AECOM

October 13, 2016

Mr. Andrew R. Port, AICP
Director of Planning & Development
City of Newburyport
60 Pleasant Street
Newburyport, MA 01950

SUBJECT: Review of Water Resources Impact Evaluation Report, Evergreen Commons, LLC, Newburyport, Massachusetts, 2016

Dear Mr. Port:

We are in receipt of the September 2016 Water Resources Impact Evaluation Report for the Evergreen Commons Development in Newburyport prepared by Northeast Geosciences, Inc. (NGI). Per our Agreement with the City of Newburyport, we have conducted a review of the content of the report. We have also referenced the following historic documents during our review:

1. Report of Findings, Evergreen Estates & Golf Course, Newburyport, Massachusetts for Board of Water Commissioners by M. Anthony Lally Associates, September 17, 1985.

2. City of Newburyport, MA Zoning Board of Appeals Special permit for a 9-hole golf course and clubhouse at 63 Ferry Road, September 25, 1985.

3. Source Water Assessment Program Conceptual Zone II Delineation, Newburyport Water Works Gravel Packed Wells 1 and 2, prepared for MassDEP, by TEEM, LLC, final revision June 2001.

Before we provide our thoughts on NGI's Water Resources Impact Evaluation Report, we would like to note the intent of a Zone I and Zone II of a municipal-water supply well.

> Zone I: A Zone I for a municipal well is normally a 400-foot radius, which is intended strictly as a sanitary setback. No sewer and no septic systems are allowed in Zone I. Indeed, no human activities are allowed in Zone I, apart from those related to water-supply. Zone I dates back to the 1950s, and represents the 1950s-era belief that bacteria and viruses of human origin are sufficiently filtered from groundwater in a distance of 200 feet. The Department of Public Health (DPH) doubled the setback to 400 feet as a conservative measure. The 400-foot radius has proven to be a good and reasonable distance, although we have learned a lot more about the survivability of bacteria and viruses since then.
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> Zone II: A Zone II is more scientifically based than Zone I. Zone II came about in the early 1980s as it was gradually recognized that certain human activities in the broader recharge area could contaminate well water. Contaminants such as gasoline compounds, degreasing solvents, road salt, and others are not well filtered in groundwater systems of New England, and can travel significant distances once they reach the water table. Zone II reflects a more modern understanding of groundwater flow and hydrogeology. Newburyport's Zone II delineation was completed in 1999 with a final version issued in 2001. The original water resource protection district ordinance went into effect in July 1998 and was modified in October 2003.

We have the following comments concerning the NGI report:

1. Introduction, page 1. The report notes that the proposed development will eliminate the golf course as a potential source of contamination to the wells.

AECOM Comment: The Zone II Delineation report prepared by TEEM, LLC identified the golf course as a moderate risk for contamination based on a MassDEP land use matrix. It is unknown if TEEM was aware of or considered the fact that significant restrictions were placed on the golf course construction and operation when it was approved by the ZBA in September 1985. The ZBA imposed 22 conditions on the golf course to reduce possible water quality impacts to Well No. 2. These conditions included strict limitations on the type of insecticides, herbicides, fungicides, and fertilizers that could be used by the golf course. The conditions also limited the frequency of applications and the application rates. The ZBA conditions required that a certified superintendent be responsible for handling and applying the insecticides, herbicides, fungicides, and fertilizers. It is AECOM's opinion that the conditions put in place by the ZBA in 1985 have contributed to the excellent water quality that the City currently has at Well No. 2. As such, it is AECOM's opinion that, in practice, the golf course may have represented a lower risk to groundwater than a typical golf course.

2. Section 5, page 4. The NGI report notes the presence of a bedrock high in the northeast portion of the Evergreen Commons Property which forms a hydraulic boundary to the flow of Well No. 2.

   AECOM Comment: Only one boring was taken in the area of the bedrock high which identified the top of bedrock was approximately elevation 56. The water-table elevation in the vicinity of this boring was found to be 45 to 46 feet above sea level at the time of NGI's work. The seasonal high groundwater elevation in this area was between 53 and 55 feet based on test pits conducted by NGI. It is AECOM's opinion that one boring does not confirm the presence of a bedrock high. It is also AECOM's opinion that under certain hydrologic conditions, groundwater could pass over the top or around the bedrock high and flow toward Well No. 2. AECOM's point is that the information provided to date is insufficient to confirm the extent of the bedrock high and it is possible that more than the 50% of the groundwater on the Evergreen Commons Property flows toward Well No. 2 as noted in the NGI report. As such, it is AECOM's opinion that activities anywhere on the site could impact the water quality of Well No. 2 and possibly Well No. 1. It should be noted that most of the proposed Evergreen Commons residential units fall on the southern portion of the site where groundwater flow to Well No. 2 is undisputed.

3. Section 7, page 5. The report notes that the sodium levels at Well No. 2 peaked at 51 mg/L in 2003 and have decreased to approximately 27 mg/L or approximately 11% of the secondary drinking water standard of 250 mg/L for sodium.

