TATA & HOWARD

August 7, 2023

Ms. Sue Brown, Town Planner
Town of West Newbury
Town Office Building
381 Main Street
West Newbury, MA 01985

Subject: Hydraulic Evaluation
MBTA Communities (3A) Zoning Compliance Initiative – Water Planning Assistance
West Newbury, MA
T&H No. 7520

Dear Ms. Brown:

Tata & Howard, Inc. (T&H) has completed a hydraulic evaluation of three potential locations for a multi-family development to assist with the water planning aspect of the MBTA Communities (3A) Zoning Compliance Initiative.

Background

An electronic copy of the PowerPoint presentation titled "West Newbury Housing Opportunities Initiative (aka MBTA Communities Zoning Compliance) Potential Zoning District Sites" prepared by Dodson & Flinker, dated June 27, 2023, was provided to T&H for review. The presentation indicates three potential locations/parcels for a future multi-family district development including the Mullen Property, the Dunn Property, and the Knapp Property. All three potential locations are located along Main Street in West Newbury, MA.

The Town's MBTA (3A) Zoning Compliance Initiative is currently in the early stages of planning and evaluation. The PowerPoint presentation does not indicate the proposed number of units for the multi-family district development, nor does it show the proposed utility configurations for the development. A high-level evaluation was completed for the three potential locations to determine if any one location or combination thereof is more favorable in regard to water supply from the existing West Newbury water distribution system.

The estimated domestic demand at the potential multi-family district development is currently unknown. The demand will heavily depend upon the number of housing units

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and number of bedrooms proposed for the development. Therefore, an evaluation of the impact of the potential demand from the development on the West Newbury water distribution system was not included as part of this analysis. If an estimated domestic demand for the potential development is provided, or assumptions can be made as to the size of the development and estimated demand per unit, the existing hydraulic model of the West Newbury water system can be updated with the potential development demand and the effects on the rest of the system can be evaluated.

In addition, the estimated needed fire flow at the potential development is unknown. The estimated needed fire flow should be determined by a fire protection engineer once a draft plan for the proposed development is in place. If the proposed development includes sprinkler systems, the needed fire flow will depend on the requirements of the sprinkler systems. In general, the 2014 ISO Guidelines for Determination of Needed Fire Flows states that where evidence is available from local fire or building officials to document the installation, approval, testing, and maintenance of the sprinkler system as defined in Chapter 6 of the NFPA Standard, the needed fire flow shall be the greater of the demand at the base of the sprinkler system riser or 1,000 gallons per minute (gpm) at 20 pounds per square inch (psi). As part of this analysis, the available fire flow was estimated in the West Newbury water distribution system to determine the estimated available fire flow at each potential development location. However, at present, it cannot be determined if the estimated available fire flow is adequate for the potential development.

Hydraulic Model Simulations

The existing hydraulic model of the West Newbury distribution system was updated and verified in October 2022 by T&H as part of the Town's Water Distribution System Study Update. The updated hydraulic model was used to estimate the existing pressures and estimated available fire flows along Main Street at the three potential development locations. Static pressures and estimated available fire flows were evaluated with the Brake Hill Tank at a water level of 295 feet above MSL (five feet below overflow elevation). The Pipestave Booster Pump Station was offline, and the interconnection with the Town of Groveland was closed. The hydraulic model was run under a 2022 system maximum day demand (MDD) of approximately 264 gallons per minutes (gpm).

Hydraulic model simulations were first completed under existing pipe conditions. Please note that the Town is currently in the design phase to upgrade the existing 6-inch diameter water main in Church Street from Main Street to Bridge Street and in Prospect Street from Main Street to Church Street to new 8-inch diameter ductile iron water main. Construction of this water main improvement is scheduled to begin in the summer of 2024. Therefore, it was assumed that the improvement would be completed prior to the start of construction on the potential new development. Thus, the new 8-inch diameter water mains along Church Street and Prospect Street were incorporated into the model and included as part of the existing pipe conditions.

