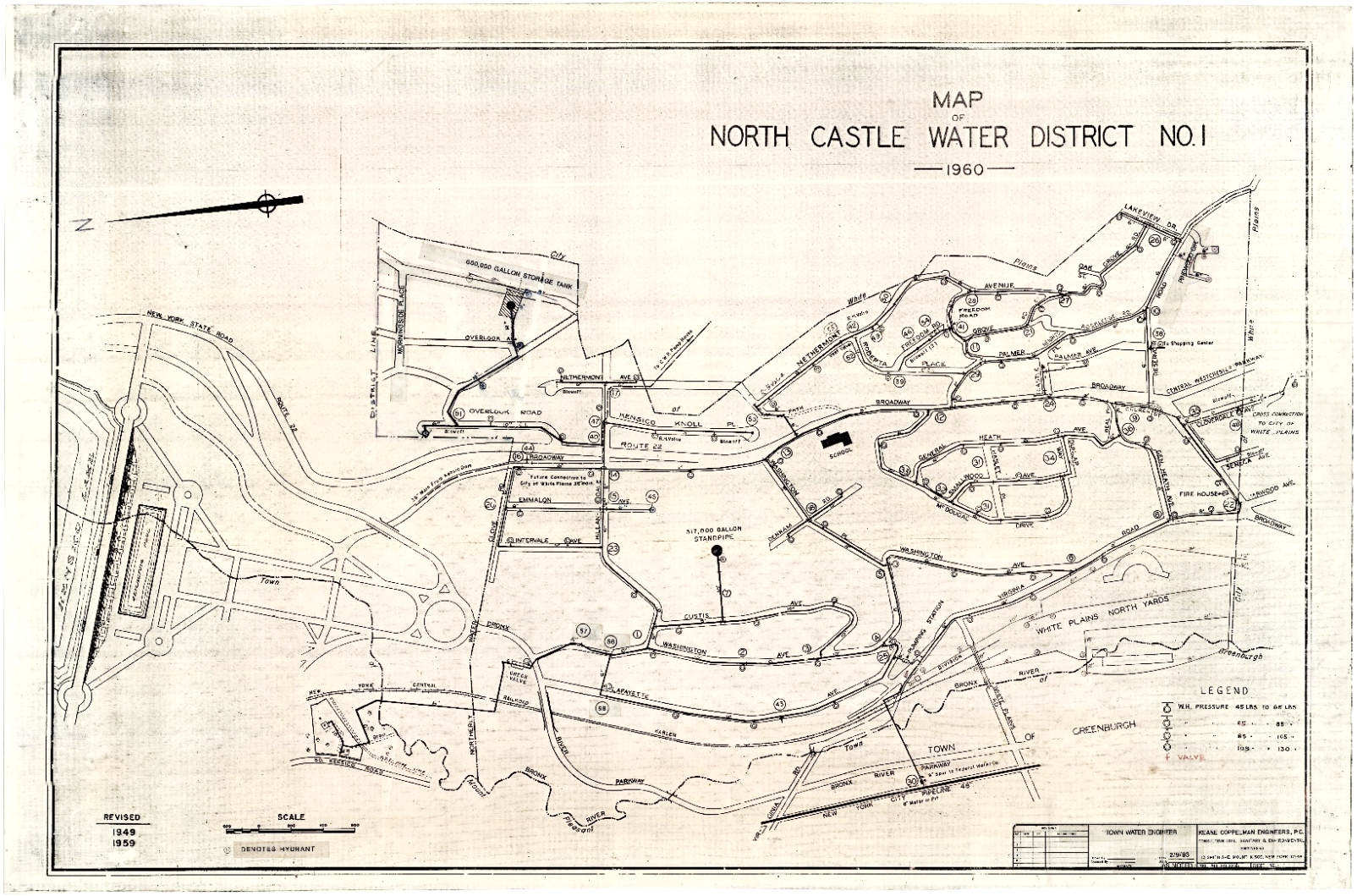
North Castle Water District #1
Water Main Improvements

