NOVER-ARMSTRONG ASSOCIATES, INC.

124 Main Street, Unit 2GG
Carver, Massachusetts 02330
Telephone 508.866.8383

89 Shrewsbury Street, Suite 300
Worcester, MA 01604
Telephone 508.756.1600

Date: June 6, 2018

To: Linda Hansen, Conservation Administrator
Wayland Conservation Commission

From: Henry T. Nover, P.E.

Subject: **24 School Street – Mounding Calculations/Stormwater Review**

DOCUMENTS REVIEWED

- *Letter to Wayland Conservation Commission*, prepared by CREATIVE Land and Water Engineering, LLC; dated May 8, 2018.
- *Slug Test and Groundwater Mounding Analysis Report, 24 School Street, Wayland MA:* prepared by CREATIVE Land and Water Engineering, LLC; dated February 28, 2018 revised through May 7, 2018.
- Existing Conditions Site Plan, prepared by MetroWest Engineering, Inc.; dated May 23, 2017, revised through January 5, 2018; endorsed May 8, 2018 by Robert A Gemma, MA PLS 37046 and MA Civil PE 31967.
- Site Plans (5 Sheets), prepared by MetroWest Engineering, Inc.; dated September 6, 2017, revised through April 20, 2018; endorsed May 8, 2018 by Robert A Gemma, MA PLS 37046 and MA Civil PE 31967
- *Revised Hydrologic Analysis Proposed Site Redevelopment, 24 School Street, Wayland, MA;* prepared by MetroWest Engineering, Inc.; dated September, 2017, revised through May 2018.
- *Stormwater Report Proposed Site Redevelopment, 24 School Street, Wayland MA;* prepared by MetroWest Engineering, Inc.; dated September, 2017.

1.0 PROJECT UPDATE

On March 20, 2018, Nover-Armstrong Associates, Inc. (Nover-Armstrong) reviewed by conference call their March 9, 2018 comments with the applicant's representatives: M.A. Kablack & Associates, P.C. (Kablack); CREATIVE Land and Water Engineering, LLC (CREATIVE), and MetroWest Engineering, Inc. (MWE). Based on discussion and agreements made in the call, additional information was submitted and changes were made to the plans, the stormwater management system, and the hydrologic calculations that are included in the documents listed above.

Our review of the revised Groundwater Mounding Report for the Soil Absorption System (SAS) for disposal of the Project's sanitary wastewater found a number of issues that we feel the applicant should address before we can confirm their results and findings on the SAS estimated mound height.

Except for potential impacts of the proposed building foundations on the stormwater mounding height, we are now generally satisfied with the results and findings of the revised Groundwater Mounding Report for the subsurface infiltration system and have used these findings to complete our review of the proposed stormwater management system.

2.0 GENERAL COMMENT

The plans and calculations may be adequate for the ZBA Comprehensive Permit process but are not sufficient to describe the effect of the work on the interests identified in the MA Wetlands Protection Act (the Act). The Massachusetts Wetland Regulations, 310 CMR 10.00 (the Regulations) specify that the information submitted by the Applicant with the Notice of Intent must be "sufficient to describe the site, the work or the effect of the work on the interests identified in the Act.

Local conservation commissions have an important role in determining whether proposed projects comply with the requirements of the Act and the Regulations and must be provided sufficient information from the project proponent to make that determination. Otherwise, a project proponent can make an end run around a local conservation commission by failing to provide sufficient information and proceed to DEP with a Superseding Order of Conditions request presenting new information under the guise of "de novo" review. [1]

3.0 SAS MOUNDING CALCULATION COMMENTS

3.1 SAS mounding analysis as per 310 CMR 15.000: (Title 5 Regulations) Section 15.240: Soil Absorption Systems (12) for systems with a design flow of 2,000 gpd or greater, the separation distance to the high groundwater elevation required by 310 CMR 15.212 shall be determined by adding the effect of groundwater mounding to the high groundwater elevation.

3.2 CREATIVE's estimate of the mounding height beneath the SAS is based on a 17.3 foot depth of aquifer (initial saturated thickness) using MW 1's bottom elevation of 142.7 and an estimated seasonal high groundwater (ESHGW) of 160.0.

3.3 Nover-Armstrong does not agree with using elevation 160.0 as the ESHGW or the bottom of MW 1 to estimate an aquifer depth. The depth of the aquifer is shallower as you go down the slope towards the wetland. The aquifer depth at MW 2 is about 11.5 feet.

3.4 In our opinion, the depth of the aquifer should be based on a MWE's ESHGW elevation in the middle of the SAS compared to an average of the bottom elevations of MW 1 and MW 2. We estimate an average aquifer depth closer to 14.4 feet.

