Prepared for

Narragansett Bay Commission

CSO Control Facilities Phase III Reevaluation Grey Alternatives

10 April 2014

MWH

BUILDING A BETTER WORLD

PARE CORPORATION

Outline

- Alternatives definition & Stakeholder engagement process
- Grey infrastructure alternatives development

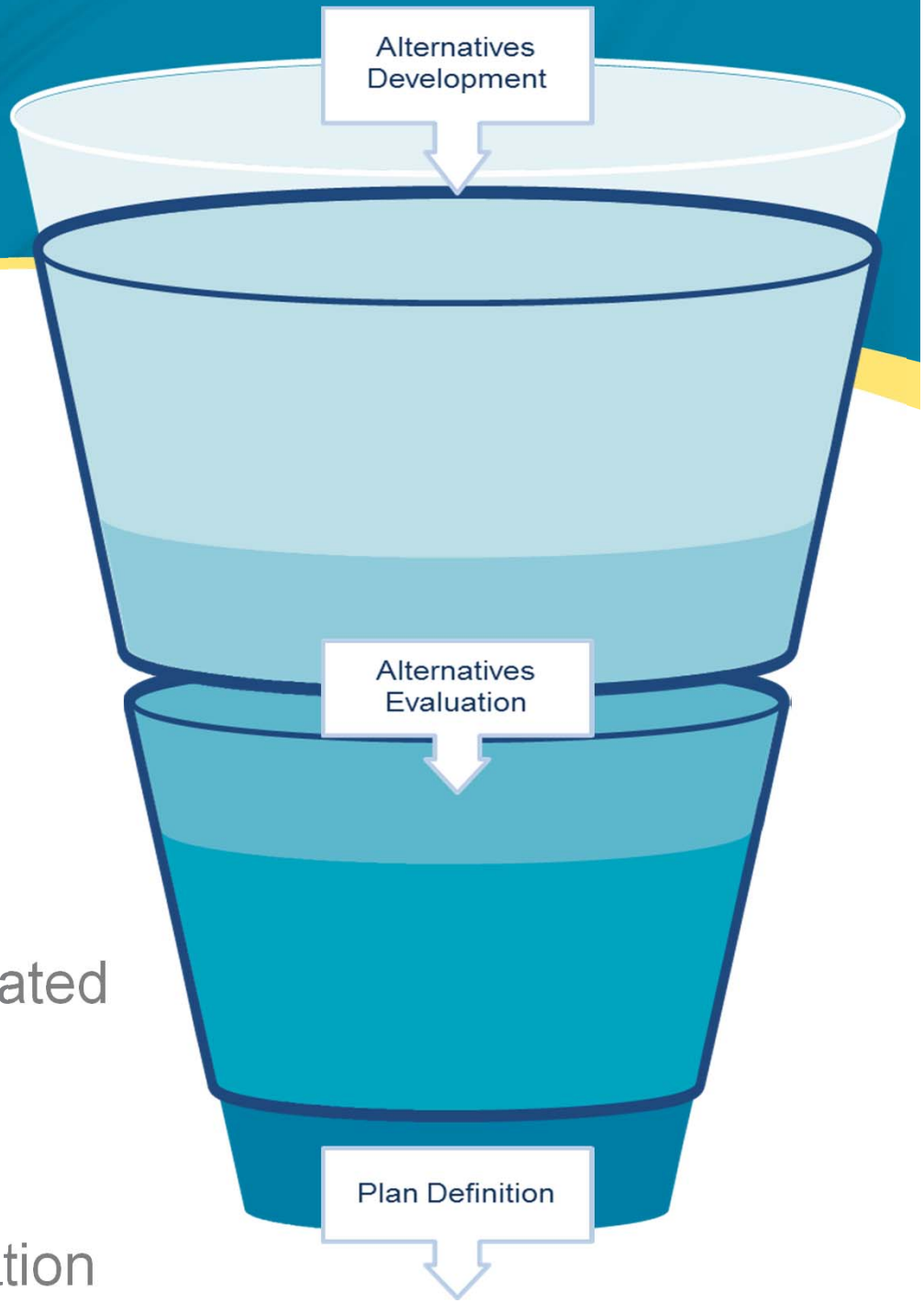
Alternatives Definition & Stakeholder Engagement Process

Table 1
Summary of Abatement Alternatives for Phase III Overflows

Alternatives	Overflows
Tunnel and Interceptors	103,104, 105, 201, 203, 205, 210, 211, 213, 217, 218, 220
Sewer Separation	035, 039, 056, 206
Regulator Modifications	036, 101,107, 202, 204, 207, 208, 209, 212, 214, 215, 216

Development & Evaluation Process

- Alternatives Development
  - April 10, Grey Infrastructure Focus
  - May 22, Green Infrastructure Focus
- Alternatives Evaluation
  - June 19, Evaluation Criteria Focus
  - September 4, Integrated Planning Workshop
- Plan Definition
  - October 23, Plan Review and Finalization



Alternatives Development Meeting Structure

- Alternative General Overview
  - Advantages & disadvantages
  - Technical constraints
- CSO-Specific Applications
  - Detailed evaluation
- Evaluation Criteria
  - → Parking lot

Grey Infrastructure Alternatives

Meeting Outline

- Sewer separation
  - Overview
  - 035, 039, 056, 206 (baseline)
  - All other 100- and 200-series
- Pawtucket Tunnel
- Tunnel Interceptors
  - Overview
  - 101-4, 201-5, 220 (baseline)
- Spur tunnel
  - 220
- Localized combined flow handling (near-surface storage, discharge)
  - Overview
  - 035, 039, 056, 220, 101, 102, 103, 205, 218
- Stormwater control
  - Overview (flow controls, infiltration, storage, GSI)
  - 035. 039. 056

Grey Infrastructure Alternatives

Fundamental Differences

- Sewer separation
  - All wastewater to WWTF
  - All stormwater to rivers
  - Eliminates the CSO
  - Discharges urban runoff to rivers
- Tunnel & Near-surface storage
  - CSO volumes detained & subsequently treated at WWTF
  - CSO discharges to rivers for large storms
  - Urban runoff treated for small storms & first flush
- Localized treatment & discharge
  - CSO volumes minimally treated and discharged to rivers
  - Urban runoff treated for small storms & first flush
- Stormwater control
  - System optimization

Sewer Separation

Sewer Separation Overview

- Advantages
  - Reduced stormwater discharge to NBC interceptors
    - May help upstream and downstream discharges
  - Reduced treatment volume
  - Potential for improved streetscape
- Disadvantages
  - Increased stormwater discharge to flood-prone rivers may require mitigation
  - Increased pollutant load to receiving water bodies
  - Major disruptions to residential and commercial areas
    - Street closures and traffic delays
    - Economic impact to businesses
  - Illicit discharge potential
  - Utility coordination (water, gas, electric)
  - Cost of improved streetscape

NBC Phase II Sewer Separation

Neighborhood Impacts

- Impacts to Businesses from Reduced Visibility, Access
- Impacts to Pedestrians and Traffic from Road Conditions
- Impacts on Residents from Noise, Dust, other Nuisances

NBC Phase II Sewer Separation

Utility Issues

- Utility Crossings/Conflicts Complicate Drain Installation
- Inaccurate/Incomplete Mapping Represents Significant Risk

NBC Phase II Sewer Separation

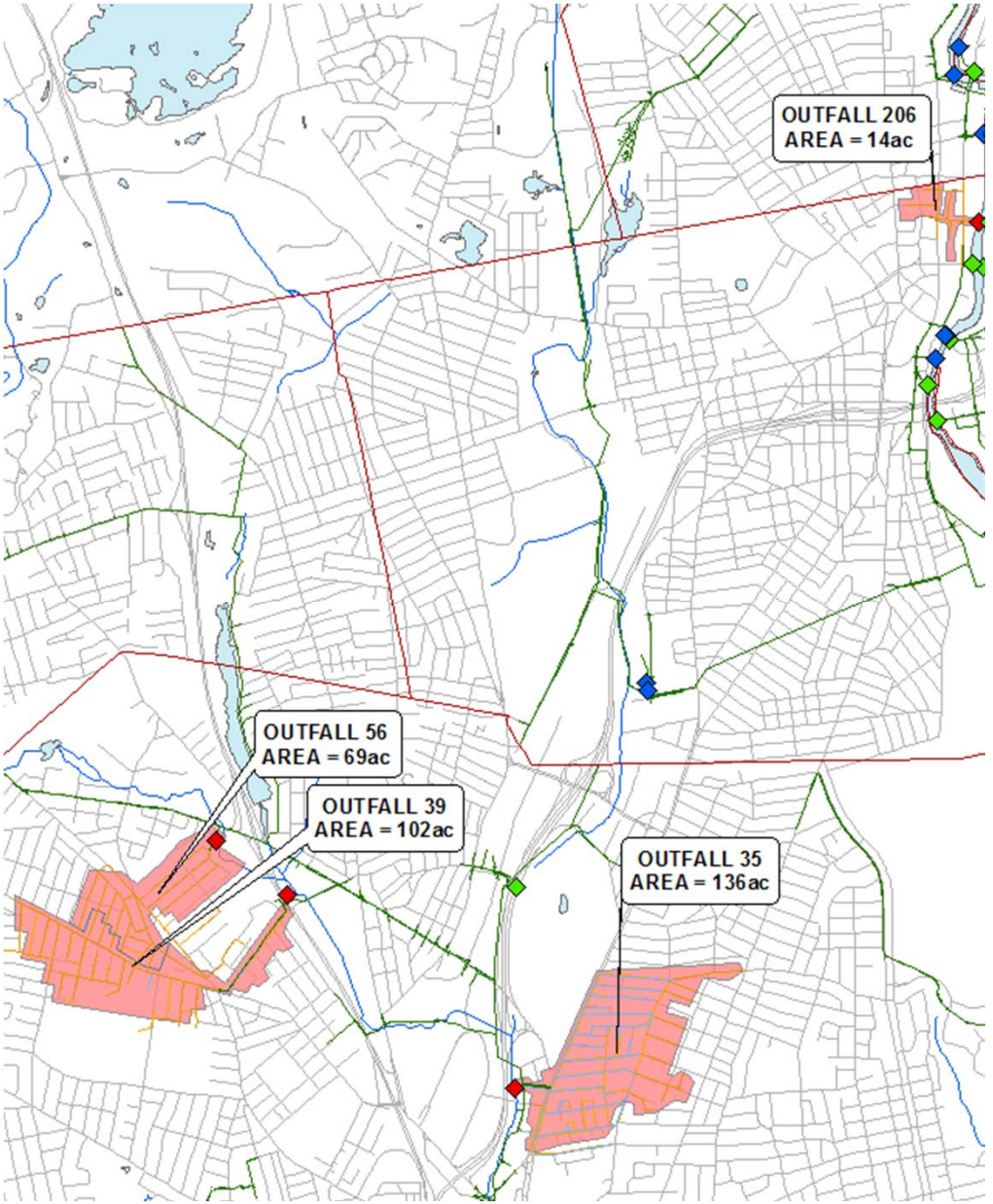
- Water and Gas Relocations Required
- Beautification/Safety Improvements Added on Hope Street

