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Implementation of an I/I Reduction and Hydraulic Modeling Program to Optimize Collection System Capacity for Future Development

Welcome

An abstract, high-contrast image with a blue and black textured background, possibly representing water or a rocky surface, occupying the left half of the slide.

Session overview

- 1** Background / Hydraulic Model Development
- 2** Using model to assess hydraulic restrictions
- 3** Using model in infiltration / inflow program
- 4** Next steps

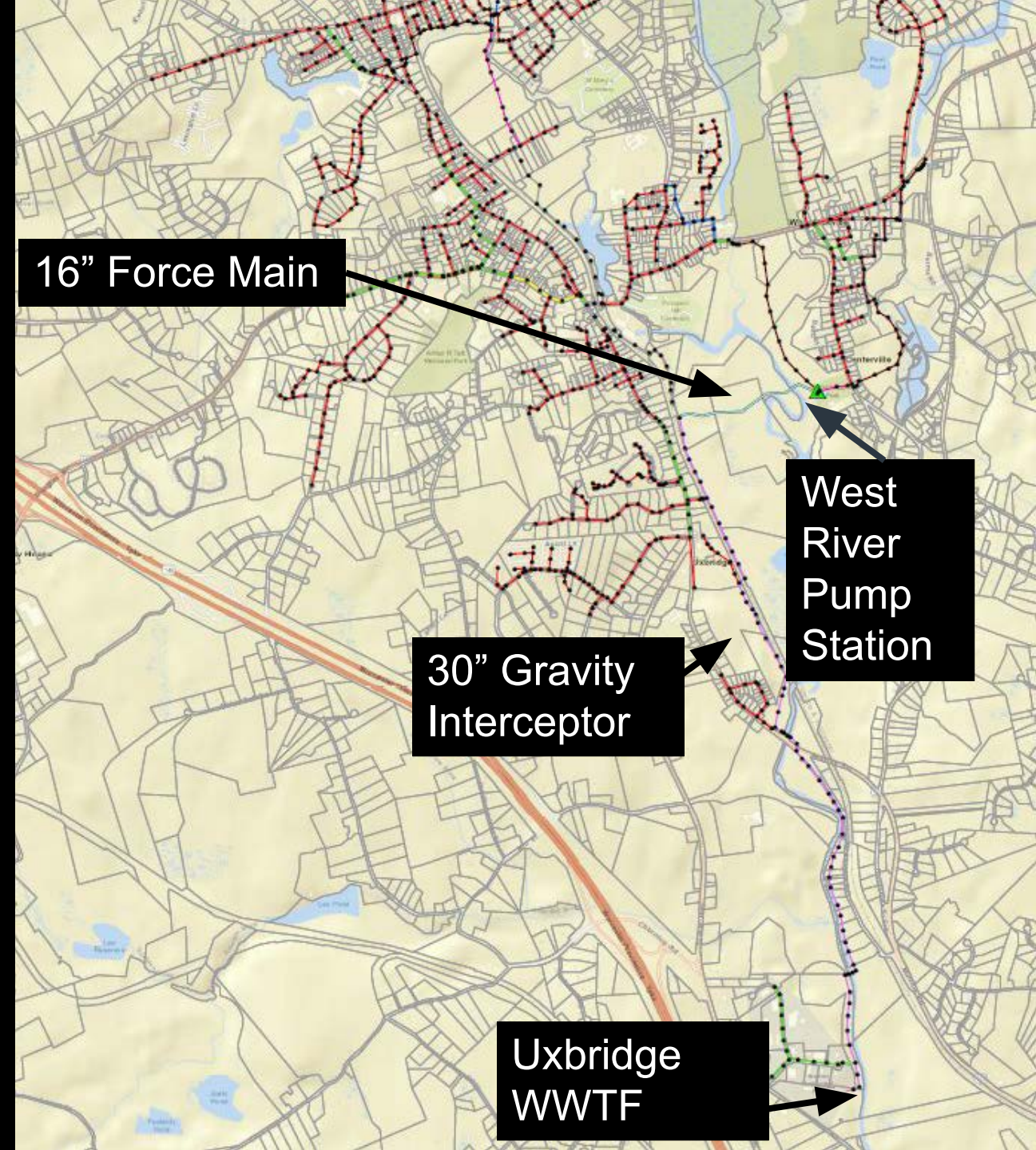
Background

Uxbridge collection system

- Original sewer system constructed in the late 1970s
 - RCP, AC, PVC, and DI Pipe
 - ~ 189,000 LF of gravity sewer
 - ~ 6,000 LF of Force Main
 - Five pump stations
- Since original installation developments have be proposed out periphery of system