3.5 Nover-Armstrong also has reservations regarding the use of the hydraulic conductivity estimated from the slug tests in MW 1 and MW 2 to estimate the mound height under the SAS. In our March 8, 2018 comments we had noted that the hydraulic conductivity estimated in MW 3 was about 4 times slower than was found in MW 1 and MW 2.

3.6 CREATIVE explained the difference as possibly due to boulders and/or micro soil limitations in the specific drilling location. Although we acknowledged this possibility during the conference call, Nover-Armstrong is now suggesting that the difference in hydraulic conductivities could be a result of the differences in the soil properties of Hinckley loamy sand and Narragansett silt loam soil types present on the Project site.

3.7 DTH -2, DTH-3, DTH-8, and DTH-10 all have silt loam horizons at the top of the aquifer that may reflect a different hydraulic conductivity than what was found by the slug tests in MW 1 and MW 2.

3.8 Nover-Armstrong recommends that the SAS mound height estimate be checked using an average of the hydraulic conductivities estimated for MW 1 and MW 3 and an average depth of the aquifer.

[1] Matter of David A. Bosworth Co., Inc. Docket No. WET-2015-015 Recommended Final Decision (February 17, 2016), adopted by Final Decision (March 16, 2016).

4.0 STORMWATER MOUNDING CALCULATION COMMENTS

4.1 CREATIVE's May 8, 2018 Letter to the Commission for the most part provides adequate responses to Nover-Armstrong's March 9, 2018 stormwater infiltration system mounding comments.

4.2 Nover-Armstrong cannot however confirm that there will be no impact on the stormwater mounding height from the proposed building foundations. The foundations are less than 20 feet from the infiltration system and would appear to have frost wall footings lower than the elevation of the estimated mound height.

4.3 CREATIVE's Groundwater Mounding Analysis Report demonstrates that the stormwater infiltration system will meet the DEP mounding standards to drain in less than 72 hours.

4.4 The stormwater recharge volume used in the mounding analysis is consistent with MWE's Revised Hydrologic Analysis.

4.5 CREATIVE estimated groundwater mounding under the SAS and stormwater infiltration system will have minor impact on each other's mounding heights. Four cross sections were provided with the *Letter to Wayland Conservation Commission,* prepared by CREATIVE Land and Water Engineering, LLC; dated May 8, 2018 showing the mounding impacts on each other.

4.6 The elevation of the seasonal high groundwater was raised to 160.14 (about 3 feet - CREATIVE) at the location of the stormwater infiltration system BMP based on a reading of MW 3 on March 12, 2018.

4.7 The stormwater infiltration system was raised in elevation based on the new groundwater elevation and was redesigned to reduce the amount of infiltration and have more discharge to the outlets. The system will overflow and discharge to the wetlands for storm events equal to or larger than the 2-year 24-hour storm event (3.2 inches).

4.8 The mounding height under the stormwater infiltration system was estimated using two different aquifer depths based on the different bottom elevations of MW 1 and MW 3.

4.9 MW 3 is located at the stormwater infiltration system and MW 1 is located within the footprint of the SAS near School Street. It is CREATIVE's opinion that they are being conservative using a shallower aquifer depth based on MW 3 as they feel the depth of the well was limited by perhaps a boulder.

4.10 CREATIVE estimated the 100-year storm 3-day residual mounding height under the stormwater infiltration system to be less than the required 2 feet in both cases.

5.0 STORMWATER MANAGEMENT COMMENTS

5.1 The September 2017 Stormwater Report narrative and O & M Plan should be updated to reflect the revisions to the proposed stormwater management system provided in the May 2018 Revised Hydrologic Analysis.

5.2 Under the Stormwater Standards, this project is classified as a mix of new and redevelopment as there is an increase in impervious surface of 11,283 square feet (MWE -Revised Hydrologic Analysis).

5.3 Due to the fact that there is an increase in the amount of impervious surface, the project is classified as a mix of "New" and "Redevelopment". The Wetland Regulations Stormwater Standards require that the runoff from the new impervious surface fully meet the Standards and the existing or redeveloped impervious surface meet the Standards to the maximum extent practicable but must at the very least improve existing conditions.

5.4 It appears that the proposed stormwater infiltration system could meet full compliance with the Standards for the 11,283 square feet increase in impervious surface reported in MWE's Revised Hydrologic Analysis. This system is designed to treat a total of 14,145 square feet of impervious surface. The capacity of the system to treat more impervious than the new impervious surface be considered as improvement of the existing conditions.

5.5 There is little difference between the pre-development and post-development runoff Time of Concentration. Nover-Armstrong recommends that the Velocity Method found in TR-55 versus the Lag Method be used to estimate the times of concentrations and that the overland flow paths cross perpendicular to the topographic contour lines.

