



# Keeping Downtown Above Water: Resiliency Strategies in Salem, MA

NEWEA 2021 Annual Conference and Exhibit



David Knowlton, P.E., City of Salem

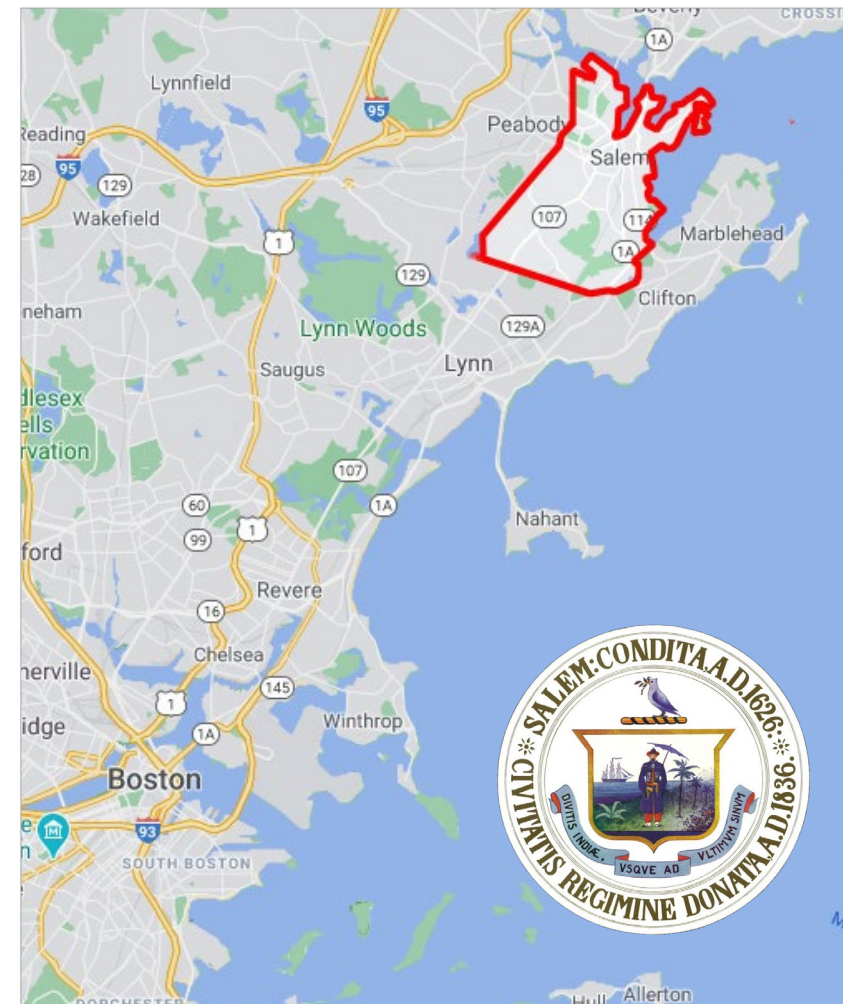
David White, P.E., Woodard and Curran





# Introduction to Salem, MA

- Location: 16 Miles North of Boston
- Population: 41,000
- Land Area: 8.30 Sq. Miles
- Founded in 1626
- Fact: **The Salem Witch Museum offers an educational experience about the historical trials, and it was recently featured in Netflix's *Hubie Halloween*.**



