Scott Horsley
Water Resources Consultant
65 Little Road • Cotuit, MA 02635 • 508-364-7818

February 3, 2025

Mr. Charles Tirone, Chairperson
Town of Arlington
Conservation Commission
730 Massachusetts Avenue
Arlington, MA 02476

RE: Thorndike Place

Dear Mr. Tirone and Conservation Commissioners:

I have reviewed the recent reports prepared by BSC and peer reviewer GZA and offer the following comments. I continue to disagree with the suggested use of 4.0 feet as an appropriate seasonal high groundwater level. I have consistently questioned this value since the beginning of my reviews that I have provided to the town (2021). It is not based upon MADEP Handbook recommended methods and is inconsistent with other water level measurements in the area (including the wetland).

The applicant is now using this suggested value of 4.0 feet to avoid providing a groundwater mounding analysis of the stormwater infiltration system. They have adjusted the bottom of the infiltration system to elevation 8.0 and are claiming because they have 4-feet vertical separation that they are no longer obligated to provide a groundwater mounding analysis of that system.

We respectfully ask the Arlington Conservation Commission and GZA to reconsider the determination of estimated seasonal high groundwater (ESHGW) elevation of 4.0 which is used as the foundation for the site design. There are multiple lines of evidence that suggest that this value of 4.0 is not reliable and likely understates the required design elevation. Specifically, we request a fresh look at test pit data provided by the town's consultant Whitestone, the applicability of the water level data provided at the USGS Lexington well and our own wells installed along Dorothy Road on behalf of the Arlington Land Trust (ALT). These multiple lines of evidence are as follows.

**1. The MADEP Handbook:** The MADEP Handbook provides two accepted methods to determine estimated seasonal high groundwater (ESHGW). These include 1) the identification of redoximorphic (redox) features (exhibited as water stains in the soils), and 2) measured water levels during the Spring months that are then compared (and adjusted if necessary) with USGS index wells (see Figure 1 below). These methods were not followed by the applicant in identifying the ESHGW elevation. They did not use the redox features which were identified by Whitestone and they did not compare (and adjust) their groundwater level measurements with USGS wells.

*Determining Seasonal High Groundwater*

Seasonal high groundwater represents the highest groundwater elevation. Depth to seasonal high groundwater may be identified based on redox features in the soil (see Fletcher and Venneman listed in References). When redox features are not available, installation of temporary push point wells or piezometers should be considered. Ideally, such wells should be monitored in the spring when groundwater is highest and results compared to nearby groundwater wells monitored by the USGS to estimate whether regional groundwater is below normal, normal or above normal (see: http://ma.water.usgs.gov).

Figure 1 – Excerpt from MADEP Stormwater Handbook, Volume 3, Chapter 1

**2. The Whitestone Report:** Two test pits were conducted May 18, 2023 by the town's contractor Whitestone within the proposed infiltration system INF-1. TP-7 in this report identified redox features at a depth of 32 inches (elevation 5.8). However, this was discounted as "likely perched". Yet, no confining layers that might create a perched condition are noted in any of the four test pits within the proposed area of infiltration system 1P. This observation of redox features complies the methods recommended in the MADEP Stormwater Handbook to determine seasonal high groundwater and deserves further consideration as a reasonable indication of ESHGW.

**3. Measured Water Levels**: BSC conducted two additional test pits within the area of the infiltration system INF-1 on April 17, 2024. Neither of these test pits exhibited redox features. Therefore, BSC observed the depth of "weeping water" in the test pit TP-9 at 90 inches (7.5 feet) and simply subtracted this from the test pit grade elevation (11.47 feet) and calculated a value of 3.97 feet (see Table 1 below). Based upon this they assumed the ESHGW elevation of 4.0.

"Weeping water" refers to temporarily observed water seeping (or weeping) from the sidewalls of the test pit at the time of the excavation. This is not an acceptable method to identify ESHGW. Rather, this simply shows a minimum level observed at the time of the test pit excavation.