5.6 Part 630 Hydrology, National Engineering Handbook states that the velocity method (TR-55 overland flow) is "the best method for calculating time of concentration for an urbanizing watershed or if hydraulic changes to the watercourse are being considered." Our experience has found using the Lag Method versus the Velocity Method estimates smaller peak rates of runoff.

5.7 The CN value used for the existing block driveway and walk should be adjusted to reflect some level of perviousness instead of considering it as a complete impervious paved surface.

6.0 STORMWATER SYSTEM COMMENTS

6.1 Subsurface Infiltration BMP

6.1.1 The subsurface infiltration system BMP does not have the required 2 feet of separation from seasonal high groundwater. The March 12, 2018 groundwater level in MW 3 was 160.14 feet. On the plans and calculations by MWE, the bottom of the 3.0' high subsurface infiltration precast structure is 162.25. The bottom of crushed stone under the BMP is 161.25 feet. The bottom of the stone needs to be 2 feet above groundwater. The mounding calculations by CREATIVE used 162.25 as the bottom of the stone.

6.1.2 The manifold inlet fittings to the infiltration BMP should be detailed. The fitting layout is conceptual. Nover-Armstrong does not recommend 12" diameter connections to an 8" diameter manifold.

6.1.3 The two 6" diameter outlets from the infiltration BMP are labelled as 8" diameter on the plans and should be corrected.

6.1.4 Design information should be provided to support the diversion manhole outlet invert elevations to the Stormceptor units and the infiltration BMP

6.1.5 The pipe run from CB 2 to DMH 3 should not be located within the SAS reserve area.

6.1.6 Design information to support the Level Spreader manifold sizing needs to be provided. The Detail and plan view of its layout are inconsistent. Additional detail of the inspection cover should be provided as it is conceptual in nature. A second inspection point on the manifold inside of the wall should be provided. Future access for maintenance and/or repair of the manifolds and the outlet pipe on the south side of Unit 1B will be difficult.

6.1.7 The location of the gutter downspouts and pipe connections to the subsurface infiltration BMP should be added to the plans. Nover-Armstrong is of the opinion that the roof runoff collection system would not be able to capture and convey the roof runoff from large storm events. Depending on the roof configuration, overflow from the gutters may by-pass the infiltration BMP, particularly from Units 1A and 1B.

6.1.8 The grading at the top of the driveway from East Plain Street will allow runoff to by-pass CB 3 and discharge out to East Plain Street.

6.1.9 Subsurface Infiltration System BMPs have an expected TSS removal rate of 80% versus the 99% reported. Requisite pretreatment BMPs receive no additional TSS removal credit per the Handbook

6.2 Rain Garden BMP

6.2.4 The design of the Rain Garden BMP is not consistent with the Stormwater Handbook. The planting soil and stone specifications and thicknesses do not match the Handbook detail.

6.2.5 Rain Garden BMPs have an expected TSS removal rate of 90% if designed in accordance with the Handbook. The BMP better resembles a landscaped infiltration basin that has an expected TSS removal rate of 80%.

6.2.6 Separation of the bottom of the Rain Garden BMP and seasonal high groundwater appears to be about 2.5 feet.

6.2.7 The limits of the bottom of the Rain Garden (elevation 103.5) should be shown on the plans.

6.2.8 The two specification notes for seeding the bottom of the Rain Garden are inconsistent. We don't think "New England Wet Mix" is appropriate considering the amount of groundwater separation.

6.2.9 There are a lot of plants proposed for the Rain Garden. The planting schedule should be reviewed for spacing guidelines.

6.3 Stormceptor Proprietary BMP

6.3.1 The Stormceptor 450i was originally designed by the manufacturer to be used as a stand-alone inlet. The manufacturer claims it will remove 93% of the annual TSS loading on this Project. It is Nover-Armstrong's opinion that the removal efficiency of proprietary BMPs claimed by the manufactures exceed actual rates found in the field.

6.3.2 As the unit is provided here in an "off-line" configuration and captures a relatively small amount of impervious area, it is our opinion however that the units combined with the Deep-Sump Catch Basin BMPs will remove at a minimum the 44% TSS required for discharges near or to critical areas or within an area of soils with rapid infiltration.

7.0 SUMMARY

Based on our technical review of the plans provided with the NOI, the Applicant has not provided sufficient information for the Commission to issue an Order of Conditions at this time. They should address the comments presented herein and submit revised, more detailed design plans for further review.

Sincerely
Nover-Armstrong Associates, Inc.

Henry T. Nover, MA Civil P.E. 30339
Senior Engineer