

# Manchester-by-the-Sea

## A Community Plans for Coastal Resilience

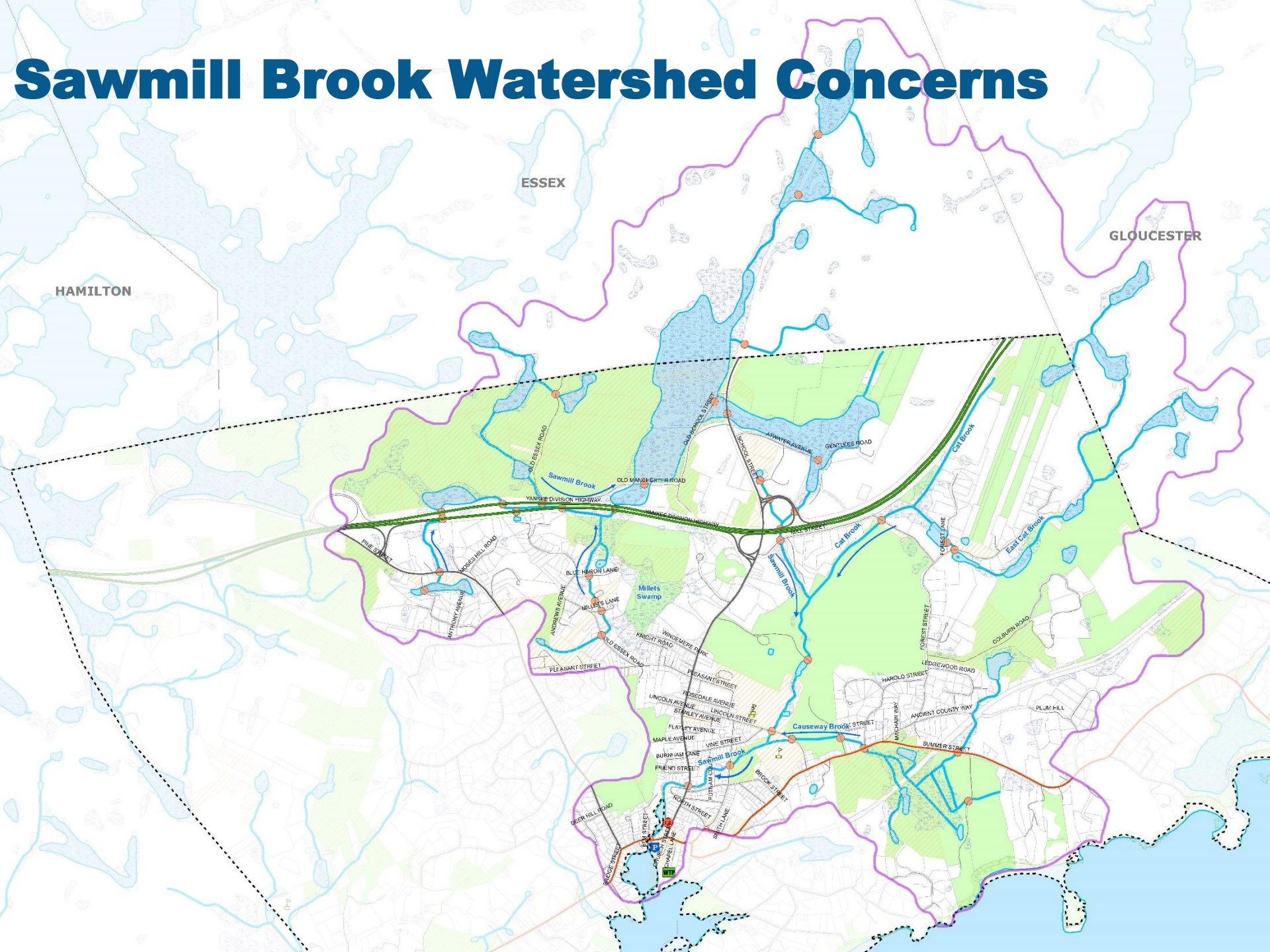


Finding Solutions to our Coastal Challenges  
Salem Sound Coastwatch 25<sup>th</sup> Anniversary Symposium

March 18, 2016

**Janet Moonan, P.E.**, Project Engineer

# Sawmill Brook Watershed Concerns



ESSEX

GLOUCESTER

HAMILTON

OLD ESSEX ROAD  
Sawmill Brook  
YANKIN DIVISION HIGHWAY  
OLD MANICHESTER ROAD  
DUNSTON DRIVE  
SCHOOL STREET  
WATER AVENUE  
GENTLES ROAD

