatersheds). Septic systems within the Town contribute approximately 33,936 pounds of total nitrogen per year, 99% of which is from septic systems located more than 200 meters from a 5^{th} order stream and 1% is from septic systems located less than 200 meters from a 5^{th} order stream. Compared to the other subwatersheds, the Little River subwatershed contributes the most of the unattenuated groundwater septic system initial load (almost 40%).

Table 8: Groundwater Septic System Unattenuated Total Nitrogen Load by Town and by Subwatershed.

	Septic Systems Initial (unattenuated) Load (lbs N/yr)			% of Town Total
	INSIDE 200 M	**OUTSIDE 200 M**	**Total**	
Town of Exeter	474	33,462	**33,936**	
Subwatershed:				
Great Brook-Exeter River	57	7,753	7,810	23%
Little River	0	13,273	13,273	39%
Piscassic River	0	4,344	4,344	13%
Squamscott River	417	5,312	5,729	17%
Taylor River-Hampton River	0	2,648	2,648	8%
Winnicut River	0	133	133	<1%

5.1.2 Non-Septic System Load

The annual unattenuated load to groundwater from non-septic system sources (i.e., infiltration) is estimated by subtracting the stormwater and groundwater septic load from the total source load deposited on the surface, as estimated in the GBNNPSS. The GBNNPSS used the Nitrogen Load Model (Valiela, et al., 1997) to quantify nitrogen inputs from atmospheric deposition, chemical fertilizers, septic systems and groundwater and calculate the total source load. To estimate the unattenuated groundwater load from non-septic system sources, the stormwater load (18,423 pounds) and septic system load (33,936 pounds) were subtracted from total source load (156,089 pounds) (Table 9).

Table 9: Calculation of Groundwater Non-Septic Unattenuated Total Nitrogen Load.

	Initial (unattenuated) Load (lbs N/yr)						
	Total Source Load		**Stormwater**		**Groundwater Septic**		**Groundwater Non-Septic**
Town of Exeter	156,089	-	18,423	-	33,936	=	**103,730**
Subwatershed:							
Great Brook – Exeter River	37,451	-	4,426	-	7,810	=	**25,215**
Little River	56,019	-	5,756	-	13,273	=	**36,990**
Piscassic River	16,079	-	1,249	-	4,344	=	**10,486**
Squamscott River	39,929	-	6,375	-	5,729	=	**27,825**
Taylor River – Hampton River	6,107	-	560	-	2,648	=	**2,899**
Winnicut River	505	-	58	-	133	=	**315**

5.2 Delivered Groundwater Load

The delivered load from septic systems was multiplied by a delivery factor to account for natural attenuation of nitrogen within the groundwater pathway (Trowbridge et.al, 2014). For septic systems located within 200 meters of a 5th order stream, a delivery factor of 60% was applied. For septic systems located more than 200 meters from a 5th order stream, a delivery factor of 26% was applied.

The nitrogen load delivered to the receiving water from non-septic sources originates from deposition on the ground surface in rainfall that infiltrates. This is different from surface runoff, which ultimately makes its way through the soil layers and into a groundwater aquifer. To estimate the amount of total nitrogen which is not "lost" during this transport pathway through the soil layers to an aquifer, a delivery factor is applied. Based on the GBNNPSS, a range of groundwater delivery factor for non-septic system groundwater are available based on nitrogen input source and land use type (9 to 15%). A delivery factor of 15%, the most conservative values, was applied in order to estimate the delivered groundwater load from the aquifer to the receiving waters.

Refer to Table 10 for a summary of the delivered groundwater load for the Town and for each subwatershed. The total delivered groundwater nitrogen load is estimated to be 24,457 pounds per year. Of that total, 37% originates in the Little River subwatershed, 24% originates in the Great Brook-Exeter River subwatershed, and 24% originates in the Squamscott River subwatershed. The remaining subwatersheds - Piscassic River, Taylor River-Hampton River, and Winnicut River - contribute substantially less to the delivered groundwater nitrogen load at 11%, 5% and <1%, respectively.

Table 10: Groundwater Delivered Total Nitrogen Load.

	Delivered Groundwater Nitrogen Load (lbs/yr)				% of Town Total
	Non-Septic	**Septic System (inside 200 m)**	**Septic System (outside 200 m)**	**Total Load**	
Delivery Factor	*15%*	*60%*	*26%*	--	
Town of Exeter	15,560	285	8,613	**24,457**	
Subwatershed:					
Great Brook-Exeter River	3,782	34	1,996	**5,812**	24%
Little River	5,548	0	3,416	**8,965**	37%
Piscassic River	1,573	0	1,118	**2,691**	11%
Squamscott River	4,174	250	1,367	**5,791**	24%
Taylor River-Hampton River	435	0	682	**1,116**	5%
Winnicut River	47	0	34	**81**	<1%

6.0 WASTEWATER TREATMENT PLANT NITROGEN LOAD

The point-source nitrogen loads to the Squamscott River associated with the Exeter Wastewater Treatment Facility (WWTF) are based on data provided by Wright-Pierce (Wright-Pierce, 2015) which show that, from the period between 2009 and 2011, the average annual effluent total nitrogen was 83,600 pounds (41.8 tons) per year. This load has no attenuation as it is discharged to the Squamscott River in accordance with the NPDES permit.