GHD
Kevin Castro, P.E. | Principal
John Abbatangelo, E.I.T. | Project Engineer
January 23, 2020

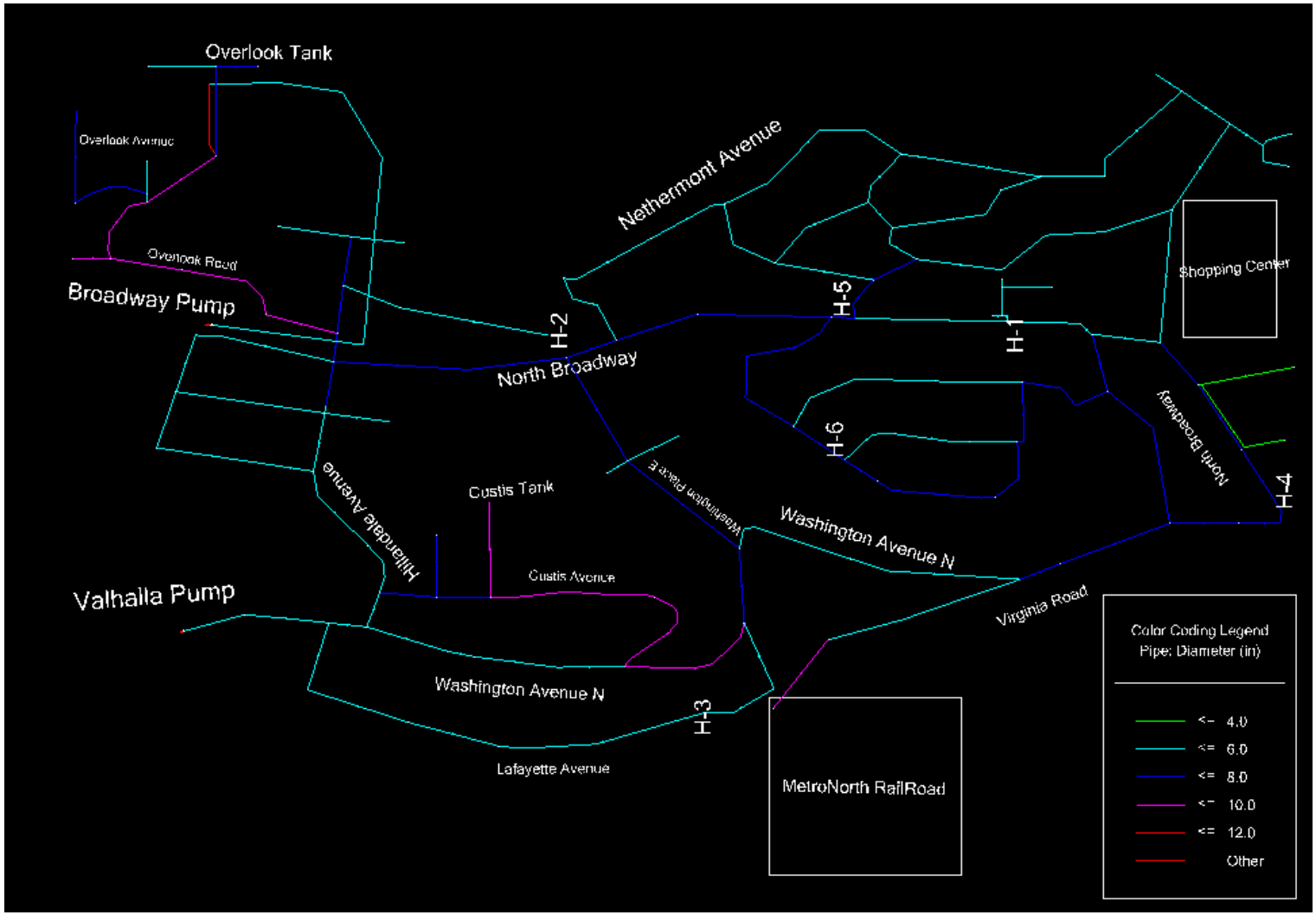
Meeting Agenda

1. Overview of Water District #1 (WD #1)
2. System and Supply Statistics
3. Model Calibration and Hydrant Testing
4. Recommended Improvements
5. Cost Opinions

