Memorandum

To: Mr. Michael Behrendt
Durham Town Planner
Town of Durham
8 Newmarket Road
Durham, NH 03824

Date: March 4, 2021

VHB Project #: 52747.01

Map & Lot: 10, 8-6

From: Mark J. Verostick, P.E.
Senior Project Engineer

Re: Technical Review
Residential Subdivision
93 Bagdad Road
Durham, New Hampshire

As requested, VHB has conducted a technical review of plans and information related to the stormwater management design submitted for a proposed residential subdivision to be located off of Gerrish Drive. VHB reviewed the following information associated with this project:

- Site Plan for Michael & Marti Mulhern, 93 Bagdad Road, Durham, NH, dated October 28, 2020 and revised through February 4, 2021, prepared by MJS Engineering, P.C.
- Drainage Report, prepared for Michael and Marti Mulhern, 91 Bagdad Road, Durham, NH 03824, Tax Map 10, Lot 8-6, dated December 9, 2020 and revised through February 15, 2021, prepared by MJS Engineering, P.C.
- Pre-Development Conditions Plan and Post-Development Conditions Plan, dated 10/28/20 and revised through 3/2/21, prepared by MJS Engineering, P.C.
- Stormwater Systems Management Plan, prepared for Michael and Marti Mulhern, 91 Bagdad Road, Durham, NH 03824, Tax Map 10, Lot 8-6, dated February 15, 2021, prepared by MJS Engineering, P.C.
- Culvert Design memo and analysis prepared by MJS Engineering, P.C.

The following sections contain VHB's comments relative to the information reviewed:

GENERAL COMMENTS

1. On Thursday, February 25, 2021, I attended a site walk with Mr. Michael Behrendt (Durham Town Planner), Mr. Richard Reine (Durham Director of Public Works) and Mr. Mike Sievert (MJS Engineering, P.C.) to review the existing conditions and the proposed development at the project site. We reviewed the proposed roadway layout that had been previously staked out, existing wetland areas, approximate location of proposed stormwater features and spent some time looking at the locations of the two culvert crossings on the entrance roadway at approximate stations 1+75 and 4+10. There is an existing drainage channel to the north of the proposed roadway that allows runoff to flow from an existing driveway culvert on Tax Map 10 lot 6-10. This drainage channel is on the downstream side of the proposed entrance roadway, joins another drainage channel near the downstream end of a proposed roadway culvert and then continues flowing to the north, downstream and away from the proposed roadway. The proposed roadway does not appear to affect the flow of this channel because the road will be constructed upstream from this channel. There is another drainage channel that flows from the abutting

property to the south (Tax Map 10 lot 6-9). A proposed 5-foot wide by 2-foot high concrete box culvert is proposed at the location where this existing drainage channel crosses the proposed roadway. Based on the culvert analysis provided to VHB, it appears this proposed culvert has been adequately sized to accommodate runoff from a 100-year design storm and maintain at least 1-foot of freeboard from the lowest point on the proposed entrance road. Therefore, based on my observations in the field and the information reviewed it does not appear that the project as proposed would result in any stormwater impacts on the adjacent upstream lots including Tax Map 10 Lots 6-9, 6-10, 6-11 and 6-16.

PLANS

Existing Conditions Plan (Sheet C100)

2. VHB recommends labeling the exiting driveway culvert on Tax Map 10 Lot 6-10 for reference.

Grading and Drainage Plan - Entrance (Sheet C104)

3. The total area of disturbance is noted as 195,821 SF, accordingly an Alteration of Terrain Permit will be required from NHDES and the requirements of Env-W1 1500 will need to be met.
4. The proposed temporary erosion control measures (e.g. compost filter sock, rolled erosion control, stabilized construction entrance, etc.) should be shown on the plan view to confirm the locations.
5. It should be confirmed that the wetland impact associated with the access road will include the final design of the upstream headwall of the culvert at approximate station1+50.