Table 1 – Water Level Measurements and ESHGW estimates (BSC, April 17, 2024)

| Test Pit | Existing Grade | Total Depth (in.) | Depth Fill (in.) | Depth Standing GW (in.) | Depth Weeping GW (in) | Depth to Redox (in.) | ESHGW |
|---|---|---|---|---|---|---|---|
| TP-7 | 8.92 | 114 | 108 | 110 | n/a | n/a | -0.24 |
| TP-8 | 11.83 | 120 | 120 | n/a | 112 | n/a | 2.50 |
| TP-9 | 11.47 | 118 | 100 | 116 | 90 | n/a | 3.97 |
| TP-10 | 11.27 | 130 | 130 | 126 | 94 | n/a | 3.44 |
| TP-11 | 11.09 | 114 | 114 | 111 | 93 | n/a | 3.34 |
| TP-12 | 8.37 | 76 | 76 | 68 | 53 | n/a | 3.95 |
| TP-13 | 7.96 | 74 | 74 | 67 | 57 | n/a | 3.21 |

**4. Comparison with USGS Wells:** As stated earlier (and shown above in Figure 1), the MADEP Handbook recommends comparing observed groundwater levels with USGS wells. However, no such comparison (or adjustment) was made by BSC with USGS index wells.

Figure 2 shows a comparison of water levels measured in a well installed by BSC at the location of TP-9 (red dots) with the USGS Lexington well hydrograph during the 2024 spring period. This comparison shows that BSC water level measurements were reported on dates that missed all of the peak levels recorded at the USGS well during the Spring 2024 period. The highest groundwater levels were observed at the USGS well on March 24, 29, and April 4. Had BSC used a continuous recorder (as I recommended in my earlier comment letters) they would have likely recorded higher levels, consistent with the USGS well).

This comparison shows that the highest water level measured by BSC was on April 1 when the USGS well was more than one foot below its peak high measurement on March 10. This suggests that the ESHGW would be at least 5.0 feet. This would be consistent with the redox level of 5.8 feet reported by Whitestone.

This same variance in groundwater levels is further corroborated with our own water level measurements at the Arlington Land Trust well located on Dorothy Road which showed a peak elevation on March 29, 2024 and a similar decline throughout much of April to a level of approximately 1-foot lower on April 17 when the test pits were excavated (see figure 3). This suggests that the relative groundwater level fluctuations over this period are consistent with the USGS Lexington well (which showed a 1-foot decline during this same period).