NBC Phase II Sewer Separation

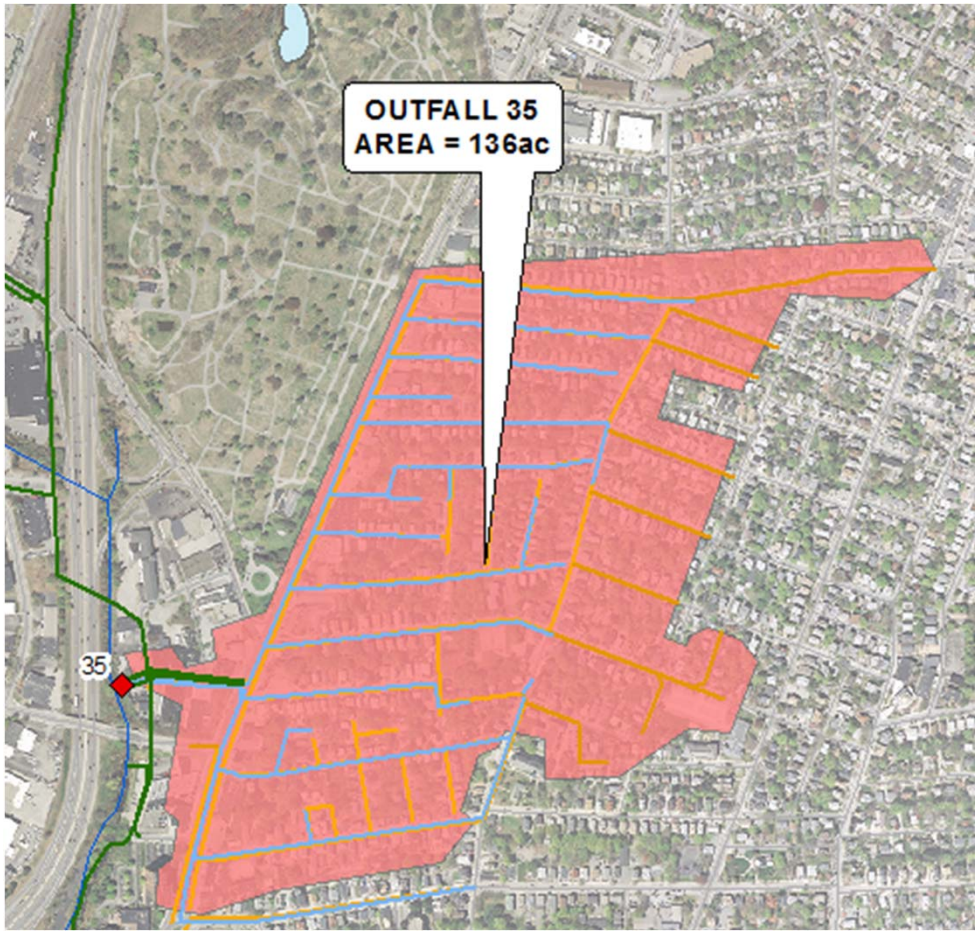
Restoration Issues

- Costly Pavement & Concrete Base Replacement
- Sidewalk and Curb Replaced Beyond Original Limits
- Several New Wheelchair Ramps Added During Construction

