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April 12, 2022

Daniel C. Hill  
Hill Law  
6 Beacon Street  
Suite 600  
Boston, MA 02108

Re: The Sanctuary, School Street, Manchester, MA

Dear Dan:

I have completed a preliminary review of the recently-provided test pit data and the revised site plans prepared by Allen & Major dated March 23, 2022. The test pits were excavated and data collected in April and November, 2020, but were only provided to the Board just a few weeks ago. My comments are as follows:

**1. Test Pit Data are Inconclusive and Inadequate.** Overall, these data indicate glacial till and shallow bedrock conditions within 108 inches (9 feet) of the land's surface for approximately half of the test pits (see Table 1). Groundwater was observed in only 4 of the 29 test pits.

However, neither of the test pit dates (April 8, 2020 and November 18, 2020) represent seasonal high groundwater conditions. According to historical water level data at USGS index wells in glacial till in Massachusetts, high groundwater levels can be expected to be as much as 3 - 6 feet higher than the conditions that existed on the test pit dates.

**2. The proposed stormwater infiltration area lacks adequate hydrologic data.** The revised plans rely heavily on the large stormwater infiltration system located in the former wastewater disposal area. Six test pits are shown in this area (see figure 1 and yellow highlights in Table 1). Groundwater was not observed in any of these. The feasibility of this infiltration system will be partially determined by hydrologic conditions (depth to estimated seasonal high groundwater (ESHGW) and groundwater mounding. The groundwater mounding analysis is triggered if high groundwater (ESHGW) is within four feet of the bottom of the infiltration systems.

As none of the test pits that are provided in this area determined groundwater levels additional field work is necessary. This could be accomplished with additional test pits and/or installation of monitoring wells. Because groundwater levels fluctuate significantly, monitoring wells are best suited for this analysis. Pressure transducers can be placed in wells to monitor water levels on a continuous basis in order to determine the high groundwater conditions. Test pits can be

helpful if they happen to be conducted during the high-water conditions or if soil mottling is clearly observed<sup>1</sup>. In this case no soil mottling was observed in the test pits.

**3. The proposed project will result in significant alternations to the drainage area associated with the on-site vernal pools.** The site plans show a large wetland system interior to the development (delineated with “A” series flags) that contains two vernal pools. This wetland is dependent on water levels that are supported by groundwater discharge as baseflow throughout the year. The rates and timing of baseflow is dependent upon groundwater recharge within the drainage area to the wetland.

According to the “Existing Watershed Plan” attached to the drainage report, the existing drainage area to this wetland, labelled “E-4” on the watershed plan, measures 185,366 square feet. In post-development conditions this drainage area, identified as area “P-4” on the “Proposed Watershed Plan,” is reduced to 123,881 square feet. Two small post-development watersheds (P-5 and P-6) are directed to a bioretention area near the outlet of the wetland. This represents a reduction of approximately 33% of the contributing drainage area and will result in significantly reduced groundwater recharge to the wetland/vernal pool complex and reduced water levels and vernal pool habitat areas.

On April 5, 2022, the Applicant submitted a detailed list of requested waivers from the Manchester Wetlands Bylaw and Regulations, including waivers from specific provisions protecting vernal pools. In the waiver request, the Applicant stated that “[a]s will be demonstrated by the Applicant’s consultant, the project will not impair vernal pool function.” We do not know how the Applicant intends to demonstrate no adverse impact, but it is recommended that detailed hydrologic budgets for pre- and post-development conditions be prepared to analyze these impacts. This analysis should include monthly and seasonal alterations to the wetland system.

I am continuing to review and evaluate other aspects of the proposed project and will provide additional comments. Please contact me with any questions that you have.

Sincerely,



Scott Horsley  
Water Resources Consultant

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<sup>1</sup> Mottling refers to coloration or staining of soils that represents high groundwater conditions. It defined by the MADEP as “A color pattern in soil consisting of blotches or spots of contrasting high or low chroma colors which may be an indication of the upper extent of soil saturation by groundwater”.

Table 1 - Summary of Test Pit Data (depths shown in inches)

TP	date	geology	soil texture	land elev	overall depth	depth mottles	depth weeping water	depth standing water	depth to refusal bedrock/ledge
1	4/8/20	till	sandy loam		108				108
2	4/8/20	till	sandy loam		60		24		60
3	4/8/20	till	sandy loam		60				60
4	4/8/20	till	sandy loam		60		55		60
5	4/8/20	till	sandy loam		24				24
6	4/8/20	till	sandy loam		53				
7	4/8/20	till	sandy loam		144				53
8	4/8/20	till	sandy loam		108				
9	4/8/20	till	sandy loam		144				
10	4/9/20	till	sandy loam		108				
11	4/9/20	till	sandy loam		84				84
12	4/9/20	till	sandyloam		120				
14	4/9/20	till	sandy loam		82				82
15	4/9/20	till	sandy loam		100				100
16	4/9/20	till	sandy loam		80		44	80	80
17	4/9/20	till	sandy loam		60		32		60
18	4/9/20	till	sandy loam		59				59
OSE-TP-1	11/18/20	till	loamy sand		120				
OSE-TP-2	11/18/20	till	loamy sand		120				
OSE-TP-3	11/18/20	till	loamy sand		120				
OSE-TP-4	11/18/20	till	loamy sand		120				
OSE-TP-5	11/18/20	till	loamy sand		120				
OSE-TP-6	11/18/20	till	loamy sand		120				
OSE-TP-7	11/18/20	till	loamy sand		120				
OSE-TP-8	11/18/20	till	loamy sand		67				67
OSE-TP-9	11/18/20	till	loamy sand		120				
OSE-TP-10	11/18/20	till	loamy sand		120				
OSE-TP-11	11/18/20	till	loamy sand		58				58
OSE-TP-12	11/18/20	till	loamy sand		120				