



# NBC Phase III CSO Control Program



2023 NEWEA Annual Conference

## Incorporating Community-Based GSI Into a Large Scale CSO Program

January 23, 2023



# Introductions



## **Narragansett Bay Commission**

**Kathryn Kelly, P.E.** – CSO Program Manager



## **Pare Corporation**

**Brandon Blanchard, P.E.** - Managing Engineer

**Peter Georgetti, P.E.** – Managing Engineer

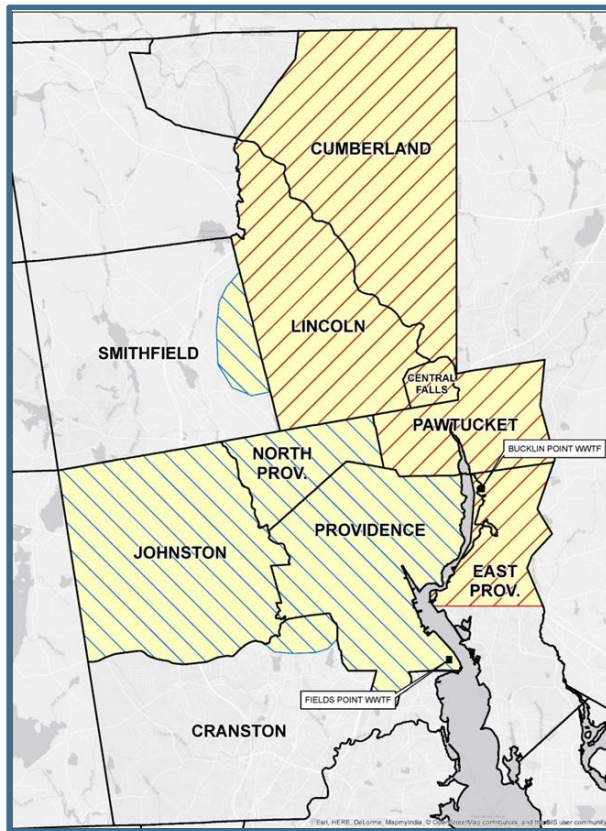


## **Horsley Witten**

**Brian Kuchar, R.L.A P.E.** – Associate Principal

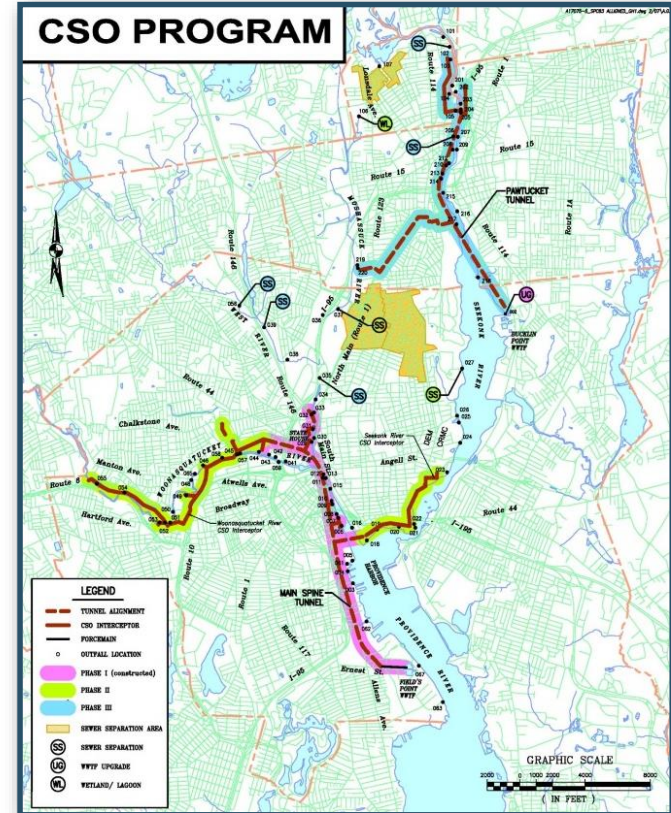
# Narragansett Bay Commission (NBC)

- Serves 10 Communities in Greater Providence
- Operates 2 largest POTWs in RI
  - Fields Point WWTF
  - Bucklin Point WWTF
- Serves 360,000 Residents & 7,800 Businesses



# NBC CSO Control Program

- 1992: NBC begins CSO Control Program
- 1998: Three Phase Program is Established
- Program Goals to Comply with Consent Agreement:
  - 98% reduction annual CSO volumes
  - 98% reduction fecal coliform loading
  - 95% reduction in number of annual overflows
  - < 4 overflows per year at each outfall
  - 75% and 80% reduction in TSS and BOD loadings, respectively
  - 80% reduction in shellfish bed closures