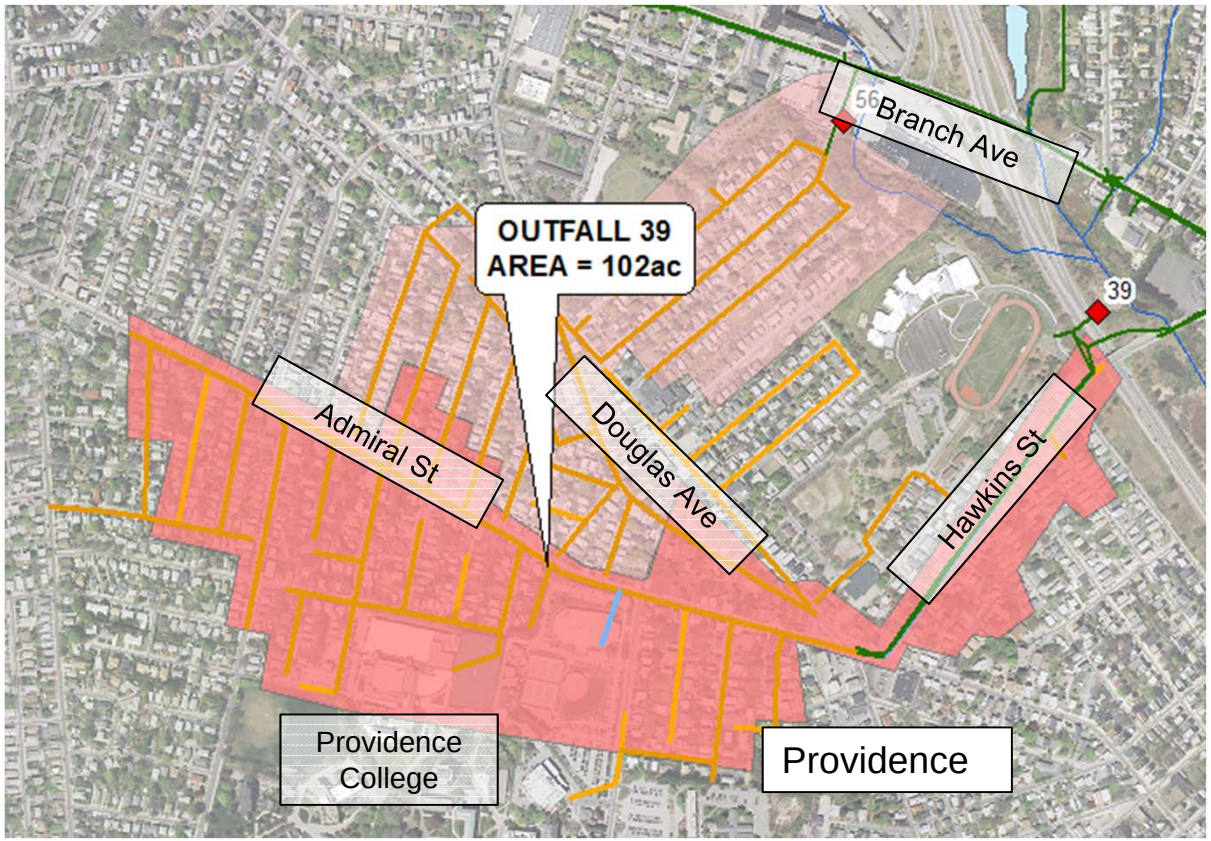
Phase III Baseline Sewer Separation



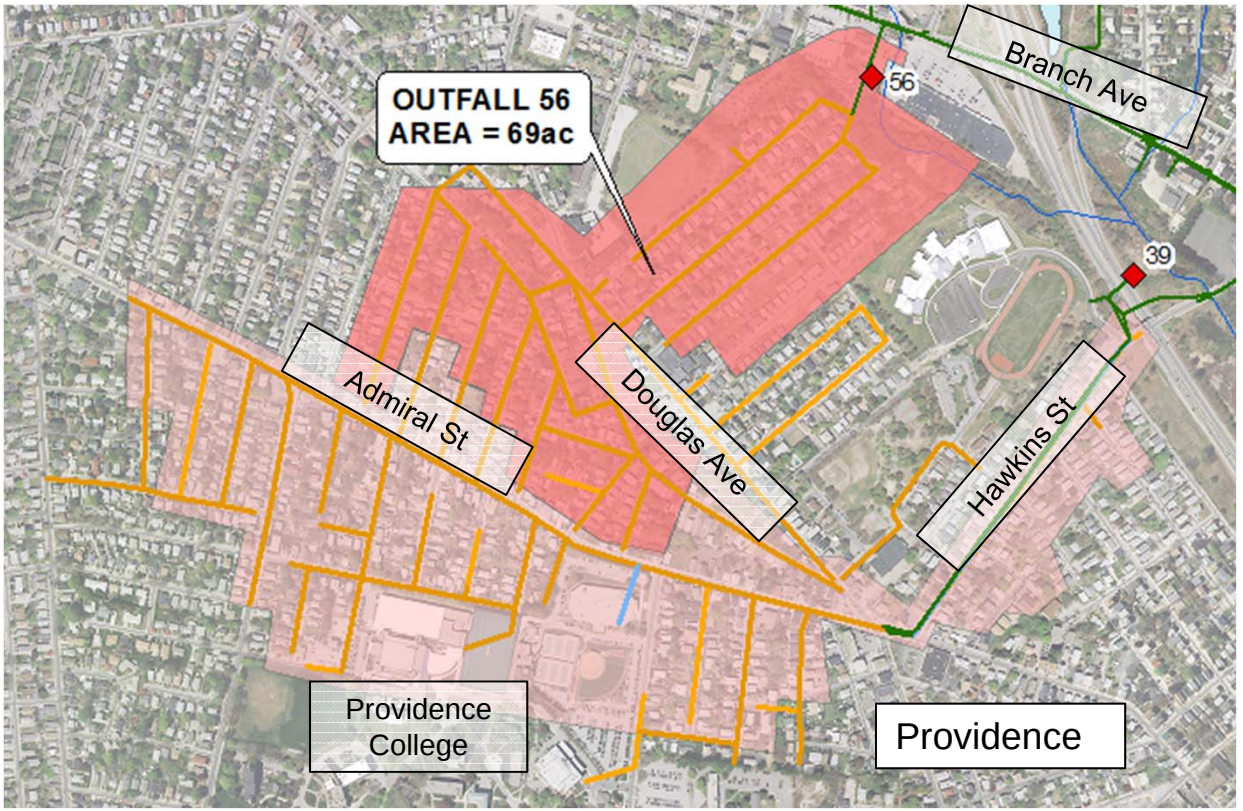
035 Sewer Separation



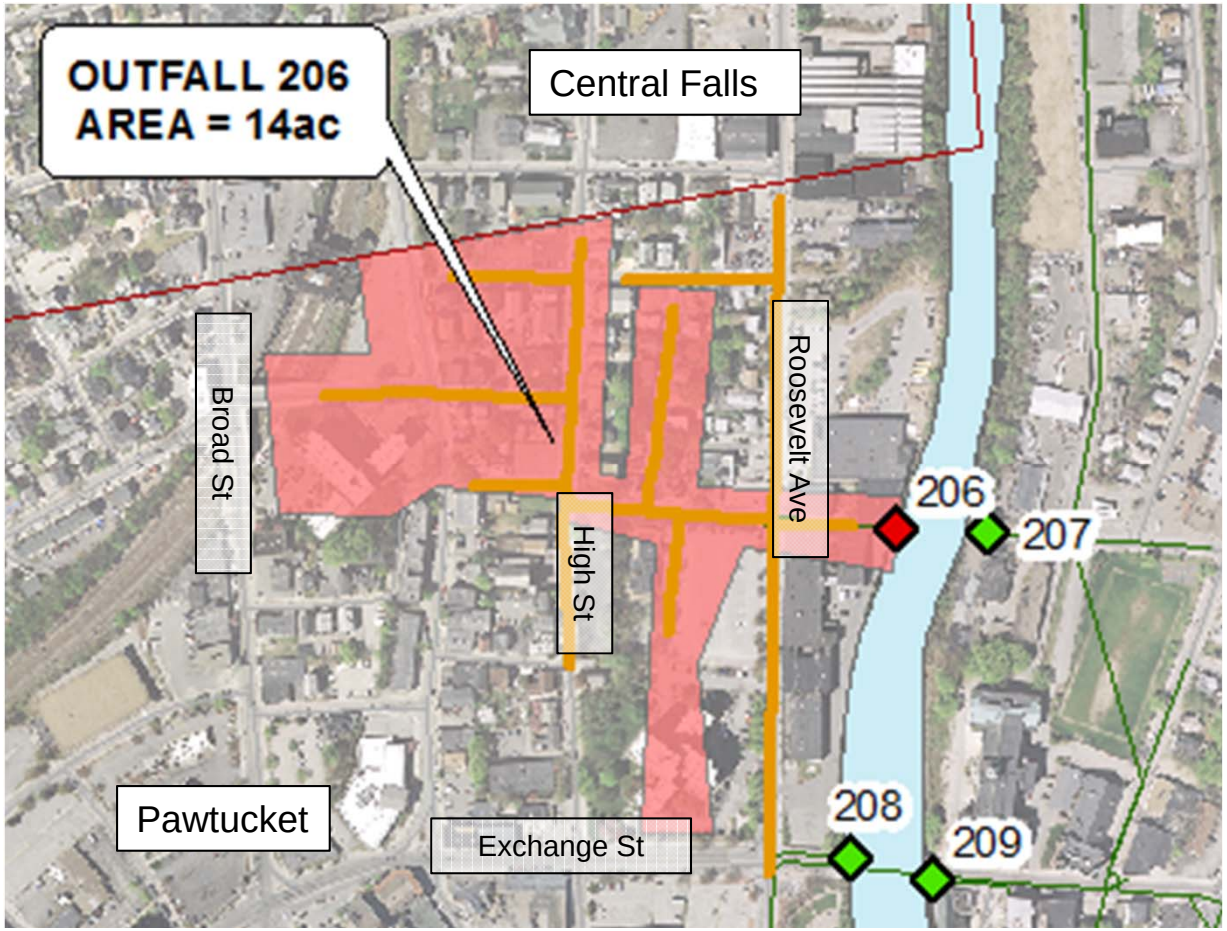
039 Sewer Separation



056 Sewer Separation



206 Sewer Separation



Sewer Separation Overview

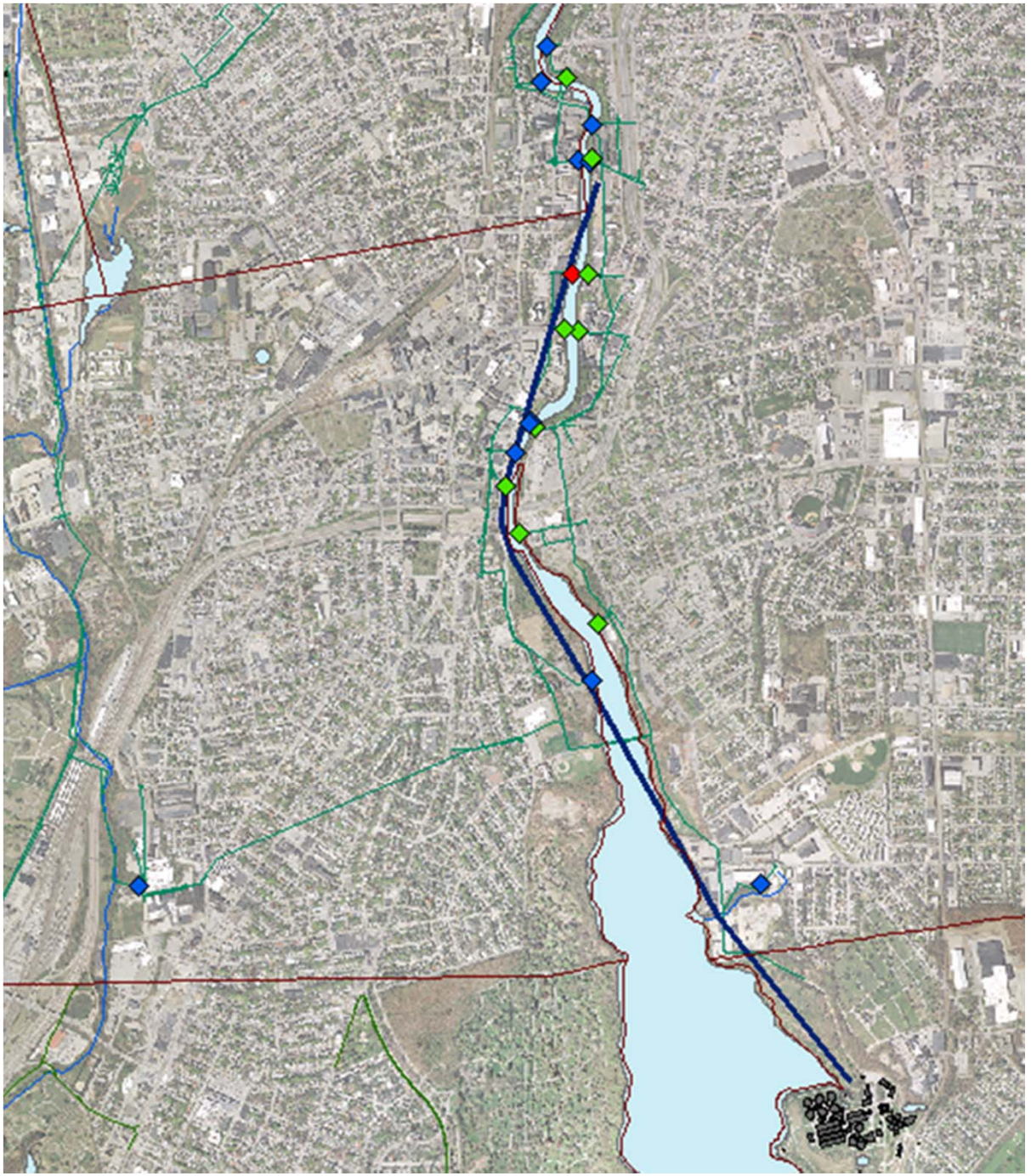
- Advantages
  - Reduced stormwater discharge to NBC interceptors
  - Reduced treatment volume
  - Potential for improved streetscape
- Disadvantages
  - Increased stormwater discharge to flood-prone rivers may require mitigation
  - Increased pollutant load to receiving water bodies
  - Major disruptions to residential and commercial areas
  - Illicit discharge potential
  - Utility coordination (water, gas, electric)
  - Cost of improved streetscape

Deep-Rock Tunnel

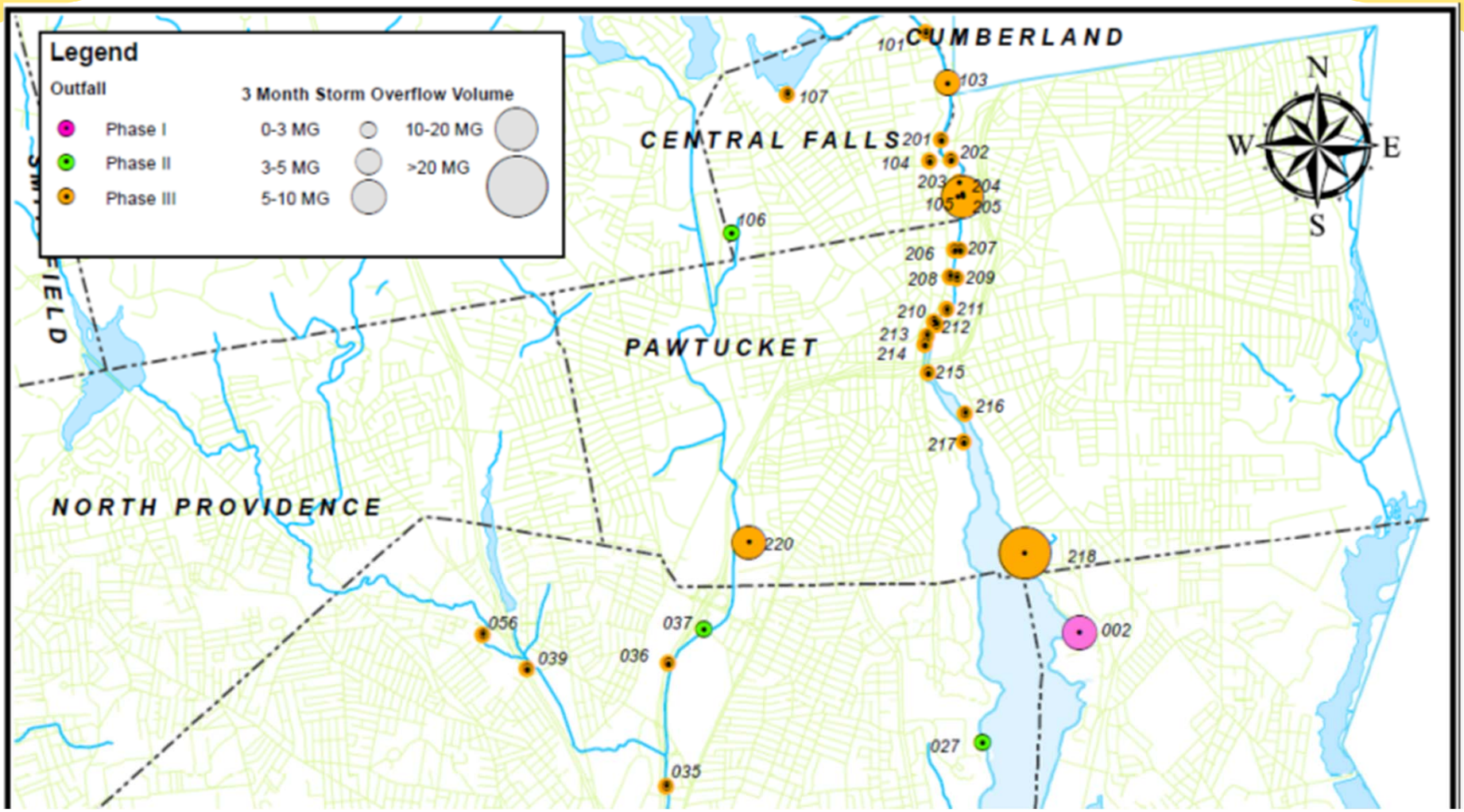
Tunnel Overview

- Advantages
  - Facilitates full secondary treatment of combined flows
  - Construction impacts limited to shaft locations
  - Low operation and maintenance costs
  - Provides operational flexibility
  - Cost effective for large flows
- Disadvantages
  - Large-scale effort & cost