PRUE STREET  
WINDMILL ROAD  
ANTHONY AVENUE  
ANDREWS AVENUE  
MILLETTS LANE  
MILLETTS LANE  
OLD ESSEX ROAD  
PLEASANT STREET

Millets Swamp

WINCEMERE PARK  
KNIGHT ROAD  
PEASANT STREET  
ROSEDALE AVENUE  
LINCOLN AVENUE  
STANLEY AVENUE  
FLATLEY AVENUE  
VINE STREET  
BURNHAM LANE  
FRIEND STREET  
PUNYON STREET  
NORTH STREET  
BROOK STREET  
MILLETTS LANE

CAUSEWAY BROOK  
Sawmill Brook  
Cair Brook  
FOREST LANE  
East Cair Brook

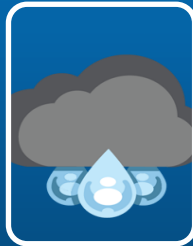
LEDGEMERE ROAD  
HAROLD STREET  
MAGUIRE WAY  
ANCIENT COUNTRY WAY  
SUMMER STREET

PLUM HILL

WINDMILL ROAD



# Sawmill Brook Watershed Concerns



### Inland Flooding

- Poor Soils
- Impervious Surface
- Channelized Drainage



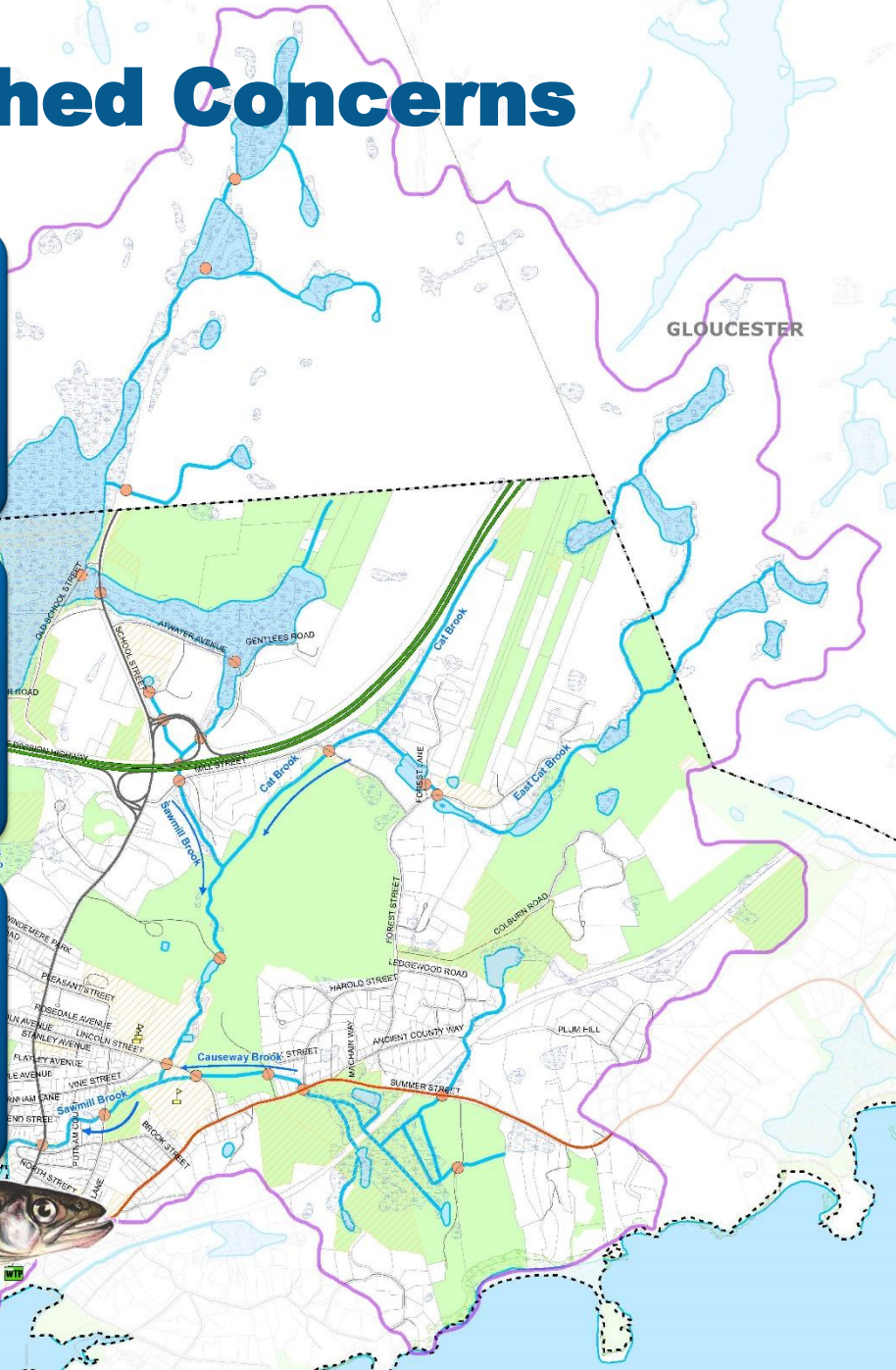
### Coastal Flooding

- High Tide
- Wave Action
- Storm Surge



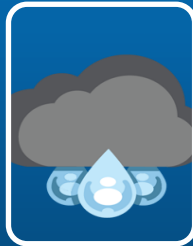
### Water Quality Issues

- Bacteria
- Low pH
- Sedimentation





# Sawmill Brook Watershed Concerns



### Inland Flooding

- Poor Soils
- Impervious Surface
- Channelized Drainage



### Coastal Flooding

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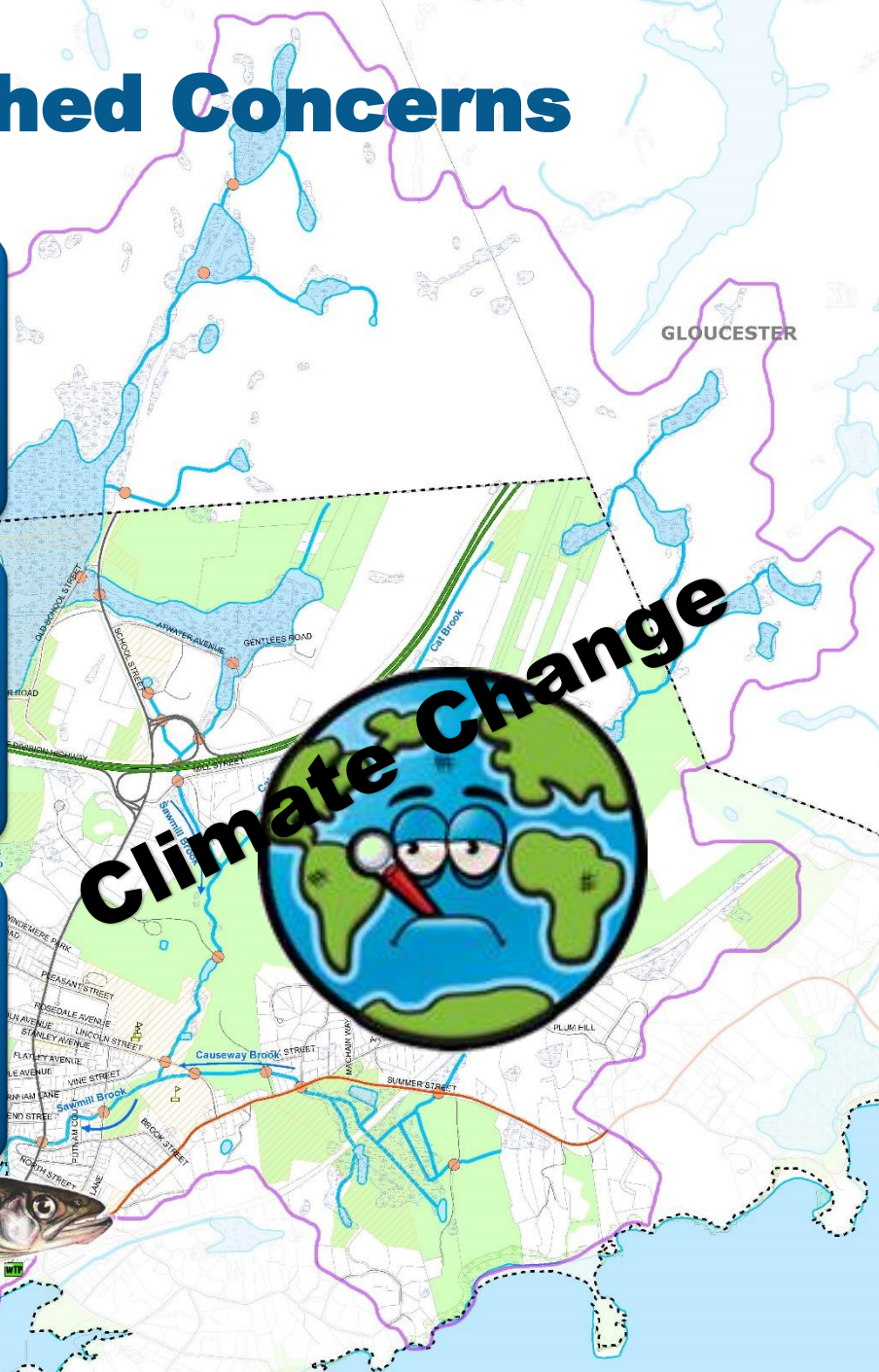