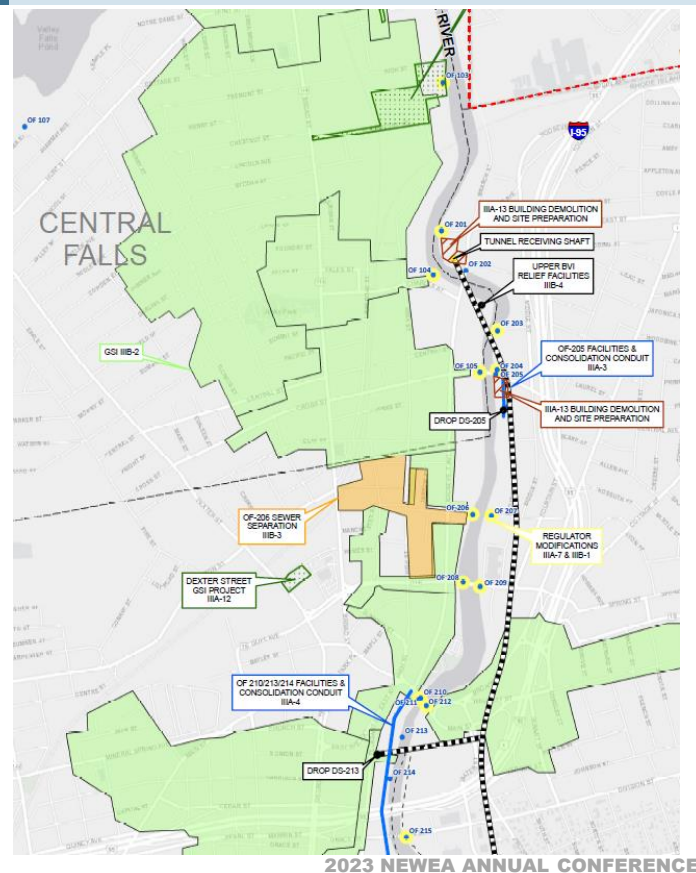
# NBC CSO Control Program

- Phase I (Complete)
  - **Construction:** 2001 to 2008
  - **Cost:** \$360M
  - Deep rock storage tunnel, tunnel pump station, drop shafts, consolidation conduits
- Phase II (Complete)
  - **Construction:** 2011 to 2015
  - **Cost:** \$197M
  - CSO interceptors, sewer separation, and storage/wetlands facility



# Phase III CSO Program

- Reevaluation of Phase III began 2014
  - Phase III Reevaluation & Optimization:
    - ✓ Engage stakeholders
    - ✓ Prioritize water quality benefits
    - ✓ Extend schedule to lower impact on ratepayers
    - ✓ Four subphases planned, Phase IIID complete in 2041
- *GSI added to Program from stakeholder input*
- *GSI planned in all 4 subphases of Phase III*



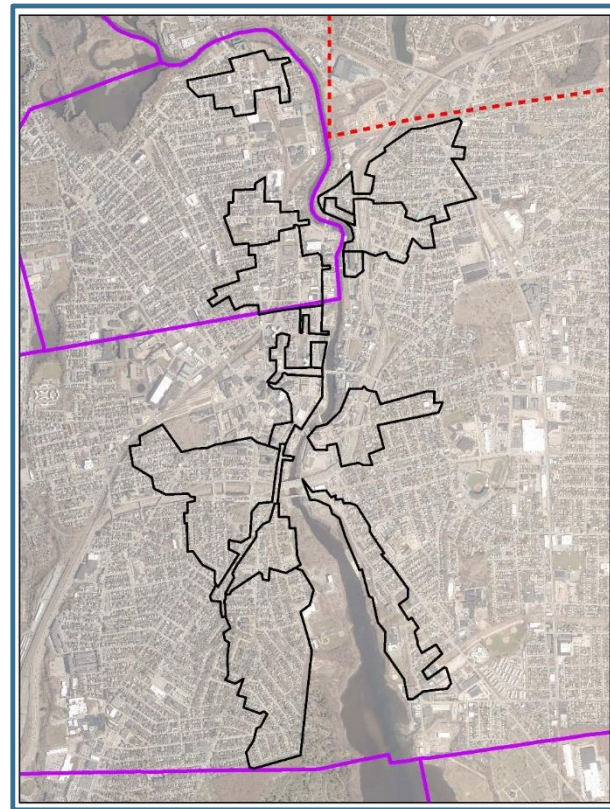
# GSI for the Phase III CSO Program

## *Objectives*

- Intercept Stormwater Before Entering Combined System
- Infiltrate or Detain Stormwater
- Reduce CSO Volumes
- Reduce Stormwater Treated at WWTF