7.0 BASELINE TOTAL NITROGEN LOAD ESTIMATES

For the baseline assessment, the total nitrogen unattenuated load from the Town is estimated at 239,690 pounds (119.8 tons) per year (Figure 6). Of the total baseline unattenuated load, approximately 43% is from groundwater non-septic (103,730 lbs N/yr) followed by 35% (83,600 lbs N/year) is from the wastewater treatment plant, 14% (33,936 lbs N/year) from groundwater due to septic systems, 8% (18,424 lbs N/year) from stormwater.

For the baseline assessment, the total nitrogen delivered load from the Town is estimated at 124,085 pounds (62.0 tons) per year (Figure 6). Of the total baseline delivered load, approximately 67% (83,600 lbs N/year) is from the wastewater treatment plant followed by 13% (16,028 lbs N/year) from stormwater, 13% (15,559 lbs N/year) from groundwater non-septic and 7% (8,898 lbs N/year) from groundwater due to septic systems.

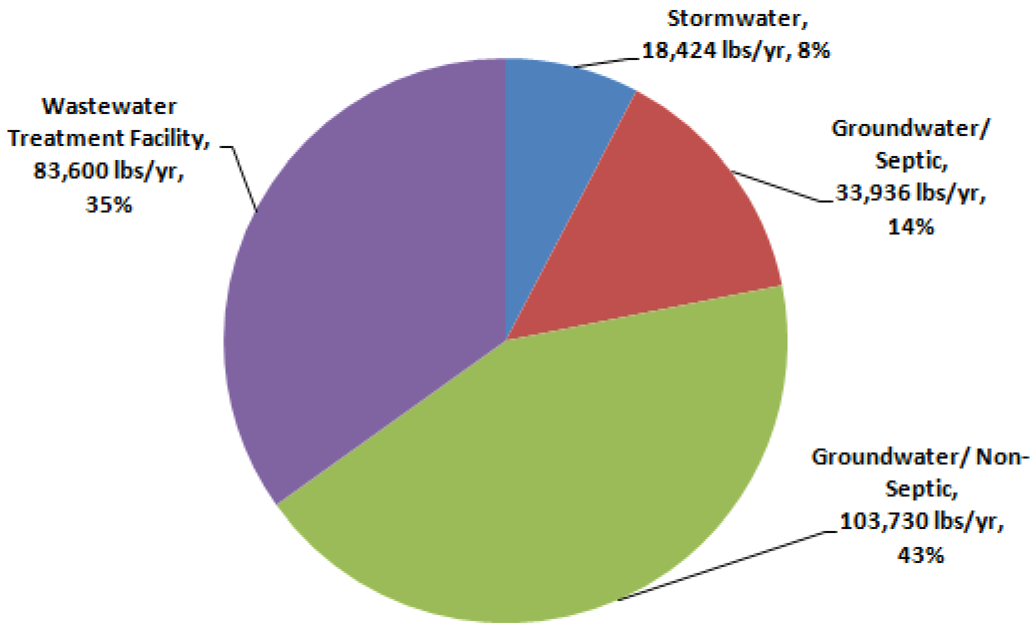


Figure 5. Baseline Unattenuated Total Nitrogen Load from Town

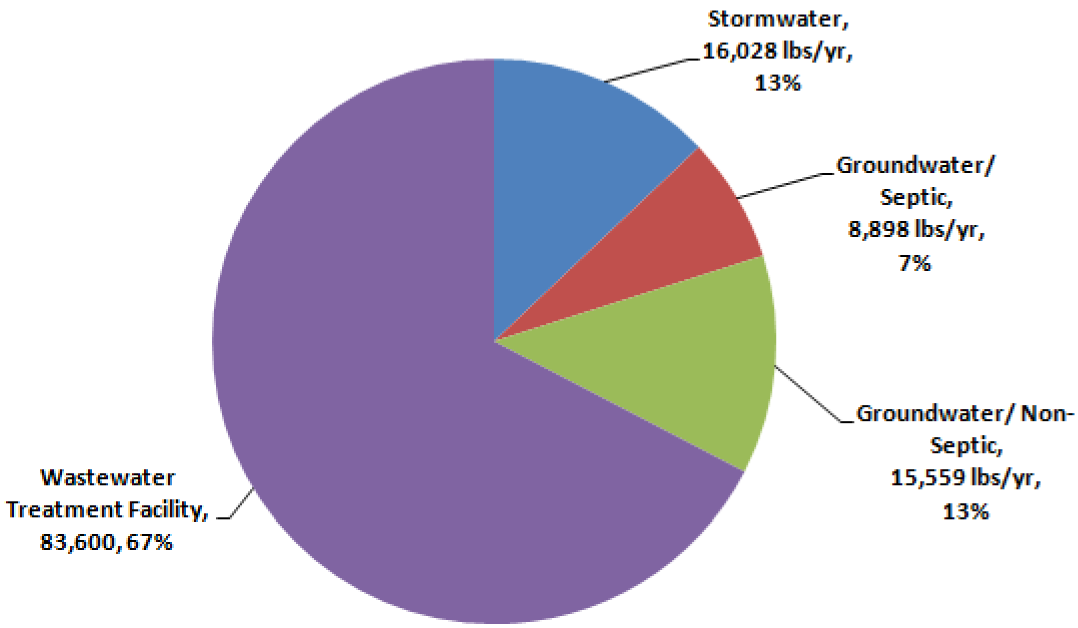


Figure 6. Baseline Delivered Total Nitrogen Load from Town

For future tasks, understanding Exeter's contributing portion to the larger river basin will be important when determine load reduction targets and implementation. Table 11 presents Exeter's baseline load in each of the four major river basins in the Town. The Exeter/Squamscott River includes the Squamscott, Little River and Great Brook-Exeter River subwatersheds and delivers 96% of the total load.