### Water Quality Issues

- Bacteria
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GLOUCESTER





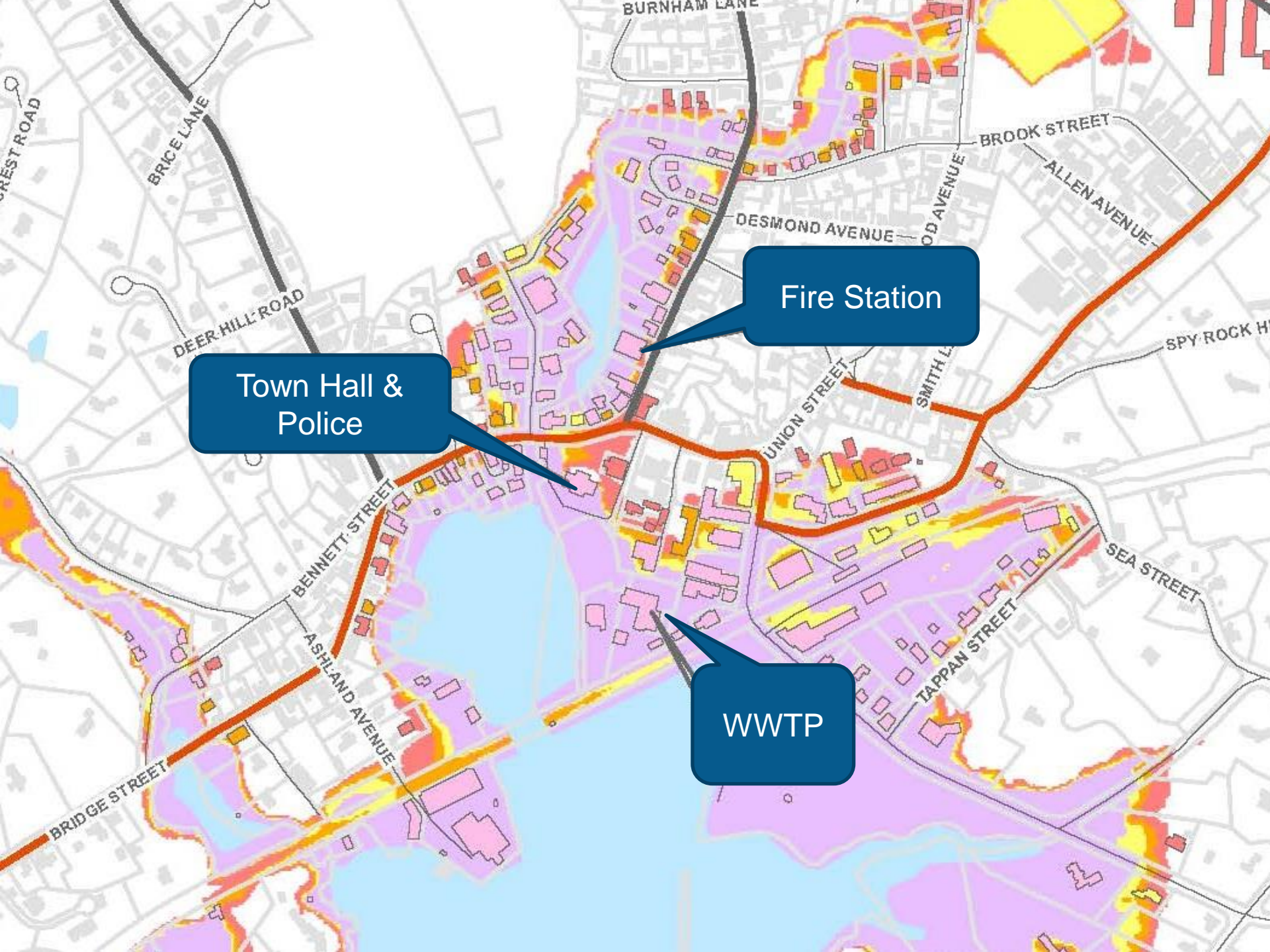


Town Hall &  
Police

Fire Station

WWTP





Town Hall & Police

Fire Station

WWTP

# Coordinated Grants



**Massachusetts Office of  
Coastal Zone Management**



**FEMA**

**Desktop Watershed Assessment  
Field Survey**

**Modeling with Climate Change**

**Identification of Locations for  
Flood Mitigation  
Conceptual Designs for  
Flood Mitigation**

**Identification of Community Assets**

**Enhance Hazard Mitigation Plan**

**Public involvement & participation**





# Coordinated Grants



Massachusetts Office of  
Coastal Zone Management

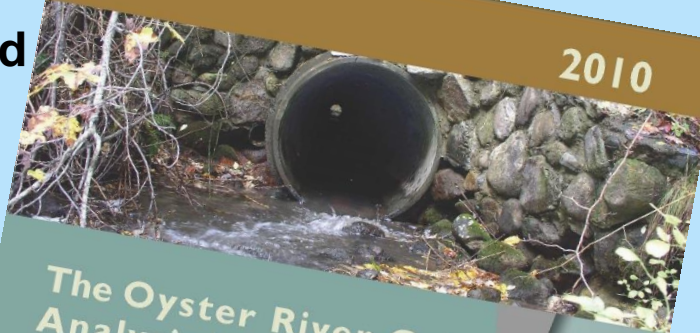


FEMA

Desktop Assessment

Field

2010



## The Oyster River Culvert Analysis Project

A Joint Project of:  
Syntect International  
Antioch University New England  
Climate Techniques  
University of New Hampshire Stormwater Center  
Piscataqua Region Estuaries Partnership

