

Date: **March 7, 2023**

Project No.: **21347**

To: **Steve Studer, Berchem Moses**

From: **Mike Giggey**

Subject: **Avery Brook Homes Subdivision, Ledyard CT
Updated Review of Water Quality Impacts**

Introduction

Avery Brook Homes, LLC has proposed a 26-home subdivision to be located on four existing lots (9.2 acres in aggregate area) off Stoddards Wharf Road in Ledyard, within the watershed of Groton Utilities. My December 28, 2022 memorandum presented Wright-Pierce's initial comments on water quality concerns related to this project, and that memorandum was presented at the January 3, 2023 meeting of the Ledyard Inland Wetlands and Watercourses Commission. Since that meeting, we have received several additional submittals from the developer's consultants. We have found those materials to be largely incomplete and not fully reflective of all of the water quality issues of this project.

Project Setting

The project is located in the northerly portion of the Groton Utilities watershed, just north of Stoddards Wharf Road. Avery Brook and associated wetlands are located to the immediate east and north of the proposed project. Avery Brook flows into Billings Avery Reservoir at a point about 300 feet northwesterly of the northerly corner of the project site.

The site vicinity is relatively rural. There are approximately 8 to 10 nearby homes along Stoddards Wharf Road, all served by private wells and individual septic systems.

The soils have been shown to be sandy loams with high permeabilities and little attenuative capabilities. Development on these soils requires special attention with respect to movement of contaminants toward wetlands and watercourses. Bedrock is 10 to 30 feet below the ground surface. Groundwater is generally 10 to 15 feet below the ground surface.

It is my judgement that the groundwater, Avery Brook, Billings Avery Reservoir and the wetlands associated with these watercourses are all inter-related in accordance with fundamental hydrologic principles. The developer has estimated groundwater table elevations in the central portion on the site but has not shown the expected and important connections with Avery Brook, Billings Avery Reservoir and their surrounding wetlands. This is a significant omission.

The site is relatively flat at elevations between 145 and 165 feet above sea level. The gentle slope of the ground surface is in easterly and southeasterly directions. The groundwater table is generally between elevations 135 and 144 feet, sloping predominantly northwesterly toward Billings Avery Reservoir, which has a typical water surface of about 132 feet. Without doubt, some groundwater will flow directly toward

Avery Brook in some areas of the site, although the developer has provided no information on that important feature.

Sensitive Receptors

Given the fragile ecological setting, it is important to identify the sensitive receptors that are likely to be impacted by this project. They are:

- The watercourse named Avery Brook, particularly where it enters the developer's property near its southeast corner and where the brook skirts the northerly boundary of the site.
- The watercourse named Billings Avery Reservoir, an open body of water that is part of the water supply reservoir system owned by Groton Utilities that provides drinking water to a population of over 40,000 in several towns in southeastern Connecticut, including Ledyard.
- The wetlands associated with, and hydrologically connected to, Avery Brook and Billings Avery Reservoir.
- The 26 proposed on-site private wells that would provide drinking water to the proposed 26 homes.
- Existing nearby private wells, particularly those located at homes directly to the west of the project.

The interconnectedness of these system must be documented by the developer. Groundwater below this 26-home development will be seriously impacted by numerous contaminants and those contaminants will migrate to these receptors. Most of that groundwater, carrying a host of wastewater contaminants, will reach Billings Avery Reservoir in a few months. On the site's easterly and northerly borders, contaminated groundwater will reach Avery Brook in a matter of weeks. Under certain storm conditions, the stormwater facilities will result in immediate flow of contaminants to Avery Brook. It is critical to recognize that those contaminants that reach Avery Brook will then reach Billings Avery Reservoir in a matter of hours.

Any thorough assessment of potential environmental impacts must consider all of these sensitive receptors and their interconnectedness. The developer has failed to do.

Water Quality Contaminants of Concern

In residential projects with on-site wastewater disposal, on-site private potable wells and stormwater collection facilities, the important potential contaminants are:

- Nitrogen compounds, particularly in the nitrate form for which there is a drinking water standard of 10 mg/l. Nitrogen sources include wastewater disposal, lawn and garden fertilizer and stormwater runoff.
- Phosphorus compounds which can cause eutrophication of fresh surface waters. Sources include wastewater disposal, lawn and garden fertilization and stormwater runoff.
- Pathogenic organisms, particularly bacteria and viruses. These organisms are found in wastewater effluent and in stormwater that carries pet wastes.
- Suspended solids, such as silt, sand and debris that are conveyed to surface waters by storm runoff.
- Petroleum products, such as oil and gasoline. These are commonly found in stormwater runoff.

- Other organic compounds such as those found in wastewater effluent, lawn care products and stormwater runoff. Personal care products, pharmaceuticals and other persistent organic compounds can be expected to reach the groundwater from septic systems. One class of these pollutants is Volatile Organic Compounds (VOCs).
- Heavy metals found in stormwater runoff.
- Sodium resulting from the use of de-icing chemicals.

These contaminants are all associated with residential activities, and their water quality impacts must be dealt with, particularly in this very sensitive setting.

How has Developer Addressed these Contaminants and Their Impacts on Sensitive Receptors?

We have reviewed reports by the developer's consultants and found them to be incomplete in many significant ways. Those deficiencies are summarized in this memorandum. Where those submittals have partially addressed our concerns, our comments are also summarized here.

