Project Narrative

for
The Installation of a Permeable Reactive Barrier
51A Durham Point Road
Tax Map 011-35, Lot 001

To: Durham Conservation Commission
From: Kyle Pimental, Principal Regional Planner, Strafford Regional Planning Commission
Mark Kelley, P.E., Senior Hydrogeologist, Haley & Aldrich Inc.
Danna Truslow, CG, PG, Truslow Resource Consulting LLC
Date: 11/13/2020
Re: November 23rd Conservation Commission Meeting

Project Background

The Great Bay Estuary includes 21 square miles of tidal waters located in southeastern New Hampshire. In 2009, most of this estuary was placed on New Hampshire's 303 (d) list for impairments associated with total nitrogen. Specifically, low dissolved oxygen, macroalgae blooms, and declining eel grass habitat has been observed in the estuary (DES, 2009).

The 2013 Great Bay Nitrogen Non-Point Source Study (GBNPSS) estimates that 177,548 of the 325,775 people in the Great Bay watershed live outside municipal sewer service areas. Additionally, GBNPSS showed that 29% (475,339 lbs/yr) of the overall non-point source nitrogen load delivered to the estuary comes from human waste (septic systems). For the Oyster River watershed, which is recognized as having some of the largest non-point source nitrogen yields, the average nitrogen load to Great Bay is 60.6 tons per year. Wastewater treatment facilities account for 19% (11.8 tons/yr) of the load. The remaining 81% of the load (48.6 tons/yr) comes from nonpoint sources. Septic systems account for 26% (18,550 lbs/yr) of the nonpoint source nitrogen load delivered from the Oyster River watershed to the estuary. Existing nitrogen loads from the Oyster River watershed need to be reduce to prevent low dissolved oxygen, and reducing nitrogen loads from septic systems is a priority strategy for achieving nutrient load reductions in the Oyster River watershed and the Great Bay region.

Currently, very few options for removing nitrogen migrating in groundwater from septic systems are being used in the region; however, Permeable Reactive Barriers (PRBs) consisting of wood chips are an exploratory technology designed to treat effluent before the groundwater discharges into surface waters, thereby reducing nitrogen loading to streams. Studies in other areas of the country using similar technology to the PRB proposed in this project resulted in a 74-94% reduction in nitrogen from septic effluent from on-site septic systems. At Waquoit Bay in Falmouth, MA, PRBs were documented to remove 99% of the nitrate using Nitrex PRBs (Vallino, 2008), which consist primarily of wood chips.

It is the hope that over time, as this technology is shown to be environmentally and economically effective, more municipalities, as well as septic systems designers will adapt the technology, and broad-scale water quality improvements will be seen as nitrogen loads are reduced.

Project Overview

Over the past year and a half, the Town of Durham, in partnership with the Strafford Regional Planning Commission, Haley & Aldrich Inc., and the Strafford County Conservation District, have been working with several interested landowners to install a PRB on their property.

Based on results from a lengthy data collection and scoring process, which included subsurface conditions, site hydrology, and groundwater and surface water testing, the project team has decided the Paine site (51A Durham Point Road) is a good candidate site for installing a PRB consisting of a wood chip trench.

The existing conditions at the Paine site showed that a drain existed down-gradient of the existing septic system. In order to allow for the effluent from the septic system to flow within the natural groundwater flow path, it is proposed to excavate a trench perpendicular to the drain and backfill with a clean sand or more permeable material to at least 3 ft. below the observed groundwater. This trench will extend at least 15 ft. to either side of the drain or preferential pathway to allow for the water flowing into the drain to dissipate back into the natural groundwater flow path. This would be much like a level spreader in a surface water discharge feature that dissipates the flow over a larger area than the point source or pipe discharge. The location of the PRB would then be located at least 10 ft. down slope from this sand filled trench.

The location of the PRB is within the 100-ft buffer of a tidal wetland and therefor subject to Conservation Commission review.

Three Criteria Identified in Article XIII, Section 175-60. B. Permitted Uses in the WCOD.

1. Appropriate erosion control measures will be used:

   Design plans call for the installation of straw wattle erosion control measures placed along the slope between the wetland and the location of the PRB. Straw wattles will be inspected daily and maintained for the duration of construction.

2. Any disturbed area will be restored, and

   Construction of the PRB and associated groundwater interceptor trenches should only take a day or two to complete. Once the PRB has been backfilled with the wood chips and the interceptor trench with sand, the areas will be coated with a non-woven geotextile then finally a layer of loam-seed with grass seed to match the existing grade (*see photos of a PRB placement and site restoration from a past project on the next page*) and will not be visible at the ground surface. The erosion control measures will stay up until full re-growth. Additional well installation and monitoring will take place throughout 2021.

3. The activity will be conducted in a manner that minimizes any impact on the wetland (or shoreland in SPOD)

   There will be no direct impacts to the adjacent wetland. Construction of the PRB will require some minor earth removal and disturbance within the wetland buffer. The PRB will serve as a cost-effective way to removal nitrogen that is currently flowing via groundwater into the wetland and discharging into the Oyster River.

Respectfully submitted,

Kyle Pimental, Principal Regional Planner
Strafford Regional Planning Commission