CLIMATE READY  
ESTUARIES  
Pilot Project  
SEPA

Climate Change

Identification of Community Assets

Enhance Hazard Mitigation Plan

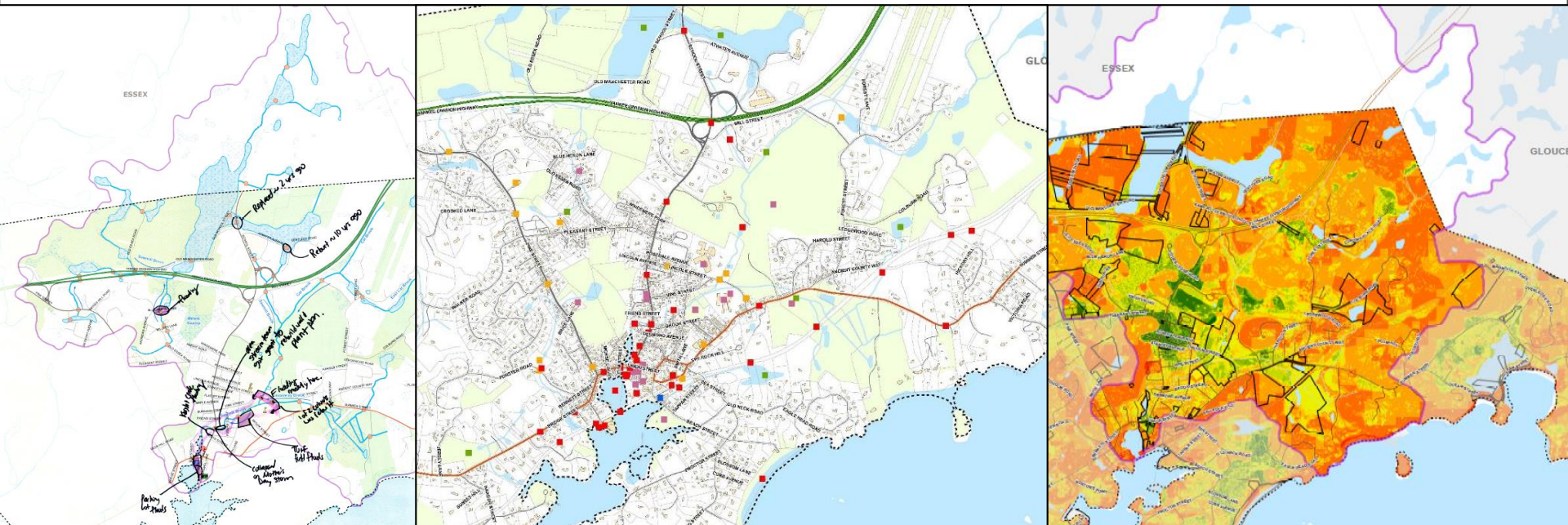
Involvement & participation





# Desktop Assessment

- Where does it flood?
- Where are critical community assets located?
- What opportunities exist to reduce flooding?

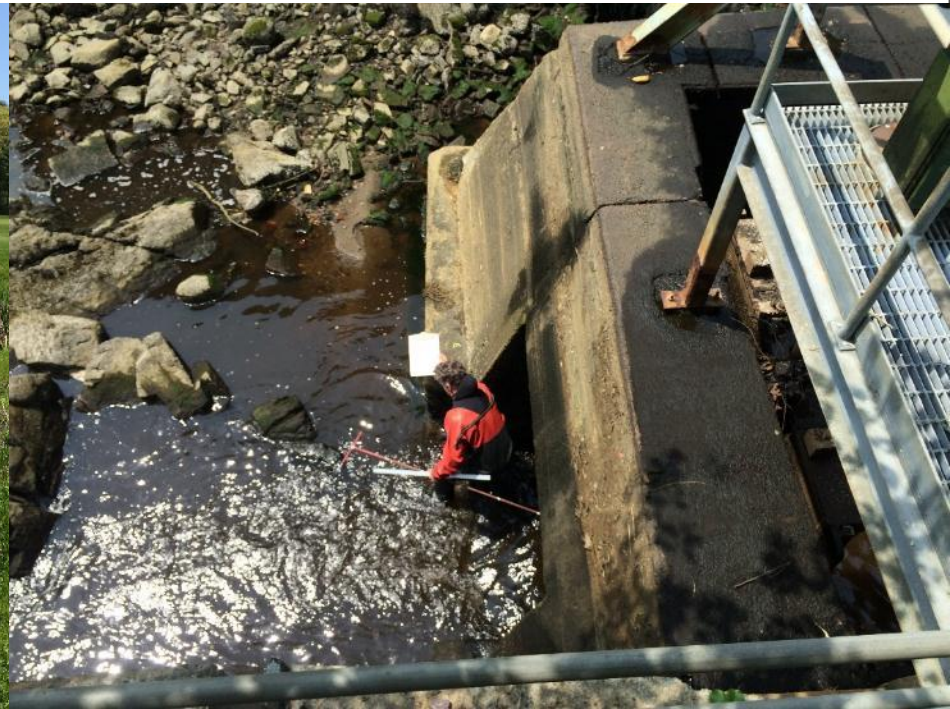




# Field Survey

## Assessment of:

- 23 culverts
- 15 sites for Green Infrastructure/ Flood Mitigation
- Central Street Tide Gate / Culvert





# Field Survey

## Assessment of:

- 23 culverts
- 15 sites for Green Infrastructure
- Central Street Tide Gate



Town of Manchester-by-the-Sea  
**INSTRUCTIONS:** Please return complete forms to Town Hall Meeting Room  
**QUESTIONS:** during field work, call 508-367-5598