Pawtucket Tunnel



Pawtucket Tunnel



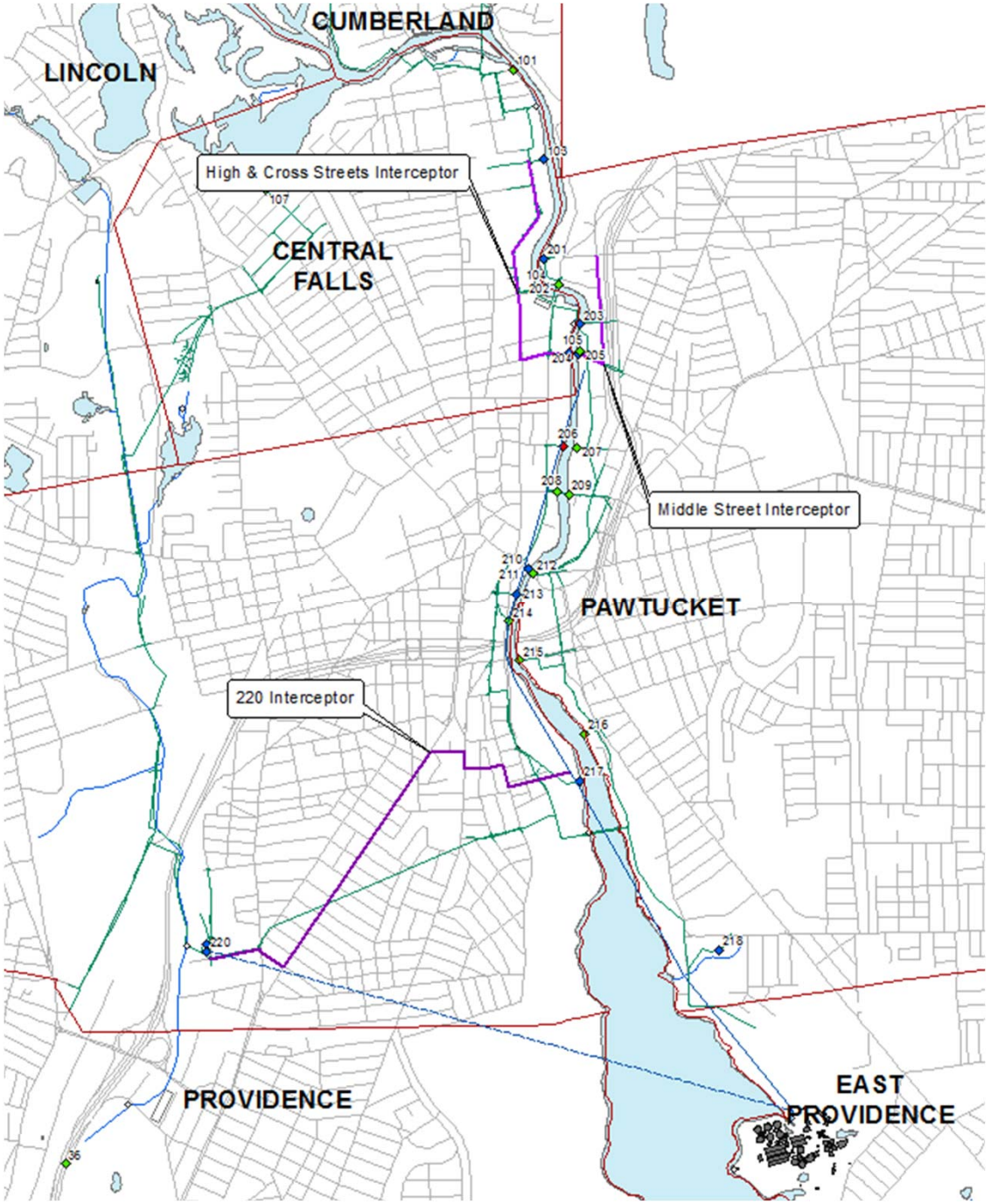
Interceptors for Tunnel Connections

Interceptor Overview

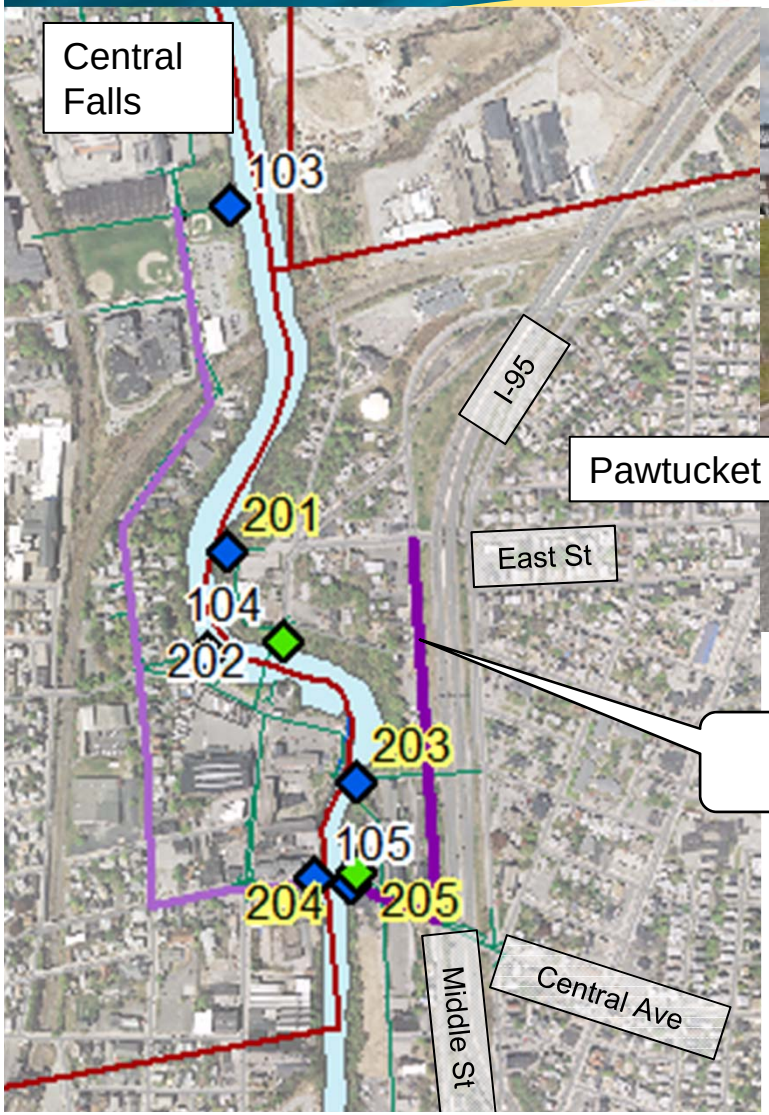
- Advantages
  - Eases siting requirements of tunnel dropshafts or storage / treatment facilities
  - Provides additional system storage
  - Low operation and maintenance costs
  - Helps relieve strained collection systems
- Disadvantages
  - Major disruption of surface roads
  - Deep excavation / Micro-tunneling
  - May require land or easement acquisition
  - Potential for utility conflicts