# Agenda



Overview of  
Flooding Along  
the South  
River



Alternative  
Mitigation  
Options  
Considered



Canal Street  
Flood Mitigation  
Program



Project  
Implementation



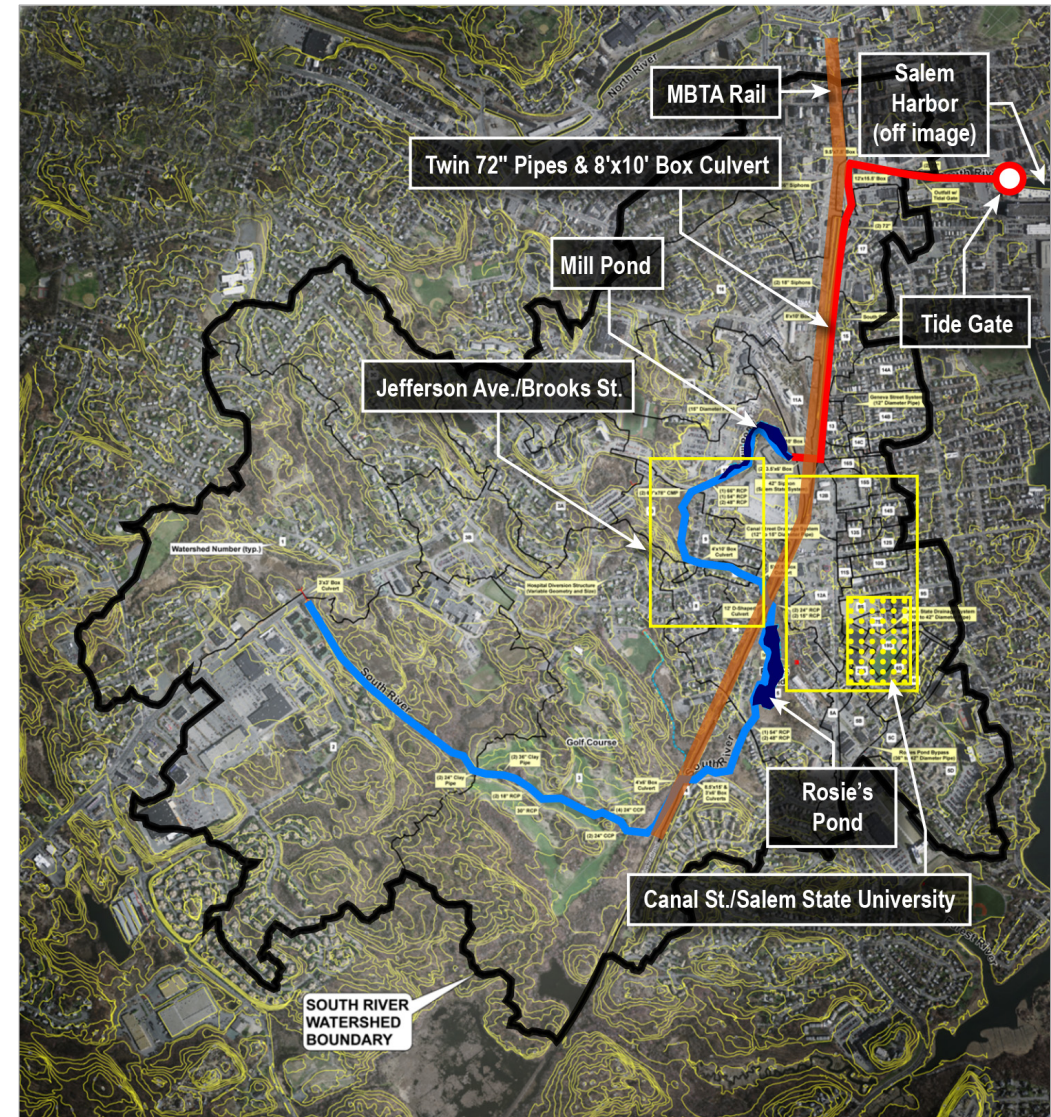
Project  
Funding



# Overview of Flooding Along the South River

## ■ South River Watershed

- 1400 Acres
- Bisected by a MBTA Freight and Commuter Rail
- 2 Waterbodies; Mill Pond and Rosie's Pond
- Culverted from Mill Pond to Outfall in Salem Harbor
- Tide Gate at Outfall
- Land Uses
  - Residential and Commercial Land Uses to West of MBTA (Headwaters)
  - Dense Commercial, Residential and Institutional Land Uses to East of MBTA



# Overview of Flooding Along the South River, Cont'd

- 2 Principal Areas
  - Canal Street/Salem State University (SSU)
  - Jefferson Ave/Brooks St.
- Intense Rainfall
- Moderate Rainfall w/ High Tides
- Minor (Nuisance) Sunny Day Flooding
- Six Significant Events since 1996
- Last - Mother's Day 2006
- Severe Damage to Resident/Commercial Property and Public Infrastructure

