INSITE
ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.

# Preliminary Water Engineering Report

**For**

**1 Croton Point**

**Croton Point Ave.**
**Croton-On-Hudson, New York**

**July 11, 2024**

Prepared By

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## 1.0 INTRODUCTION

### 1.1 Project Description

The project consists of a proposed 100-unit, for sale affordable condominium development consisting of 46 one-bedroom and 54 two-bedroom homes in a to be constructed 5-story building with requisite parking and amenities (the "Development") to be located on lands fronting on Croton Point Avenue consisting of (i) Tax Map Parcels 79.17-1-5 & 3 owned by the Village ("Lot A"); and (ii) Tax Map Parcel 79.17-1-3 owned by Croton Point Realty Inc (the "CPR Parcel"). Lot A is currently in use as a Village commuter parking lot. The CPR Parcel is improved with an office building which is proposed to be demolished for the Development.

The proposed brick and metal panel building will be served by 100 parking spaces to be located in a below grade parking level and two outdoor parking areas, including five (5) Level 2 EV charging stations. Amenities within the building will include a community room, a fitness center, a co-working lounge, a bike storage room and a roof-top deck providing expansive scenic views overlooking Croton Point Bay and the Hudson River.

Sustainable building design features will likely include full electrification, solar readiness, high efficiency HVAC equipment (cold climate air source heat pumps) and appliances (Energy Star Multifamily New Construction Program) and low-flow water fixtures.

In total the property consists of 1.8 ± acres and is located in the LI (Light Industrial with a Transoriented Development Overlay) zoning district, the Village of Corton-on-Hudson Water District and the Ossining Sanitary Sewer District.

### 1.2 Existing Site Conditions

The subject project is located on Croton Point Avenue across from Veterans Plaza in the Village of Croton-On-Hudson. As previously stated, the site currently exists as a Village Parking lot and commercial development with several buildings, parking areas, walkways, and other appurtenances. It currently exists as some office buildings as well as overflow parking for the Croton-Harmon train station.

### 1.3 Proposed Site Conditions

It is proposed to construct a 21,500 sf ± (footprint area) affordable condominium development with associated parking and various site appurtenances. The new five-story building will contain one hundred units. There will be 46 one-bedroom apartments and 54 two-bedroom apartments. Amenity spaces will also be constructed which will be used by the residents of the building. As part of the proposed development, there will be a new water and fire service connection to the building. The new service lines will exit the building on the west side and will tie into the existing water main on Croton Point Ave. See Appendix A for Water Main mapping.

## 2.0 PROJECT DESIGN FLOWS

The project domestic maximum daily water demand used for design is anticipated to be the same as the maximum daily wastewater demand. As such the design maximum daily water flows for the proposed project, are 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 design maximum daily water demand is a conservative design flow on which the water infrastructure will be designed. This value does not represent the average daily demand, which is expected to be less.

The design flow rates for the residential units are based on the number of bedrooms per the tables below. The following table calculates the hydraulic loading rates and the design flow rates (gallons per day or gpd) for the proposed project.

| Proposed Use | # of Units | Hydraulic Loading Rate | Design Maximum Daily Flow (gpd) |
|---|---|---|---|
| One Bedroom Units | 46 Units | 110 gpd/bedroom | 5,060 |
| Two Bedroom Units | 54 Units | 110 gpd/bedroom | 11,880 |
| **Total** | | | **16,940** |

The anticipated design average daily flows for the project are expected to be significantly less than the design maximum daily flow rate. The design maximum daily flows represent conservative flows to ensure that the proposed sewer works are designed with an ample factor of safety. The anticipated actual flows are based on anticipated occupancy rates and measured data for water use. Statistical data (obtained from *Rutgers University, Center for Urban Policy Research*, *Residential Demographic Multipliers*, June 2006) for the average number of occupants in rental units (based on number of bedrooms) was used to calculate the expected number of residents anticipated for the project as shown in the table below. Data from the American Water Works Association (AWWA) Water Conservation Division Subcommittee Report, Water Conservation Measurement Metrics Guidance Report, dated January 2010 shows that the average in home water use is 69.3 gpd per person. This number is reduced to 43.5 gpd per person when water saving fixtures are used, which is the case for this project. The following table below will be used to calculate flow to the existing sewer main. The 45 gpd per person was used to calculate the proposed anticipated average daily design as water saving fixtures will be used. See the table below for the calculation of the design average daily flow rates in the existing and proposed conditions.