NBC Phase II Interceptors

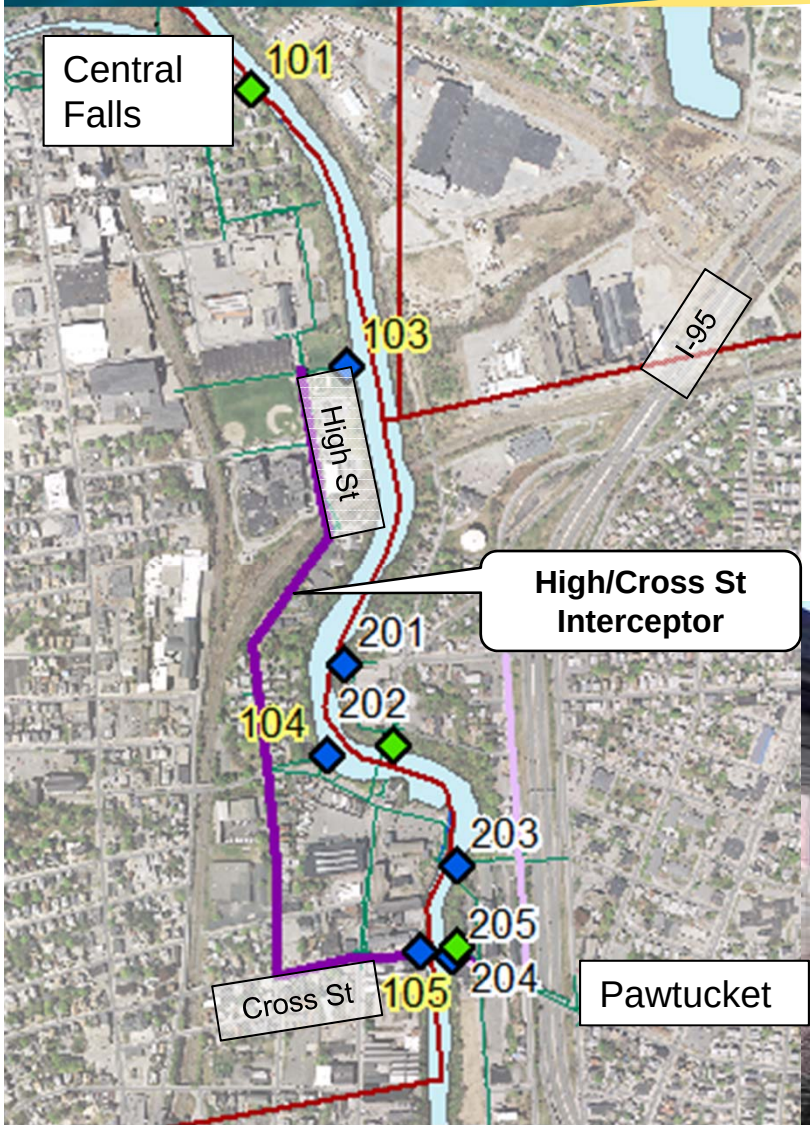
Phase III Baseline Interceptors

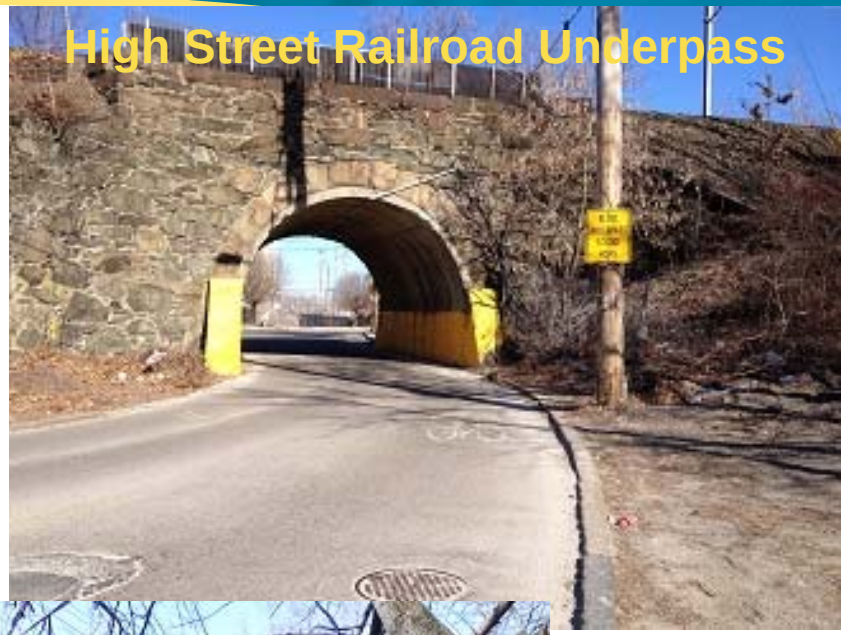


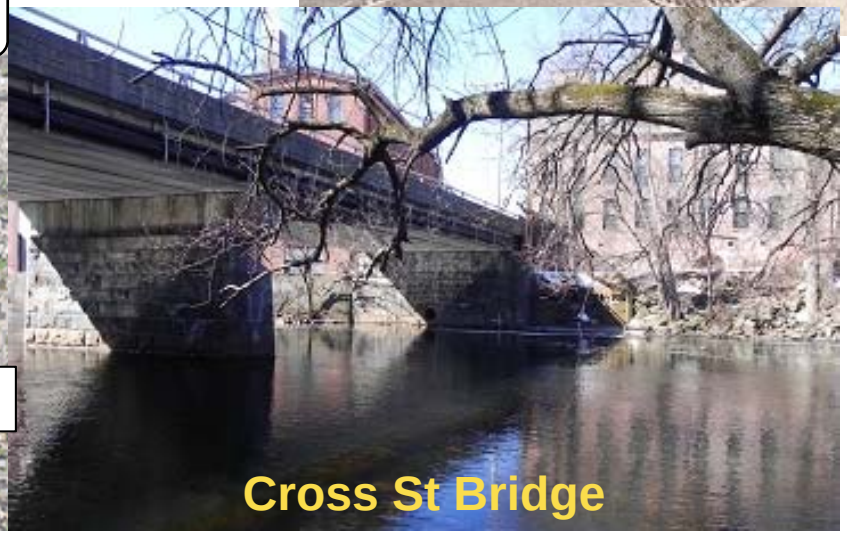
Middle Street Interceptor



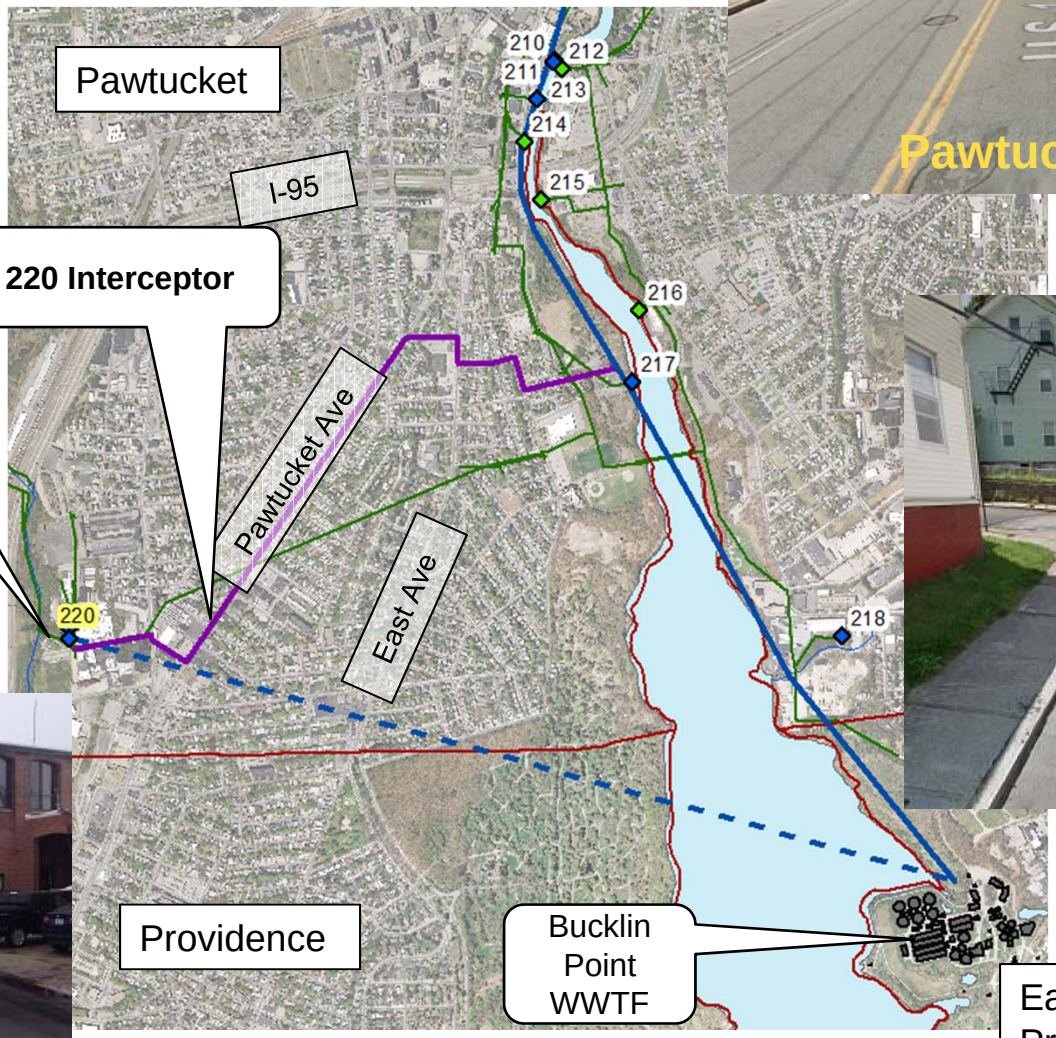
High & Cross Streets Interceptor





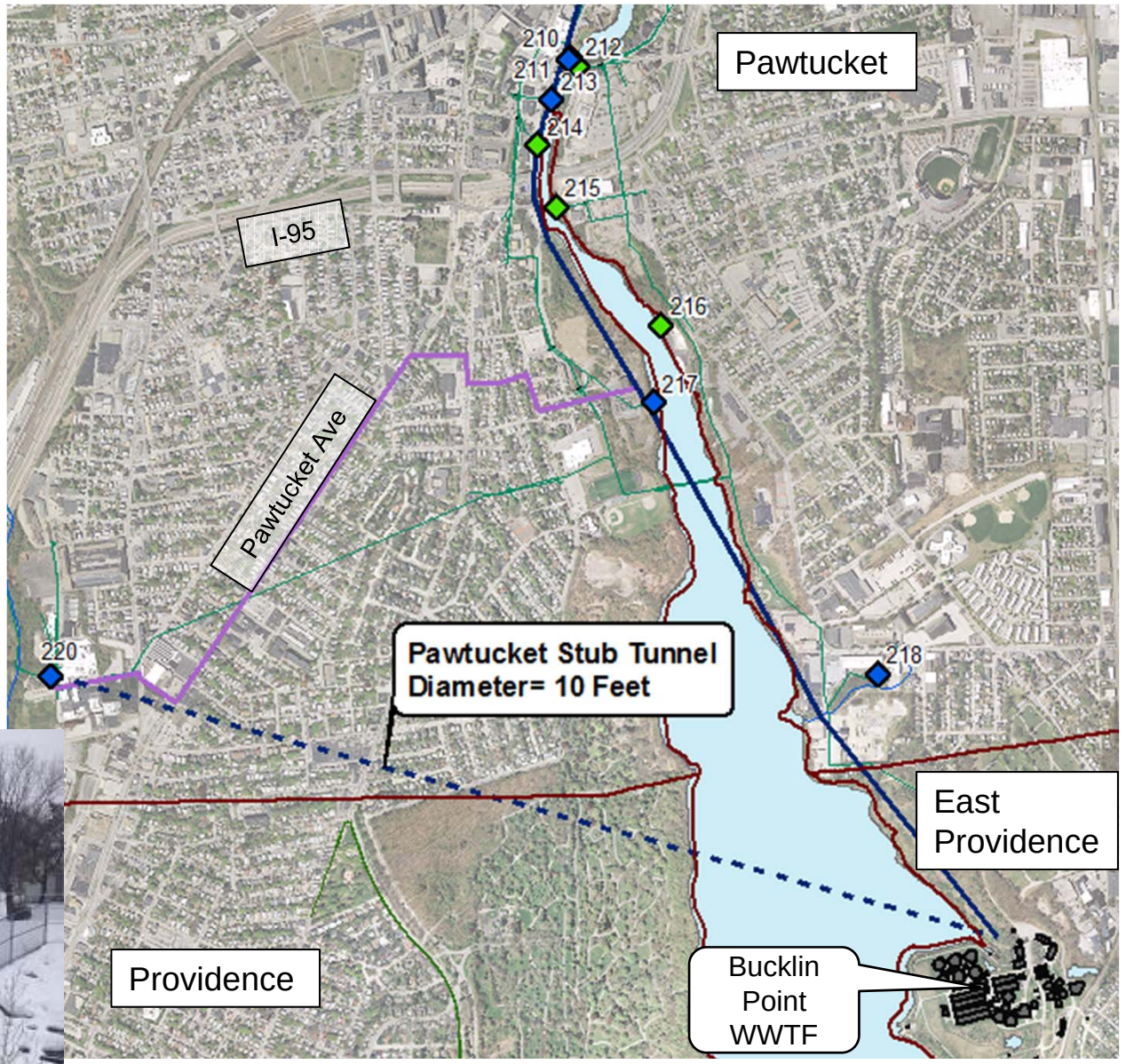


220 / Pawtucket Avenue Interceptor



Esten St adjacent to Outfall 220

Phase III Alternative 220 Stub Tunnel



Stub Tunnel Overview

- Advantages
  - Significantly reduce disruption to roadway and neighborhoods along interceptor route
  - Little to no utility coordination required
  - Isolated construction areas
  - Removes need for pump station, reducing operation and maintenance costs
  - Increase operational flexibility of system
- Disadvantages
  - Requires additional deep rock boring evaluation
  - Requires additional deep rock drop shaft

Localized Combined Flow Handling

West River Interceptor
Near-Surface Storage
Treatment and Discharge

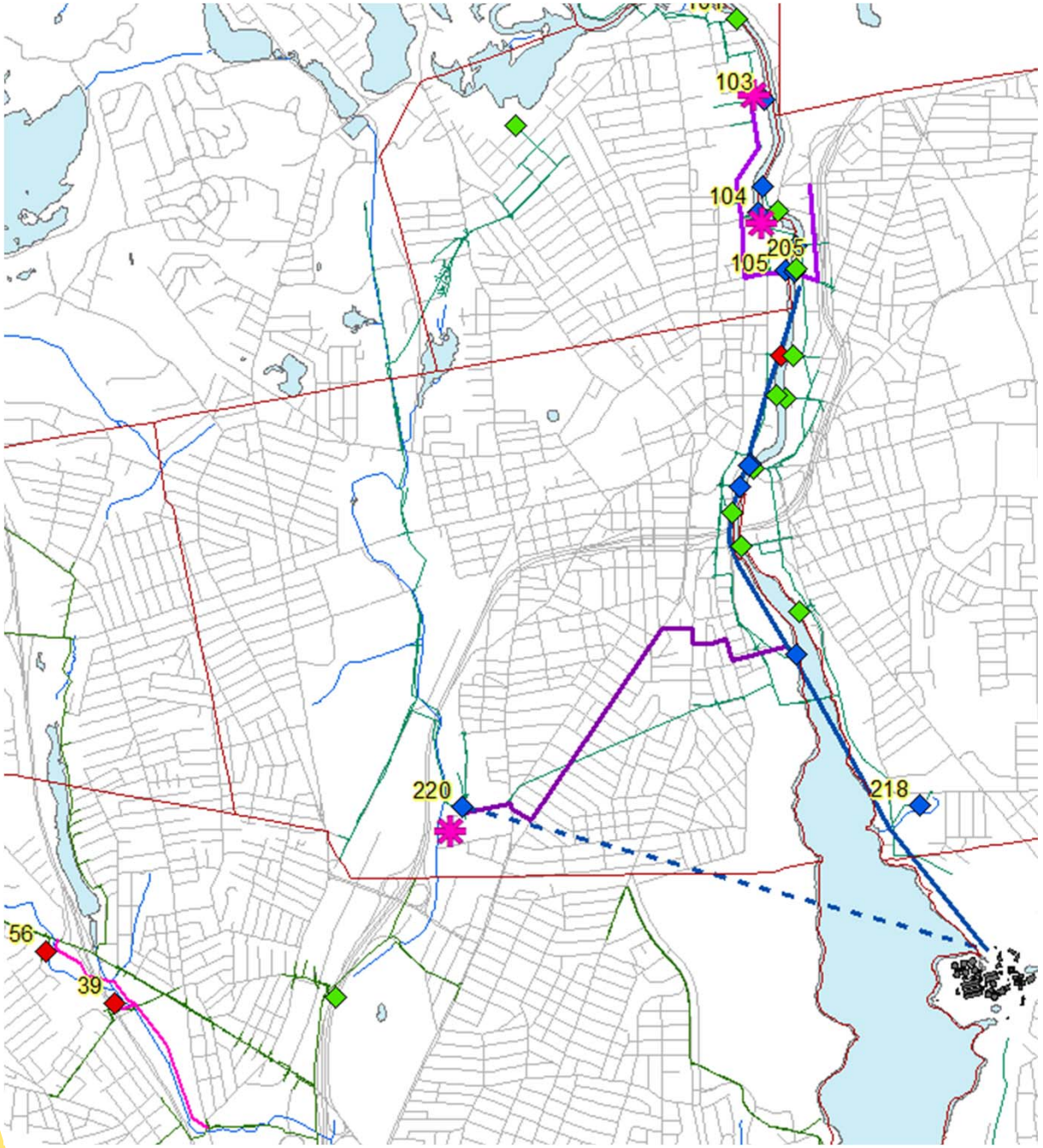
Near-Surface Combined Storage Overview

- Advantages
  - Provides storage of peak flows
    - Stored flow treated at WWTF after storm event
  - Localized construction impact
- Disadvantages
  - Screening and/or Floatable Control required
  - Odor Control required
  - Operation and Maintenance of remote facilities
  - Limited siting possibilities in dense urban areas
  - Land acquisition requirement