Table 11. Summary of Exeter's Baseline Load by River Basin

Source	River Basin				Total
	Exeter/ Squamscott	Lamprey	Winnicut	Hampton	
Unattenuated Load					
Stormwater	16,557	1,249	58	560	**18,424**
Groundwater/ Septic	26,812	4,344	133	2,648	**33,936**
Groundwater/ Non-Septic	90,030	10,486	315	2,899	**103,730**
Wastewater Treatment Facility	83,600	0	0	0	**83,600**
Total - Unattenuated Load					**239,690**
Delivered Load*					
Stormwater	14,404	1,087	50	487	**16,028**
Groundwater/ Septic	7,064	1,118	34	682	**8,898**
Groundwater/ Non-Septic	13,504	1,573	47	435	**15,559**
Wastewater Treatment Facility	83,600	0	0	0	**83,600**
Total - Delivered Load					**124,085**

Table 12 presents summary statistics by each major river basin which the Town contributes to and the Exeter portion of that total river basin load. Also presented are per capita unattenuated and delivered load by river basin and for Exeter.

Table 12. Summary Statistics by River Basin and Exeter Portion

	Exeter/ Squamscott	Lamprey	Winnicut	Hampton	Total
Number of Towns – River Basin	15	14	5	7	-
Acres by Watershed	115,545	135,619	9,011	4,050	**264,225**
Acres - Exeter Portion	10,977	1,546	20	270	**12,813**
Population by Watershed	44,878	39,966	6,233	34,315	**125,392**
Population - Exeter Portion	13,294	411	22	584	**14,311**
Unattenuated Load – River Basin	1,224,510	1,492,060	185,500	456,480	**3,378,550**
Unattenuated Load - Exeter Portion	216,998	16,079	506	6,107	**239,690**
Delivered Load – River Basin	331,260	362,170	47,380	131,880	**872,690**
Delivered Load - Exeter Portion	118,572	3,778	131	1,603	**124,085**
Unattenuated TN/capita – River Basin	27.7	37.3	29.8	13.3	
Unattenuated TN/capita – Exeter Portion	16.3	39.1	23.0	10.5	
Delivered TN/capita – River Basin	7.4	9.1	7.6	3.8	
Delivered TN/capita - Exeter	8.9	9.2	6.0	2.7	

8.0 REFERENCES

EPA. 2014. *EPA's Methodology to Calculate Baseline Estimates of Impervious Area (IA) and Directly Connected Impervious Area (DCIA) for Massachusetts Communities.* April.

EPA. 2017. *New Hampshire 2017 Final MS4 Permit, Appendix F, Attachment 3 (DRAFT).* March 28, 2017.

Geosyntec Consultants. 2015. *Water Integration for the Squamscott Exeter (WISE) River Watershed: Pollutant Load Modeling Report.* April 2015.

Geosyntec Consultants, National Estuarine Research Reserve System, University of New Hampshire, Consensus Building Institute, and Rockingham Planning Commission. 2015. *Water Integration for the Squamscott Exeter (WISE) Preliminary Integrated Plan*, Final Technical Report. Prepared for Towns of Exeter, Stratham, and Newfields, NH. December. 373 p.

NHDES. 2009. *Numeric Nutrient Criteria for the Great Bay Estuary.* New Hampshire Department of Environmental Services. June.

NRCS. 2007. *National Engineering Handbook, Part 630, Chapter 7 – Hydrologic Soil Groups*. Natural Resources Conservation Service (NRCS), United States Department of Agriculture (USDA). May.

Piscataqua Region Estuaries Partnership. 2013. *State of the Estuaries 2013.* PREP Publications. Paper 259. http://scholars.unh.edu/prep/259

Trowbridge, P., M. Wood, J. Underhill, and D. Healy. 2014. *Great Bay Nitrogen Non-Point Source Study.* Report by the New Hampshire Department of Environmental Services. June 16. 82 p.

Wright-Pierce, 2015. *Wastewater Facilities Plan for the Town of Exeter, New Hampshire.*

ATTACHMENT

STORMWATER SUMMARY TABLES BY SUBWATERSHED

Table 1a: Area of Hydrologic Response Units within the Great Brook-Exeter River Subwatershed.

Land Use Type	Pervious Areas				Total Impervious Area (ac)	Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)			
DEVELOPED SOURCES							
Agriculture	29	25	0	65	2	0	121
Commercial, Services, and Institutional	7	21	0	39	64	0	131
Industrial and Commercial Complexes	0	0	0	1	2	0	3
Industrial	7	0	0	14	2	0	23
Mixed Development Uses	0	0	0	0	0	0	0
Outdoor	6	1	0	76	8	0	91
Residential	127	204	18	252	108	3	712
Transportation, Communications, and Utilities	7	6	0	19	78	1	109
Total Developed Sources	**183**	**257**	**18**	**465**	**264**	**4**	**1,190**
UNDEVELOPED SOURCES							
Barren	0	1	0	1	0	0	2
Forest	172	238	14	928	3	15	1,370
Transitional	22	13	0	54	1	1	91
Water	4	1	0	14	0	61	79
Wetland	7	17	0	452	0	20	496
Total Undeveloped Sources	**205**	**270**	**14**	**1,449**	**4**	**96**	**2,038**
TOTAL	**387**	**527**	**32**	**1,914**	**267**	**101**	**3,228**

Table 1b: Area of Hydrologic Response Units with Directly Connected Impervious Cover (DCIA) within the Great Brook-Exeter River Subwatershed.