**Table 2.3: Croton Point - Proposed Design Average Daily Flow Rate**

| Proposed Use | Occupancy Rate | Total Anticipated Residents | Water Use Per Resident (gpd) | Water Use (gpd) |
|---|---|---|---|---|
| 46 – One Bedroom Units | 1.86 people/unit | 86 | 43.5 | 3,741 |
| 54 –Two Bedroom Units | 1.88 people/unit | 102 | 43.5 | 4,437 |
| | | | **Total Anticipated Water Use (gpd)** | **8,178** |

As demonstrated above, through the use of water saving fixtures as required by current building code, a design maximum flow of 16,940 gpd is proposed for the project, while the actual anticipated flows are 8,178 gpd.

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 Domestic Flow

16,940 gpd ÷ (24 hr/day) ÷ (60 min/hr) = 11.8 gallons per minute (gpm)

Peak Hourly Flow = 11.8 gpm x 4 = 47 gpm

Although the anticipated flows (average daily design flow) for the project is significantly lower than the design maximum daily flows, the Peak Hourly Flow based on the design maximum daily flows are used for the design of the system. This provides a factor of safety in the proposed design.

The requirements for fire sprinkler systems were preliminarily established for the project based on other similar projects completed by the application. The new building is required to have fire sprinklers. The fire sprinkler demand for the building has been initially assumed at 1,000 gpm at 20 psi. This value will need to be confirmed by the project MEP as the design progresses..

## 3.0 PROPOSED CONNECTION TO VILLAGE OF CROTON-ON-HUDSON SYSTEM

### 3.1 System Characteristics

Based on mapping provided of the existing system there is an existing 6 inch main in Croton Point Avenue that services the existing structures on the subject property. There is also an existing 10 inch main in Wayne Street. See Appendix A for the Water Main mapping and hydrant flow test results.

### 3.2 Proposed Water Service Connection

The existing water main which the project proposes to connect to is in Croton Point Avenue. As previously discussed, two separate service lines, one for domestic and one for fire service are proposed. Based on the available mapping provided in Appendix A the existing watermain is a 6" diameter pipe in Croton Point Avenue.

All water service piping will be Class 52 DIP. 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, disinfection, and flushing will be performed in accordance with AWWA standards.

Recommended Standards for Water Works (RSWW) recommends that the normal working pressure not be below 35 psi, and both the RSWW and the American Water Works Association (AWWA) M 31 recommend that a minimum of 20 psi be maintained at all points in the water distribution system during fire flows.

Based on previous flow data provided by the Village it is anticipated offsite improvements will be necessary to obtain the necessary project design flows. For the purpose of this initial analysis previous hydrant flow test data, as provided by the Village, has been used. Ultimately updated hydrant flow tests will need to be performed. Based on the previous data the 6-inch water main that feeds the 6 inch line in Croton Point Avenue had less than 500 gal/min and 20 psi. It was noted by the Village a 10-inch water line was installed in Wayne Street and a stub installed in Croton Point Avenue to allow the extension of the 10-inch line in Wayne Street to Croton Point Avenue. The flowing flow and pressure calculations assume that connection is made.

Flow data on the existing watermain has been provided in Appendix A. The hydrant at the corner of Benedict Boulevard and Wayne Street (referenced as Hydrant B) has a static pressure of 122 psi. The following calculations contemplate the flows and pressures using a static pressure of 122 psi to demonstrate 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 point of connection to the main and 20 psi throughout the system during fire flow as required by RSWW.