Uxbridge hydraulic model development

- SewerCAD model originally developed in 2016
 - Town GIS data
 - Town Record Drawings
- Converted to a SewerGEMS model in 2020 to allow to model steady-state and dynamic wet-weather conditions



Identifying hydraulic constrictions

Potential
Hydraulic
Constriction

Sub Area 3

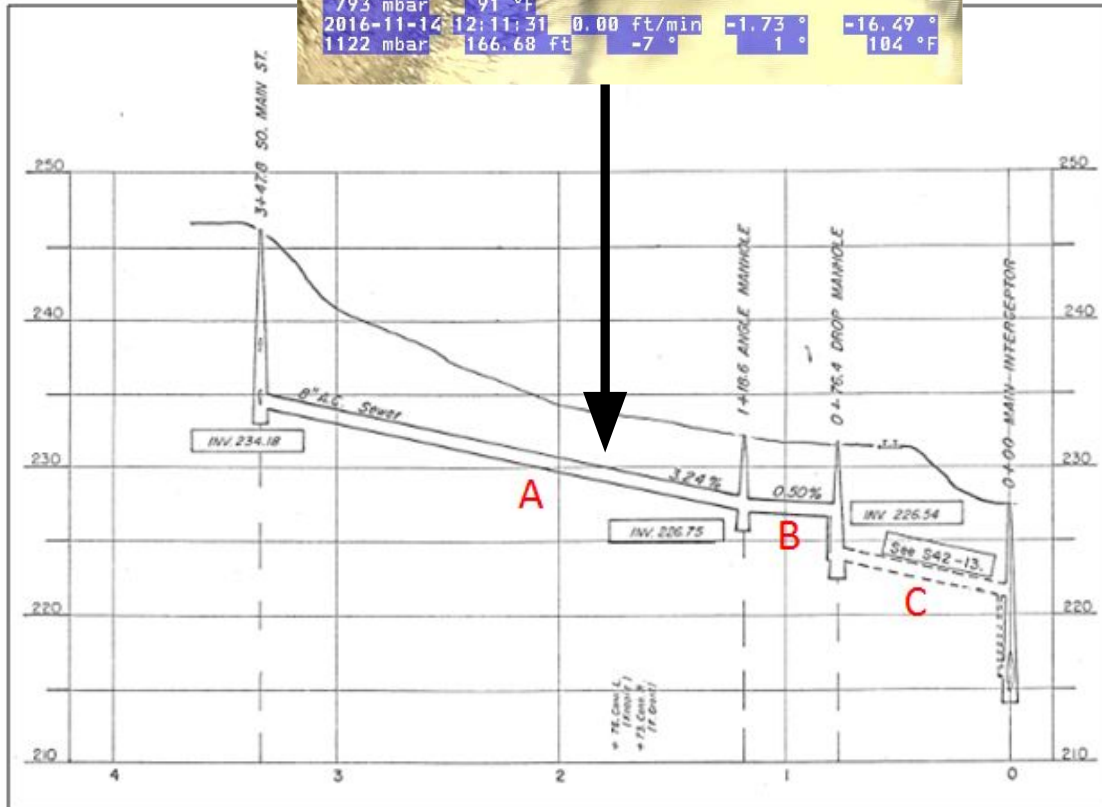
30" Gravity Interceptor

Sub Area 2

Proposed New Development
- 750 new bedrooms

Potential hydraulic constriction

- Very shallow slope where gravity system passes under railroad
- CCTV footage showed evidence of historic surcharging ~ 20 feet from downstream invert indicating backup



Potential Hydraulic Constraint



- SewerCAD model run at peak flow conditions with proposed development
- Hydraulic capacity analysis indicated adequate capacity in pipe
- Town surveyed pipe found a sag in the pipe
- Pipe replaced and slope increased
- Model updated to allow assessment of future developments