Land Use Type	PERVIOUS (inc. Disconnected IA)				DCIA				Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)		
DEVELOPED SOURCES										
Agriculture	29	26	0	65	0	0	0	0	0	121
Commercial, Services, and Institutional	11	33	0	65	2	5	0	15	0	131
Industrial and Commercial Complexes	0	0	0	2	0	0	0	0	0	3
Industrial	8	0	0	15	0	0	0	0	0	23
Mixed Development Uses	0	0	0	0	0	0	0	0	0	0
Outdoor	6	1	0	83	0	0	0	0	0	91
Residential	147	237	19	300	1	2	0	4	3	712
Transportation, Communications and Utilities	13	12	0	36	7	17	1	22	1	109
Total Developed Sources	**214**	**309**	**19**	**565**	**11**	**24**	**1**	**41**	**4**	**1,190**
UNDEVELOPED SOURCES										
Barren	0	1	0	1	0	0	0	0	0	2
Forest	173	239	14	929	0	0	0	0	15	1,370
Transitional	22	13	0	55	0	0	0	0	1	91
Water	4	1	0	14	0	0	0	0	61	79
Wetland	7	17	0	452	0	0	0	0	20	496
Total Undeveloped Sources	**206**	**271**	**14**	**1,451**	**0**	**0**	**0**	**0**	**96**	**2,038**
TOTAL	**420**	**580**	**34**	**2,016**	**11**	**24**	**1**	**41**	**101**	**3,228**

Table 1c: Unattenuated Total Nitrogen Stormwater Pollutant Load by Land Use for the Great Brook-Exeter River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	9	31	0	236	0	**276**
Commercial, Services, and Institutional	3	39	0	233	333	**609**
Industrial	0	0	0	5	11	**17**
Industrial and Commercial Complexes	2	0	0	53	1	**56**
Mixed Development Uses	0	0	0	0	2	**3**
Outdoor	2	2	0	299	3	**305**
Residential	44	284	47	1,079	93	**1,546**
Transportation, Communications, and Utilities	4	15	0	129	501	**648**
					TOTAL DEVELOPED LAND LOAD:	**3,460**
UNDEVELOPED LAND						
Barren	0	1	0	4	0	**5**
Forest	86	119	7	465	0	**677**
Transitional	11	7	0	27	0	**45**
Water	0	0	0	0	0	**0**
Wetland	4	9	0	226	0	**238**
					TOTAL UNDEVELOPED LAND LOAD:	**966**
					TOTAL LOAD:	**4,426**

Table 1d: Stormwater Delivered Total Nitrogen Load for the Great Brook-Exeter River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	8	27	0	205	0	**240**
Commercial, Services, and Institutional	3	34	0	203	290	**529**
Industrial	0	0	0	5	10	**15**
Industrial and Commercial Complexes	2	0	0	46	0	**48**
Mixed Development Uses	0	0	0	0	2	**2**
Outdoor	2	1	0	260	2	**266**
Residential	38	247	41	938	81	**1,345**
Transportation, Communications, and Utilities	3	13	0	112	436	**564**
					TOTAL DEVELOPED LAND LOAD:	**3,010**
UNDEVELOPED LAND						
Barren	0	1	0	4	0	**4**
Forest	75	104	6	404	0	**589**
Transitional	10	6	0	24	0	**39**
Water	0	0	0	0	0	**0**
Wetland	3	7	0	197	0	**207**
					TOTAL UNDEVELOPED LAND LOAD:	**840**
					TOTAL LOAD:	**3,850**

Table 2a: Area of Hydrologic Response Units within the Little River Subwatershed.

Land Use Type	Pervious Areas				Total Impervious Area (ac)	Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)			
DEVELOPED SOURCES							
Agriculture	8	9	0	83	2	0	101
Commercial, Services, and Institutional	1	17	0	29	69	0	116
Industrial and Commercial Complexes	0	1	0	2	5	0	9
Industrial	0	8	0	2	9	0	20
Mixed Development Uses	0	0	0	0	0	0	0
Outdoor	4	3	0	52	8	0	66
Residential	51	352	0	344	128	0	875
Transportation, Communications, and Utilities	2	52	0	41	117	0	212
Total Developed Sources	**65**	**443**	**0**	**553**	**338**	**1**	**1,400**
UNDEVELOPED SOURCES							
Barren	3	8	0	9	5	0	25
Forest	53	844	0	940	5	1	1843
Transitional	10	20	0	93	2	0	125
Water	0	3	0	49	0	11	64
Wetland	1	94	0	639	1	4	738
Total Undeveloped Sources	**67**	**968**	**0**	**1,731**	**13**	**16**	**2,795**
TOTAL	**132**	**1,411**	**0**	**2,284**	**351**	**17**	**4,195**

Table 2b: Area of Hydrologic Response Units with Directly Connected Impervious Cover (DCIA) within the Little River Subwatershed.