### 3.3 Calculation for Residual Pressure at Service Connection for Peak Domestic Flow

The following calculations determine the residual pressure at the service connection to ensure that the minimum pressure of 35 psi is met at the highest service connection as required by RSWW. The residual pressure will be calculated for peak domestic demand of 47 gal/min as calculated in section 2.0:

1. Calculate Residual Static Pressure at highest service connection

| | | | |
|---|---|---|---|
| Static Pressure at Hydrant B | | = | 122 psi |
| Elevation at Hydrant B | | = | 88 ft |
| Elevation of Proposed Service Connection | | = | 34 ft |
| Difference in Elevation of Hydrant & Highest Fixture | (34 ft – 88 ft) | = | -54 ft |
| Equivalent pressure Associated with Change in Elev. | (54.0 ft / 2.31 psi) | = | 24 psi |
| Static Pressure at FFE | (122 psi + 24 psi) | = | 146 psi |

2. Calculate Friction at Peak Domestic Flow

Total Head Loss Due to Friction (See Spreadsheets in Appendix B) = 4 psi

3. Calculate Residual Static Pressure at highest service connection

Static Pressure at FFE – Total Head Loss Due to Friction = 142 psi

3.4 Calculation for Residual Pressure at Service Connection for Peak Domestic and Fire Flow

The equation below is taken from AWWA M17. The equation is used to calculate flow available at different pressures or differences in the residual pressure that would result from different flow rates. Here the equation is used to calculate the residual pressure (at the observation hydrant) for the domestic design flow of the building, using the pressures and flow rates measured during the flow test. The proposed domestic water service lines will be sized for a flow of 1,047 gpm which is the combination of the peak instantaneous domestic flow of 47 gpm and the required flow of 1,000 gpm.

Domestic Flow Calculation:

$Q_R=Q_F* h_r^{0.54}/ h_f^{0.54}$

Where:

- $Q_R$ = peak flow (47 gpm)
- $Q_F$ = flow from hydrant during test (1,120 gpm)
- $h_r$ = the difference in pressure between the static pressure measured at the observation hydrant and the residual pressure at the total combined flow
- $h_f$ = the difference between the static pressure and residual pressure measured at the observation hydrant during the flow test, (69 psi)

47 gpm = 1,120 gpm * $h_r^{0.54}$/ 69 psi $^{0.54}$

$h_r$ = 0.19 psi = Use 1 psi

Fire Flow Calculation:

$Q_R=Q_F* h_r^{0.54}/ h_f^{0.54}$

Where:

- $Q_R$ = peak flow (1047 gpm)
- $Q_F$ = flow from hydrant during test (1,120 gpm)
- $h_r$ = the difference in pressure between the static pressure measured at the observation hydrant and the residual pressure at the total combined flow
- $h_f$ = the difference between the static pressure and residual pressure measured at the observation hydrant during the flow test, (69 psi)

1047 gpm = 1,120 gpm * $h_r^{0.54}$/ 69 psi $^{0.54}$

$h_r$ = 61 psi

Domestic Flow Calculation:

Next calculate the frictional loss for the domestic water service line at the peak flow of 47 gpm. As shown in Appendix A, a head loss of 9 ft (4 psi) is calculated in the service line. This results in a calculated pressure of:

142 psi– loss in service line, - Static Pressure Change

142 psi – 4 psi -1 psi = 137 psi

As noted above the 137 psi pressure under peak hourly flow conditions exceeds the RSWW requirement of 35 psi for peak hourly domestic flow conditions.

Fire Flow Calculation:

As shown in Appendix A, a head loss of 13 ft (9 psi) is calculated in the service line. This results in a calculated pressure of:

142 psi– loss in service line, - Static Pressure Change

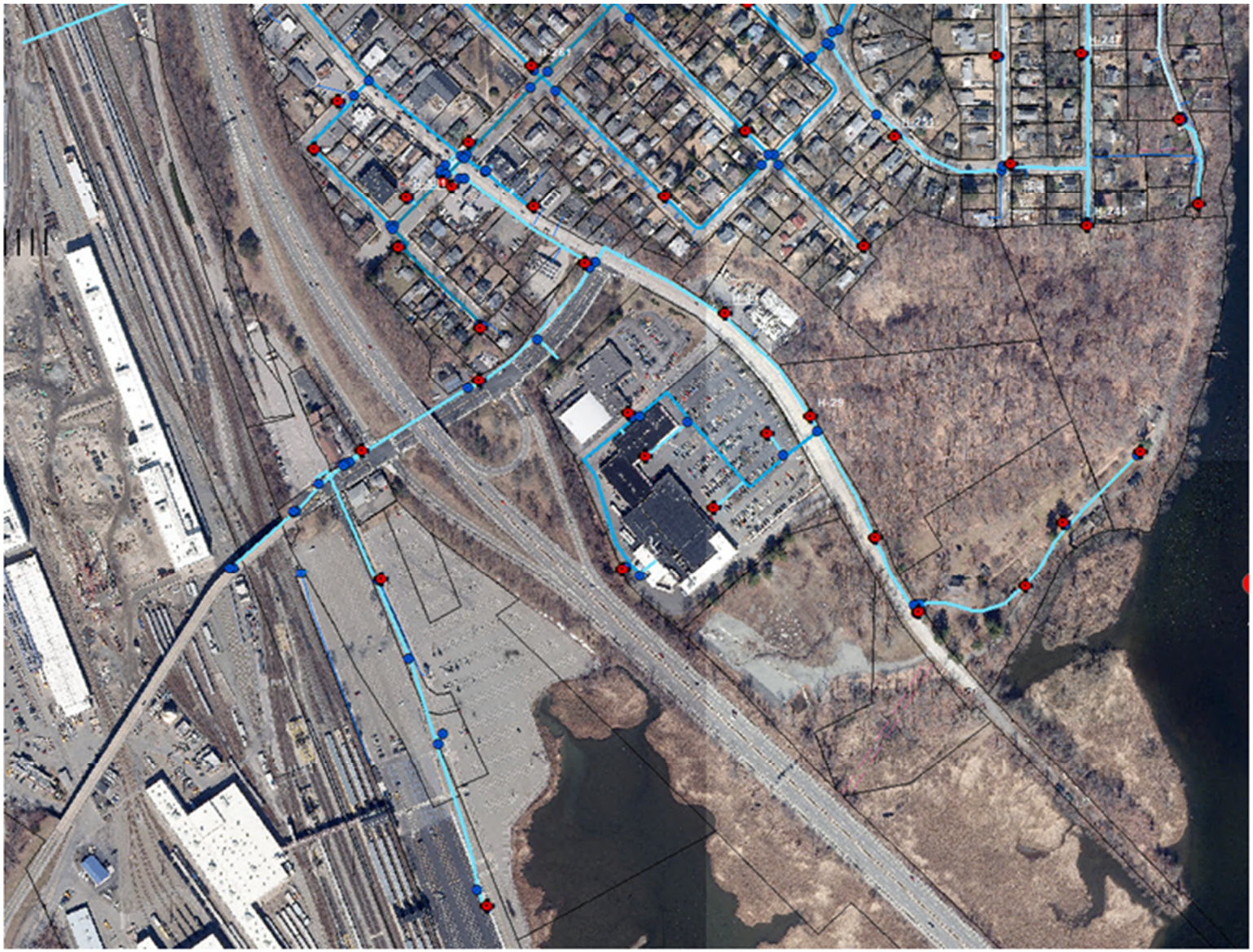
142 psi – 6 psi -61 psi = 75 psi

As noted above the 75 psi pressure under combined domestic and fire flow conditions exceeds the RSWW requirement for 20 psi throughout the system.

**APPENDICES**

Appendix A Croton-On-Hudson Water Main Mapping & Hydrant Flow Data
Appendix B Head Loss Calculation Worksheets

**Appendix A**
**Water Main Mapping & Hydrant Flow Data**


H-241
H-247
H-251
H-245
H-29

# FLOW TEST REPORT

Location Harmon Fire House, Benedict Blvd Date 4/13/11

Test Made by Daniel O'Connor,, P.E. Time 2:05 PM .M.

Representative of Village of Croton-on-Hudson

Witness Tom Brann (Water Dept.) and Tex Dinkler (Fire Dept.)

