



WATER ENGINEERING REPORT

For

**Artis Senior Living of Tarrytown, LLC
Village of Tarrytown, New York**

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1.0 INTRODUCTION

Artis Senior Living of Tarrytown is proposing to construct a two story, 64 bed Alzheimer's and Dementia Care facility, with associated parking and other appurtenances at 153 White Plains Road. Access to the site is provided via the existing driveway servicing the adjoining 155 White Plains Road parcel. The proposed building is to be served by public water and public sewer.

The subject 4.6-acre property is in the OB Zone and is identified as Tax Map #1.201-121-5.12. The lot is currently vacant, except for a P-1, micropool extended detention pond. This pond was constructed under a previously approved project SWPPP for the porous pavement parking lot on the 155 White Plains Road parcel. The micropool extended detention pond and porous pavement parking lot (located on the 155 White Plains Road parcel) were constructed from 2014 to 2015.

The subject parcel is in within the Tarrytown Water District. In 2007 a Site Plan Approval was issued for the construction of a 60,000 s.f. office building on the subject property. Assuming a hydraulic loading rate of 0.08 gpd/s.f. the previously approved office building would have anticipated a Design Maximum Daily Wastewater Flow Rate of 4,800 gpd.

2.0 PROJECT DESIGN MAXIMUM DAILY FLOW AND ANTICIPATED FLOW

The design maximum daily flow for the proposed project, will be calculating used two methods. The first is based on the hydraulic loading rates given in the New York State Department of Environmental Conservation (NYSDEC) publication *Design Standards for Intermediate Sized Wastewater Treatment Works – 2014* (DEC 2014). The second will be based on utilizing the *International Plumbing Codes* simultaneous probable fixture unit count method. The following table calculates the maximum daily domestic demand / flow rate in gallons per day (gpd) that will be used for design in the proposed project.

Table 1: Project Design Maximum Daily Flow Rate

Proposed Use	Hydraulic Loading Rate	Design Maximum Daily Domestic Flow (gpd)
64 – One Bedroom Apartments	110 gpd/dwelling	7,040
45 – Employees Per Day	12 gpd/employee	540
Total		7,580

Utilizing the Design Maximum Daily Flow, the peak hourly flow is calculated using a peaking factor that is based on the population of the subject project. A peaking factor of four will be used for the project based on Figure 1 from *Recommended Standards for Wastewater Facilities*.

Peak Hourly Flow utilizing DEC 2014

$$7,580 \text{ gpd} \div (16 \text{ hr/day}) \div (60 \text{ min/hr}) = 7.9 \text{ gallons per minute (gpm)}$$

$$\text{Peak Hourly Flow} = 7.9 \text{ gpm} \times 4.1 = 32.4 \text{ gpm}$$

Utilizing the *International Plumbing Code*, a peak instantaneous domestic demand of 95 gpm was calculated based upon a simultaneous probable total load of 349.4 water supply fixture units (wsfu). In order to determine the peak instantaneous flow rate, the plumbing fixtures in the building are combined to determine a total load value. The total load value is then used to determine the probable demand, which is utilized as the peak instantaneous flow rate for design purposes. See attached letter and Plumbing

Fixture Computation from LK Architecture and tables E103.3(2) and E103.3(3) from Appendix E of the *International Plumbing Code* for the detailed calculations of the peak instantaneous flow rate.

The requirements for the fire system were generated by LK Architecture and is attached hereto. The proposed building is required to have fire sprinklers. The attached letter from LK Architecture calculated a sprinkler demand for the residential building per NFPA 13, 11.2 Figure 11.2.3.1.1 and Table 11.2.3.1.2. A calculated sprinkler demand of 150 gpm with a 100 gpm hose stream for a total fire sprinkler flow of 250 gpm was calculated for the project. The hydrant demand was calculated per NFPA 1, 18.4.5.3, Table 18.4.5.2.1, 18.5.4 and NFPA 220 Annex B, Table A.4.1.1. A hydrant demand of 688 gpm was calculated in the attached. This results in a peak fire sprinkler, irrigation, hydrant and domestic combined flow of:

Peak Combined Flow

$$95 \text{ gpm} + 30 \text{ gpm} + 250 \text{ gpm} + 688 \text{ gpm} = \mathbf{1,063 \text{ gpm}}$$

The average daily demand / flow was estimated from water use data obtained from two existing Artis Senior Living Facilities over a period of one year. The average daily demand from real flow data is useful for water system operators as it provides another way to analyze the proposed project's impacts to the water system. It is also used to assess impacts to the receiving wastewater treatment plant as their SPDES permit flows are based on a 30-day average flow. The data illustrated an average daily demand per bed ranging from 89 to 104 gpd/bed for an average population of 42 beds and 63 beds respectively. This water use data while cited in gpd/bed, includes the total flow used at the site by both employees and visitors as well as irrigation. The irrigation demand can account for an excess of 25% of the metered flows. Based on removal of irrigation flows the actual per bed flow is estimated at 66 to 78 gpd / bed. The irrigation flow was removed in order to determine what will be tributary to the project's average daily wastewater demand. Based on actual flow data the project is anticipated to generate 4,224 to 4,992 gpd of domestic water demand / wastewater flow.

Although the anticipated flows (average daily demand / flow) for the project are lower than the design maximum daily flows, the design maximum daily flows are used for the design of the system. This provides an additional factor of safety in the proposed design

3.0 PROPOSED WATER SERVICE CONNECTIONS

The Village, through their consultant, provided updated modeling contemplating the effect of the water service connections to Martling Avenue or White Plains Road. Based on the results of the modeling and discussions with the Village the water service will be run to White Plains Road.