## *Best Management Practices*

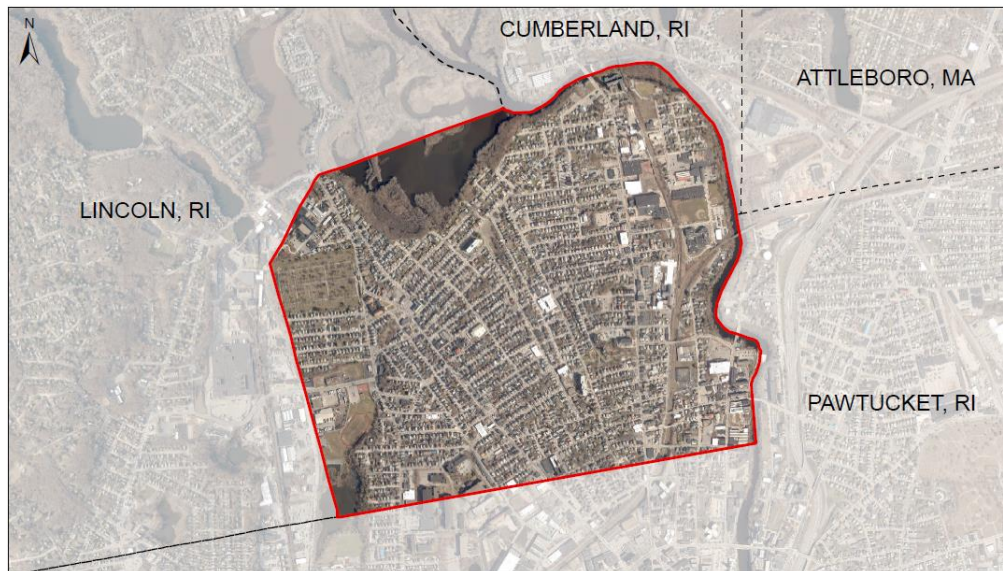
- Demonstrate effectiveness of various GSI systems
- Retrofit to existing landscape
- Enhance aesthetics of underutilized land
- Consider O&M requirements in design
- Choose projects the community supports





# City of Central Falls, RI

- 1.2 square miles
- Population ~ 20,000
- High Density
- MHI below State Average
- Environmental Justice Area
- Limited Green Space and Recreational Facilities
- No existing separate storm collection system



*Several challenges but rewarding opportunities*



# Initial GSI Screening Process

Step 1

• Opportunity Assessment

Step 2

• Land Use

Step 3

• Legislation

Step 4

• Landform

Step 5

• Calculations

Step 6

• Effectiveness

Step 7

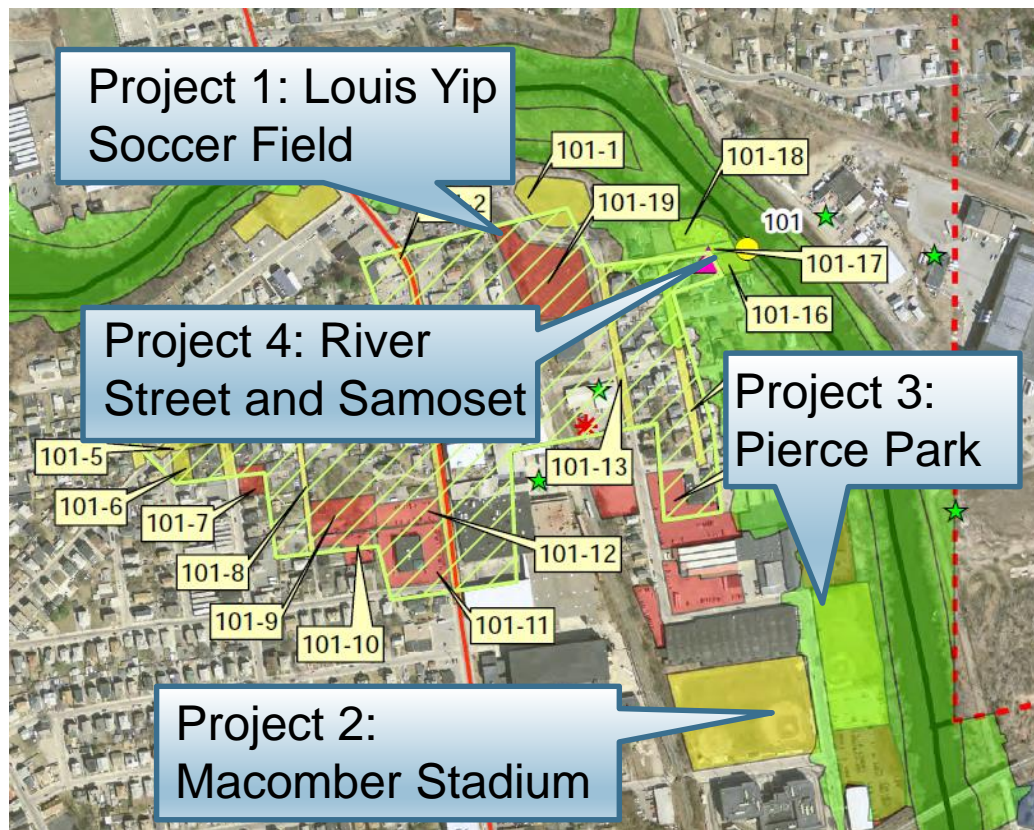
• Scalability

Step 8

• Suitability



# GSI Projects in Phase IIIA



- Projects Concentration in Small Area, Maximizing Impact
- Diverse Site Selection (Size, Use, Location)
- Retrofit to Existing Landscape, Maximize Treatment Potential
- \$10 Million Design & Construction
- Demonstration Projects
  - Show Effectiveness of Several Types of GSI Systems
  - Aesthetics and Auxiliary Benefits
  - Identify Maintenance Requirements



