

Norfolk Water System Subdivision Review

Subdivision Name: Abbyville Commons

Owner: Abbyville Development, LLC.
850 Franklin Street
Wrentham, MA 02093

Engineer: United Consultants, Inc.
850 Franklin Street
Wrentham, Massachusetts 02093

Reviewed By: Ryan J. Allgrove, P.E.

Date: July 28, 2017

At the request of the Norfolk Department of Public Works, Environmental Partners Group, Inc. has completed an assessment of the water system hydraulics associated with the proposed Abbyville Commons residential development. Abbyville Commons is located in the southwestern area of Norfolk within the parcel of land at 17 Lawrence Street. This assessment is based on subdivision plans prepared by United Consultants, Inc. dated March 15, 2017 and documents available on the Town of Norfolk Zoning Board of Appeals website. All hydraulic simulations for Abbyville Commons incorporated the proposed water main extension on Lawrence Street and water infrastructure within the Preserve at Abbyville subdivision.

Water Demand

The proposed Abbyville Commons residential development consists of forty-eight residential units. The following table summarizes the estimated water usage for the development based on information from the Town's most recent DEP Annual Statistical Reports (ASR).

Usage Scenario	Calculation	Estimate Usage
Average Day Demand (ADD)	154 gpd / residential service x 48 Units	7,392 gpd
Maximum Day Demand (MDD)	2.2 x ADD	16,262 gpd
Peak Hour Demand (PHD)	2 x MDD	32,524 gpd

Static Pressure Requirements

Water distribution system static water pressure refers to the pressure in a main when there is no water flowing and reflects the water level in the storage tank(s). Based on DEP Guidelines and Policies for Public Water Systems, the normal working pressure in the distribution system should be approximately 60 pounds per square inch (psi) and not less than 35 psi. The hydraulic grade line (HGL) for the Norfolk water system fluctuates between 365 feet (USGS Datum) when the tanks are full to 355 feet when the water level in the tanks is down 10 feet. In order to maintain a minimum pressure of 35 psi at a HGL of 365 feet, a water customer must be connected to the water system at an elevation no higher than 284 feet (USGS datum). Elevations greater than 284 feet will result in static pressures less than the DEP required pressure of 35 psi.

Based on the finished grade elevations (NAVD 88 datum) shown on the plans, the proposed dwellings will meet minimum DEP pressure requirements. During typical water system operations, pressures at the proposed dwellings will range from 61 psi to 74 psi.

Fire Flow Requirements

In accordance with DEP Guidelines and Policies for Public Water Systems, water system design must maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow (including fire flow conditions). The Norfolk water system hydraulic model was used to calculate the available fire flow within the Abbyville Common development at the proposed hydrant at the intersection of Annie Loop and Buckley Boulevard. This hydrant has the highest elevation in the subdivision and lowest static pressure. Based on the proposed distribution system network with 8-inch ductile-iron piping, model simulations show that approximately 1,725 gpm fire flow is available at 20 psi residual pressure. A schematic diagram of the modeled network is provided in Figure 1. Fire flow guidelines set forth by the Insurance Services Office (ISO) for one and two family dwellings are summarized in the table on the following page:

ISO Needed Fire Flows (one and two family dwellings)

Distance between Dwellings (feet)	Needed Fire Flow (gpm)
Greater than 100	500
31 – 100	750
11 – 30	1000
Less than 10	1500

Based on the proposed dwelling spacing, the project represents a fire flow requirement of 1,000 gallons per minute (gpm). Actual fire flow requirements should be confirmed by the developer.

Water System Materials

All water system materials shall be as per DPW specifications (latest version). Water mains to be 8-inch ductile iron pipe, class 52, conforming to AWWA C150 and AWWA C151, push on type joints with gaskets conforming to AWWA C111, double cement lined inside conforming to AWWA C104, and asphalt seal coated outside (coal tar coated outside conforming to AWWA 203 in areas where groundwater levels are above the pipe laying depth). All pipe fittings shall be ductile iron, class 350 mechanical joint conforming to AWWA C153. All fittings shall be restrained with Megalug Series 1100. Water mains shall have a minimum of five feet of cover. All gate valves shall be US Pipe Metroseal 250 or American Flow Control Model AFC2500 resilient wedge seated valves conforming to AWWA C-509, open left. Hydrants shall be American Darling (American Flow Control) B62B open right, conforming to AWWA C-502 (Dry Barrel Hydrants) and painted red.

