Responses to Horsley Comments 2 May 2022 Weston ZBA Meeting

Mr. Horsley uses text (slide 1) from the Massachusetts Stormwater Handbook about when a groundwater mounding analysis for stormwater infiltration is required. The distance from the bottom of the stormwater infiltration systems to estimated seasonal high groundwater table (EHGWT) is greater than four feet and therefore a mounding analysis for the stormwater systems is not required.

Mr. Horsley represents that breakout of infiltrated waters will occur under the design event, and the basis for his argument is that the computed/observed groundwater elevation from Hurricane Ida are lower than the post development design event groundwater elevation at the wetlands (slides 7 and 8). Unfortunately, this is an apples to oranges comparison: Hurricane Ida did not occur during a period of high groundwater levels; groundwater levels did rise significantly as result of the hurricane. In general, across the 518 South Avenue site, the groundwater table rose over one foot due to Hurricane Ida. If a one-foot difference is added to the Hurricane Ida groundwater levels of Horsley's slides 7 and 8, the result is that post development the groundwater elevations at the wetland due to the design event are LOWER than what would be created by Hurricane Ida if that Hurricane had happened at a high groundwater table elevation. The applicants' conclusion from the MODFLOW modeling is that there will not be changes to how the wetland functions after development, including saturation after rainfall events.

Mr. Horsley (slide 11) makes an oversimplification of the hydrology at the site to maintain that all infiltrated treated wastewater must flow to the intermittent stream. The basis of this premise is the following figure:

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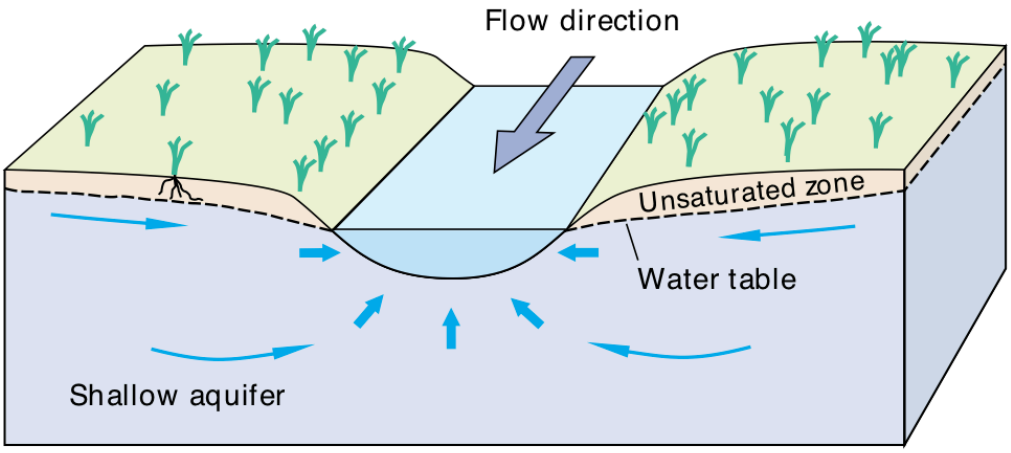
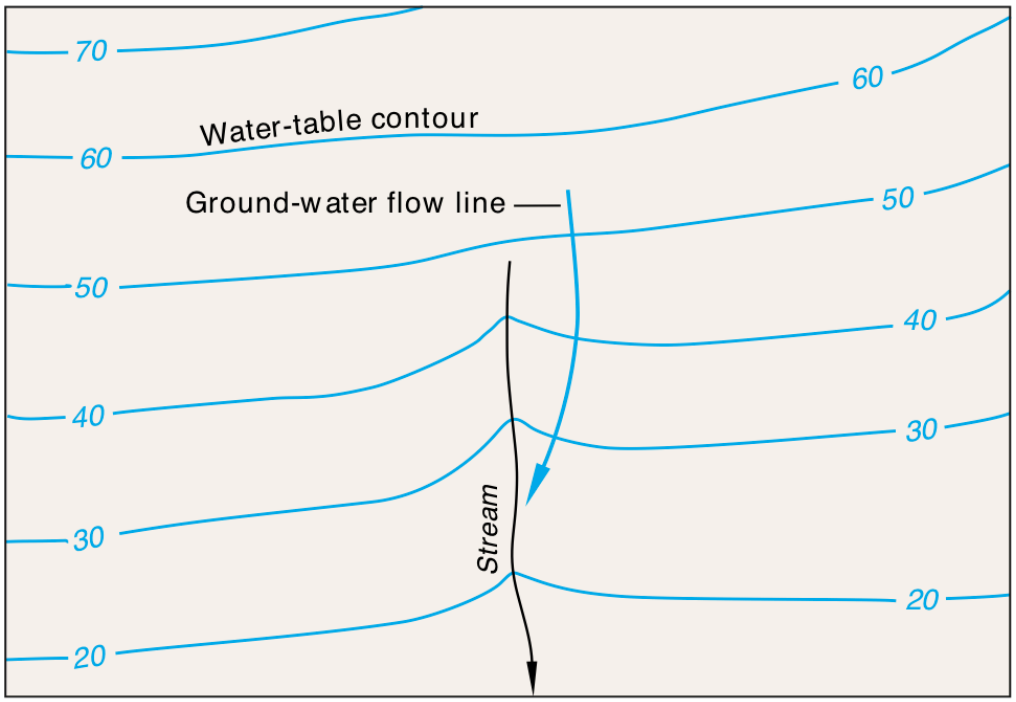
GAINING STREAM