# Project 1. Louis C. Yip Soccer Field GSI

*Before*





# Project 1. Louis C. Yip Soccer Field GSI



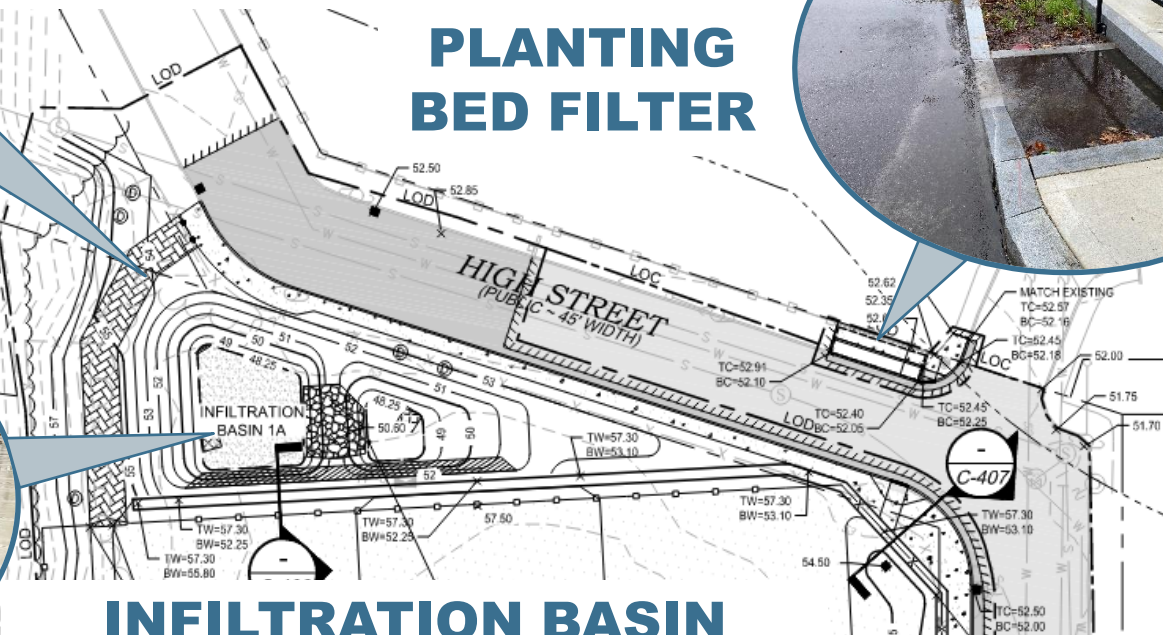


# Project 1. Louis C. Yip Soccer Field GSI

**PERMEABLE  
PAVERS**

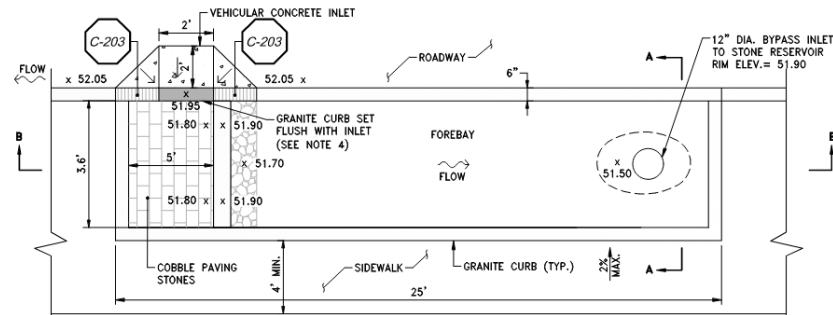
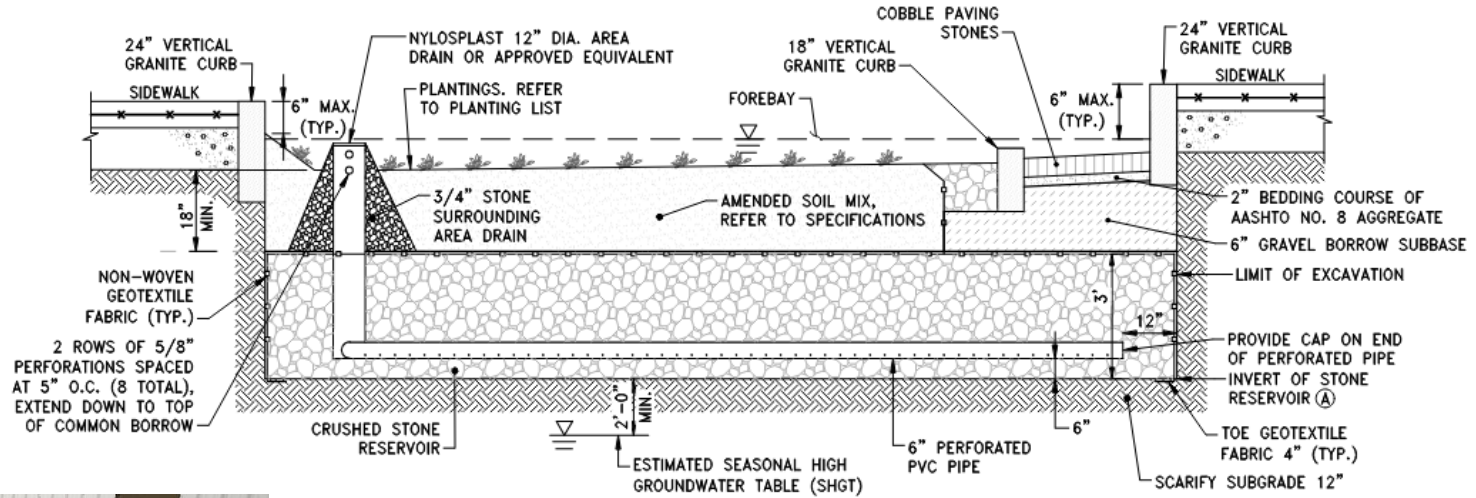