State Purpose of Test Harmon Fire House sprinkler system design

Consumption Rate During Test normal, approximately 850,000 GPD Storage tank near full

If Pumps Affect Test, Indicate Pumps Operating Well 1 running

Flow Hydrants ($A_1$) ~~$A_2$~~ ~~$A_3$~~

Size Nozzle 2.5"

Pitot Reading 44 psi Total gpm 1120

gpm 1120 (direct reading from gage on pitot diffusor)

Static *B* 122 psi Residual *B* 53 psi

Projected Results: at 20 psi Residual 1383 gpm; or at ~~___~~ psi Residual ~~___~~ gpm

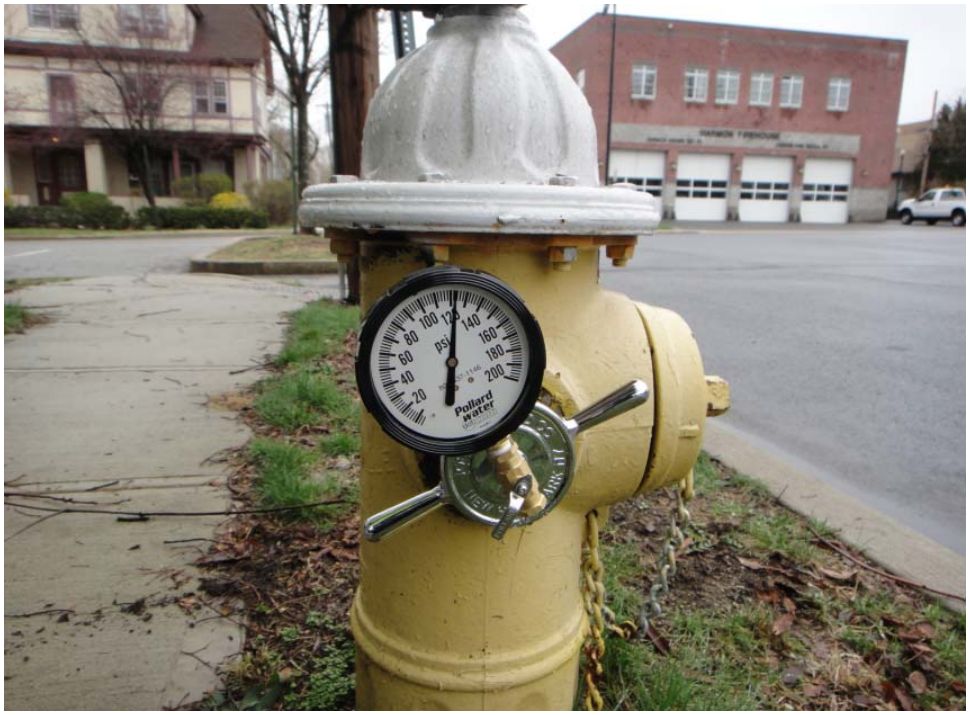
Remarks New 8" and 10" water mains on Wayne St. and Benedict Blvd. However this are feed by some smaller mains which results in the significant pressure drop.

*Location Map:* Show line sizes and distance to next cross connected line. Show valves and hydrant branch size. Indicate North. Show flowing hydrants—label $A_1$, $A_2$, $A_3$. Show location of Static and Residual—label *B*