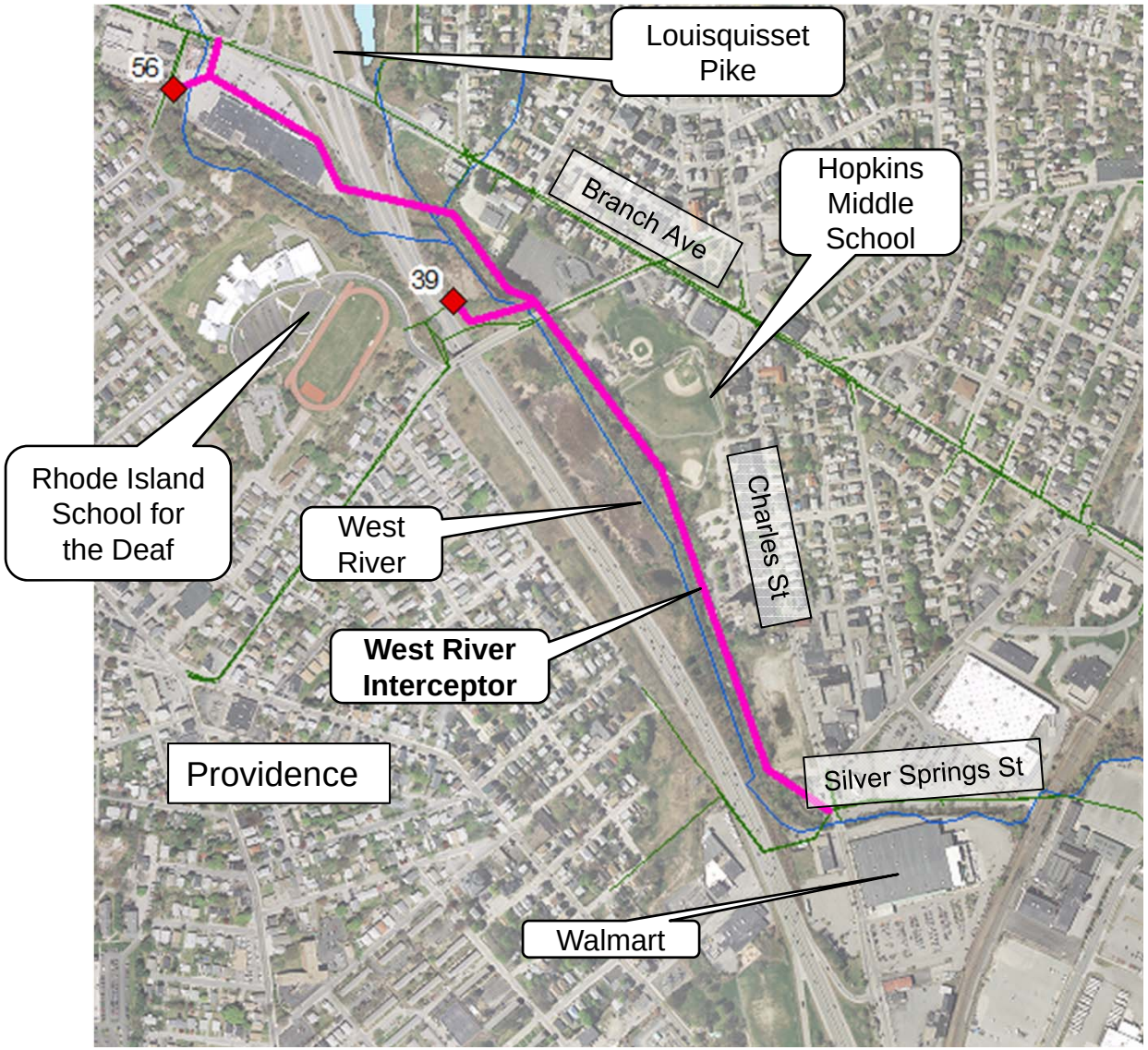
Treatment and Discharge Overview

- Advantages
  - Provides capacity relief for existing interceptors and WWTF infrastructure
  - Localized construction impact
- Disadvantages
  - High capital costs
  - High operation and maintenance costs
  - Residual pollutant loading to receiving waters
  - Limited siting adjacent to outfalls
  - Chemical storage and delivery
  - Land acquisition requirement
  - Residuals discharge

Phase III Localized Combined Flow Handling Options



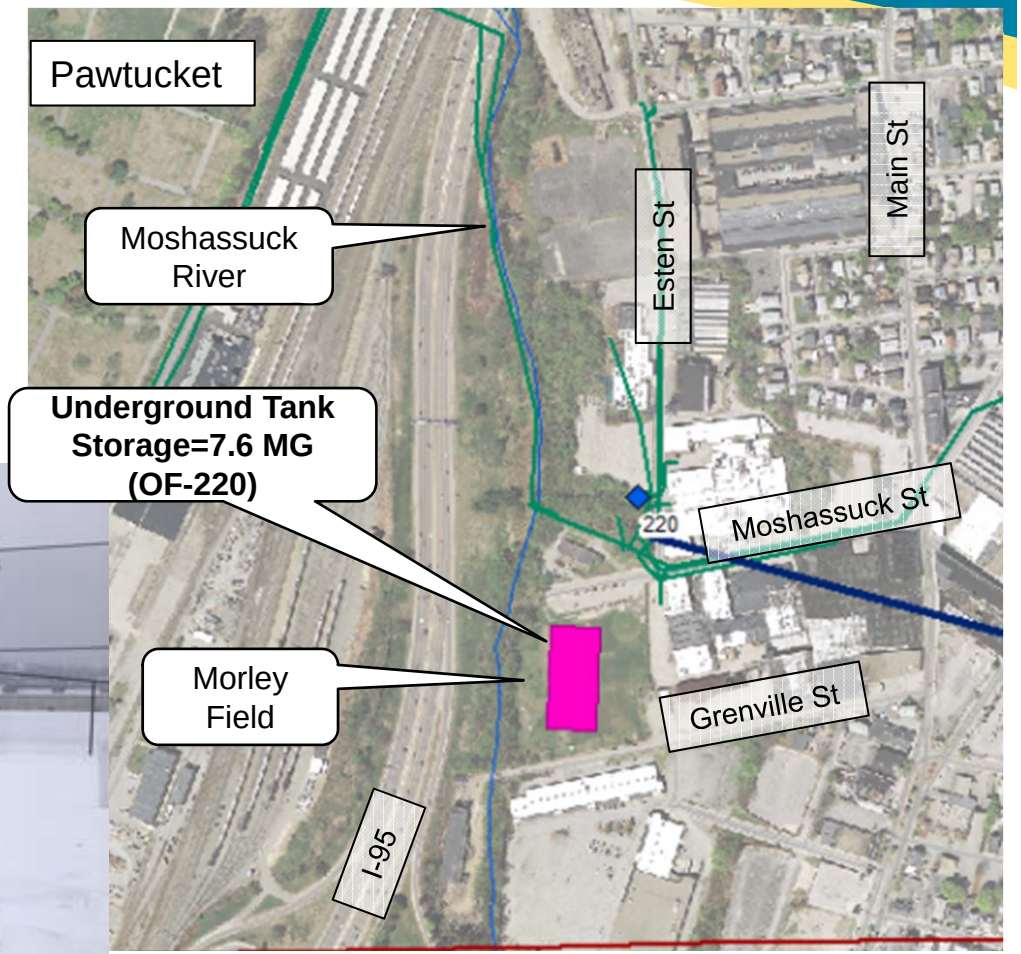
Phase III Alternative West River Interceptor



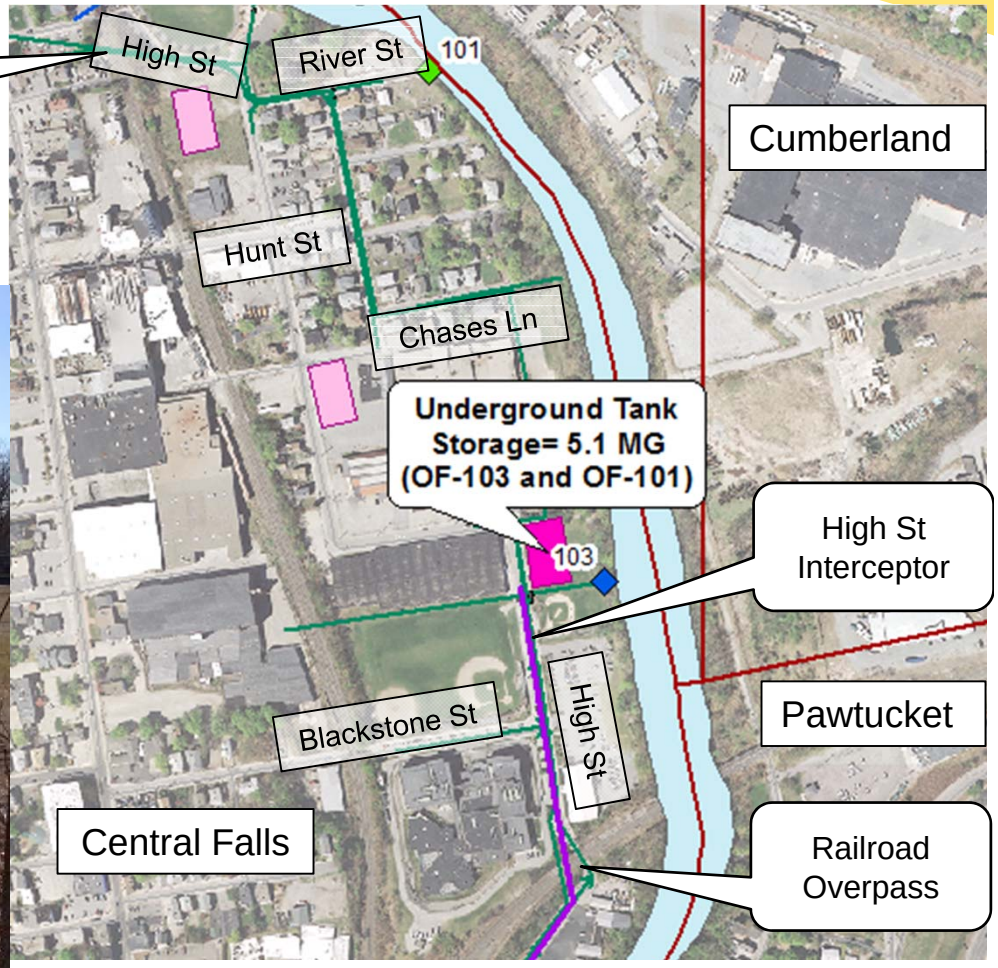
West River Interceptor Overview

- Advantages
  - Replaces sewer separation in 039 and 056 neighborhoods
  - Provides relief for Branch Ave Interceptor
- Disadvantages
  - Difficult construction
    - Requires jacking or boring beneath highway
    - Proximity to West River
    - Accessibility concerns
  - Easement acquisition requirement