Grading and Drainage - Plan Cluster (Sheet C105)

6. Stormwater runoff from the proposed development flowing to the sediment forebay near station 15+25 should be treated prior to discharging to the adjacent wetland. VHB recommends evaluating whether the water quality flow to this sediment forebay could be piped separately to the first cell of the proposed gravel wetland.
7. A detail for the sediment forebays should be provided and calculations should be included for conformance with the requirements of Env-Wq 1508.11.
8. The roadway, approximately from station 13+00 to 15+50, appears to be superelevated toward the outside of the loop road and should be revised to direct runoff to the inside of the loop road to be collected for detention and treatment.
9. The proposed 12" culvert at approximate station 15+70 is modeled as an 18" culvert in the hydrocad model. Outlet protection should be provided for this culvert.
10. The design of the gravel wetland should be checked for conformance with the UNH Subsurface Gravel Wetland Design Specifications. The 6" outlet pipe invert should be only 4" to 8" below the wetland soil surface. Also, the internal underdrain piping and risers should agree with the layout shown in the detail on sheet C505.

11. It appears a driveway culvert may be required at Unit #15. VHB recommends providing additional information (pipe size and inverts) for all driveway culverts.

12. VHB recommends a minimum 12" pipe diameter be considered for the 8" culvert at approximate station 11+75 to reduce the potential for clogging.

Roadway Plan and Profile (Sheet C201)

13. VHB recommends including details for the proposed culverts, headwalls and block retaining walls on the final plans to ensure the wetland impacts will account for the installation and any related foundations.

Construction Details (Sheet C502)

14. A detail for the outlet control structure related to the typical stormwater pond detail should be included on the final plans.

15. The perforated pvc underdrain pipe and the outlet should be shown on the grading and drainage plans.

16. The surface treatment for the spillway detail should be labeled. It appears that it is intended to be stone as shown on the grading and drainage plans.

Construction Details (Sheet C504)

17. Typical drain manhole and catchbasin details should be removed for clarity if not intended to be used on the project.

Construction Details (Sheet C505)

18. A detail for the outlet control structure should be provided for the proposed gravel wetland.

DRAINAGE REPORT

19. The final drainage report should be signed and sealed by the design engineer.

20. The drainage plans should be included in appendix B.

21. The final drainage report should incorporate the requirements of NHDES Alteration of Terrain Env-Wq 1500, including BMP worksheets.

22. A copy of the site specific soil survey plan described in the soils section should be included and be stamped by the soil scientist.

23. The post-development peak flows for POA 1 listed in Table 1 should be revised to agree with the hydrocad results. The 2-year post-development peak runoff rate should be 36.25 cfs and the 25-year post-development peak runoff rate should be 121.10 cfs. This shows a minor increase in the 25-year flow rate which should be reviewed by the designer.

24. The inlet invert elevation should be added to Reach C1.

25. The outlet devices from the proposed gravel wetland (Pond 19P) show device #4 and #5 with the same invert elevation. A detail of the outlet structure should be provided and confirmed these two devices can have the same invert elevation or the model should be revised.

STORMWATER SYSTEMS MANAGEMENT PLAN

26. Any maintenance recommendations for the pervious pavement should be included.

27. A copy of the stormwater systems overview plan was not included in Appendix A.

CULVERT DESIGN MEMO AND ANALYSIS

28. VHB recommends including this analysis in the final drainage report and providing a similar analysis for the larger wetland crossing culvert to verify adequate capacity is provided.

STATE PERMITS

The project will require the following state permit(s) associated with the site design:

- NHDES Alteration of Terrain Permit
- NHDES Dredge and Fill Permit
- NHDES Sewer Connection Permit

Copies of all state permits should be submitted to the Planning Department.

Please feel free to contact me if you have any questions regarding the above comments.

cc: Richard Reine, Director of Public Works – Town of Durham
April Talon, P.E., Town Engineer – Town of Durham