Water District #1 Map



Water District #1 Pipe Diameter Map



Water District No. 1

Total Miles of Pipe = ~**8 miles**

Pipe Material: Mostly **cast iron**, some ductile iron

- Oldest pipes approximately 90 years old
- Most common pipe diameter is 6-in

Total of **2 tanks**

- Overlook: 600,000 gallons
- Custis: 317,000 gallons

Number of hydrants = **94**

- Minimum Static/Residual Pressure = 15 psi/2 psi

Metered Sales: 230,000 GPD (161.5 GPM)

Average Daily Production: 325,000 GPD

Maximum Day Demand (est.): ±650,000 GPD

Estimated non-revenue water is **28%**

Current Water Supply Sources

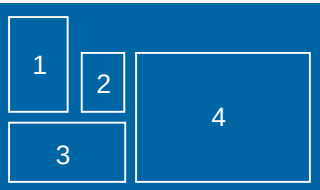
North Broadway BPS (Kensico Reservoir)—**ACTIVE**

- Capacity = 0.5 MGD

Valhalla Well—**INACTIVE** (reduced yield and electrical issues)

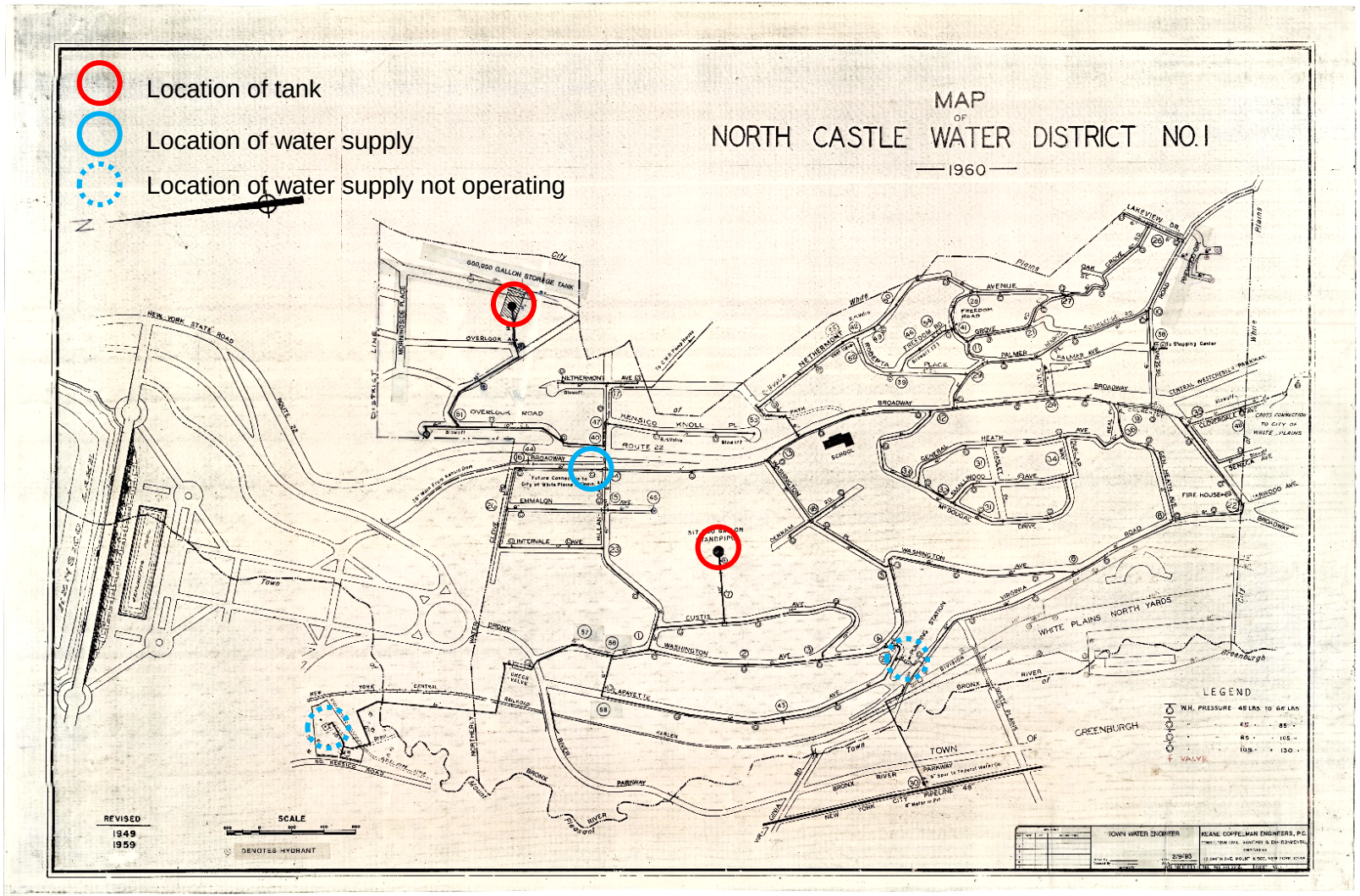
Virginia Road PS—**INACTIVE** (lacks *Cryptosporidium* inactivation)