A



B



The problem here is that this figure does not depict the intermittent stream at the site but rather a perennial stream. As is common to many of Mr. Horsley's positions, he starts with a faulty assumption and builds his logic from there: the result is a faulty conclusion. Mr.

Horsley's oversimplification of the site hydrology is then used as the basis for estimates of the movement of contaminants. Intermittent streams may subscribe to this figure during certain times of the year: when the stream is flowing and during times outside of rainfall runoff events. When the intermittent stream is not flowing, the figure is completely in error. In particular Mr. Horsley believed that the water infiltrated from the applicants' infiltration basins had no other option than to flow to the stream, which of course cannot happen when the intermittent stream is dry: the fate of the infiltrated water when the intermittent stream is dry is to flow in a southeasterly direction with groundwater where offsite it may or may not flow into the stream. Obviously when the intermittent stream is dry, groundwater is not flowing into the stream, if it did, the stream would not be dry. As evidenced in Mr. Horsley's figure, away from the stream the groundwater contours clearly demonstrate groundwater flowing parallel to the stream. The intermittent stream resides on the sand and gravel on the east of the applicant's site, and both the stream and the sand and gravel continue south of the site. Therefore, contrary to Mr. Horsley's belief that all site infiltrated water must flow to the intermittent stream, the real fate for the infiltrated water is to move with groundwater both on and offsite, for a portion of it to be removed through evapotranspiration, and for some portion to discharge into the intermittent stream during periods when the stream is flowing.

As previously mentioned, during rainfall runoff periods, the water level in the intermittent stream rises much faster than the groundwater below it. In these cases also, Mr. Horsley's oversimplification of the hydrology is incorrect. During these periods, surface water flows downwards to recharge groundwater. After the storm and the stream recedes, some of this stream-recharged groundwater may flow back into the stream (known as streambank storage). The percentage of the stream-recharged water that flows back out to the stream after a storm is site dependent. During events such as this, because the stream is pushing water into the ground, it effectively acts as a barrier to groundwater infiltration. Accordingly, water infiltrated from the applicants' infiltration systems would not all go to the stream, but flow generally in a southeasterly direction with ambient groundwater, with only a portion possibly discharging into the stream.

Mr. Horsley then continues with the assumption that all the treated wastewater from the site discharges into the Intermittent stream, and then at a very low streamflow (7Q10) it all mixes with the stream and flows offsite (slides 12 and 13). The assumption that all the wastewater flows to the stream is incorrect and the assumption that the treated wastewater was not diluted by both ambient groundwater and infiltrated stormwater is erroneous. Mr. Horsley

then goes on to look at Phosphorus as one of the elements of concern entering the intermittent stream from the proposed development and uses a USGS study on Cape Cod as validation (slides 14 and 15). The USGS Cape Cod study investigated the plume of infiltrated wastewater from the Massachusetts Military Reservation. Given the degree of Phosphorus in munitions, this wastewater is not considered representative of the domestic wastewater expected to be generated at the 518 South Avenue site. In addition the designed wastewater loading at the Cape Cod site was three million gallons per day, two orders of magnitude greater than the proposal at 518 South Avenue: Mr. Horsley's failure to consider the nature of wastewater and sub-surface conditions at the site of the cited study is at best poor science and indicative of his approach to draw conclusions from highly selective data, rather than from the full body of evidence.

As stated in our previous response to Mr. Horsley's request for an analysis of pollutant loading into Nonesuch Pond, if Mr. Horsley's assumptions about nutrient and pollutant loading into Nonesuch Pond were even close to reasonable, then the Weston Public School's treated wastewater infiltration system would have already driven the Pond to eutrophication, and this has not happened.

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Fundamentally Mr. Garner bases his opinions on the flawed positions of the peer reviewers. In that regard he believes that all infiltrated water on the 518 South Avenue site will exit in the wetlands, and wetlands hydrology will be adversely impacted. The latter comment has been addressed previously by the applicant: 1.) today, infiltrated rainfall moves towards and parallel to the wetlands and that will continue post-development, and 2.) the infiltrated treated wastewater is on the order of a 4% increase in watershed groundwater hydrology at the 518 South Avenue site and not all of this water necessarily reaches the wetlands or intermittent stream, but if it should, no documentation has been found to indicate or imply that this constitutes an adverse impact to the wetlands and the peer reviewers have offered no such documentation.

Sincerely,

Thomas P. Ballestero, PhD, PE, PH, PG, CGWP
Principal