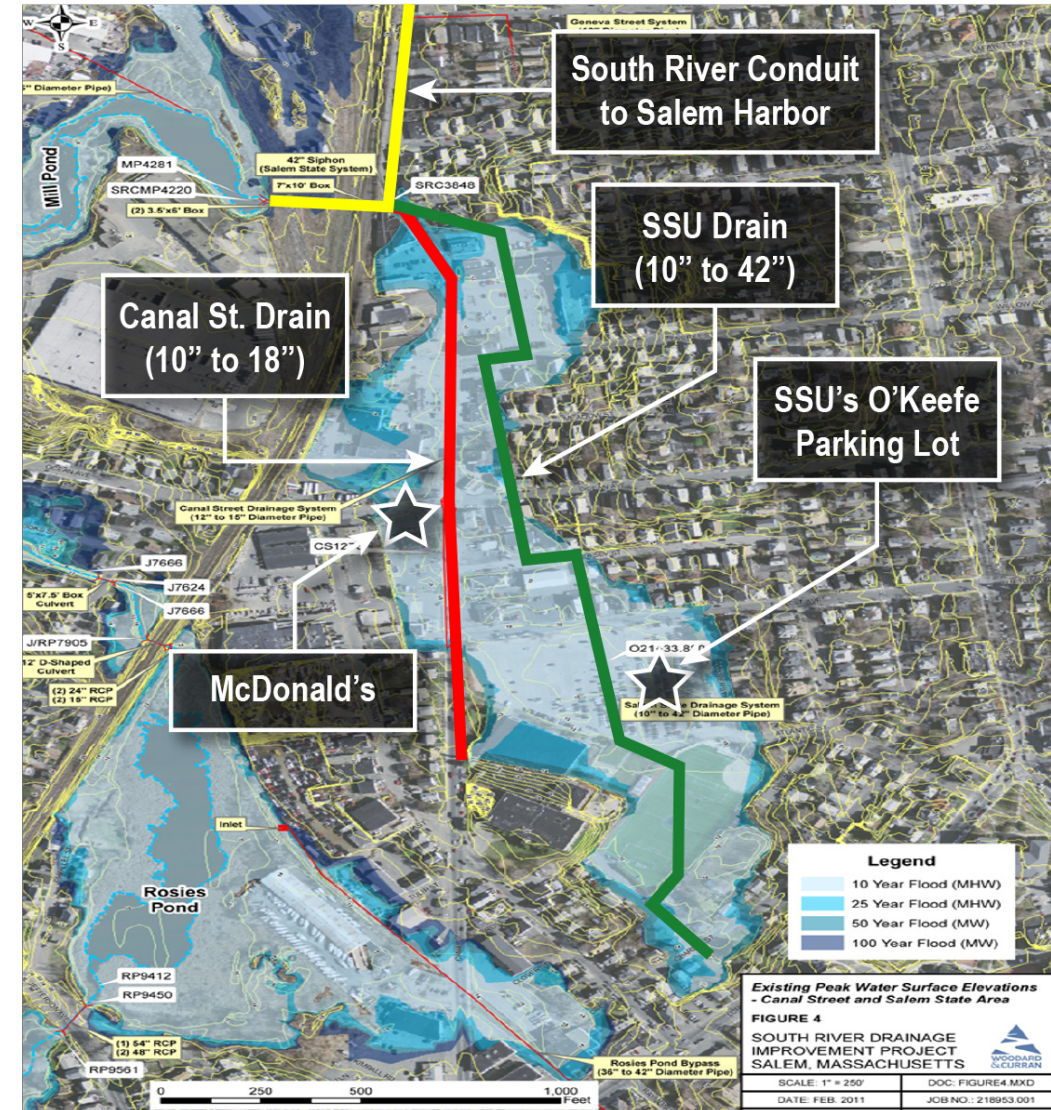


# Overview of Flooding Along the South River, Cont'd



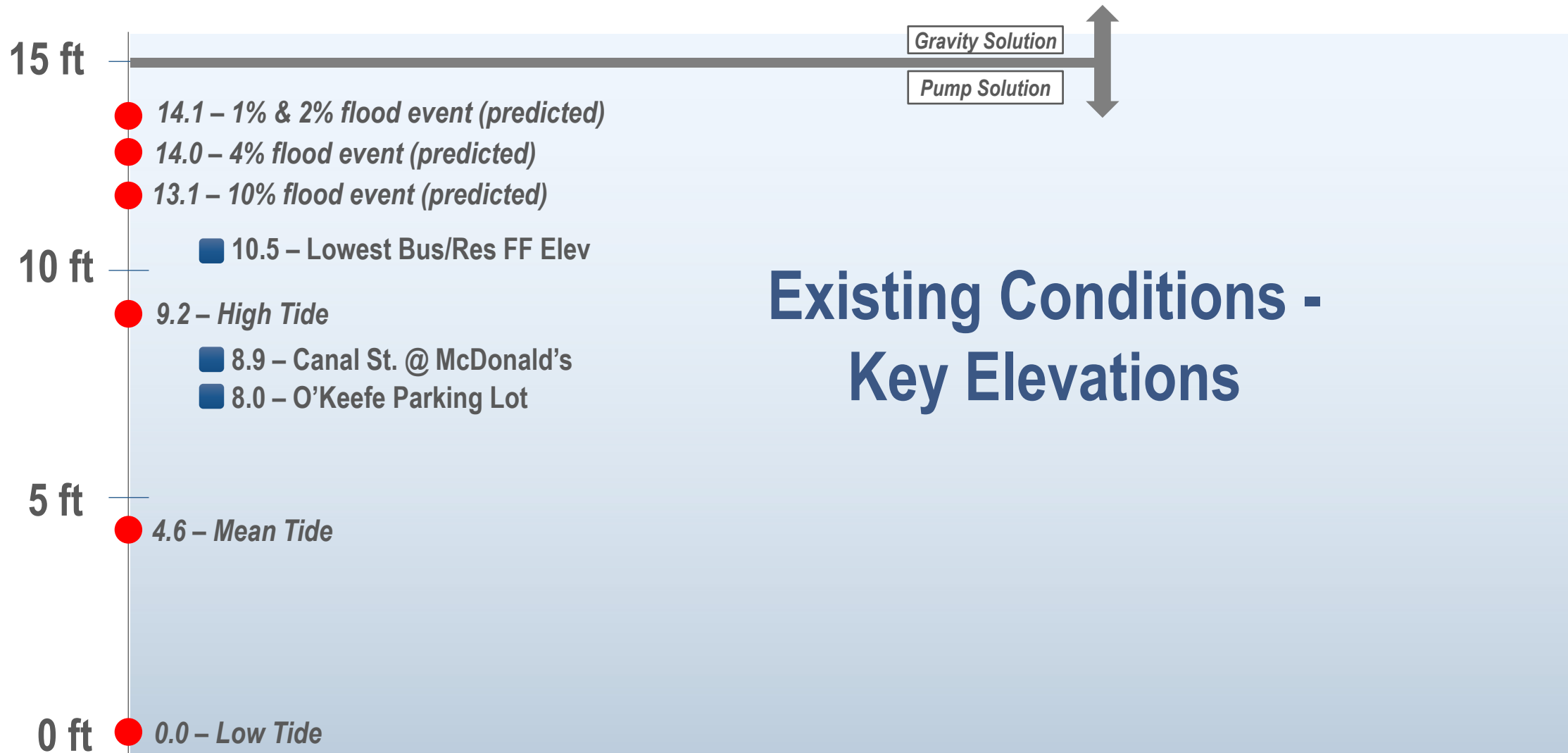
## ■ Canal Street/SSU Area

- 25-year event
  - 23.2 acres
  - 31 buildings
- 100-year event
  - 30.8 acres
  - 50 buildings
- Flooding heavily influenced by tidal conditions
- Drainage systems with insufficient capacity





# Alternative Mitigation Options





# Alternative Mitigation Options

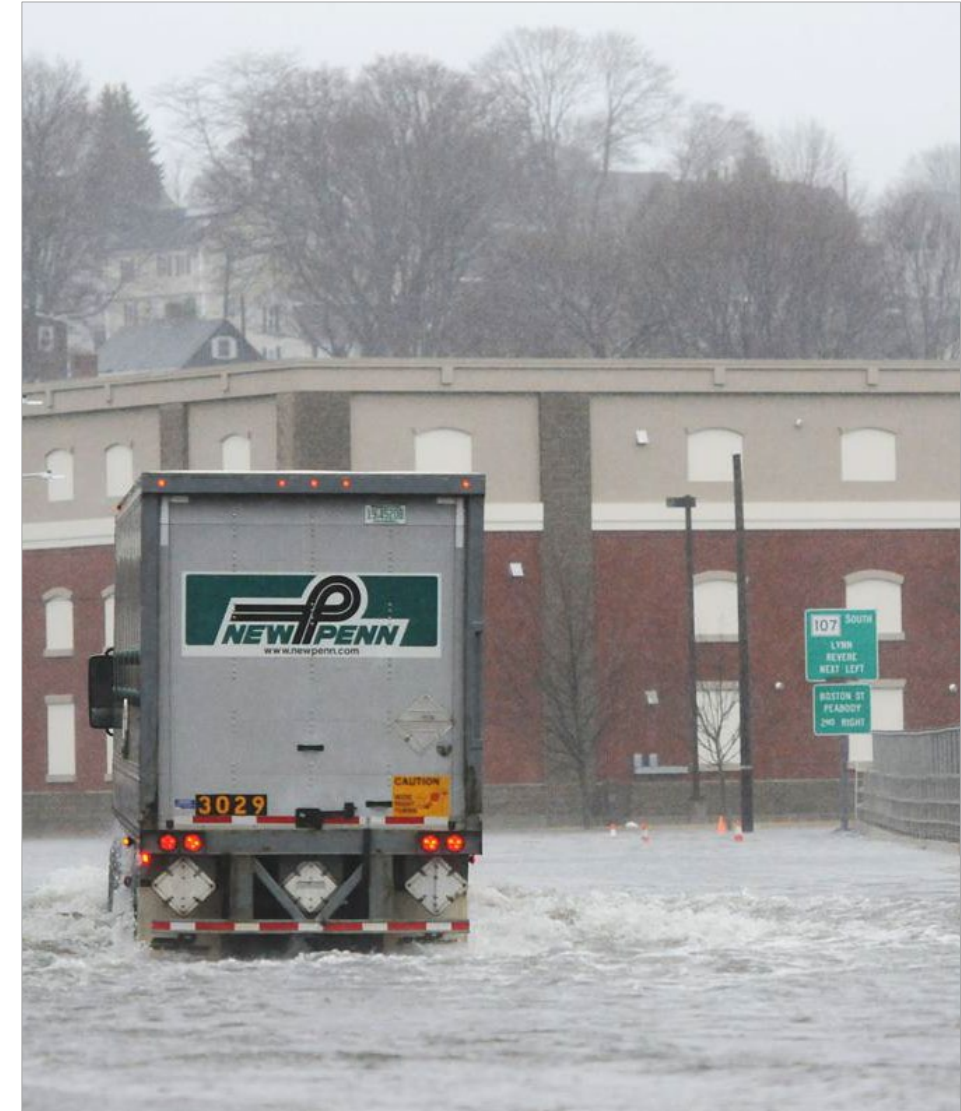
Alternative 1	Increase the capacity of South River Conduit
Alternative 2	Provide flow diversion from golf course
Alternative 3	Construct a new stormwater pump station on Canal St. & SSU drainage systems (a combination of Alternatives 8 & 9)
Alternative 4	Construct a new stormwater pump station at the outlet of South River Conduit
Alternative 5	Increase storage at Rosie's Pond
Alternative 6	Construct a new stormwater pump station at O'Keefe Center parking area
Alternative 7	Provide hydraulic improvements to Rosie's Pond Bypass and/or inlet structure
Alternative 8	Construct a new stormwater pump station on SSU drainage system (at St. Paul St.)
Alternative 9	Construct a new stormwater pump station on Canal St drainage system (at St. Paul St.)
Alternative 10	Increase the capacity of SSU drainage system
Alternative 11	Increase the capacity of Canal St. drainage system
Alternative 12	Increase the capacity of both the Canal St. and SSU drainage systems (combination of Alternatives 10 & 11)
Alternative 13	Maximize storage at golf course