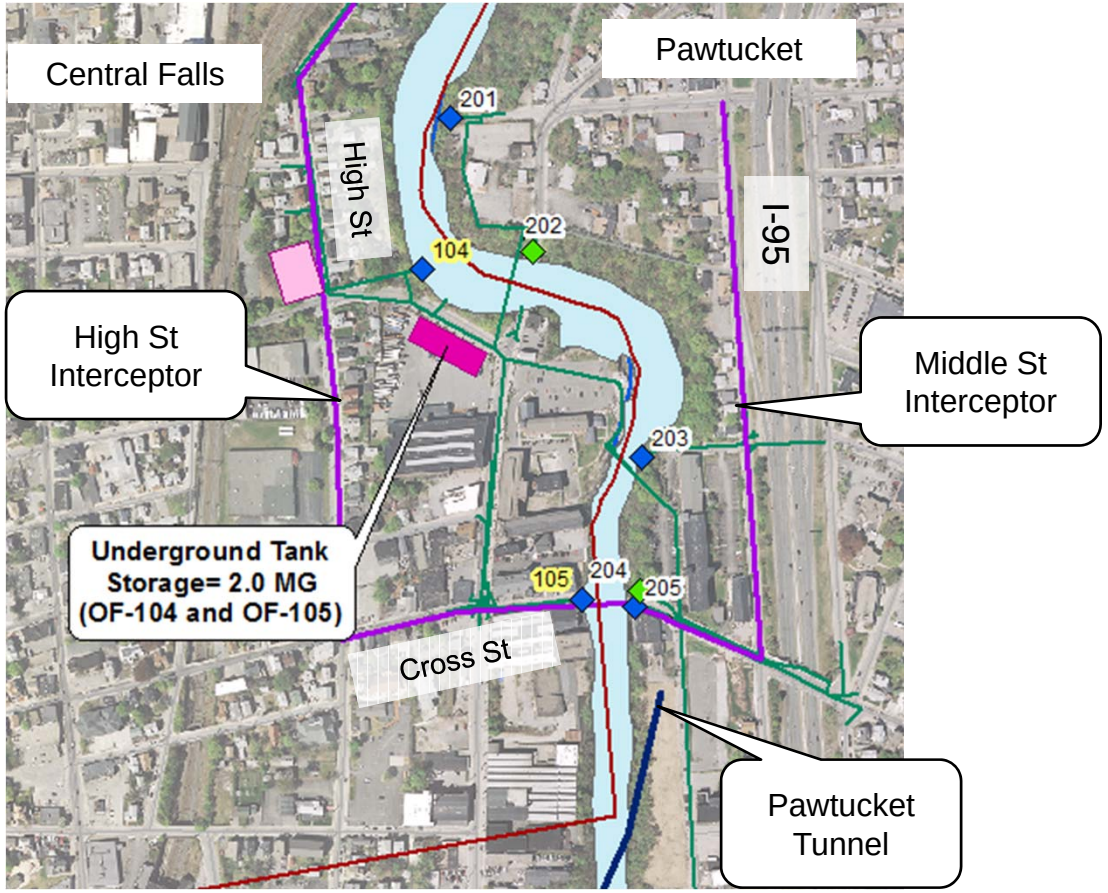
Localized Flow Handling
Outfall 220



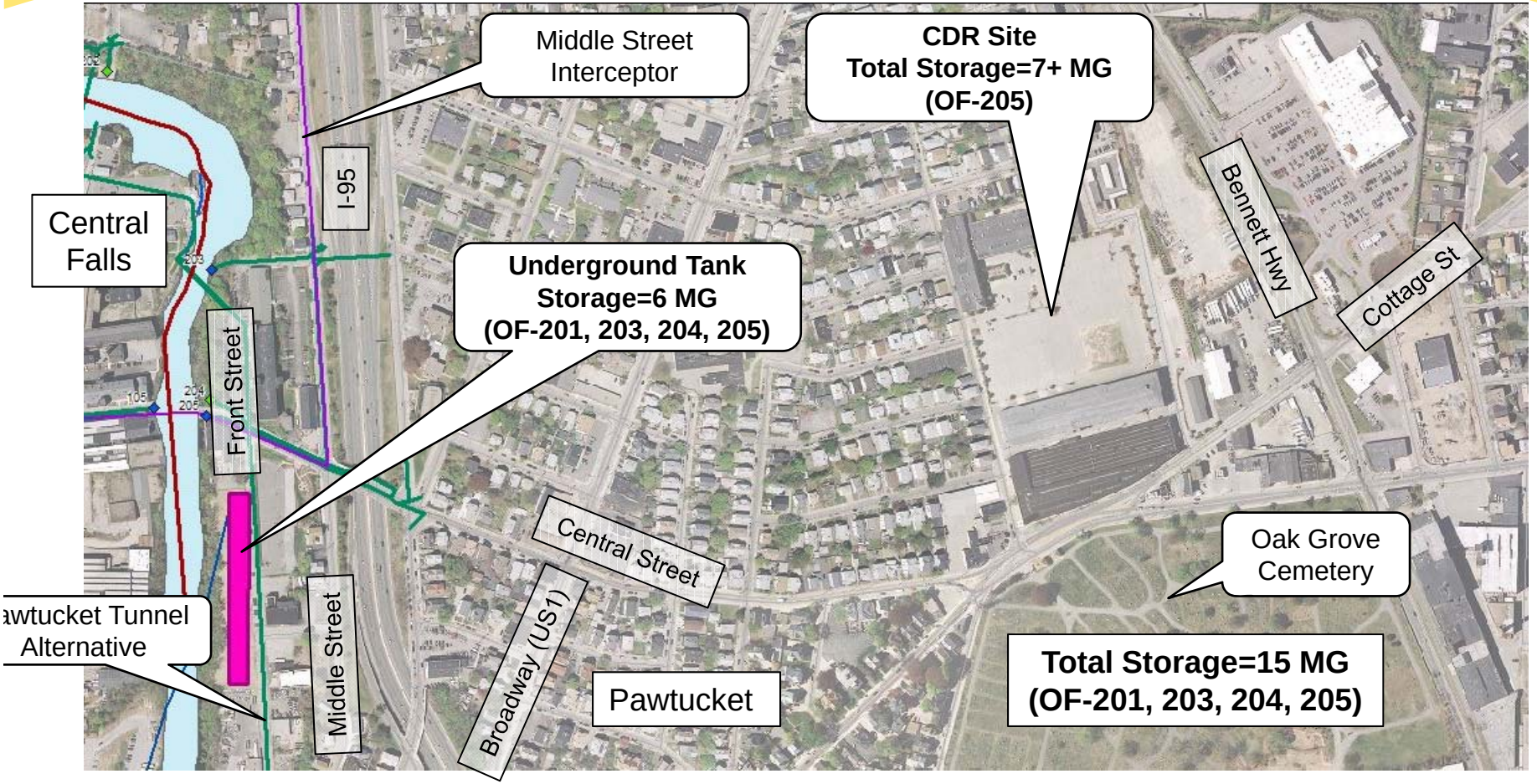
Localized Flow Handling
Outfalls 101 and 103



Localized Flow Handling
Outfalls 104 and 105

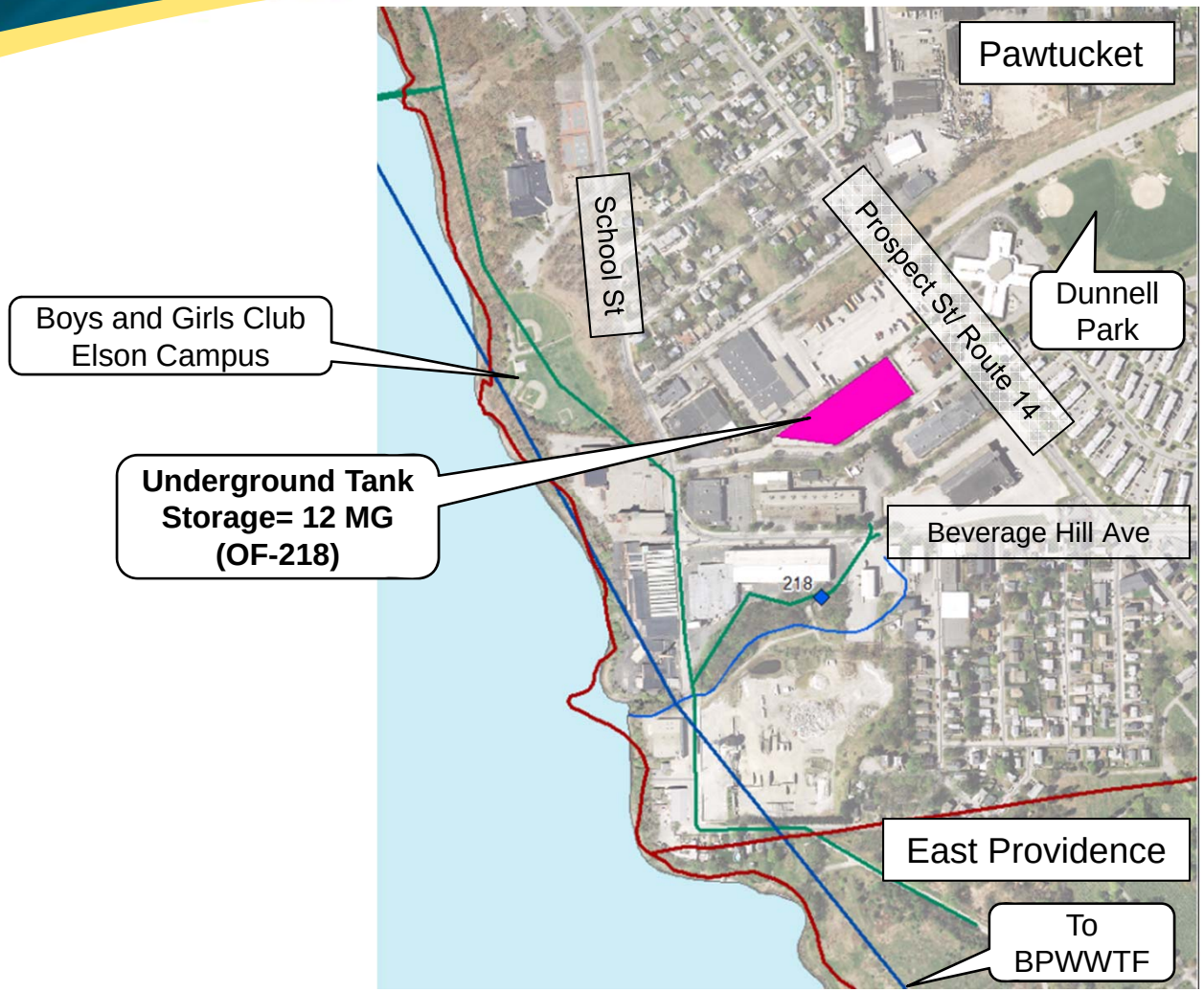


Localized Flow Handling
Outfall 205



Localized Flow Handling
Outfall 205

Localized Flow Handling
Outfall 218



Localized Combined Flow Handling Overview

Near-Surface Storage

- Advantages
  - Provides storage of peak flows
  - Localized construction impact
- Disadvantages
  - Screening and/or Floatable Control required
  - Odor Control required
  - Operation and Maintenance of remote facilities
  - Limited siting possibilities in dense urban areas
  - Land acquisition requirement

Screening, Disinfection & Discharge

- Advantages
  - Provides capacity relief for existing interceptors and WWTF infrastructure
  - Localized construction impact
- Disadvantages
  - High capital, O&M costs
  - Residual pollutant loading to receiving waters
  - Limited siting opportunities
  - Chemical storage and delivery
  - Land acquisition requirement
  - Residuals discharge

Stormwater Flow Control & Management

Hydraulic Controls Overview

- Advantages
  - Keeps stormwater out of combined sewer
  - Can be integrated with GSI
  - Low Capital Costs
  - Low Operation and Maintenance Costs
- Disadvantages
  - Strategic surface ponding
  - Often requires specific surface conditions or improvements
  - Limited by specific health and safety consideration including FEMA regulations