Land Use Type	PERVIOUS (inc. Disconnected IA)				DCIA				Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)		
DEVELOPED SOURCES										
Agriculture	9	9	0	83	0	0	0	0	0	101
Commercial, Services, and Institutional	1	28	0	55	0	6	0	26	0	116
Industrial and Commercial Complexes	0	2	0	4	0	1	0	2	0	9
Industrial	0	13	0	4	0	2	0	1	0	20
Mixed Development Uses	0	0	0	0	0	0	0	0	0	0
Outdoor	4	3	0	59	0	0	0	0	0	66
Residential	59	396	0	411	1	2	0	5	0	875
Transportation, Communications and Utilities	4	84	0	75	3	15	0	31	0	212
Total Developed Sources	**77**	**536**	**0**	**690**	**4**	**26**	**0**	**65**	**1**	**1,400**
UNDEVELOPED SOURCES										
Barren	3	11	0	11	0	0	0	0	0	25
Forest	53	847	0	942	0	0	0	0	1	1,843
Transitional	10	20	0	95	0	0	0	0	0	125
Water	0	3	0	49	0	0	0	0	11	64
Wetland	1	94	0	640	0	0	0	0	4	738
Total Undeveloped Sources	**67**	**975**	**0**	**1,737**	**0**	**0**	**0**	**0**	**16**	**2,795**
TOTAL	**145**	**1,511**	**0**	**2,427**	**4**	**26**	**0**	**65**	**17**	**4,195**

Table 2c: Unattenuated Total Nitrogen Stormwater Pollutant Load by Land Use for the Little River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
						DEVELOPED LAND
Agriculture	3	11	0	299	0	**313**
Commercial, Services, and Institutional	0	34	0	196	483	**714**
Industrial	0	3	0	14	35	**51**
Industrial and Commercial Complexes	0	15	0	14	43	**72**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	1	4	0	213	4	**221**
Residential	18	476	0	1,481	109	**2,084**
Transportation, Communications, and Utilities	1	101	0	268	522	**892**
					TOTAL DEVELOPED LAND LOAD:	**4,348**
UNDEVELOPED LAND						
Barren	1	13	0	39	4	**57**
Forest	26	424	0	471	0	**921**
Transitional	5	10	0	47	0	**63**
Water	0	0	0	0	0	**0**
Wetland	1	47	0	320	0	**367**
					TOTAL UNDEVELOPED LAND LOAD:	**1,408**
					TOTAL LOAD:	**5,756**

Table2d: Stormwater Delivered Total Nitrogen Load for the Little River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	2	10	0	260	0	**272**
Commercial, Services, and Institutional	0	30	0	171	421	**621**
Industrial	0	3	0	12	30	**45**
Industrial and Commercial Complexes	0	13	0	12	38	**63**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	1	3	0	185	3	**192**
Residential	15	414	0	1,289	95	**1,813**
Transportation, Communications, and Utilities	1	88	0	233	454	**776**
TOTAL DEVELOPED LAND LOAD:						**3,783**
UNDEVELOPED LAND						
Barren	1	12	0	34	3	**49**
Forest	23	368	0	410	0	**801**
Transitional	5	9	0	41	0	**55**
Water	0	0	0	0	0	**0**
Wetland	0	41	0	278	0	**319**
TOTAL UNDEVELOPED LAND LOAD:						**1,225**
TOTAL LOAD:						**5,007**

Table 3a: Area of Hydrologic Response Units within the Piscassic River Subwatershed.

Land Use Type	Pervious Areas				Total Impervious Area (ac)	Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)			
DEVELOPED SOURCES							
Agriculture	5	8	5	8	0	0	27
Commercial, Services, and Institutional	0	2	0	0	7	0	10
Industrial and Commercial Complexes	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0
Mixed Development Uses	0	0	0	0	0	0	0
Outdoor	0	4	0	15	6	0	25
Residential	30	67	12	29	18	0	155
Transportation, Communications, and Utilities	1	8	0	7	12	0	29
Total Developed Sources	**37**	**89**	**17**	**59**	**44**	**0**	**245**
UNDEVELOPED SOURCES							
Barren	2	3	0	6	0	0	11
Forest	64	294	15	504	2	0	879
Transitional	5	5	1	10	0	0	21
Water	0	0	0	3	0	0	3
Wetland	8	24	0	354	0	0	386
Total Undeveloped Sources	**78**	**326**	**16**	**877**	**3**	**0**	**1,301**
TOTAL	**115**	**415**	**33**	**936**	**47**	**0**	**1,546**

Table 3b: Area of Hydrologic Response Units with Directly Connected Impervious Cover (DCIA) within the Piscassic River Subwatershed.

Land Use Type	PERVIOUS (inc. Disconnected IA)				DCIA				Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)		
DEVELOPED SOURCES										
Agriculture	5	8	5	8	0	0	0	0	0	27
Commercial, Services, and Institutional	0	4	0	1	0	4	0	1	0	10
Industrial and Commercial Complexes	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0
Mixed Development Uses	0	0	0	0	0	0	0	0	0	0
Outdoor	0	7	0	16	0	2	0	0	0	25
Residential	34	74	14	32	0	0	0	0	0	155
Transportation, Communications and Utilities	2	13	0	10	1	2	1	1	0	29
Total Developed Sources	**41**	**106**	**19**	**67**	**1**	**8**	**1**	**2**	**0**	**245**
UNDEVELOPED SOURCES										
Barren	2	3	0	6	0	0	0	0	0	11
Forest	64	295	15	505	0	0	0	0	0	879
Transitional	5	5	1	11	0	0	0	0	0	21
Water	0	0	0	3	0	0	0	0	0	3
Wetland	8	24	0	354	0	0	0	0	0	386
Total Undeveloped Sources	**79**	**327**	**16**	**879**	**0**	**0**	**0**	**0**	**0**	**1,301**
TOTAL	**120**	**433**	**35**	**946**	**1**	**8**	**1**	**2**	**0**	**1,546**