Water service pipe shall be 1” polyethylene tubing, PE4710 with tracer wire. Copper tubing shall not be used. Corporation valves shall be Mueller 300 ball type with Mueller “CC” inlet thread and pack joint connection outlet. Curb stops shall be Mueller Mark II Oriseal Curb Valve Model P-15219N. Curb stop boxes shall be buffalo style.

All material specifications shall be submitted to the Norfolk DPW for review and approval prior to installation.

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Pressure Testing and Chlorination

Water mains shall be tested at minimum of 150 psi or 150% of the static pressure (whichever is greater) for a minimum of two hours. Water mains will have an allowable leakage determined by the DPW. Water mains shall be chlorinated as per AWWA standards with a minimum of 48 hours of contact time. Water mains shall be flushed until chlorine has been eliminated and sampled for total coliform by the DPW. The main shall be tested again after 24 hours of contact time with non-chlorinated water by the DPW.

Distribution System Piping

The water system of the proposed subdivision was not reviewed for discontinuities, looping, valve, and hydrant placement. Shutdowns shall be limited to 4 hours and shall be coordinated with the Town's Department of Public Works.

Lawrence Street Well

As part of the Town's ongoing well exploration program, a potential groundwater supply source was identified in 2013 at the 17 Lawrence Street Site on the west side of the Mill River. A four-inch test well (TW-1) was installed and a 5-day pump test was performed to evaluate potential well yield. Further testing at higher flow rates was recommended to determine if the well is viable as a public water supply source.

Based on available mapping, it appears that the potential groundwater source (TW-1) is located approximately 600 feet from the nearest proposed residential parcel within the overall Abbyville development (Commons/Preserve). It should be confirmed by the developer that the proposed subdivided parcels are not within 400 feet of any potential water supply source. MassDEP requires the Town own or control the 400 foot radius (Zone 1) around a public water supply.

Elevated nitrate levels at the potential well due to the development are of additional concern. The preliminary water quality testing result for nitrate was 3.55 mg/L. MassDEP has established a planning goal of preventing a 5 mg/L nitrate load for public supply wells. Nitrate levels above 5 mg/L are subject to MassDEP regulations for Water Supply Protection (310 CMR 22.21 2.d), which would require a public water supplier to prepare a nitrate management plan if nitrate levels exceed 5

mg/L during any testing. The maximum contaminant level (MCL) for nitrate/nitrite (total) is 10 mg/L. The development's proposed septic systems in relative close proximity to the potential well could result in elevating nitrate levels above the "planning threshold."

Recommendations

The Norfolk water distribution system can provide acceptable pressures to the proposed Abbyville Commons residential development. The pressures in the development benefit from their elevation and it is not anticipated that they will fluctuate significantly during high usage periods. In addition, hydraulic modeling results indicate that the Norfolk water system can also provide fire flows typically considered adequate for similar residential areas. Actual fire flow requirements for the development should be confirmed by the developer.

The Abbyville Commons residential development will increase the water system demand for the Town of Norfolk by approximately 7,392 gpd representing approximately 12% of the new services that the system can support through 2019 under the Town's existing Water Management Act permit, as described in EPG's 2017 Water Supply Assessment report. The combined reliable daily capacity of the Gold Street and Spruce Road facilities (0.96 MGD) is approximately equal to the Town's current summer maximum day demands (2015 Maximum Day = 0.93 MGD). Projected maximum day demands for the proposed development of 0.016 MGD will increase the system's reliance on storage to meet high demand periods and increase the likelihood that an interconnection with a neighboring Town will need to be activated. The pace of this development's construction should be closely monitored in conjunction with other development in Town to ensure that WMA permit limits are not exceeded. Approximately 50 new water services per year can be supported by the WMA permit through 2029.

Additionally, the Town's existing available water supply sources cannot support its existing water customers if either of its two sources are rendered inoperable or placed out of service. If either the Gold Street Wells or the Spruce Road Wells are out of service, the Town would have to rely on emergency interconnections with neighboring communities to meet seasonal water demands. EPG recommends that the Town continue to pursue development of a new water supply source to meet projected future demands and minimize Norfolk's dependence on existing interconnections with the

communities of Wrentham and Franklin

Additional testing and study is needed at the Lawrence Street well site to determine its viability as a public water supply for the Town and to understand the potential effects the development could have on water quality. It is recommended that an aquifer test be performed using a minimum 8-inch diameter test well to stress the aquifer and evaluate potential well yield. If the aquifer test has favorable results, a groundwater flow study should be performed to determine the development's effects on nitrate levels at the well. In the interim, the limits of the 400-ft radius for TW-1 should be confirmed and the Zone 1 area reserved from development.