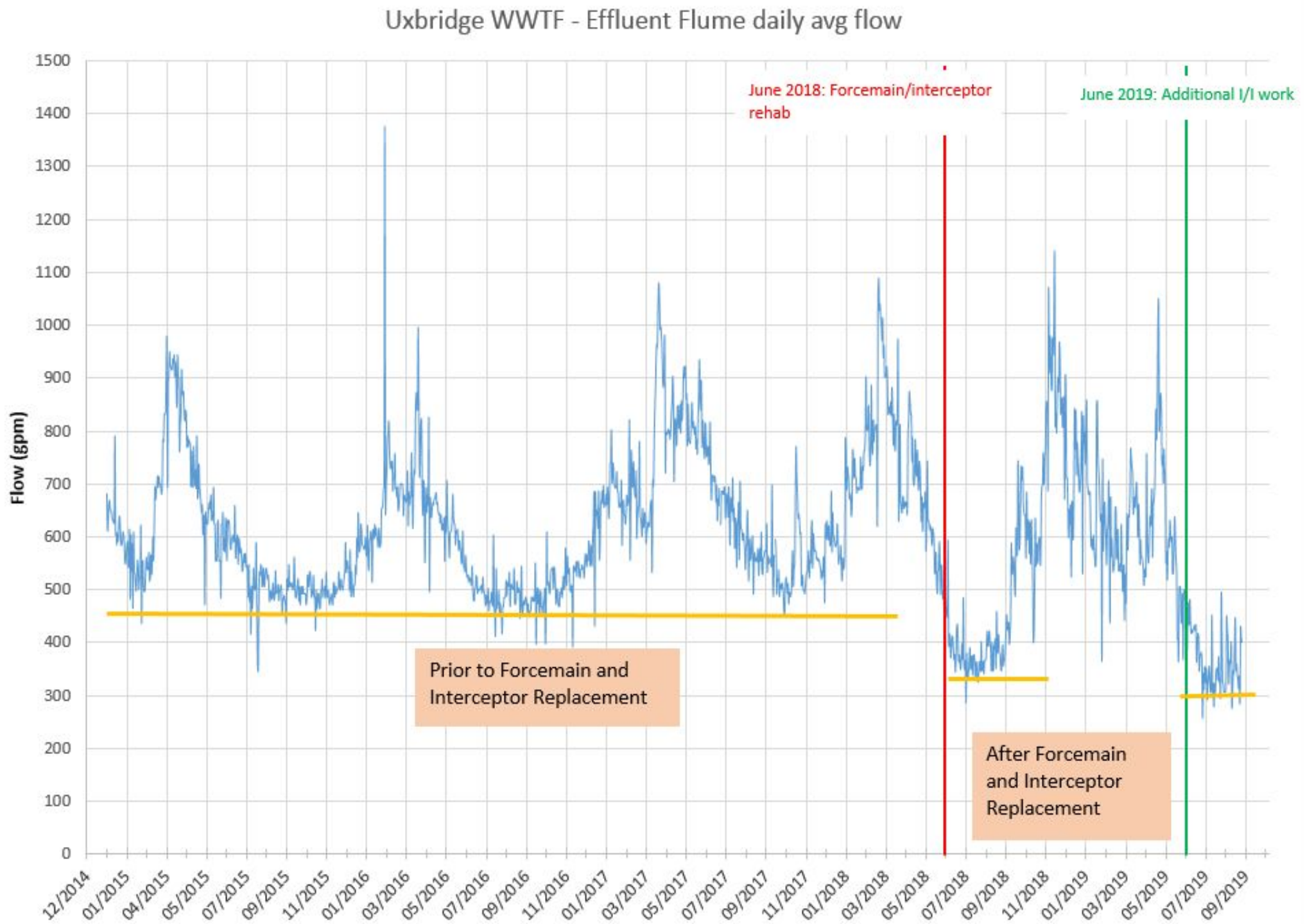
Inflow / Infiltration program



Infiltration / Inflow program

- Town conducted initial flow metering assessment in 2005
- 2005 infiltration data and water balance used to calibrate original SewerCAD model
- Town has been systematically addressing
 - Defects noted in 2005 study
 - Manhole rehabilitation program
 - Defects found through proactive inspections
 - Gravity interceptor repair
- New flow metering assessment initiated in 2020