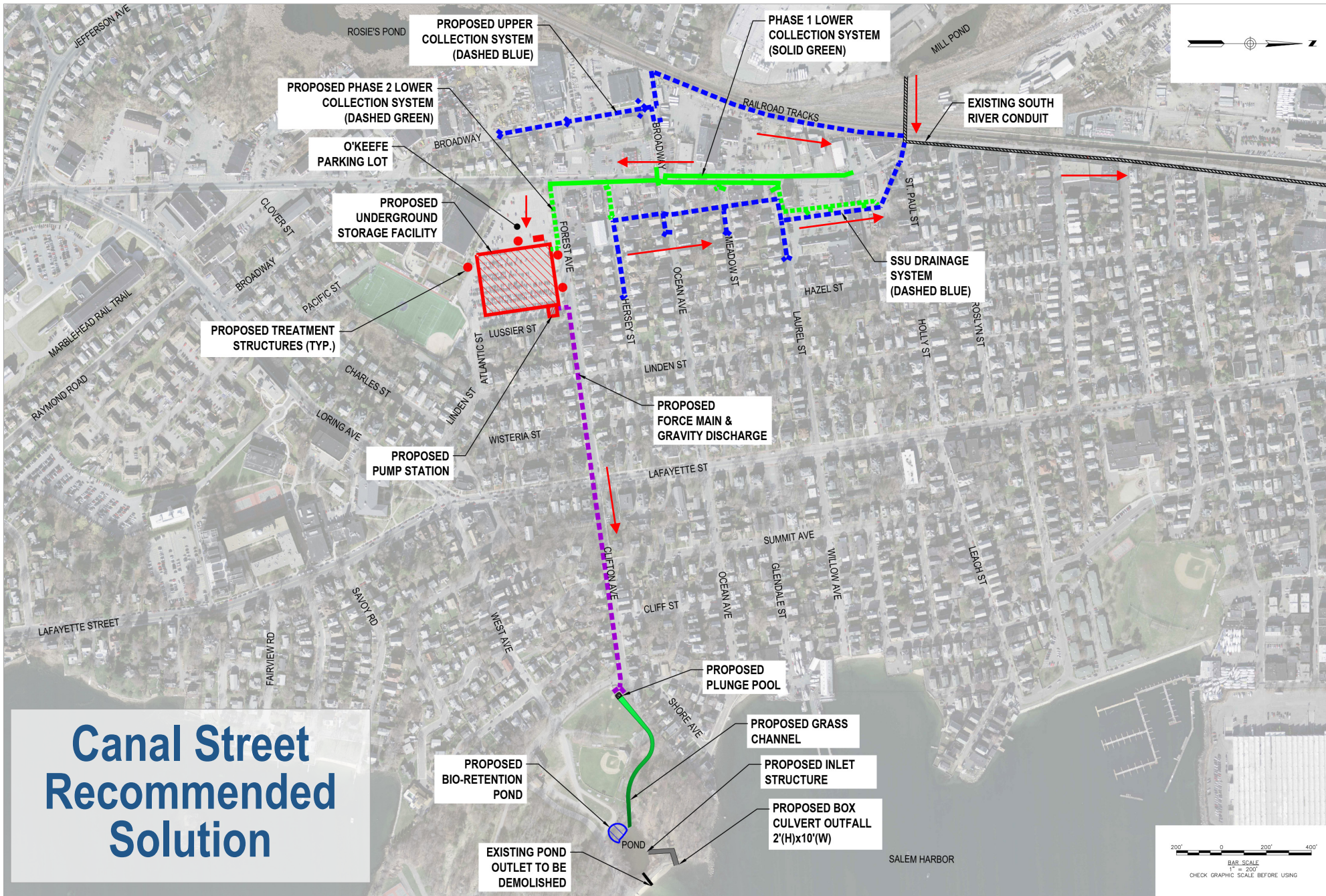




# South River Flood Mitigation Program

- 13 Alternatives = Two Areas Required Different Solutions
  - **Canal Street**
  - Brooks Street / Jefferson Ave. / Rosies Pond
- Multi-Year, Multi-Phased Approach
- Initial Focus was to Protect to 25-yr Event
- Ultimately Designed for 100-yr Event
  - Improved Resiliency (Climate Change)
  - Economy of Scale
  - Disruptions to property owners





# Canal Street Recommended Solution

200' 0 200' 400'  
GRAPHIC SCALE  
1" = 200'  
CHECK GRAPHIC SCALE BEFORE USING



# South River Flood Mitigation Program



## Canal Street

### Phase 1 – Canal Street Infrastructure

- Preparation for MassDOT Roadway Restoration
- Construct 2,100' Major Trunk Line (66" Pipe) in Canal St.
- Provisions to temporarily Drain to Existing System
- Repair and rehabilitation of Sewer and Water
- Repairs to the South River Conduit

# South River Flood Mitigation Program



## Canal Street

### Phase 2A – Forcemain, Forest River Park & Seawall Improvements

- Install 1,700 feet of 30-inch Diameter Forcemain
- Create Biofiltration Swale
- New 3-foot by 8-foot ocean outfall
- New ballfield, basketball courts and concession stand
- New parking area with Stormwater Green Infrastructure
- New boardwalk over wetland enhancement areas
- Repair and rehabilitation of Sewer and Water
- Vegetation Management along Pond
- Replacement of Seawall w/ Improved Public Access

# South River Flood Mitigation Program



## Canal Street

### Phase 2B – Bike Path Diversion

- Diverts 1 of 2 Upland Areas from Canal Street
- Constructed under new bikepath along MBTA Commuter/Freight Rail
- 1,200 feet of 36-inch Pipe