Table 3c: Unattenuated Total Nitrogen Stormwater Pollutant Load by Land Use for the Piscassic River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	2	10	12	31	0	**54**
Commercial, Services, and Institutional	0	5	0	2	77	**84**
Industrial	0	0	0	0	0	**0**
Industrial and Commercial Complexes	0	0	0	0	0	**0**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	0	9	0	57	23	**89**
Residential	10	89	33	116	10	**259**
Transportation, Communications, and Utilities	1	15	0	35	44	**95**
					TOTAL DEVELOPED LAND LOAD:	**579**
UNDEVELOPED LAND						
Barren	1	4	0	22	0	**27**
Forest	32	147	8	252	0	**439**
Transitional	2	2	1	5	0	**11**
Water	0	0	0	0	0	**0**
Wetland	4	12	0	177	0	**193**
					TOTAL UNDEVELOPED LAND LOAD:	**670**
					TOTAL LOAD:	**1,249**

Table 3d: Stormwater Delivered Total Nitrogen Load for the Piscassic River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTAL S (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	1	9	10	27	0	**47**
Commercial, Services, and Institutional	0	4	0	2	67	**73**
Industrial	0	0	0	0	0	**0**
Industrial and Commercial Complexes	0	0	0	0	0	**0**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	0	8	0	49	20	**77**
Residential	9	78	29	101	9	**225**
Transportation, Communications, and Utilities	1	13	0	30	38	**82**
					TOTAL DEVELOPED LAND LOAD:	**504**
UNDEVELOPED LAND						
Barren	1	3	0	19	0	**23**
Forest	28	128	7	219	0	**382**
Transitional	2	2	1	5	0	**9**
Water	0	0	0	0	0	**0**
Wetland	3	11	0	154	0	**168**
					TOTAL UNDEVELOPED LAND LOAD:	**583**
					TOTAL LOAD:	**1,087**

Table 4a: Area of Hydrologic Response Units within the Squamscott River Subwatershed.

Land Use Type	Pervious Areas				Total Impervious Area (ac)	Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)			
DEVELOPED SOURCES							
Agriculture	0	28	0	74	2	0	103
Commercial, Services, and Institutional	0	9	0	54	114	0	178
Industrial and Commercial Complexes	0	0	0	5	16	0	21
Industrial	1	11	0	10	37	0	59
Mixed Development Uses	0	0	0	0	0	0	0
Outdoor	3	22	0	47	9	0	80
Residential	4	101	0	338	116	0	560
Transportation, Communications, and Utilities	10	56	0	67	125	33	290
Total Developed Sources	**18**	**227**	**0**	**594**	**420**	**34**	**1,293**
UNDEVELOPED SOURCES							
Barren	2	6	0	7	7	0	22
Forest	74	885	0	677	4	4	1,645
Transitional	1	25	0	69	2	0	97
Water	0	0	0	18	0	77	96
Wetland	2	73	0	316	0	10	401
Total Undeveloped Sources	**80**	**990**	**0**	**1,087**	**14**	**91**	**2,261**
TOTAL	**98**	**1,217**	**0**	**1,681**	**434**	**125**	**3,554**

Table 4b: Area of Hydrologic Response Units with Directly Connected Impervious Cover (DCIA) within the Squamscott River Subwatershed.

Land Use Type	PERVIOUS (inc. Disconnected IA)				DCIA				Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)		
DEVELOPED SOURCES										
Agriculture	0	29	0	74	0	0	0	0	0	103
Commercial, Services, and Institutional	1	16	0	102	1	4	0	54	0	178
Industrial and Commercial Complexes	0	0	0	10	0	0	0	11	0	21
Industrial	3	21	0	18	1	11	0	6	0	59
Mixed Development Uses	0	0	0	0	0	0	0	0	0	0
Outdoor	3	23	0	54	0	0	0	0	0	80
Residential	4	117	0	427	0	1	0	11	0	560
Transportation, Communications and Utilities	14	79	0	118	1	6	0	41	33	290
Total Developed Sources	**24**	**284**	**0**	**804**	**3**	**22**	**0**	**123**	**34**	**1,293**
UNDEVELOPED SOURCES										
Barren	2	6	0	12	0	0	0	2	0	22
Forest	74	886	0	681	0	0	0	0	4	1,645
Transitional	1	26	0	70	0	0	0	0	0	97
Water	0	0	0	18	0	0	0	0	77	96
Wetland	2	73	0	316	0	0	0	0	10	401
Total Undeveloped Sources	**80**	**991**	**0**	**1,097**	**0**	**0**	**0**	**2**	**91**	**2,261**
TOTAL	**103**	**1,275**	**0**	**1,901**	**3**	**22**	**0**	**125**	**125**	**3,554**

Table 4c: Unattenuated Total Nitrogen Stormwater Pollutant Load by Land Use for the Squamscott River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	0	35	0	267	0	**302**
Commercial, Services, and Institutional	0	19	0	366	897	**1,281**
Industrial	0	0	0	37	166	**202**
Industrial and Commercial Complexes	1	25	0	65	271	**361**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	1	27	0	195	5	**229**
Residential	1	140	0	1,539	165	**1,845**
Transportation, Communications, and Utilities	4	94	0	424	495	**1,018**
					TOTAL DEVELOPED LAND LOAD:	**5,238**
UNDEVELOPED LAND						
Barren	1	7	0	44	20	**72**
Forest	37	443	0	340	0	**821**
Transitional	1	13	0	35	1	**49**
Water	0	0	0	0	0	**0**
Wetland	1	36	0	158	0	**195**
					TOTAL UNDEVELOPED LAND LOAD:	**1,137**
					TOTAL LOAD:	**6,375**