The Massachusetts Department of Environmental Projection published Guidelines for Public Water Systems recommend a minimum pressure of 35 psi at ground level under average day, maximum day, and peak hour demand conditions. For water mains or individual service lines where static pressure is above 100 psi, it is recommended that pressure reducing devices be utilized. Pressure above this level can result in increased water use and leaks from fixtures and also increased leakage throughout the distribution system. Under the existing pipe conditions with a system MDD, the estimated static pressure along Main Street ranges from approximately 65 to 95 pounds per square inch (psi).

It is recommended that a distribution system provide a minimum pressure of 20 psi at ground level throughout the system under MDD during a fire flow event. The estimated available fire flow along Main Street while maintaining a minimum system pressure of 20 psi ranges from approximately 500 gpm near the Pipestave Booster Pump Station to approximately 3,200 gpm adjacent to the Brake Hill Tank. Please note that changes in system conditions, including changes in tank operating levels, water supplies operating, and changes in water usage patterns, could decrease or increase the static pressure or available fire flow in an area. The attached Figure No. 1 indicates the resultant estimated available fire flows in this area with the existing pipe conditions. The three potential development locations are also shown on this figure. Table No. 1 summarizes the resultant estimated static pressure and available fire flows at the three potential development locations. It is assumed that water service for all three potential development locations will connect to the existing distribution system on Main Street. For the Mullen Property, it is assumed that the development would connect to the existing distribution system at both Main Street and Church Street.

Table No. 1
Estimated Static Pressure and Available Fire Flow – Existing Pipe Conditions

Potential Development Location	Estimated Static Pressure (psi)	Estimated Available Fire Flow (gpm) while Maintaining 20 psi
Mullen Property	76 (Main Street) 115 (Church Street)	700 (Main Street) 800 (Church Street)
Dunn Property	80	800
Knapp Property	87	1,100

As noted above, it is currently unknown what the needed fire flow would be for the potential development. However, the needed fire flow will likely be at least 1,000 gpm based on the 2014 ISO Guidelines for Determination of Needed Fire Flows. For a minimum needed fire flow of 1,000 gpm, the estimated available fire flow along Main

Street or Church Street under existing pipe conditions would not be adequate at the Mullen Property or Dunn Property.

Hydraulic model simulations were completed with recommended water main improvements along Main Street. As part of the Town's Water Distribution System Study Update, it is recommended that the existing 8-inch diameter and 10-inch diameter water mains on Main Street from Church Street to the Pipestave Booster Pump Station be replaced with new 12-inch diameter ductile iron water main. It is also recommended that the existing 10-inch diameter water main on Main Street from the Brake Hill Tank to Church Street be replaced with new 16-inch diameter ductile iron water main. These improvements were included in the hydraulic model under this simulation.

With the recommended pipe improvements in place and the system under MDD conditions, the estimated static pressure along Main Street ranges from approximately 65 to 95 psi. The estimated available fire flow along Main Street while maintaining a minimum system pressure of 20 psi ranges from approximately 1,100 gpm near the Pipestave Booster Pump Station to approximately 3,200 gpm adjacent to the Brake Hill Tank. The attached Figure No. 2 indicates the resultant estimated available fire flows in this area with the recommended pipe improvements on Main Street. The three potential development locations are also shown on this figure. Table No. 2 summarizes the resultant estimated static pressure and available fire flows at the three potential development locations. It is assumed that water service for all three potential development locations will connect to the existing distribution system on Main Street, and the Mullen Property will also connect to the existing distribution system on Church Street.

Table No. 2
Estimated Static Pressure and Available Fire Flow – Proposed Future Main Street Water Main Improvements

Potential Development Location	Estimated Static Pressure (psi)	Estimated Available Fire Flow (gpm) while Maintaining 20 psi
Mullen Property	76 (Main Street) 116 (Church Street)	2,400 (Main Street) 1,700 (Church Street)
Dunn Property	80	3,100
Knapp Property	87	3,300

For a minimum needed fire flow of 1,000 gpm, the estimated available fire flow along Main Street or Church Street with the proposed future Main Street water main improvements would be adequate at any of the three properties proposed for the new

development. However, as stated above, it is currently unknown what the needed fire flow at the potential development would be.