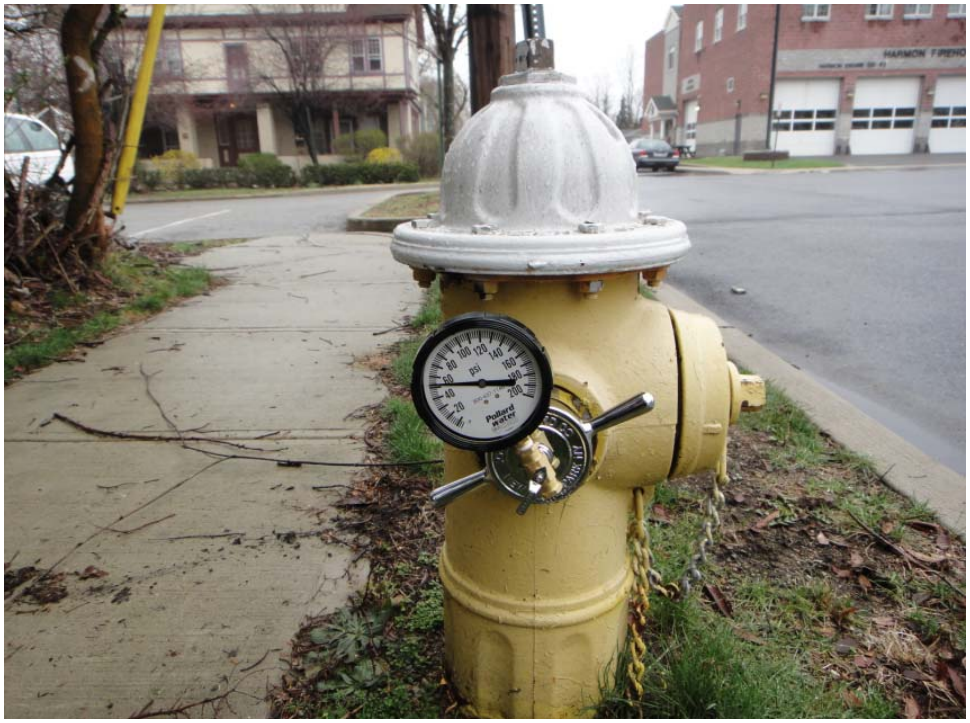
Indicate *B* Hydrant X Sprinkler ~~___~~ Other (identify) ~~___~~

STATE OF NEW YORK
DANIEL FRANCIS O'CONNOR
067961
LICENSED PROFESSIONAL ENGINEER

Harmon Sprinkler System Design Hydrant Flow Test, 4/13/11
Pictures taken by Daniel O'Connor, P.E.

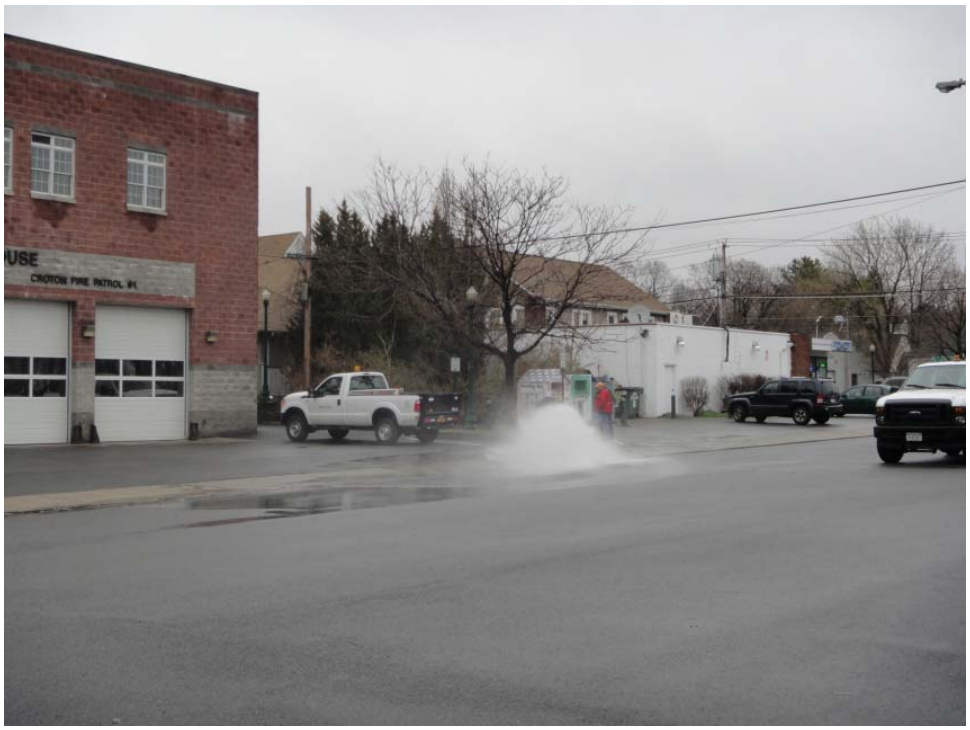


Hydrant B (Wayne St.): Static pressure of 122 psi.