   AECOM Comment: There is no secondary drinking water standard for sodium. There is a secondary maximum contaminant level (SMCL) for chloride, which is 250 mg/L. Therefore, the reference to a percentage of the "secondary drinking water standard" is not correct. The MassDEP published a Notification Form on Sodium in Public Drinking Water, Updated October 2006. This document established a guideline of 20 mg/L for sodium, which is in line with the limit applied to bottled water by the US Food and Drug Administration for low sodium water. The 20 mg/L, when exceeded, does not require treatment to reduce levels to prevent adverse health effects on public health. The guideline represents a level of sodium in water that physicians and sodium-sensitive individuals should be aware of in cases where sodium exposures are being carefully controlled. AECOM's point is that the sodium levels at Well No. 2 are currently in excess of the 20 mg/L threshold established by MassDEP to protect sodium-sensitive individuals. As such, sodium should be considered a contaminant because too much sodium can have adverse health impacts on certain individuals.

4. Section 8, page 5. The land uses presented in this section are for the combined Well No. 1 and Well No. 2 Zone II areas. The report notes that 47% is forest, 18% residential, 13% golf course, 10% transportation, 10% agricultural, and 1% water-supply protection.

   AECOM comment: Most of the proposed Evergreen Commons development falls within the Well No. 2 Zone II area. AECOM would like to see the land uses broken out by individual well to better understand the proposed development's impact on the Well No. 2 water quality. We would also

like to see the projected Well No. 2 Zone II land uses recalculated to include the proposed development.

5. Section 10, page 8. The report notes that residential land uses are allowed in Zone II according to the Newburyport Water Resources Protection District. The report notes that extensive experience evaluating wellhead protection has not identified discharges on residential properties as a common source of groundwater contamination.

   AECOM Comment: Residential development is allowed in the Zone II in Newburyport's Water Resource Protection District provided that it does not cause or contribute to the contamination of the public water supply. In the case of the proposed development, the concern would be contamination of Well No. 2. It should be noted that all but three of the homes in the Zone II areas for Well No. 1 and Well No. 2 were already constructed when the Zone II was completed in 2001.

   We would like to point out that ground-surface elevations on the golf course are in the range of 59 to 61 feet above sea level where the residential houses are proposed. Seasonal high groundwater elevations were determined to be in the range of 52 to 55 feet over the site, which corresponds to groundwater being approximately 7 feet below grade. Board of Health regulations require two feet of separation between the foundation of a building and the seasonal high groundwater level. It is AECOM's opinion that the closer to the groundwater that new structures are built, the greater chance of contamination because the ground's ability to filter contamination is diminished. The proximity of stormwater infiltration structures and pools are also a concern. There is prior evidence dating back to around 1973/1974 where fill from a salt marsh was used to fill the gravel pit at the site after excavation exposed the groundwater table. M. Anthony Lally Associates reported that sodium, sulfate, chloride, and specific conductance readings increased at Well No. 2 as a result of these actions. The potential for contamination of the Well No. 2 supply as a consequence of the proposed development exists both during and after construction. Ground water elevations at monitoring well No. 6, at the adjacent Well No. 2 site, have been at or above 57 feet on two occasions in the last 10 years. The potential impact of the proposed development cannot be fully determined until detailed plans are made available showing proposed grading, foundation elevations, proposed stormwater collection and treatment, and any use restrictions that may be imposed.

6. Section 10, page 8. The report notes that it seems reasonable to expect an 8% increase in sodium concentration in Well No. 2 due to road salt impacts. The report goes on to say that the average sodium concentration in Well No. 2 was 26.6 mg/L and the Evergreen Commons development will likely increase the average concentration to 28.7 mg/L. The report states that there are no health based drinking water standards for sodium, and that EPA has established a secondary standard of 250 mg/L for sodium based on aesthetic concerns (i.e. salty taste), and that the post development conditions are far below the secondary drinking water standard of 250 mg/L.

   AECOM Comment: The projected increase in sodium levels may not account for a potential secondary access road from the site. A second access road would be expected to increase sodium levels even more. As previously noted, there is no secondary drinking water standard for sodium. The 250 mg/L standard (SMCL) applies to chloride. As also previously noted, MassDEP published a Notification Form on Sodium in Public Drinking Water, Updated October 2006, that established a sodium guideline of 20 mg/L, which is in line with the limit applied to bottled water by the US Food and Drug Administration for low sodium water. EPA published a Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Sodium, February 2003. The Advisory recommended reducing sodium concentrations in drinking water to between 30 and 60 mg/L based on aesthetic effects (i.e. taste). The Advisory noted that drinking water containing 30 to 60 mg/L of sodium is unlikely to be perceived as salty by most individuals. The point is that the projected sodium levels should be compared to 20 mg/L and possibly 30 to 60 mg/L, and not the 250 mg/L noted.