**PLANTING  
BED FILTER**



**INFILTRATION BASIN  
WITH SEDIMENT FOREBAY**

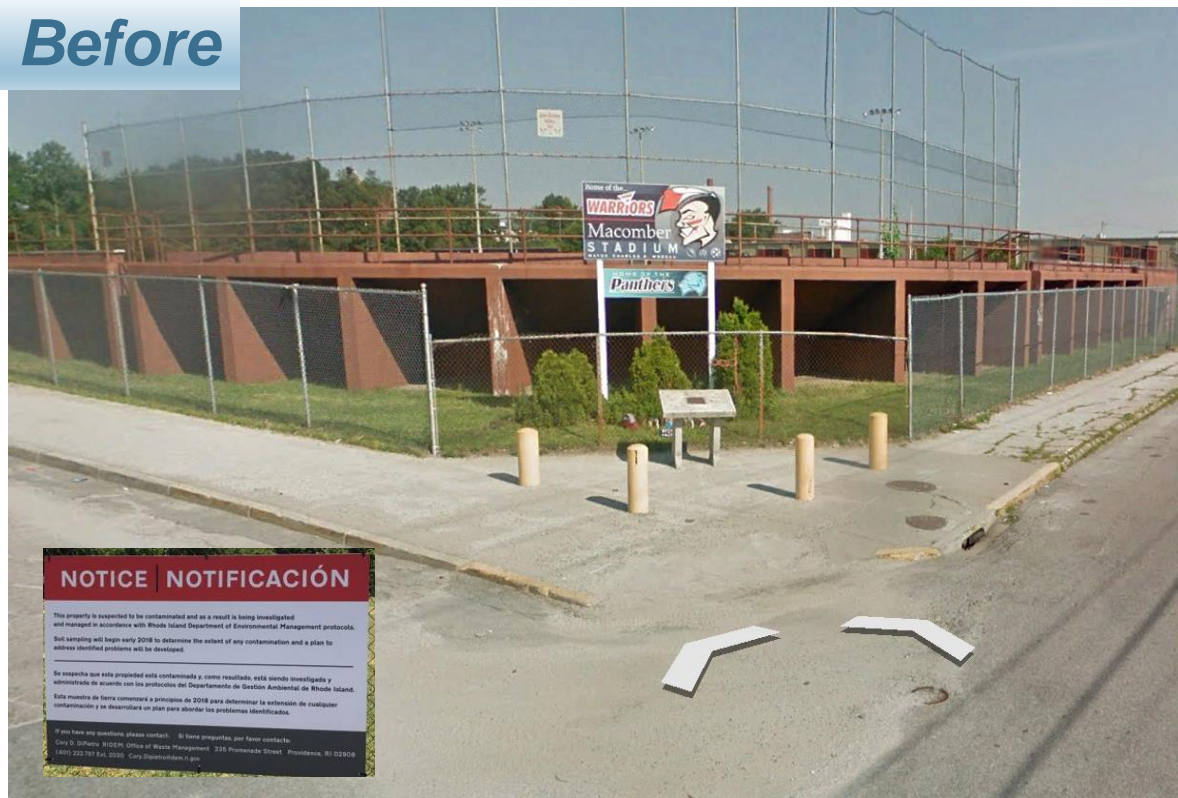
# Project 1. Louis C. Yip Soccer Field GSI Planting Bed Filters