2014 – 2019 Influent Flow Data



2020 Flow Monitoring Program



Guidelines for Performing
Infiltration/Inflow Analyses
and Sewer System Evaluation
Surveys

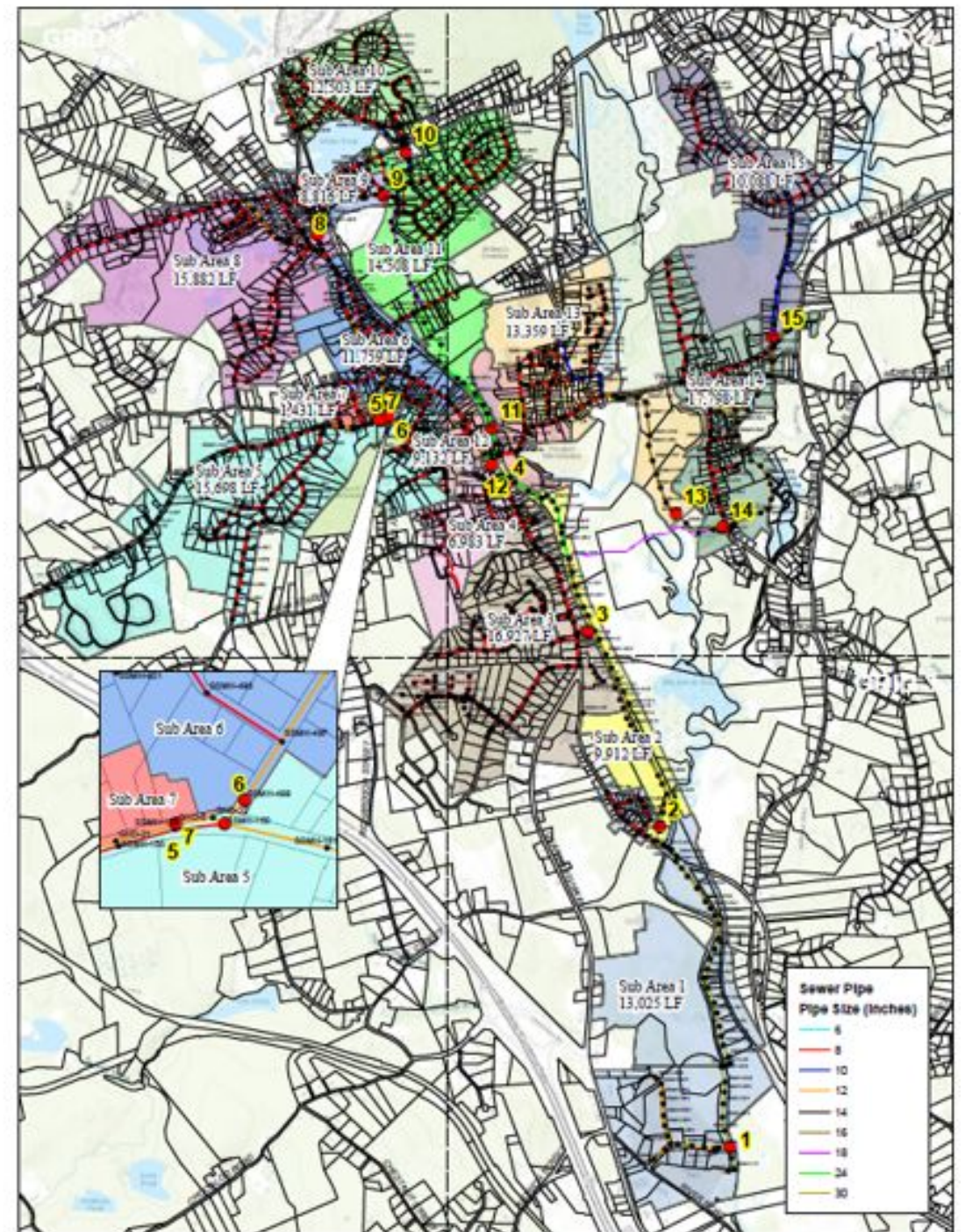


May 2017

- Developed in accordance with CMR 314 Section 12.04
- Purpose: to identify excessive I/I sources in the system:
 - Sources which lead to the risk of overflow during a 5-year, 24-hour rain event
 - Infiltration sources that can be cost effectively removed from the system
 - All public / private inflow sources

