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October 2, 2017

Sherre Greenbaum, Chair Wayland Conservation Commission 41 Cochituate Road Wayland, MA 01778

RE: 24 School Street, Wayland 40B Application

Dear Ms. Greenbaum:

The abutter George Bernard retained me to review the proposed project and to evaluate its associated water resources impacts. In order to conduct this work I have reviewed the following documents:

• Application for Comprehensive Permit, prepared by M.A. Kablack & Associates, P.C. for Windsor Place – 24 School Street, Wayland, MA, July 5, 2017.

• Stormwater Report, prepared by MetroWest Engineering, Inc., September 2017.

• Notice of Intent for 24 School Street, Wayland, MA prepared for Windsor Place LLC by MetroWest Engineering, September 2017.

• Site Plans for 24 School Street, Wayland, MA prepared for Windsor Place LLC by MetroWest Engineering, January 23, 2017.

• Effects of Water Use and Land Use on Streamflow and Aquatic Habitat in the Sudbury and Assabet River Basins, Massachusetts (Scientific Investigations Report 2010-5042), United States Geological Survey, 2010. I have thirty years of experience as a consulting hydrologist working for government, nonprofit, and private organizations throughout the United States and abroad. As a consultant to the U.S. Environmental Protection Agency I have developed Watershed Protection Guidance documents and provided related training in 43 states nationwide. I also serve on the Massachusetts DEP Stormwater Advisory Committee and have been integrally involved in the development of the Massachusetts Stormwater Standards. I also assisted in the preparation of the Massachusetts Smart Growth and Smart Energy Toolkit. I serve as an adjunct faculty at Tufts University and Harvard Extension School where I teach graduate-level courses in Water Resources Management, Low Impact Development, and Green Infrastructure.

My comments are as follows:

Perennial Stream – Riverfront Protection Area: The proposed project is located adjacent to a stream that is tributary to the Snake Brook. The stream is shown as perennial on the 1970 topographic map published by the United States Geological Survey (USGS) – (see attached figure 1). This figure shows the subject stream as a solid line (indicating perennial) and for comparison another small stream to the east showing as a dashed line (indicating intermittent). The more recent 1987 topographic map published by USGS shows the stream as intermittent. This suggests that the stream may have had perennial flow naturally, but does not currently, possibly as a result of human-induced hydrologic modifications in the area.

The Massachusetts Wetland Protection Regulations (310 CRM 10.00) provide for the protection of such streams that were naturally perennial but have been dewatered as a result of human-induced activities. Specifically, 310 CMR 10.58 (2), 1, f states that, "Rivers and streams that are perennial <u>under natural conditions</u> but are significantly affected by drawdown from withdrawals of water supply wells, direct withdrawals, impoundments, or other human-made flow reductions or diversions shall be considered perennial."

The subject area is affected by both water withdrawals and impervious surfaces constructed as a function of urbanization of the area. Largescale groundwater withdrawals at public supply wells operated by the towns of Wayland, Framingham, and Natick surround the site. Urbanization in the immediate neighborhood of the stream includes roads, rooftops, driveways, parking lots and the Wayland Middle School. This urbanization has resulted in the construction of widespread impervious surfaces that preclude groundwater recharge. This area previously (under natural conditions) provided baseflow (perennial flow) to the stream.

These types of human-induced withdrawals and land use developments and their impacts on stream flow were analyzed by the USGS in their report, "Effects of Water Use and Land Use on Streamflow and Aquatic Habitat in the Sudbury and Assabet River Basins, Massachusetts" (Scientific Investigations Report 2010-5042). The study evaluated the cumulative effects of water withdrawals and land use changes throughout the Sudbury and Assabet River Basins on stream flow. Within the Lake Cochituate basin it included 6 public supply wells in Natick (to the south of the subject project) and 8 public supply wells in Wayland (to the north of the site). Figure 21 of that report (attached) shows percentage changes to August median flows in streams as a result of withdrawals. August median flows are analyzed as the low flow or baseflow condition of a perennial stream. The subject property is located in basin 17 – LCNA, which shows a -31% decline in August median streamflow and is rates as a "maximum change". This study also concluded that, "simulations indicated that the average 1993 – 2003 withdrawals most altered streamflow relative to no withdrawals in small headwater subbasins..." Both of these findings support my interpretation that the subject stream has been altered due to water withdrawals and land use changes.

MADEP Stormwater Standard 3 – Recharge: The MADEP Stormwater Standards require that projects should approximate pre-development hydrologic conditions. Standard 3 require that the amount of groundwater recharge should approximate predevelopment conditions. The Drainage report indicates that the existing condition requires a design volume of 975 cubic feet to approximate existing conditions. Yet the proposed infiltration will infiltrate 3828 cubic feet. This means that the system will infiltrate and recharge/recharge four (4) times the existing conditions. This is presumably being proposed due to the tight site design, leaving no room for a surface detention facility. This excess infiltration/recharge will result in higher water table conditions and groundwater mounding (see figure 2). The increased water table conditions will result from the added annual recharge that occurs with precipitation events throughout the year. Additionally and cumulatively, shorter-term water table rises will occur as mounding during the larger design storms (10-year, 25-year, 100-year events). These two water level impacts should be added together.

An additional (and related) concern is that the project proposes to infiltrate and recharge stormwater and wastewater in close proximity to each other. There will be "interference effects", meaning that they will affect each other and are additive. A cumulative groundwater mounding analysis should be required to analyze this and make necessary design revisions.

The project site is low lying with a shallow water table. These cumulative water level changes will exacerbate this site constraint and must be integrated into the site design.

Please contact me directly with any questions that you might have.

Scott W. Horsley



Figure 1 – USGS Topographic Quadrangle 1970





Figure 2 – Groundwater Mounding beneath an infiltration facility