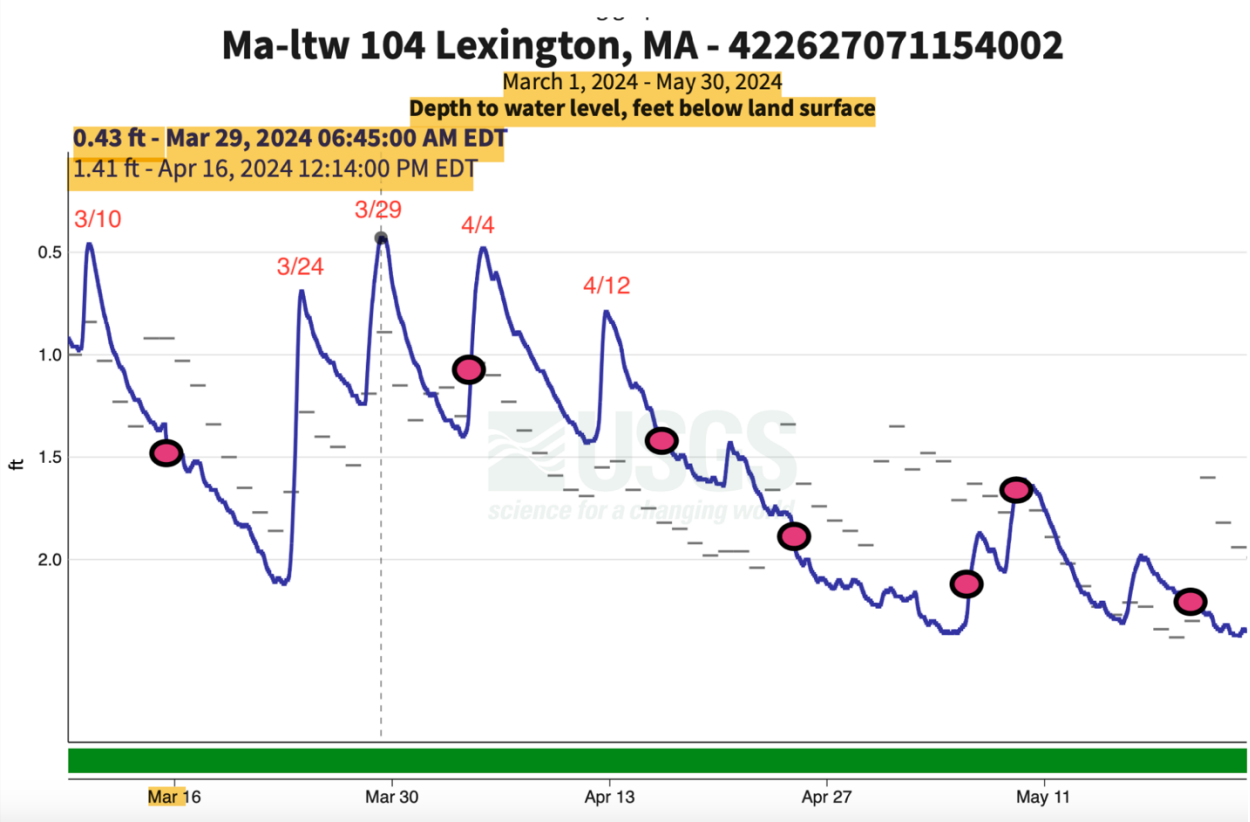


Figure 2 - Hydrograph for USGS Lexington Index Well (March - April 2024)

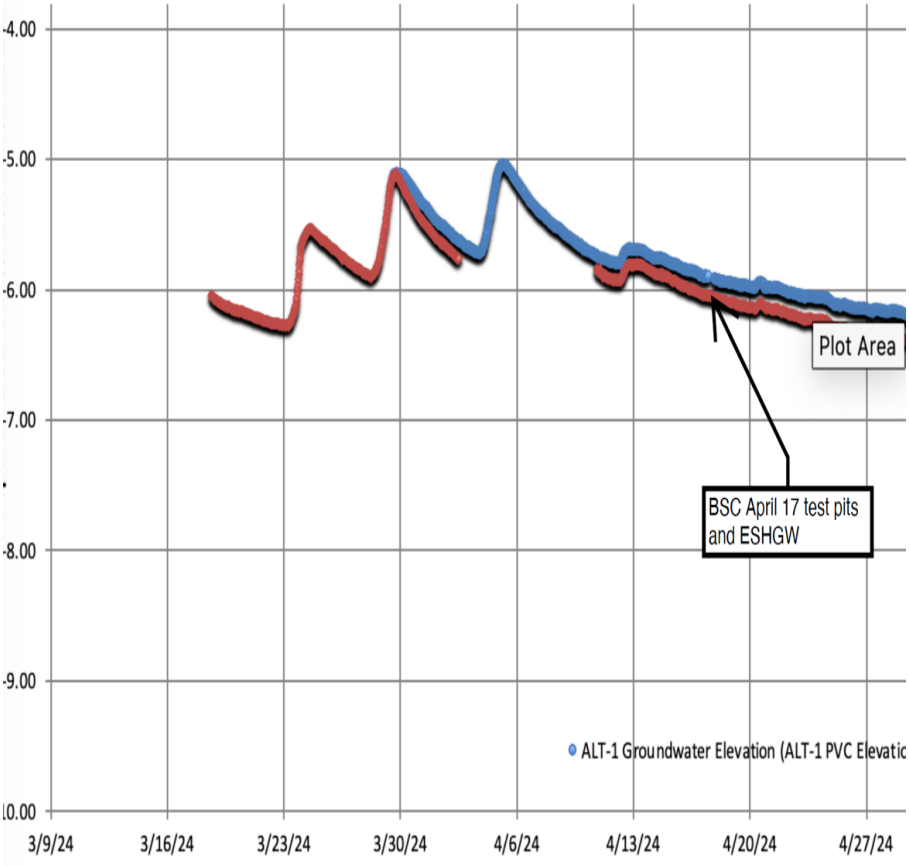


Figure 3 - Hydrograph for Arlington Land Trust (ALT) Monitoring Wells at Dorothy Road (March - April 2024)

**5. Summary**

In summary, I believe that:

a) the applicant underestimates seasonal high groundwater conditions and a value of 5.0 – 5.8 feet should be utilized rather than 4.0 feet. This provides a more realistic and conservative value.

b) a groundwater mounding analysis is required and should be evaluated for the revise infiltration system #1. This has not been provided by the applicant.

Thank you for the opportunity to provide these comments. Please contact me directly with any questions that you might have.

Sincerely,

Scott W. Horsley
Water Resources Consultant