Flow metering program

- Gravity system divided into 15 subsystems
- Flow data collected over 10 weeks (April - June)
- Data used to calibrate SewerGEMS model
- Model used to estimate risk of 5-year, 24-hour storm

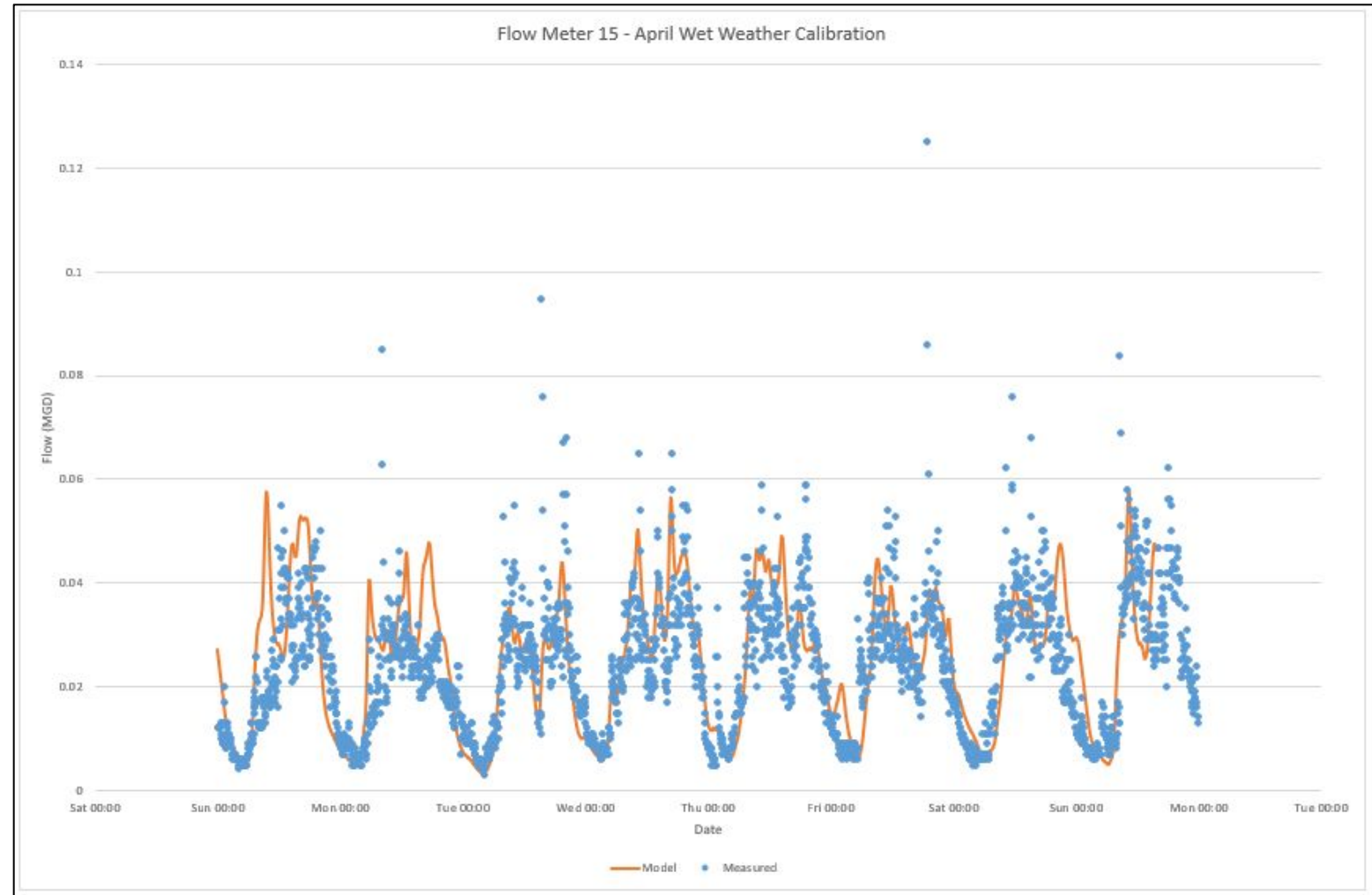


Flow monitoring



Dry weather calibration

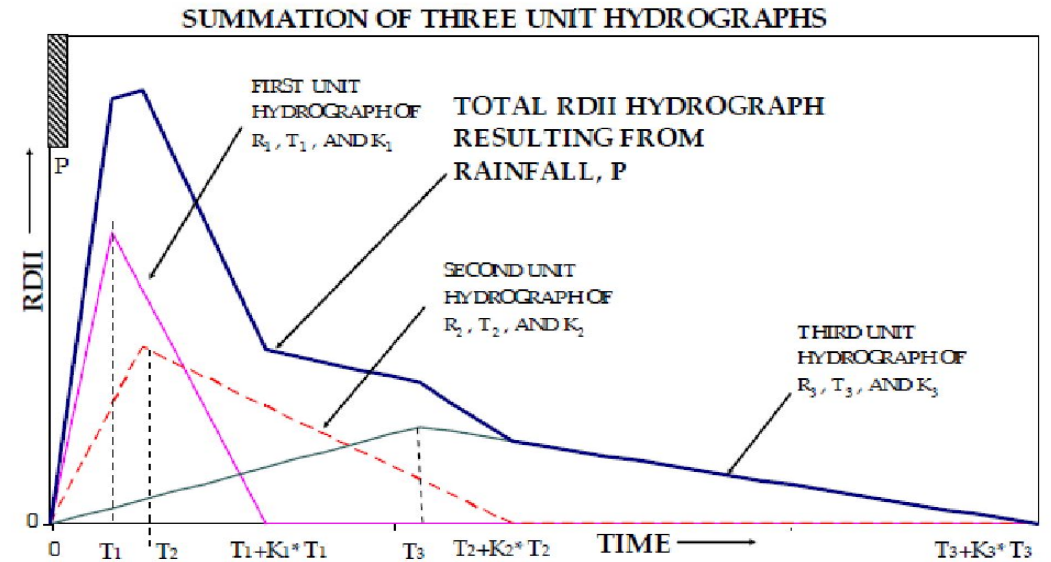
- Identified dry weather days for each day of the week
 - At least 3 days of no rainfall
- Created model dry weather week for April, May, June
- Entered into SewerGEMS as a repeating daily pattern