**Crossing Type and Dimensions** Tighe & Bond

**Crossing Type (from above):**  1.  2.  3.  4.  5.  6.  7.  8.  9.

**Upstream Dimensions (feet):** A = \_\_\_\_\_ B = \_\_\_\_\_ C = \_\_\_\_\_ D = \_\_\_\_\_

**Downstream Dimensions (feet):** A = \_\_\_\_\_ B = \_\_\_\_\_ C = \_\_\_\_\_ D = \_\_\_\_\_

Structure ID: \_\_\_\_\_



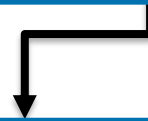
# Existing and Future Conditions Model



Model existing conditions



Evaluate future potential flooding  
Impacts due to climate change



Identify mitigation value of  
Green infrastructure and  
flood storage



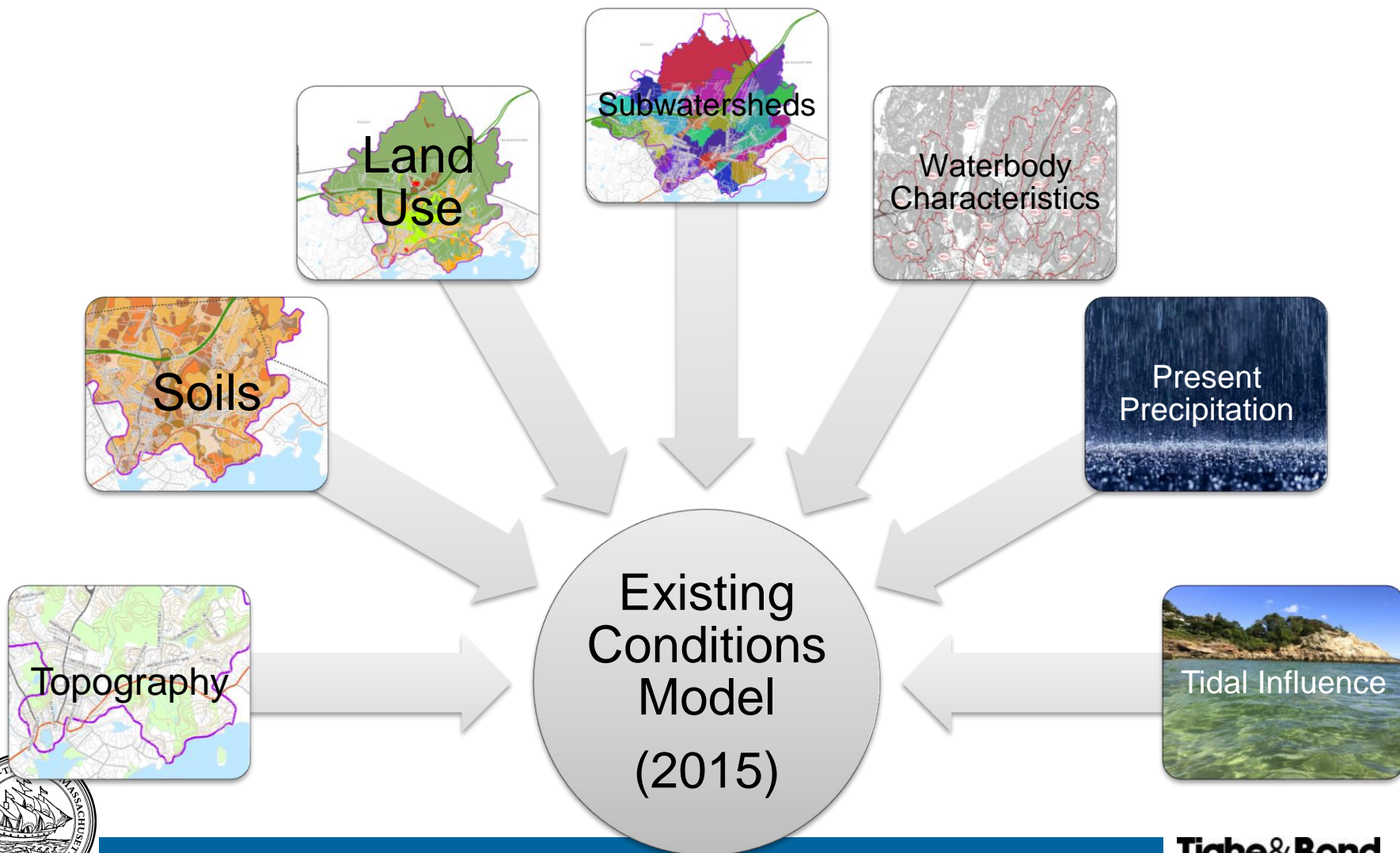
Assess adequacy  
of culvert sizes



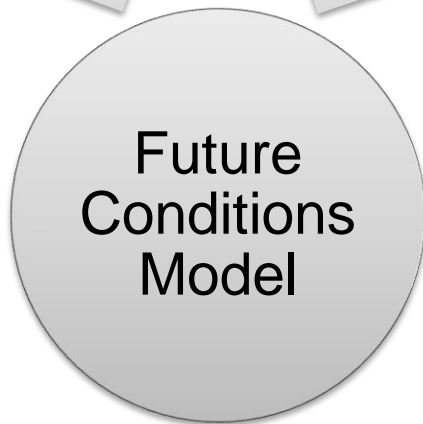
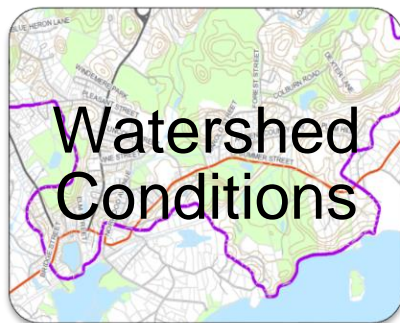
Identify impact on  
Community Assets