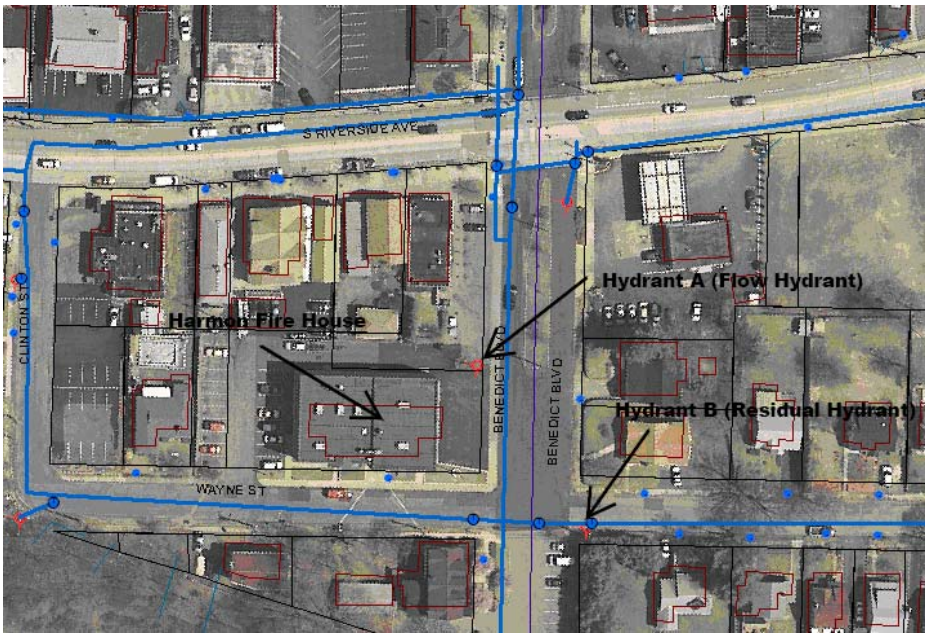


Hydrant B (Wayne St.): Residual pressure of 53 psi.

Harmon Sprinkler System Design Hydrant Flow Test, 4/13/11
Pictures taken by Daniel O'Connor, P.E.



Hydrant A (Benedict Blvd.): Flow rate was 1120 GPM.




Hydrant locations

**Appendix B**
**Head Loss Calculation Worksheets**

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**WB Croton Point**
**Head Loss Calculations - Domestic Flow**
Head Loss in Service Line

| | | | |
|---|---|---|---|
| C | 110 | | Roughness coefficient for ductile iron pipe |
| d | 2 | in | Diameter of water service line |
| L | 100 | ft | Length of water service line |
| Q | 47 | gpm | Flow Rate |
| V | 4.8 | ft/s | Velocity |
| $L_e$ | 20 | ft | Equivalent length to account for losses in valves and bends |
| $L_t$ | 120 | ft | Total Length = $L + L_e$ |
| HL | 9 | ft | $HL = \frac{10.44(L_t)(Q^{1.85})}{(C^{1.85})(d^{4.87})}$ |

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**WB Croton Point**
**Head Loss Calculations - Fire Flow**
Head Loss in Service Line

| | | | |
|---|---|---|---|
| C | 110 | | Roughness coefficient for ductile iron pipe |
| d | 6 | in | Diameter of water service line |
| L | 100 | ft | Length of water service line |
| Q | 1047 | gpm | Flow Rate |
| V | 11.9 | ft/s | Velocity |
| $L_e$ | 20 | ft | Equivalent length to account for losses in valves and bends |
| $L_t$ | 120 | ft | Total Length = $L + L_e$ |
| HL | 13 | ft | $HL = \frac{10.44(L_t)(Q^{1.85})}{(C^{1.85})(d^{4.87})}$ |