Water Main Issues



1. **Smallwood Avenue Break**
2. **MacDougal Break**
3. **Corroded Gate Valve on Emmalon Avenue**
4. **Gate Valve Repair on Emmalon Avenue**

Water District #1 Tanks and Sources



Model Calibration Effort

Hydraulic models require calibration before being used.

- Gather field data, test inside model.

Water main conditions fragile, prevented recent hydrant testing activity.

- Attempts at using past ISO data were unsuccessful:
    1. Potential for closed valves
    2. Age of available data
    3. Did ISO physically collect data?

ISO Data

INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City North Castle South Fd 1

County New York (Metro)(Westchester), State New York (Metro) (31)

Witnessed by: Insurance Services Office

Date: Dec 10, 2014

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM $Q=(29.83(C(d^2)p^{0.5}))$ INDIVIDUAL HYDRANTS			TOTAL	PRESSURE PSI STATIC	PRESSURE PSI RESID.	FLOW -AT 20 PSI NEEDED **	FLOW -AT 20 PSI AVAIL.	REMARKS***	MODEL TYPE
1.0		North Broadway & Castle Rd.	North Castle Water District 1, TOWN OF NORTH CASTLE 1	1070	0	0	1070	105	34	4500	1200	(D)-(4218 gpm)	H-1
1.1		North Broadway & Castle Rd.	North Castle Water District 1, TOWN OF NORTH CASTLE 1	1070	0	0	1070	105	34	2500	1200		
2		North Broadway & Washington Ave.	North Castle Water District 1, TOWN OF NORTH CASTLE 1	1180	0	0	1180	110	80	2000	2100		H-2
3.0		Lafayette Ave. n/o Virginia Ave.	North Castle Water District 1, TOWN OF NORTH CASTLE 1	1010	0	0	1010	127	30	2500	1100		H-3
4.0		North Broadway & Hardwood Ave.	North Castle Water District 1, TOWN OF NORTH CASTLE 1	890	0	0	890	126	40	2000	1000		H-4
5.0		North Broadway & Palmer Place	North Castle Water District 1, TOWN OF NORTH CASTLE 1	710	0	0	710	134	125	1000	2800		H-5
6		Smallwood Ave. & Mc Dougal Dr.	North Castle Water District 1, TOWN OF NORTH CASTLE 1	730	0	0	730	72	16	1000	700		H-6

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION.

THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

*** (A)-Limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (B)-2 hours, (C)-3 hours or (D)-4 hours.

Error in Calibration Data

STATIC

ISO 2014			
Test No.	Static Pressure (psi)		% Error
	Test Data	Model Output	
1	105	111	-5.4%
2	110	102	7.8%
3	127	119	6.7%
4	126	131	-3.8%
5	105	100	5.0%
6	72	72	0.0%

ISO 2014 (N Broadway pipe shut)			
Test No.	Static Pressure (psi)		% Error
	Test Data	Model Output	
1	105	111	-5.4%
2	110	102	7.8%
3	127	119	6.7%
4	126	131	-3.8%
5	105	100	5.0%
6	72	72	0.0%

ISO 1999			
Test No.	Static Pressure (psi)		% Error
	Test Data	Model Output	
1	80	102	-21.6%
2	130	121	7.4%
3	135	119	13.4%
4	74	66	12.1%

RESIDUAL

ISO 2014:

ISO 2014 - INITIAL			
Test No.	Dynamic Pressure (psi)		% Error
	Test Data	Model Output	
1	34	68	-50.0%
2	80	89	-10.1%
3	30	95	-68.4%
4	40	105	-61.9%
5	34	75	-54.7%
6	16	46	-65.2%

ISO 2014 - IN CALIBRATION			
Test No.	Dynamic Pressure (psi)		% Error
	Test Data	Model Output	
1	34	59	-42.4%
2	80	79	1.3%
3	30	74	-59.5%
4	40	96	-58.3%
5	34	66	-48.5%
6	16	36	-55.6%

ISO 2004:

ISO 2004 - INITIAL			
Test No.	Dynamic Pressure (psi)		% Error
	Test Data	Model Output	
1	34	68	-50.0%
2	80	89	-10.1%
3	30	95	-68.4%
4	40	105	-61.9%
5	34	71	-52.1%
6	16	46	-65.2%

ISO 2004 - IN CALIBRATION			
Test No.	Dynamic Pressure (psi)		% Error
	Test Data	Model Output	
1	34	59	-42.4%
2	80	79	1.3%
3	30	75	-60.0%
4	40	95	-57.9%
5	34	62	-45.2%
6	16	36	-55.6%

ISO 1999:

ISO 1999			
Test No.	Dynamic Pressure (psi)		% Error
	Test Data	Model Output	
1	49	90	-45.6%
2	85	83	2.4%
3	80	96	-16.7%
4	25	50	-50.0%

ISO 1999 - IN CALIBRATION			
Test No.	Dynamic Pressure (psi)		% Error
	Test Data	Model Output	
1	49	84	-41.7%
2	85	74	14.9%
3	80	82	-2.4%
4	25	45	-44.4%