- Multiplier used to adjust for seasonal high groundwater



Wet weather calibration

- RTK unit hydrograph method
- Rapid inflow
 - Direct connections
- Moderate infiltration
 - Through soil to pipe defects
- Slow infiltration
 - Groundwater infiltration
- R – Fraction of rainfall entering sewer
- T – Time to peak
- K – Tail factor (ratio of time to peak to time to end of hydrograph)

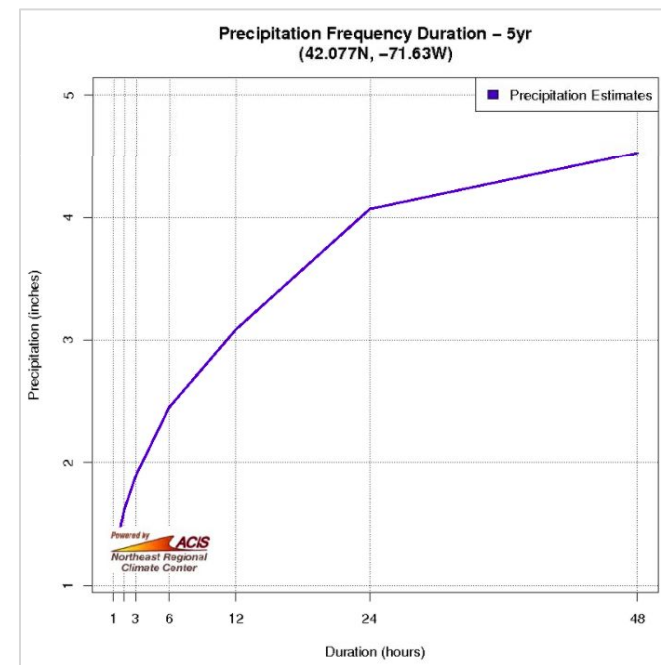
Source: 'Computer Tools for Sanitary System Capacity Analysis and Planning, USEPA October 2007