Other Considerations

Other factors in addition to hydraulic capacity may be considered when determining the best location for a future housing development. Such factors may include the availability of water infrastructure to connect a water service to, the age or material of the water main which the water service will connect to, ability to loop or have multiple service connections, etc. Each of the three potential development properties could connect to existing water infrastructure and would not require the extension of the distribution system for water supply.

Under existing water main conditions, each of the three potential development properties would connect to an existing 10-inch diameter water main that is known to have a hydraulic deficiency. Although the needed fire flow at the potential development is unknown, it is unlikely that the existing estimated fire flow would be sufficient with existing pipe conditions for the Mullen and Dunn Properties, and potentially the Knapp Property.

The potential future Main Street water main improvements would result in the Mullen and Dunn Properties connecting to a new 12-inch diameter ductile iron water main and the Knapp Property connecting to a new 16-inch diameter ductile iron water main. Connecting to new ductile iron water main would create a more reliable supply connection for the development. In addition, the upgraded water mains on Main Street would increase the inherent capacity for fire flows at the potential development properties. Therefore, depending on the needed fire flow for the development, the potential future Main Street water main improvements may result in a sufficient available fire flow at the development.

Under each hydraulic scenario, the Knapp Property has the highest estimated available fire flow of the three potential development locations. This is largely due to the Knapp Property being the closest to the Brake Hill Tank resulting in less headloss along the path of flow from the tank to the property location. However, as stated, the needed fire flow at the potential development is currently unknown.

Under either hydraulic scenario, the Mullen Property could have two connections to the existing distribution system: one at Main Street and one at Church Street. Having two water service connections would provide the added benefit of redundancy for the Mullen Property. If a water main break were to occur in the vicinity of one of the water service connections, water could continue to be supplied to the development from the other connection. The two connections could also yield higher available flows throughout the development depending upon the proposed configuration of the water infrastructure in the new development.

We appreciate the opportunity to assist you on this important project. If you have any questions, please do not hesitate to contact us.

Sincerely,

TATA & HOWARD, INC.

Jon W. Gregory, P.E.
Vice President

Enclosures

cc: Mr. Angus Jennings, Town Manager
Town of West Newbury

N

Church Street and Prospect Street
New 8-inch diameter water main
to be constructed in 2024

Mullen Property

Dunn Property

Knapp Property

Brake Hill Tank
Capacity: 0.4 mg
Overflow Elevation: 300 feet

Legend

Estimated Available Fire Flow
- 500 gpm and less
- 500 - 1,000 gpm
- 1,000 - 1,500 gpm
- 1,500 - 2,000 gpm
- 2,000 - 2,500 gpm
- 2,500 - 3,000 gpm
- 3,000 - 3,500 gpm
- 3,500 gpm and greater

Water Main Diameter
- 4-inch and smaller
- 6-inch
- 8-inch
- 10-inch
- 12-inch

Figure No. 1

Estimated Available Fire Flow - Existing Conditions

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Date: August 2023
Approximate Scale: 1" = 1,000'

N

Church Street and Prospect Street
New 8-inch diameter water main
to be constructed in 2024

Mullen Property

Dunn Property

Knapp Property

Brake Hill Tank
Capacity: 0.4 mg
Overflow Elevation: 300 feet

Legend

Water Main Diameter
- 4-inch and smaller
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 16-inch

Estimated Available Fire Flow
- Less than 500 gpm
- 500 - 1,000 gpm
- 1,000 - 1,500 gpm
- 1,500 - 2,000 gpm
- 2,000 - 2,500 gpm
- 2,500 - 3,000 gpm
- 3,000 - 3,500 gpm
- 3,500 gpm and greater

Figure No. 2

Estimated Available Fire Flow - Proposed Future Main Street
Water Main Improvements

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