Table 4d: Stormwater Delivered Total Nitrogen Load for the Squamscott River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	0	31	0	232	0	**263**
Commercial, Services, and Institutional	0	16	0	318	780	**1,115**
Industrial	0	0	0	32	144	**176**
Industrial and Commercial Complexes	1	22	0	56	236	**314**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	1	24	0	170	4	**199**
Residential	1	122	0	1,339	144	**1,605**
Transportation, Communications, and Utilities	4	82	0	369	430	**885**
					TOTAL DEVELOPED LAND LOAD:	**4,557**
UNDEVELOPED LAND						
Barren	0	6	0	38	17	**62**
Forest	32	386	0	296	0	**714**
Transitional	0	11	0	30	1	**43**
Water	0	0	0	0	0	**0**
Wetland	1	32	0	137	0	**170**
					TOTAL UNDEVELOPED LAND LOAD:	**989**
					TOTAL LOAD:	**5,547**

Table 5a: Area of Hydrologic Response Units within the Taylor River-Hampton River Subwatershed.

Land Use Type	Pervious Areas				Total Impervious Area (ac)	Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)			
DEVELOPED SOURCES							
Agriculture	1	0	0	0	0	0	1
Commercial, Services, and Institutional	0	3	0	2	4	0	10
Industrial and Commercial Complexes	0	0	0	2	5	0	7
Industrial	0	0	0	0	0	0	0
Mixed Development Uses	0	0	0	0	0	0	0
Outdoor	0	0	0	0	0	0	0
Residential	3	33	0	34	19	0	89
Transportation, Communications, and Utilities	1	9	0	14	20	0	43
Total Developed Sources	**5**	**45**	**0**	**53**	**48**	**0**	**151**
UNDEVELOPED SOURCES							
Barren	0	4	0	4	1	0	9
Forest	2	27	1	52	1	0	82
Transitional	0	6	0	5	0	0	11
Water	0	0	0	0	0	0	0
Wetland	0	1	0	16	0	0	17
Total Undeveloped Sources	**2**	**38**	**1**	**76**	**2**	**0**	**119**
TOTAL	**7**	**83**	**1**	**129**	**50**	**0**	**270**

Table 5b: Area of Hydrologic Response Units with Directly Connected Impervious Cover (DCIA) within the Taylor River-Hampton River Subwatershed.

Land Use Type	PERVIOUS (inc. Disconnected IA)				DCIA				Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)		
DEVELOPED SOURCES										
Agriculture	1	0	0	0	0	0	0	0	0	1
Commercial, Services, and Institutional	0	5	0	4	0	0	0	0	0	10
Industrial and Commercial Complexes	0	0	0	5	0	0	0	3	0	7
Industrial	0	0	0	0	0	0	0	0	0	0
Mixed Development Uses	0	0	0	0	0	0	0	0	0	0
Outdoor	0	0	0	0	0	0	0	0	0	0
Residential	4	43	0	41	0	1	0	1	0	89
Transportation, Communications and Utilities	1	14	0	22	1	2	0	4	0	43
Total Developed Sources	**6**	**61**	**0**	**72**	**1**	**4**	**0**	**7**	**0**	**151**
UNDEVELOPED SOURCES										
Barren	0	4	0	4	0	0	0	0	0	9
Forest	2	27	1	52	0	0	0	0	0	82
Transitional	0	7	0	5	0	0	0	0	0	11
Water	0	0	0	0	0	0	0	0	0	0
Wetland	0	1	0	16	0	0	0	0	0	17
Total Undeveloped Sources	**2**	**39**	**1**	**77**	**0**	**0**	**0**	**0**	**0**	**119**
TOTAL	**8**	**100**	**1**	**149**	**1**	**4**	**0**	**7**	**0**	**270**

Table 5c: Unattenuated Total Nitrogen Stormwater Pollutant Load by Land Use for the Taylor River-Hampton River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	0	0	0	0	0	**0**
Commercial, Services, and Institutional	0	6	0	13	14	**33**
Industrial	0	0	0	17	40	**57**
Industrial and Commercial Complexes	0	0	0	0	0	**0**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	0	0	0	0	0	**0**
Residential	1	51	0	149	29	**230**
Transportation, Communications, and Utilities	0	17	0	79	68	**164**
TOTAL DEVELOPED LAND LOAD:						**484**
UNDEVELOPED LAND						
Barren	0	5	0	16	0	**21**
Forest	1	14	0	26	0	**41**
Transitional	0	3	0	2	0	**6**
Water	0	0	0	0	0	**0**
Wetland	0	0	0	8	0	**8**
TOTAL UNDEVELOPED LAND LOAD:						**76**
TOTAL LOAD:						**560**

Table 5d: Stormwater Delivered Total Nitrogen Load for the Taylor River-Hampton River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	0	0	0	0	0	**0**
Commercial, Services, and Institutional	0	5	0	11	12	**29**
Industrial	0	0	0	15	35	**49**
Industrial and Commercial Complexes	0	0	0	0	0	**0**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	0	0	0	0	0	**0**
Residential	1	44	0	129	26	**200**
Transportation, Communications, and Utilities	0	15	0	69	59	**142**
					TOTAL DEVELOPED LAND LOAD:	**421**
UNDEVELOPED LAND						
Barren	0	4	0	14	0	**18**
Forest	1	12	0	23	0	**36**
Transitional	0	3	0	2	0	**5**
Water	0	0	0	0	0	**0**
Wetland	0	0	0	7	0	**7**
					TOTAL UNDEVELOPED LAND LOAD:	**66**
					TOTAL LOAD:	**487**

Table 6a: Area of Hydrologic Response Units within the Winnicut River Subwatershed.