Recommended Standards for Water Works (RSWW) provides minimum pressure requirements for distribution systems. For domestic water use a minimum pressure of 35 psi at the highest service connection is required and 20 psi must be maintained at the highest service connection during fire flow conditions. Based on the results of the Village modeling the onsite water service connection will be sized to provide these domestic flow and pressure.

The proposed water service is anticipated to be constructed of Class 52 DIP. Typically, Artis facilities are supplied by a 6" DIP service line. This service line will be a combined service line for domestic and fire use. An irrigation system will also be constructed onsite. The irrigation system will be contracted by Artis as a design build system. The final design will be coordinated with the Village water department prior to construction.

Restrained joint connections will be provided at all pipe bends through the use of Mega-lug fittings, or approved equal. In addition, thrust blocks will be provided at all bends. Upon completion of the water service installation pressure testing and disinfection will be performed in accordance with AWWA standards. Details for the construction, testing and disinfection of the proposed watermain / water service line have been provided on the project drawings.

The following calculations contemplate the flows and pressures assuming minimum and maximum pressures based on modeling provided by Woodard and Curran. For a static pressure range of 81 psi to

150 psi, the attached calculation demonstrates there is adequate flow and pressure to supply the peak domestic demand and meet the minimum pressure requirement of 35 psi at the highest service connection required by RSWW. The current sprinkler/hose stream and hydrant demand for this project is 938 gpm. Utilizing a combined domestic, irrigation, sprinkler, and hydrant flow of 1,063 gpm, the attached calculations indicate there will be sufficient pressure to meet the 20 psi requirement in RSWW for static water main pressures of 81 psi to 150 psi.

Static Pressure Calculation (Assuming Minimum Pressure of 81 psi):

Elevation of Point of Connection from W&C Modeling	158 ft
First floor elevation of building	185 ft

Loss of static head to building	27 ft
Static Pressure at Point of Connection from W&C Modeling (at NYS Route 119)	81 psi
Loss of Static Pressure at FFE of proposed building	12 psi
Static Pressure at FFE of proposed building	69 psi

Domestic Flow Calculation (Assuming Minimum Pressure of 81 psi):

Calculations of the head loss in the watermains under domestic peak hourly flow and peak combined flow were performed to evaluate the pressure at the FFE during the respective flow conditions. The calculations are based on a 6" diameter watermain being extended to the building.

Residual pressure at Point of Connection from W&C Modeling (at NYS Route 119)	81 psi
Loss of Static Pressure at FFE of Proposed Building	12 psi
Friction loss of pressure through 6" DIP Water Service	1 ft (0.4 psi)
Residual pressure at FFE of Proposed Building during Domestic Peak Hourly Flow:	69 psi

As noted above the 69 psi pressure under peak hourly flow conditions exceeds the RSWW requirement of 35 psi for peak hourly domestic flow conditions.

Fire Flow Calculation (Assuming Minimum Pressure of 81 psi):

Calculations of the head loss in the watermains under domestic peak hourly flow and peak combined flow were performed to evaluate the pressure at the FFE during the respective flow conditions. The calculations are based on a 6" diameter watermain being extended to the building.

Residual pressure at Point of Connection from W&C Modeling (at NYS Route 119)	81 psi
Loss of Static Pressure at FFE of Proposed Building	12 psi
Friction loss of pressure through 6" DIP Water Service	39 ft (17 psi)
Residual pressure at FFE of Proposed Building during Domestic Peak Hourly Flow:	52 psi

As noted above the 52 psi pressure under peak hourly flow conditions exceeds the RSWW requirement of 20 psi for peak hourly domestic flow conditions.

Static Pressure Calculation (Assuming Maximum Pressure of 150 psi):

Elevation of Point of Connection from W&C Modeling	158 ft
First floor elevation of building	185 ft
Loss of static head to building	27 ft
Static Pressure at Point of Connection from W&C Modeling (at NYS Route 119)	150 psi
Loss of Static Pressure at FFE of proposed building	12 psi
Static Pressure at FFE of proposed building	138 psi

Domestic Flow Calculation (Assuming Maximum Pressure of 150 psi):

Calculations of the head loss in the watermains under domestic peak hourly flow and peak combined flow were performed to evaluate the pressure at the FFE during the respective flow conditions. The calculations are based on a 6" diameter watermain being extended to the building.

Residual pressure at Point of Connection from W&C Modeling (at NYS Route 119)	150 psi
Loss of Static Pressure at FFE of Proposed Building	12 psi
Friction loss of pressure through 6" DIP Water Service	1 ft (0.4 psi)
Residual pressure at FFE of Proposed Building during Domestic Peak Hourly Flow:	138 psi

As noted above the 138 psi pressure under peak hourly flow conditions exceeds the RSWW requirement of 35 psi for peak hourly domestic flow conditions.

Fire Flow Calculation (Assuming Minimum Pressure of 150 psi):

Calculations of the head loss in the watermains under domestic peak hourly flow and peak combined flow were performed to evaluate the pressure at the FFE during the respective flow conditions. The calculations are based on a 6" diameter watermain being extended to the building.

Residual pressure at Point of Connection from W&C Modeling (at NYS Route 119)	150 psi
Loss of Static Pressure at FFE of Proposed Building	12 psi
Friction loss of pressure through 6" DIP Water Service	69 ft (30 psi)
Residual pressure at FFE of Proposed Building during Domestic Peak Hourly Flow:	108 psi

As noted above the 108 psi pressure under peak hourly flow conditions exceeds the RSWW requirement of 20 psi for peak hourly domestic flow conditions.