# Project 2. Macomber Stadium GSI Project

*Before*





# Project 2. Macomber Stadium GSI Project

*After*

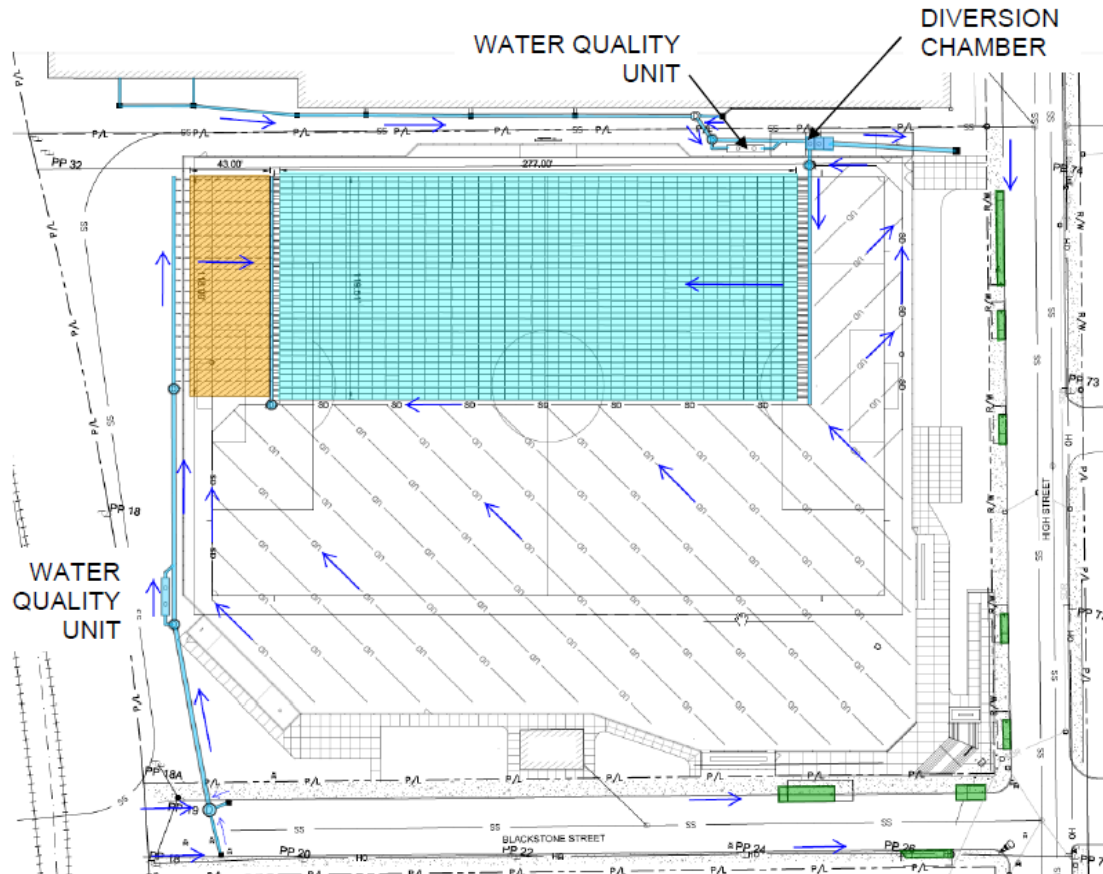


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# Project 2. Macomber Stadium GSI Project