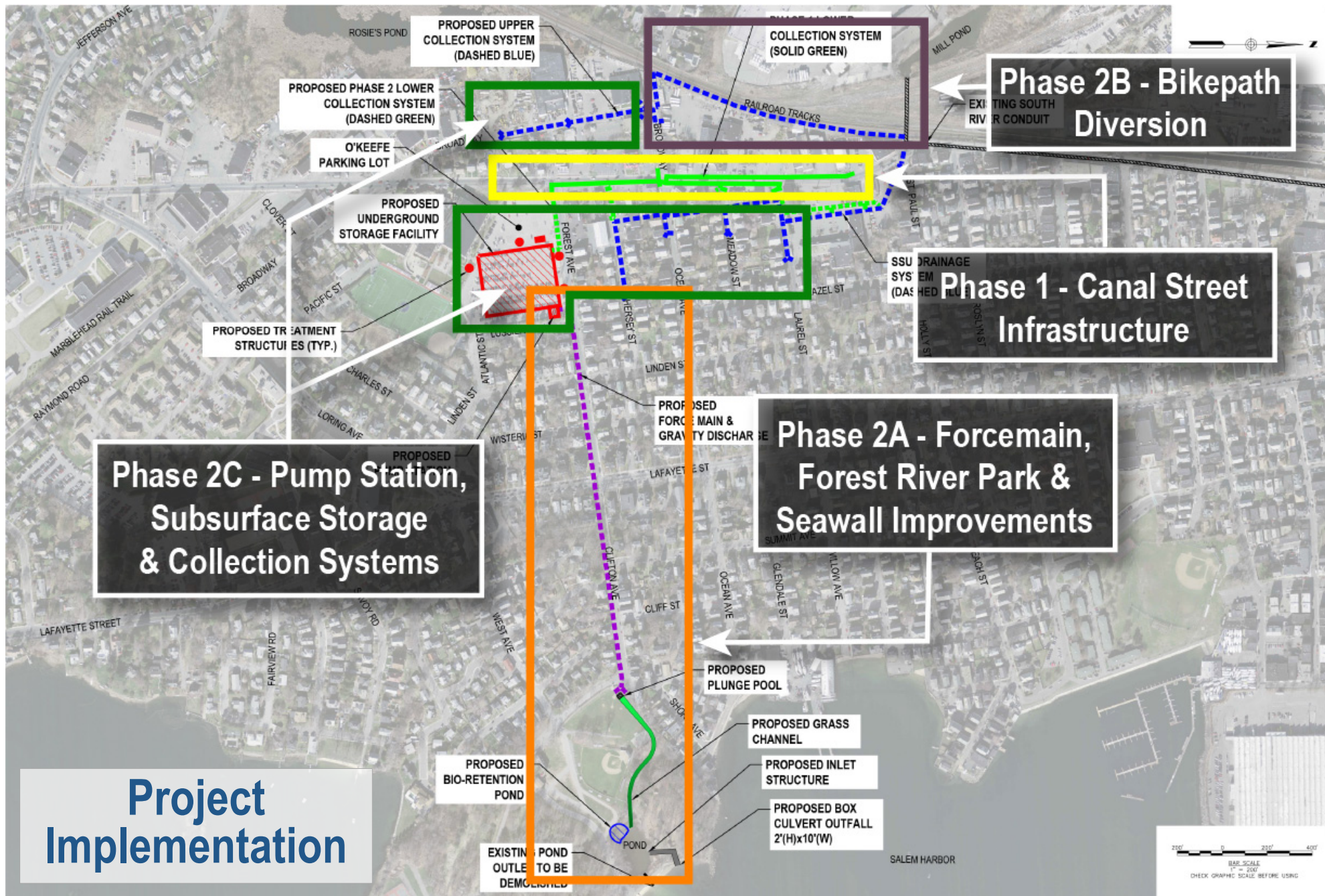
# South River Flood Mitigation Program



## Canal Street

Phase 2C – Pump Station,  
Subsurface Storage & Collection  
Systems

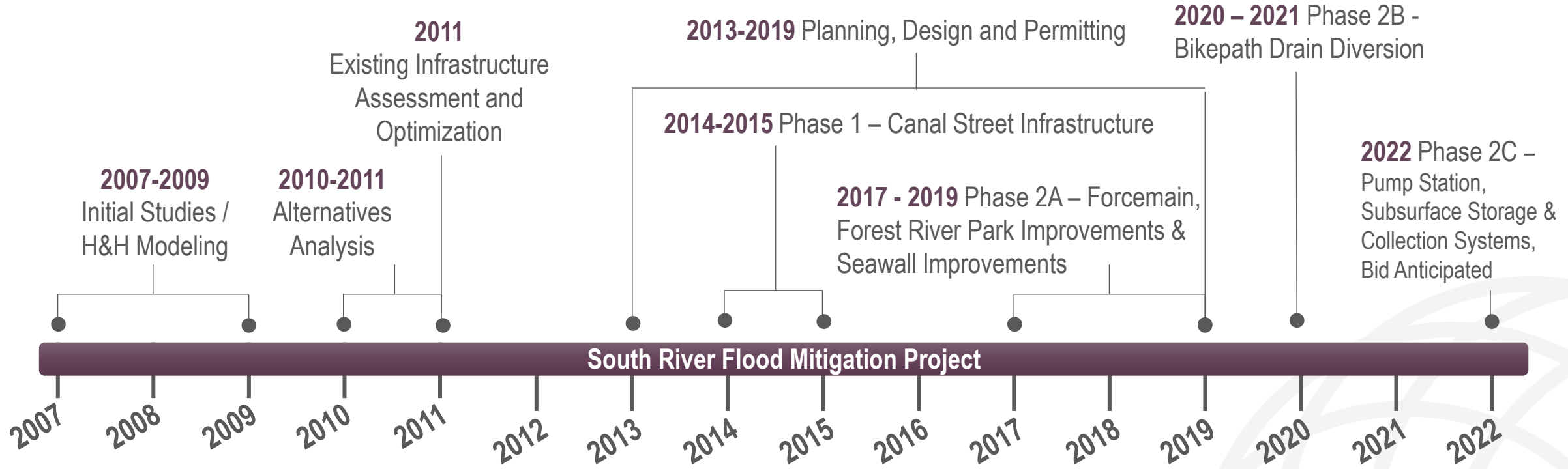
- Construct 11,000 gpm Pump Station
- Install 4 Million Gallon Subsurface Storage Tank
- Install Collection Systems from Side Streets
- Install Proprietary Stormwater Treatment Devices
- Resurface and Reconfigure SSU Parking Lot