Phase III Stormwater Flow Control & Management

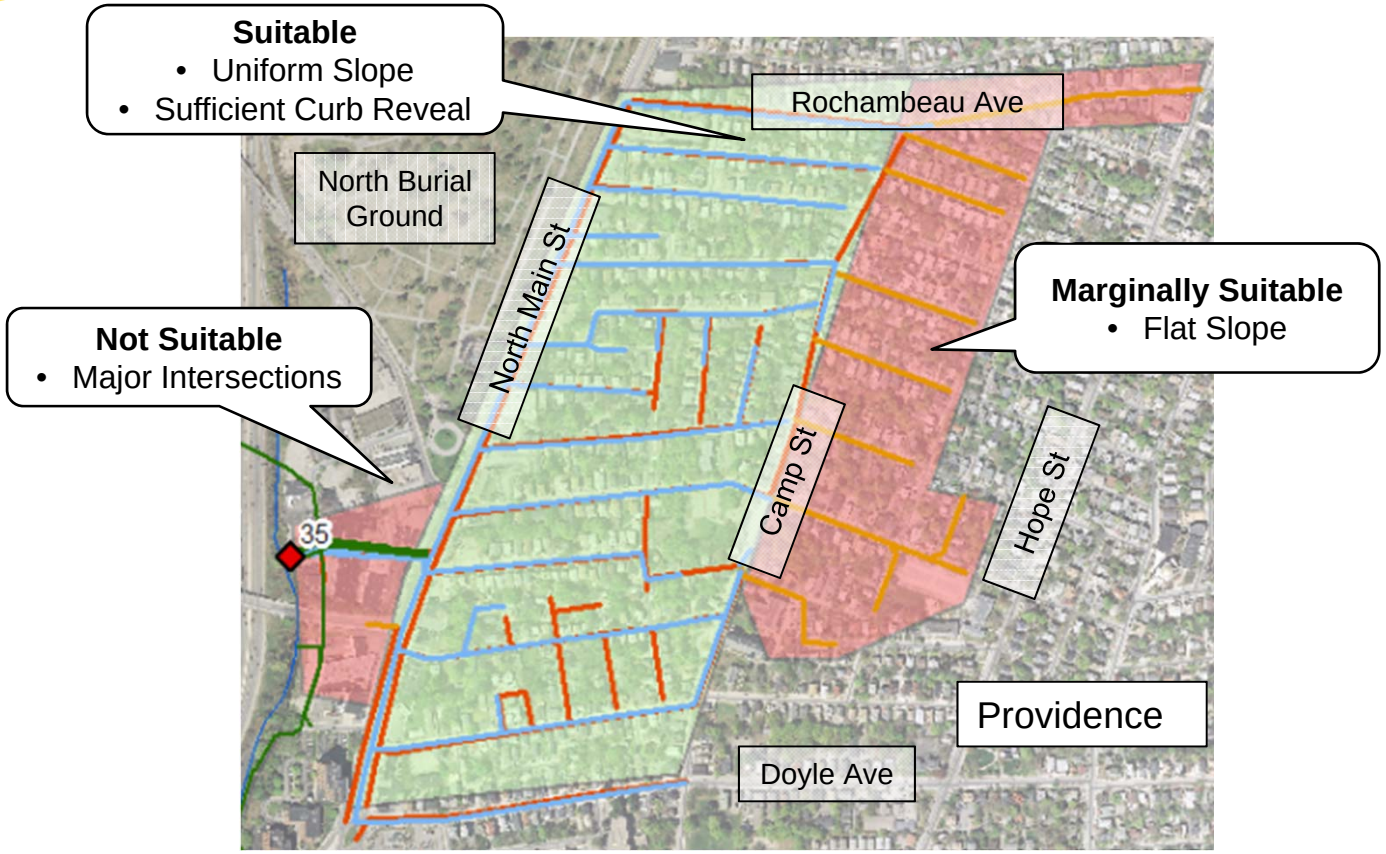
Vortex Flow Throttle

Detention Storage on Atwood Ave
Johnston, RI

Stormwater Storage Overview

- Advantages
  - Provides capacity relief for existing interceptors and WWTF infrastructure
  - Odorless storage
    - Expands siting possibilities
  - Lower operation and maintenance costs
  - Provides for treatment of stormwater at WWTF
  - Can be integrated with GSI
- Disadvantages
  - Requires dedicated stormwater collection system
  - Requires land acquisition or easements
  - Susceptible to grit buildup (can be mitigated)

035 Stormwater Management



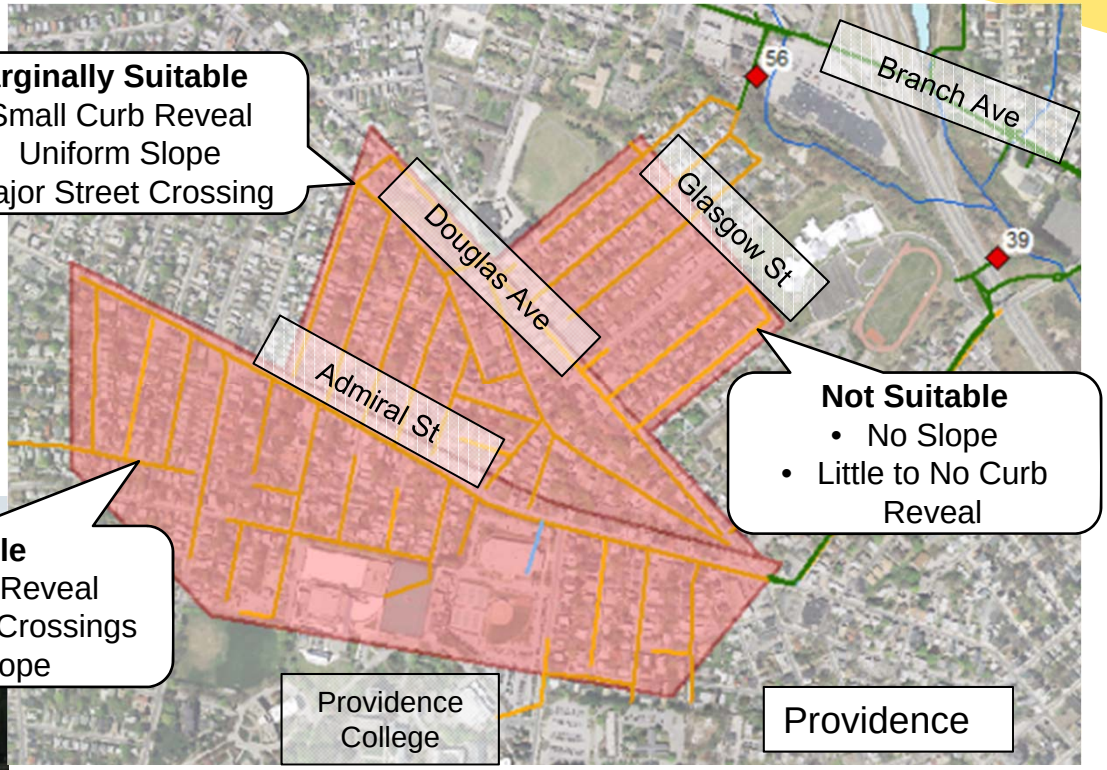
035 Stormwater Management

North Main St at Abbott St

Cypress Street

039/056 Stormwater Management

Marginally Suitable
- Small Curb Reveal
- Uniform Slope
- Major Street Crossing



Not Suitable
- No Slope
- Little to No Curb Reveal

Not Suitable
- Minimal Curb Reveal
- Major Roadway Crossings
- Minimal Slope

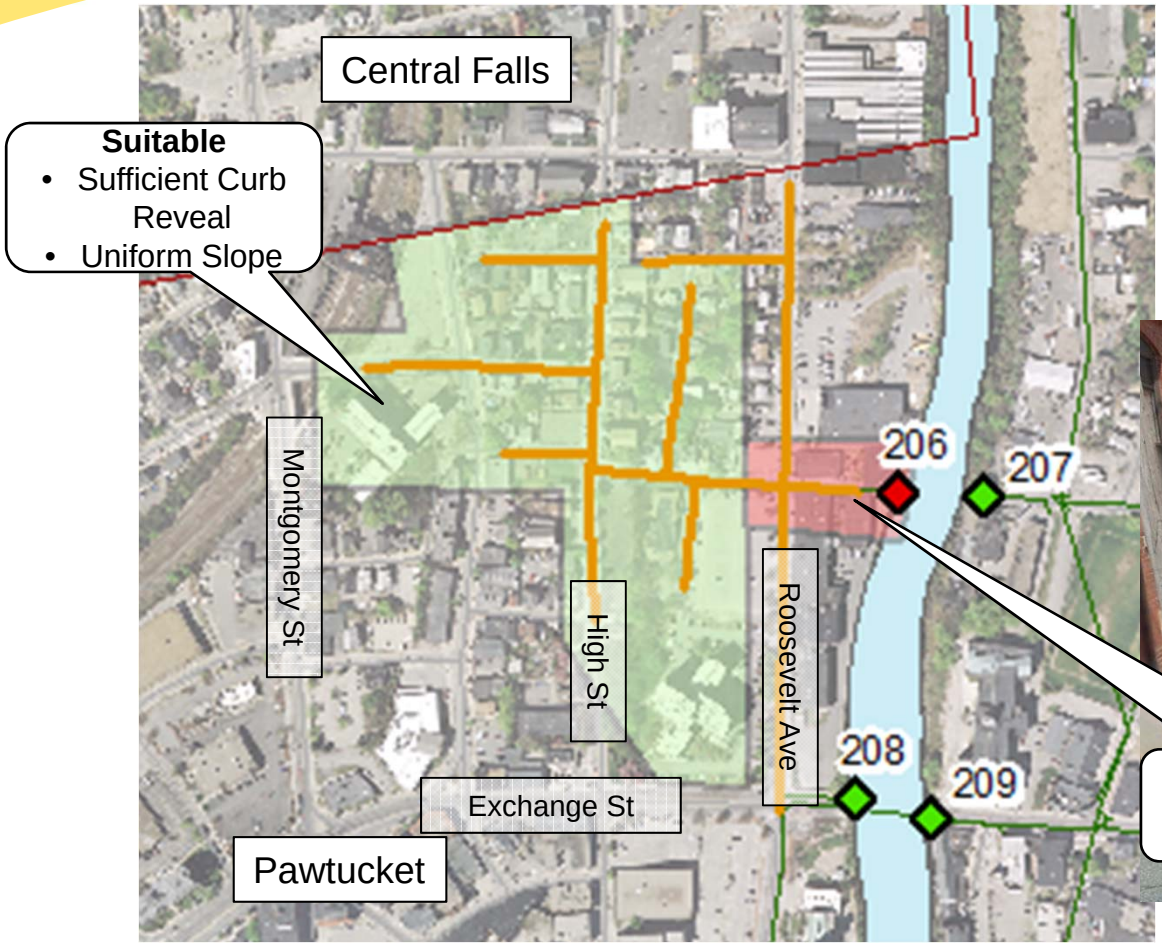
039/056 Stormwater Management

039/056 Stormwater Management

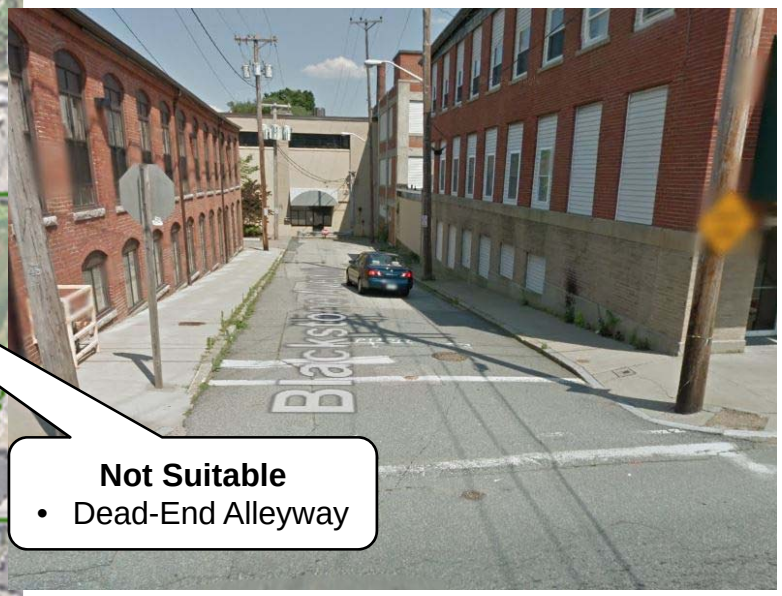
Grand Broadway at Stansbury St

Vandewater St at Grand Broadway

206 Stormwater Management



Blackstone Ave East of Roosevelt Ave



Not Suitable
- Dead-End Alleyway

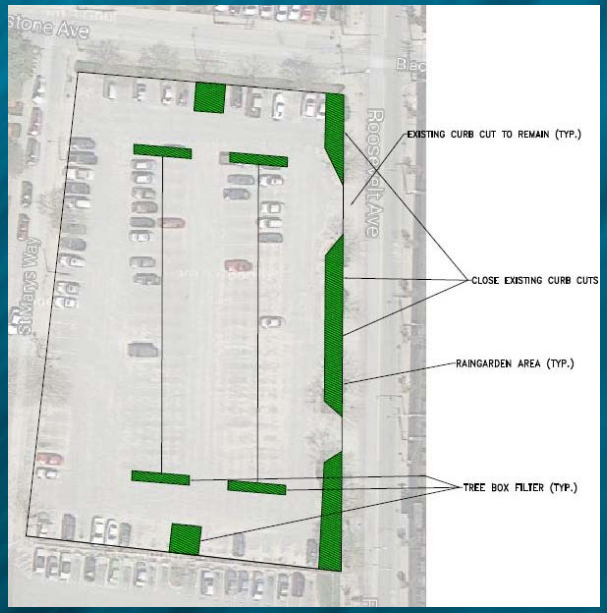
206 Stormwater Management

Blackstone Ave West of Roosevelt

Roosevelt Ave at Blackstone Ave

Next Meeting

22 May 2014, 9:00AM
Green Infrastructure Focus



Localized Flow Handling
Outfalls 101 and 103

Alternative Site – Under Utilized Parking Lot

Alternative Site – Vacant land on High St at River St

Near-Surface Storage
Outfalls 104 and 105

CDR Proposed Site – Elizabeth Webbing Mills on Charles St

Alternate Site – High St at Charles St