## Stormwater Design



Underground Infiltration Chambers

Sand Filter

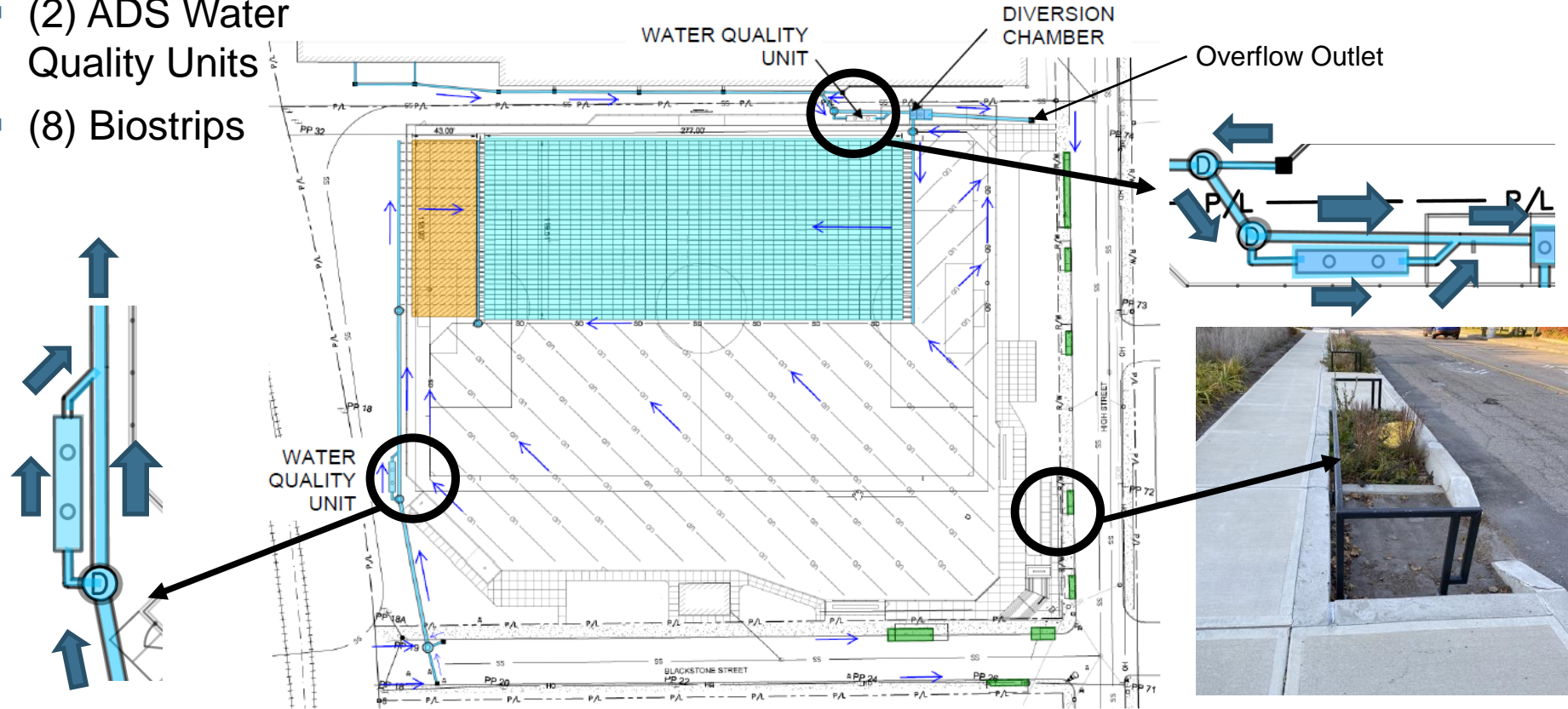
Biostrips

Water Flow

- Drainage Area: 10.32 ac.
- Impervious Area: 7.1 ac. (69%)  
1.8 ac. (roof)
- Target Volume : 35,500 cf  
265,600 gal.
- Design Volume: 141,725 cf  
1,060,177 gal.  
(25-year storm)

# Project 2. Macomber Stadium GSI Project Stormwater Design

- (2) ADS Water Quality Units
- (8) Biostrips

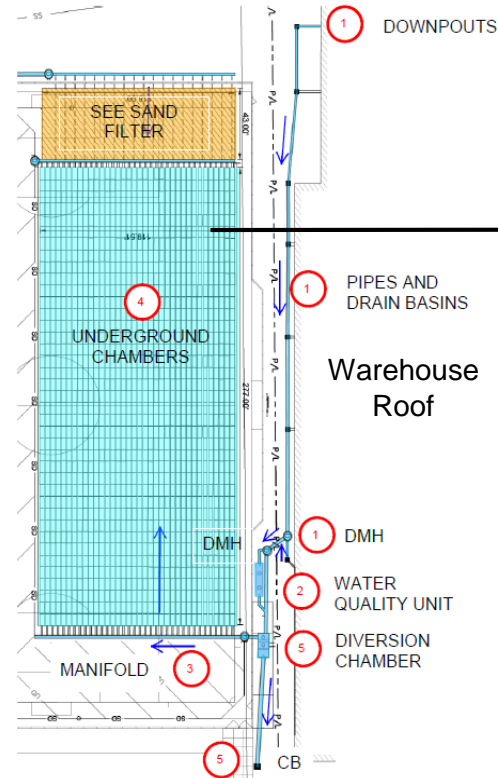
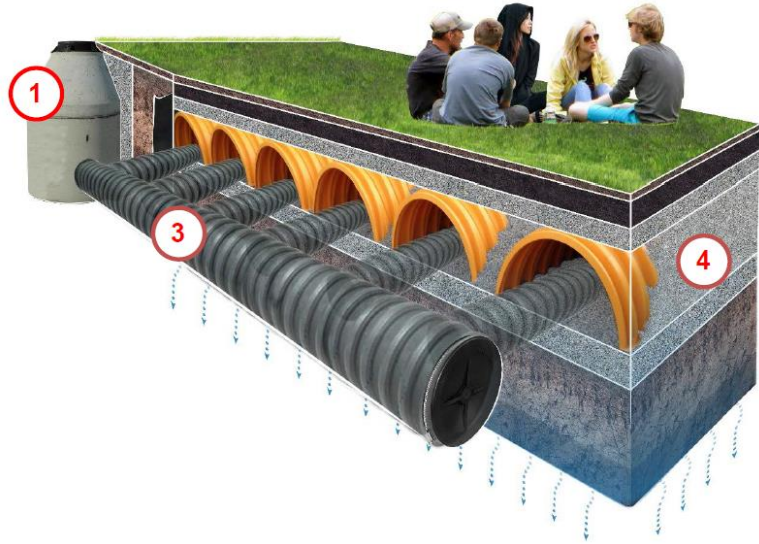






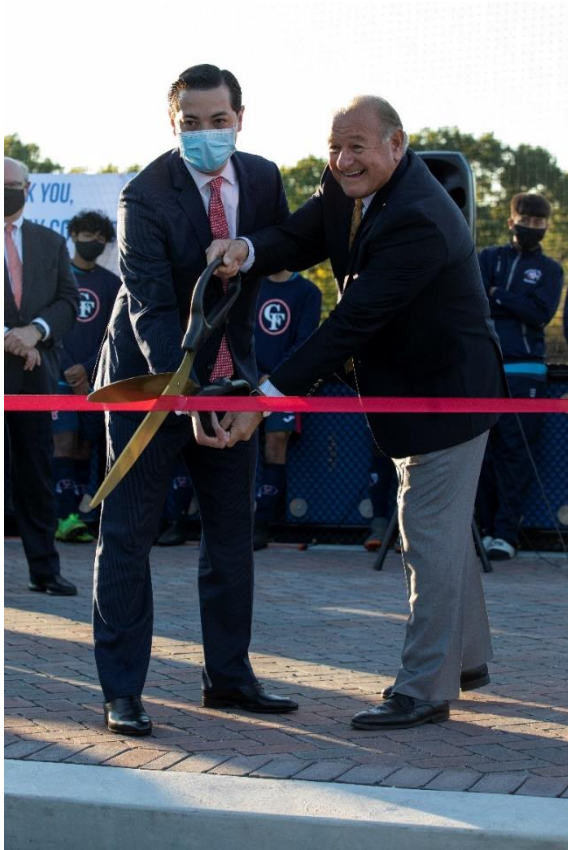
# Project 2. Macomber Stadium GSI Project Stormwater Design