# Project Timeline





# Project Funding



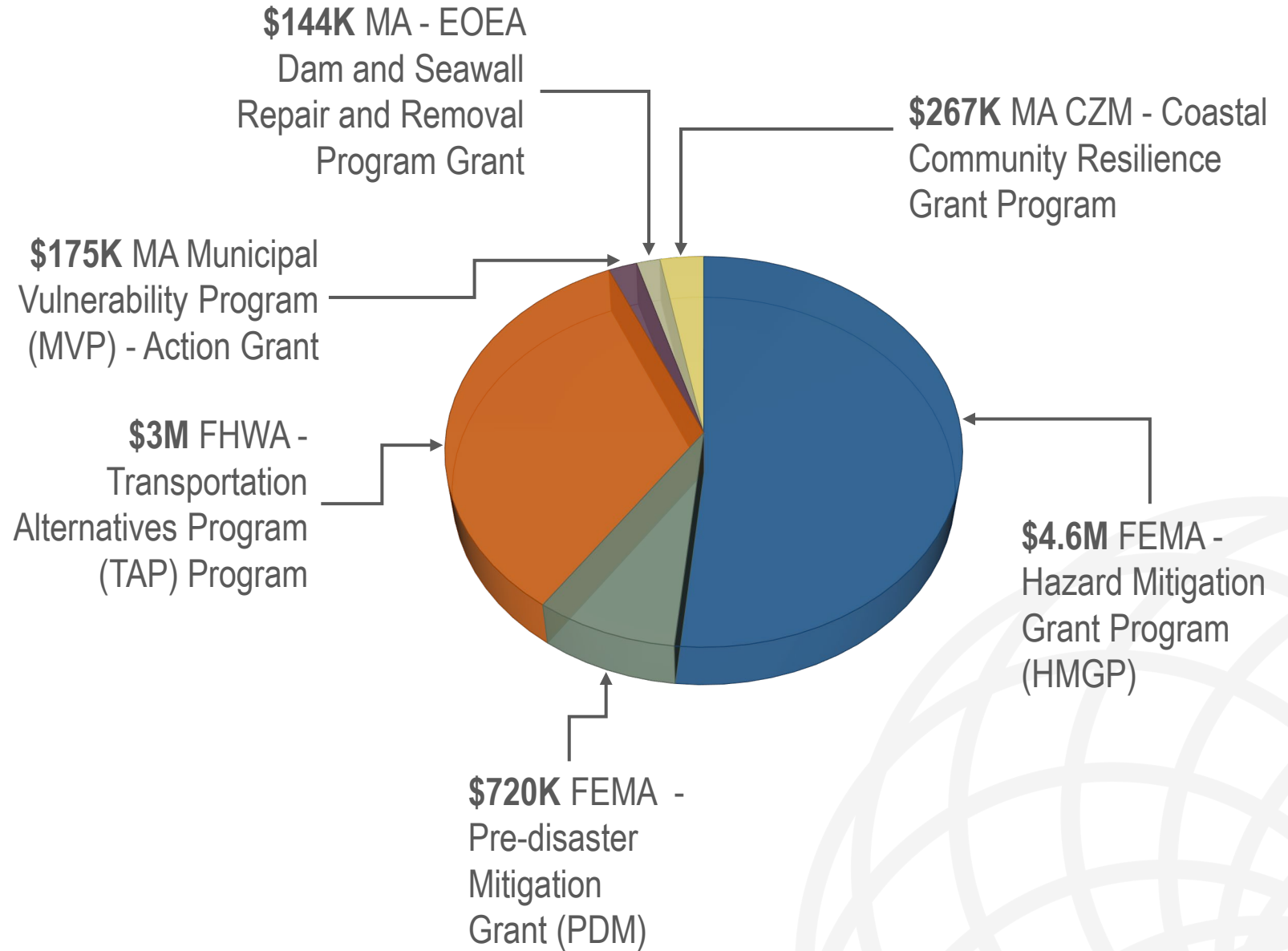
**\$50M Estimated Program Cost**



## Balance

- City Capital Budget
- MA CW SRF Loan Program
- Federal Stimulus Package?

**\$8.9M in Federal & State Support to Date**





# Thank you!!

## Presenters Contact:

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## Team Acknowledgements:

GeoComp - Geotechnical Engineering

WSP - Survey

LEC Environmental - Wetlands & Permitting

AECOM - Bikepath & Canal Street Surface Improvements

Preferred Construction Management - Cost Estimating

New England Civil Engineering Corp. - Flow Monitoring