It should be noted that sodium levels in the City's water distribution system are measured annually. Over the past 9 years, sodium levels have ranged from 34 to 61 mg/L. The sodium levels in the distribution system can partly be associated with the addition of sodium hydroxide, sodium hypochlorite, and sodium fluoride as part of the treatment process. Regardless, sodium levels have exceeded the 60 mg/L EPA Advisory level in the past and any increase of sodium from Well No. 2 will increase the likelihood of the advisory level being exceeded again in the future.

It is AECOM's opinion that any increase in sodium above the current level is contributing to the contamination of Well No. 2. To follow the point about contributing to contamination, we would like to take this opportunity to provide the definition of contamination according to the EPA Safe Drinking Water Act:

> The EPA Safe Drinking Water Act (SDWA) defines "contaminant" as "***any*** *physical, chemical, biological or radiological substance or matter in water".* It goes on to say that "*Drinking water may reasonably be expected to contain at least small amounts of some contaminants. Some contaminants may be harmful if consumed at certain levels in drinking water. The presence of contaminants does not necessarily indicate that the water poses a health risk".*

The point is that EPA defines "contaminant" as any substance or matter in water. By definition, an increase in sodium levels at Well No. 2 would constitute contamination of the Well No. 2 supply. The projected increase in sodium levels also shows a direct link between actions at the proposed development site and the water quality in Well No. 2.

AECOM would also like to provide the following general comments that bear more on good drinking-water practice than the particulars of the proposed development.

7. Well No. 2 currently appears to have very-high quality water. The City wants to preserve the high quality. Also, it should be noted that Well No. 2 discharges directly to the water distribution system without passing through the City's water treatment plant.

8. Well No. 2 is a reliable water supply of high capacity, even during extreme drought. The City wants to maintain that.

9. The land uses in the near vicinity of Well No. 2 already create a risk of well contamination. Any new development will increase the risk of contamination.

10. The City has invested millions of dollars over the years in the infrastructure at Well No. 2, in its upgrades, operations and maintenance, and in water-supply protection. Well No. 2 is an important water asset. Good water supply practice calls for limiting human activity in recharge areas of water supplies. This is an acknowledged fact.

11. No amount of water-quality testing will prove one way or the other that the proposed development will not threaten groundwater quality. Industry (chemical, pharmaceutical, etc.) is constantly developing new chemicals with unknown properties, and unknown fate and transport mechanisms. USEPA cannot possibly keep up with all of these chemicals, either in terms of understanding them, testing for them, or regulating them. Homeowners purchase all kinds of chemicals with unknown properties, and are not always careful in their use, handling or disposal. For all practical purposes, it would be very difficult to effectively and reliably police the activities of 38 to 44 new homeowners and their families regardless of any conditions or restrictions placed on the home owners.

12. What Newburyport department will be responsible for enforcing any restrictions placed on the development with respect to chemical storage and usage? How would this department police the

activities of 38 to 44 homeowners and their families now and in the future with the possible resale of the property? Who will be responsible for educating residents and supervising compliance with the restrictions? How will new owners be educated when the property is sold? What restrictions will be placed on future additions and pools? Note that Arch Associates Consulting Hydrogeologists in a September 3, 1985 letter to M. Anthony Lally Associates stated that a golf course is no more threatening to the quality of groundwater than residential housing, partly because a golf course can be better controlled than a private home owner. AECOM agrees with Arch Associates statement and consequently disagrees with the development team's assertion that the proposed development will improve water quality at Well No. 2.

13. New, man-made groundwater contaminants are being discovered with regularity. MtBE, perchlorate, and PFASs are examples of groundwater contaminants identified in just the last 20 years. Even if these occur at trace levels in groundwater, their very occurrence undermines public confidence in their drinking water supply. At the very least, this puts the public water supplier on the defensive, and distracts his energies from maintaining or making needed improvements to the water system. At worst, the public water supplier may need to deactivate or abandon the supply. Emerging water quality threats to drinking water is a very big concern in the drinking water community, so much so that New England Water Works Association is dedicating the 2016 Water Resources and Sustainability Symposium to emerging water quality threats to drinking water sources. Contaminants of concern included 1,4-Dioxane, chlorates, PFC, PFASs. The NGI report has already shown that post-development activities on the site will increase sodium levels at Well No. 2. Therefore, the development team acknowledges the direct connection between proposed on-site activities and the water quality at Well No. 2.

In conclusion, at least half of, and perhaps all of the proposed development is in the recharge area of Well No. 2 based on the hydrogeology. The proposed development is 700 feet directly upgradient of Well 2, with maybe only a few weeks to a few months travel time to the well. Therefore, it is our opinion that the Evergreen Commons development could cause or contribute to the contamination of Well No. 2 based on the information presented.

Please feel free to call me at 978-905-2981 with any questions that you may have.

Yours sincerely,
AECOM

Doug Gove, P.E.
Associate Vice President

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