Land Use Type	Pervious Areas				Total Impervious Area (ac)	Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)			
DEVELOPED SOURCES							
Agriculture	0	0	0	0	0	0	0
Commercial, Services, and Institutional	0	0	0	0	0	0	0
Industrial and Commercial Complexes	0	2	0	1	4	0	6
Industrial	0	0	0	0	0	0	0
Mixed Development Uses	0	0	0	0	0	0	0
Outdoor	0	0	0	0	0	0	0
Residential	0	0	0	0	0	0	1
Transportation, Communications, and Utilities	0	6	0	0	3	0	9
Total Developed Sources	**0**	**8**	**0**	**1**	**7**	**0**	**16**
UNDEVELOPED SOURCES							
Barren	0	0	0	0	0	0	0
Forest	0	2	0	1	0	0	2
Transitional	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0
Wetland	0	0	0	1	0	0	1
Total Undeveloped Sources	**0**	**2**	**0**	**2**	**0**	**0**	**4**
TOTAL	**0**	**10**	**0**	**3**	**7**	**0**	**19**

Table 6b: Area of Hydrologic Response Units with Directly Connected Impervious Cover (DCIA) within the Winnicut River Subwatershed.

Land Use Type	PERVIOUS (inc. Disconnected IA)				DCIA				Water (ac)	Total (ac)
	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)	A Soil (ac)	B Soil (ac)	C Soil (ac)	D Soil (ac)		
DEVELOPED SOURCES										
Agriculture	0	0	0	0	0	0	0	0	0	0
Commercial, Services, and Institutional	0	0	0	0	0	0	0	0	0	0
Industrial and Commercial Complexes	0	3	0	1	0	1	0	1	0	6
Industrial	0	0	0	0	0	0	0	0	0	0
Mixed Development Uses	0	0	0	0	0	0	0	0	0	0
Outdoor	0	0	0	0	0	0	0	0	0	0
Residential	0	0	0	0	0	0	0	0	0	1
Transportation, Communications and Utilities	0	8	0	1	0	0	0	0	0	9
Total Developed Sources	**0**	**11**	**0**	**2**	**0**	**2**	**0**	**1**	**0**	**16**
UNDEVELOPED SOURCES										
Barren	0	0	0	0	0	0	0	0	0	0
Forest	0	2	0	1	0	0	0	0	0	2
Transitional	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0
Wetland	0	0	0	1	0	0	0	0	0	1
Total Undeveloped Sources	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**4**
TOTAL	**0**	**13**	**0**	**4**	**0**	**2**	**0**	**1**	**0**	**19**

Table 6c: Unattenuated Total Nitrogen Stormwater Pollutant Load by Land Use for the Winnicut River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	0	0	0	0	0	**0**
Commercial, Services, and Institutional	0	0	0	0	0	**0**
Industrial	0	4	0	5	29	**38**
Industrial and Commercial Complexes	0	0	0	0	0	**0**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	0	0	0	0	0	**0**
Residential	0	0	0	1	0	**1**
Transportation, Communications, and Utilities	0	9	0	2	5	**16**
TOTAL DEVELOPED LAND LOAD:						**56**
UNDEVELOPED LAND						
Barren	0	0	0	0	0	**0**
Forest	0	1	0	0	0	**1**
Transitional	0	0	0	0	0	**0**
Water	0	0	0	0	0	**0**
Wetland	0	0	0	1	0	**1**
TOTAL UNDEVELOPED LAND LOAD:						**2**
TOTAL LOAD:						**58**

Table 6d: Stormwater Delivered Total Nitrogen Load for the Winnicut River Subwatershed.

Land Use Type	N Load Pervious Areas				DCIA (lbs/yr)	TOTALS (lbs/yr)
	A soil (lbs/yr)	B soil (lbs/yr)	C soil (lbs/yr)	D soil (lbs/yr)		
DEVELOPED LAND						
Agriculture	0	0	0	0	0	**0**
Commercial, Services, and Institutional	0	0	0	0	0	**0**
Industrial	0	3	0	4	26	**33**
Industrial and Commercial Complexes	0	0	0	0	0	**0**
Mixed Development Uses	0	0	0	0	0	**0**
Outdoor	0	0	0	0	0	**0**
Residential	0	0	0	1	0	**1**
Transportation, Communications, and Utilities	0	8	0	2	4	**14**
					TOTAL DEVELOPED LAND LOAD:	**48**
UNDEVELOPED LAND						
Barren	0	0	0	0	0	**0**
Forest	0	1	0	0	0	**1**
Transitional	0	0	0	0	0	**0**
Water	0	0	0	0	0	**0**
Wetland	0	0	0	0	0	**1**
					TOTAL UNDEVELOPED LAND LOAD:	**2**
					TOTAL LOAD:	**50**

WRIGHT-PIERCE

Engineering a Better Environment

Horsley Witten Group