## 1,404 Underground Infiltration Chambers





# Project 2. Macomber Stadium GSI Project Ribbon Cutting (October 9, 2020)



# Project 3. Pierce Park GSI Project

- Pervious Basketball Court
- Infiltration System Under Court
- Permeable Paver Plaza
- Sidewalk Improvements
- Little League field Restoration
- Environmental Remediation (Cap over Contaminated Soil)





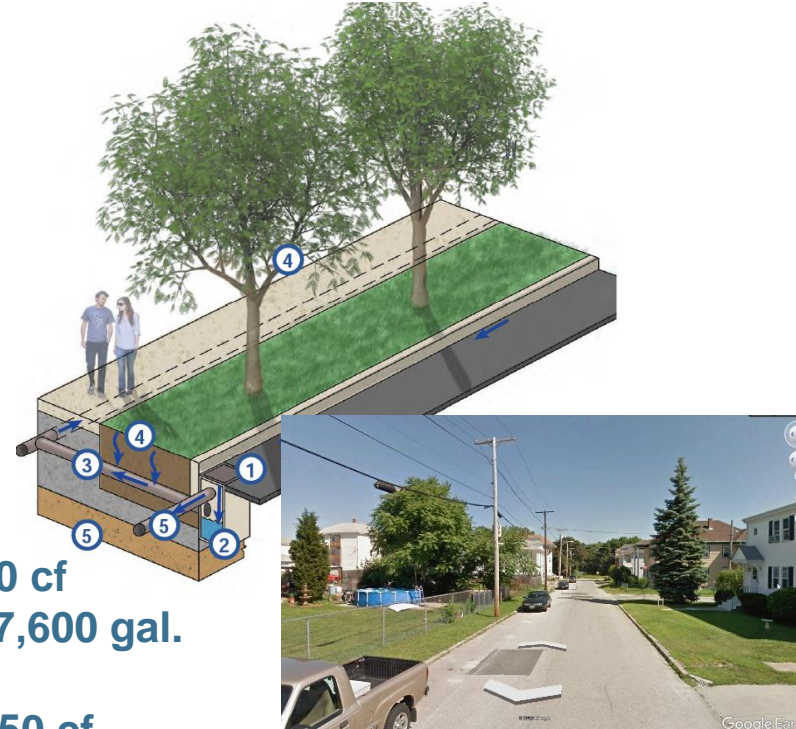
# Project 4. River Street and Samoset Ave.

- Underground Infiltration System



- Drainage Area: 1.95 ac.
- Impervious Area: 1.5 ac. (77%)
- Target Volume : 7,700 cf  
57,600 gal.
- Design Volume: 17,950 cf  
132,300 gal.

- Tree Trenches



# GSI Project Team Members

- NBC – Project Owners
- City of Central Falls – Site Owners
- Rhode Island Infrastructure Bank - Financing
- Stantec/Pare – Program Manager
- Designers
  - Stantec
  - Pare Corporation
  - Horsley Witten
- Contractors
  - Cardi Construction
  - J.H. Lynch
  - Manafort Brothers



**RHODE ISLAND  
INFRASTRUCTURE BANK**





# Lessons Learned

- Balance Stormwater Removal with Future Site Uses
- Assess Environmental Conditions at Early Stages of Project
- Build in Design Flexibility & Forecast Possible Field Changes
- Engage with Stakeholders to Build Project Consensus
- Make Design Choices that Minimize Maintenance Requirements

# Benefits Realized from GSI

- ✓ Water Quality Improvements
- ✓ Reduced Combined Sewer Overflows
  - ✓ Some systems treat up to the 25-year storm
  - ✓ Optimize “grey” stormwater controls
  - ✓ Lowered CSO Volume at Multiple Outfalls
- ✓ Reduced Stormwater Flows to WWTF
- ✓ Resiliency Against Increasing Storm Intensity
- ✓ Environmental Cleanup
  - ✓ Contaminated soils removal and encapsulation
  - ✓ Environmental Land Use Restrictions for ongoing compliance
- ✓ Urban Redevelopment
- ✓ Address Stakeholder Input and Regulatory Requirements

# Future GSI Projects

- **Phase IIIB Projects in Central Falls & Pawtucket**

- **Sacred Heart Park - Central Falls**
- **Max Read Field - Pawtucket**
- **Oak Hill Neighborhood - Pawtucket**

- **High Street Green Corridor – Central Falls**

- **Leverage Additional Opportunities Between GSI Sites**

- **Pawtucket/Central Falls TOD District**

- **Municipal Support to Drive Future Opportunities**



# Questions?