Nitrogen. The February 3, 2023 report from Angus McDonald Gary Sharpe (authored by Mr. Stuart Fairbank) estimates the average recharge concentration of nitrogen, a common approach for assessing nitrogen impacts on the groundwater and downgradient receptors (see CT DEEP Guidance for Design of Large-Scale On-Site Wastewater Renovation Systems, 2006). Mr. Fairbank has estimated an average groundwater recharge concentration of about 9 mg/l, based only on wastewater loads. I have applied a more up-to-date and complete loading model that predicts a concentration of 13 mg/l. This figure is an average across the site. Methods are available to estimate the nitrogen concentrations at specific points along the downgradient property line and those concentrations will be well above the site-wide average at many points. Mr. Fairbank has not conducted that analysis of property-line concentrations. Based on my assessment of a site-wide average at 13 mg/l, it is clear that this project will not comply with the 10 mg/l standard at the property line. Further, it is evident that many of the 26 proposed on-site drinking water wells will experience nitrogen concentrations above the drinking water standard and will be unusable for potable purposes. The developer has not assessed the nitrate impacts on existing private wells to the west of the site, but they may be affected as well.

Mr. Fairbank estimates that the project will add about 510 pounds of nitrogen per year to the groundwater from wastewater disposal. I estimate that the nitrogen load will be 720 pounds per year to include load from wastewater, lawn fertilization and stormwater infiltration. Mr Fairbank has made no assessment of the impact of that large nitrogen load on Avery Brook or Billings Avery Reservoir. Such a high nitrate load may impact the nitrogen-phosphorus balance in the reservoir, to the detriment of water quality.

Phosphorus. We have received no documents that address phosphorus loadings or impacts on surface waters. It is widely known that these porous soils provide limited phosphorus retention, and that open surface waters are sensitive to phosphorus. CT DEEP has established methodologies for assessing phosphorus transport, and that methodology must be applied to this project. From my experience on wastewater disposal projects with similar soils, it is my opinion that this proposed project is sufficiently close to Billings Avery Reservoir to allow phosphorus migration there in the future.

Pathogens. That same report by Mr. Fairbank predicts that the groundwater velocity will be about 9 feet per day, and he depicts a 21-day travel time to assess the areas needed for viral activation. Since he has not depicted groundwater contours near the surface waters around the site, he has not addressed viral transport to Avery Brook. When private or public drinking water supplies are nearby, CTDEEP requires that a 56-day travel time be used to address virus inactivation on-site (CT DEEP, 2006). Mr. Fairbank has not applied that more appropriate criterion.

While the burden is on the developer to provide a more accurate assessment of groundwater directions and velocities and to apply the more appropriate travel time, it is my expert opinion that more complete and accurate data will demonstrate that viruses from this project will reach Avery Brook and Billings Avery Reservoir. Even with the shorter 21-day travel time, it can be surmised from the Fairbanks report that many of the proposed on-site potable wells will be impacted by viruses. No assessment has been provided of viral impacts on existing private wells to the west of the site, but such impacts may also occur.

It is a fundamental premise of the 2006 DEEP Guidance that the renovation of wastewater-related contaminants (including nitrogen, phosphorus and viruses) must be accomplished on-site, that is, on land owned or controlled by the proponent. Mr. Fairbank's analysis ignores that important precept. The developer cannot expect Groton Utilities to allow its public watershed lands and natural resources to be used to attenuate the pollutants from this project.

Suspended solids. The developer proposes a stormwater retention pond near the southeast corner of the site that will provide some removal of suspended solids. We have seen no estimates of the expected removal capabilities of the stormwater facilities, or of the impact of the discharge on Avery Brook, for any of the project's contaminants, all of which are considered pollution

Petroleum Products. This class of contaminants is not addressed by the developer. Roadways and driveways will inevitably receive spills of oil and gas. With the rudimentary stormwater system proposed by the developer, contamination of Avery Brook and its associated wetlands is likely to occur.

Other organic compounds. Both wastewater effluent and stormwater contain organic contaminants other than petroleum products. Studies have documented the presence of these compounds in the groundwater under un-sewered residential developments and their subsequent travel to drinking water supplies. While numerical loadings and concentrations are still being developed, the developer has not addressed this subject, even in narrative form.

Sodium. If a paved roadway is developed on this site, and turned over to the Town of Ledyard, the Town will be responsible for plowing and deicing that roadway. Such activities in close proximity to public water supply are inconsistent with Groton Utilities' responsibility to limit sodium concentrations in the drinking water.

All contaminant concerns. Unsewered development near public water supplies has been shown, repeatedly, to cause significant impacts from multiple contaminants. An important document is the DEP Report to the State Blue Ribbon Commission on Housing (May 1989) that weighed all of the contaminants and the expected impacts noted above. It concludes that such projects in this setting should be limited in density to one home per 2 acres of non-wetland area. Applying that standard to this project site would

indicate that no more than 4 homes should be located here if these impacts are to be avoided. The developer has proposed a density 6.5 times as high.

Conclusion

Our review of reports by the developer's consultants reveals several key points:

1. A full assessment of potential impacts has not been provided.
2. The assessments we have reviewed are incomplete and/or significantly understate the project's impacts.
3. Unacceptable impacts from nitrates and viruses are certain.
4. While the viability of on-site private wells has not been directly addressed, the developer's assessments to date indicate that on-site wastewater disposal will preclude the use of private wells on this project.

While a 26-lot subdivision can be environmentally acceptable when public water is available and public sewers can remove sewage-related contaminants from the vicinity, such a project is not appropriate when on-site wells and septic systems are proposed in close proximity to a public water supply. CT DEEP has established a density threshold for projects like this, and the developer is proposing a project that is 6.5 times denser.

The developer may intend to further document the environmental impacts of this proposed project, addressing the many significant comments we have provided. However, it is my expert opinion that the project as currently configured will have unacceptable impacts on public and private drinking water sources and the wetlands and watercourses leading to and protected by those resources. Impacts on the nearby watercourses and associated wetlands will occur. Those impacts will be related to nitrogen, phosphorus, viruses, petroleum compounds, other organic substances and sodium.