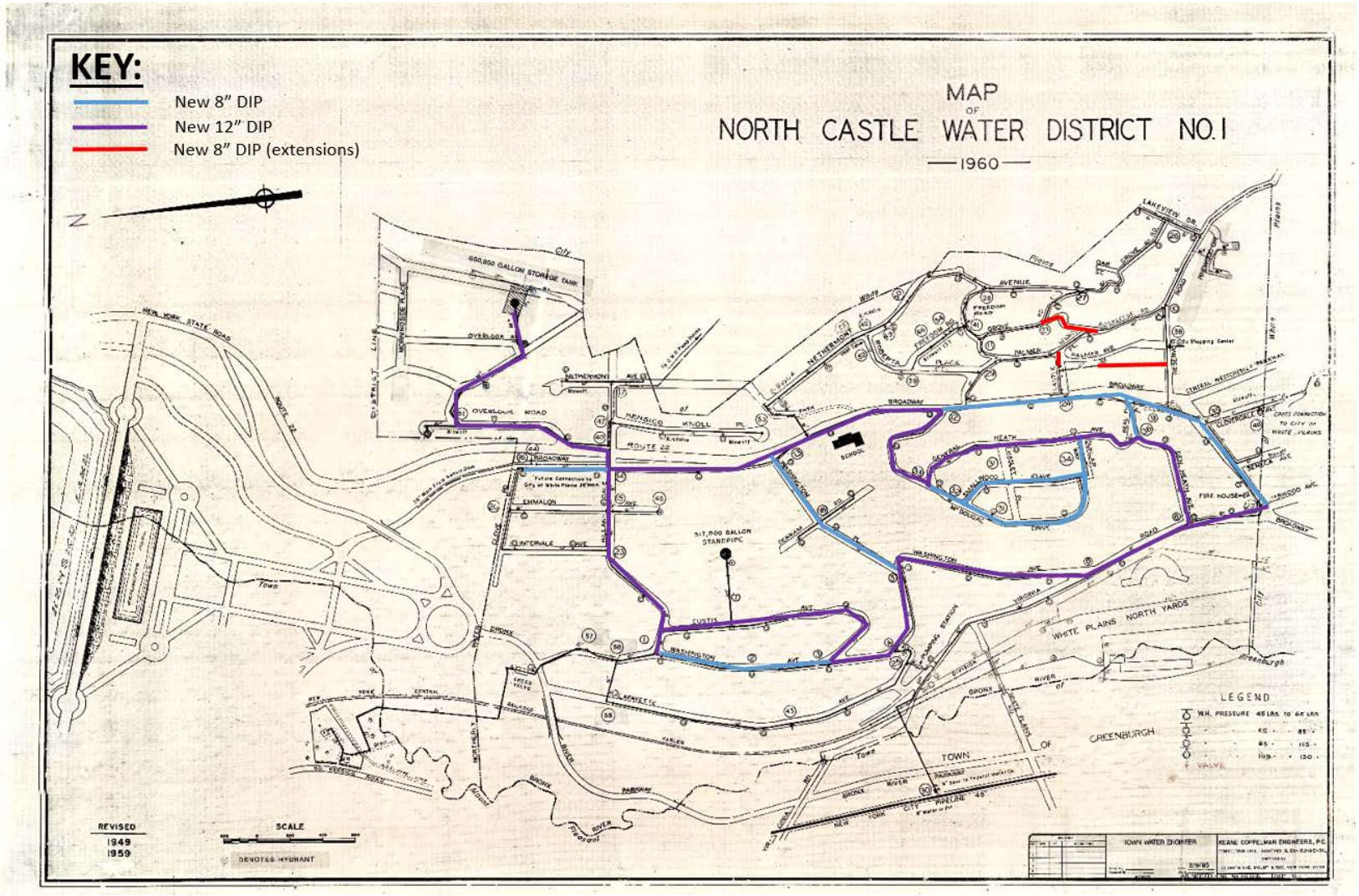
Hydrant Testing

Recommended Improvements

GHD believes that the best option for improving the system is pipe size increase and added mains:

1. General Heath and Palmer Avenue areas (priority)
2. North Broadway, Hillandale Avenue, Virginia Road, and Washington Avenue (hydraulics and condition)

Water District #1 Main Rehabilitation Recommendations



Cost Opinions

1. **Priority Replacements—General** Heath Avenue and Palmer Avenue, 6,100 LF
   - Project Cost: **$1,940,000**
2. **Recommended Replacements**—North Broadway, Hillandale Avenue, Virginia Road, Washington Avenue, 10,900 LF
   - Project Cost: **$3,500,000**

Other Recommendations

- Valhalla Well
- Virginia Road PS
- Low Pressures near Overlook Tank

Questions?

www.ghd.com