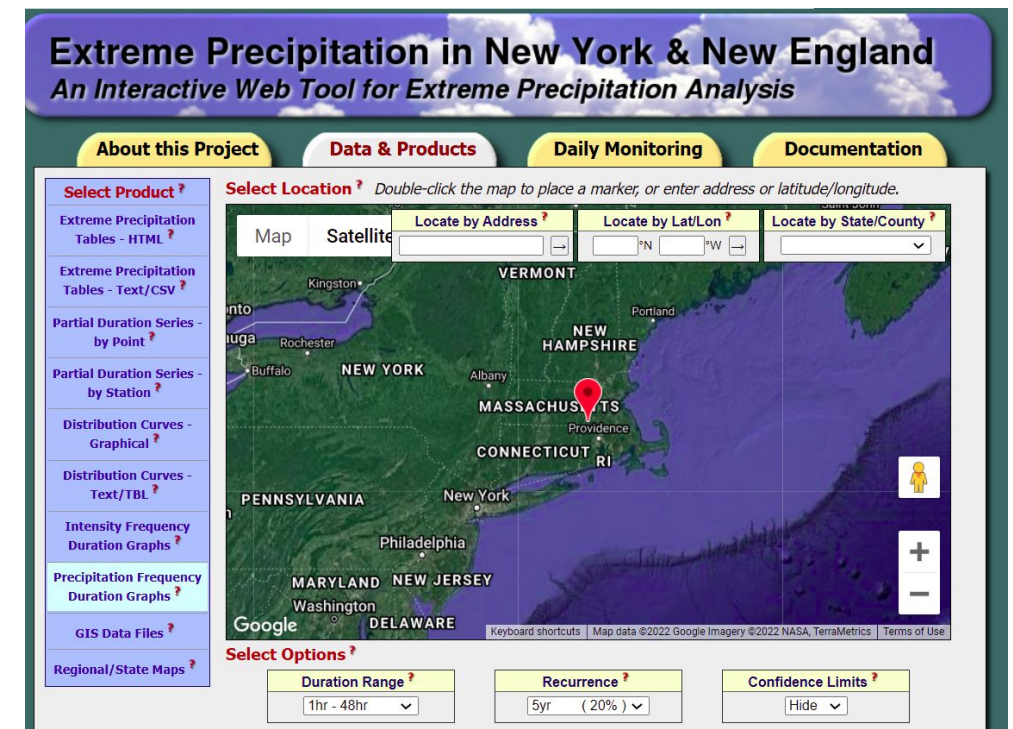
	R	T (hours)	K
Short-Term	0.005	0.030	1.000
Medium-Term	0.000	1.000	2.000
Long-Term	0.000	3.000	5.000

Design storm

- Extrapolate largest observed rainfall events to 5-year, 24 hour storm
- Conduct simulation of design storm during the highest groundwater month (April)
- Assess risk of SSO's



Source: Northeast Regional Climate Center



Findings

- Analysis indicated no major hydraulic restrictions during 5-year, 24-hour rainfall event
 - No SSO's observed during simulated design storm
 - Groundwater infiltration observed along main interceptor
- 5-year, 24-hour rainfall event can be used in future capacity evaluations

Next steps ↴

- Based on flow metering program findings Town is focusing next I/I program steps on:
 - Physical inspections
 - Repairing structural defects
- Model will continue to be refined with new data
- 5-year, 24-hour storm simulation can be used to assess hydraulic capacity for future proposed developments

CAMPANELLI BUSINESS PARK OF UXBRIDGE



Overview:

Campanelli brings over 70 years of development experience, civic commitment and expertise to Uxbridge, in the form of a new \$100 million business park on 275 acres on the east and west sides of Route 146 at Route 16.

Class A Industrial property totaling just under 2 Million Square Feet

- Lot One: 800,000 SF – OCCUPIED
- Lot Two A: 74,000 SF – OCCUPIED
- Lot Two B: 100,000 SF – OCCUPIED
- Lot Three: 450,800 SF – SPEC BUILDING UNDER CONSTRUCTION
- Lot Five: 518,300 SF – DISTRIBUTION CENTER UNDER CONSTRUCTION

Watch Our Progress!



Lot 5 - Distribution Center Building



* Questions