# Existing Conditions Model Inputs



# Future Conditions Model Inputs



2025

2050

2100



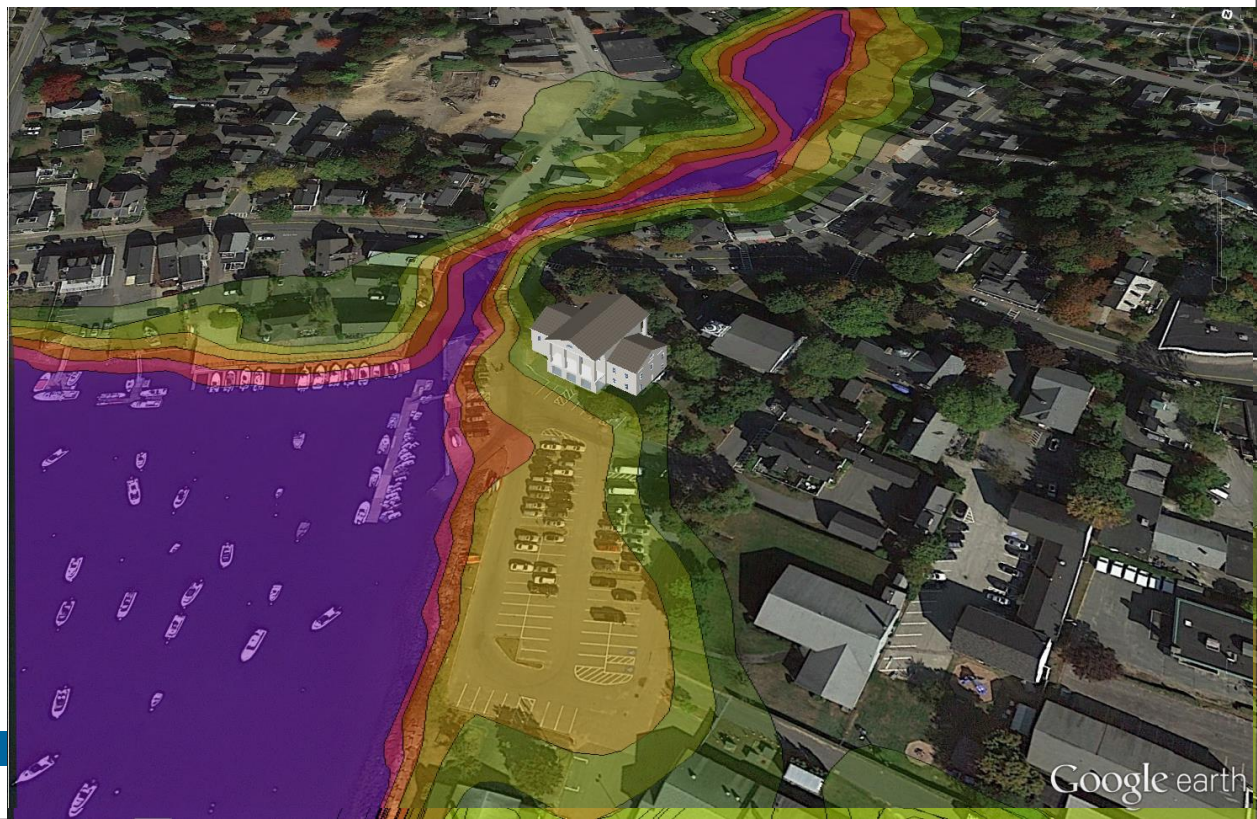


# Future Conditions Model Sea Level Rise & Storm Surge

Coastal influence from  
Inundation Risk Model (IRM)  
developed by Keil Schmidt of Geoscience Consultants

<http://www.geosciconsultants.com/projects/2015/5/27/coastal-risk-mapping-in-salem-sound>

- Sea Level Rise
- Shallow Coastal Flooding
- Storm Surge
- Hurricane



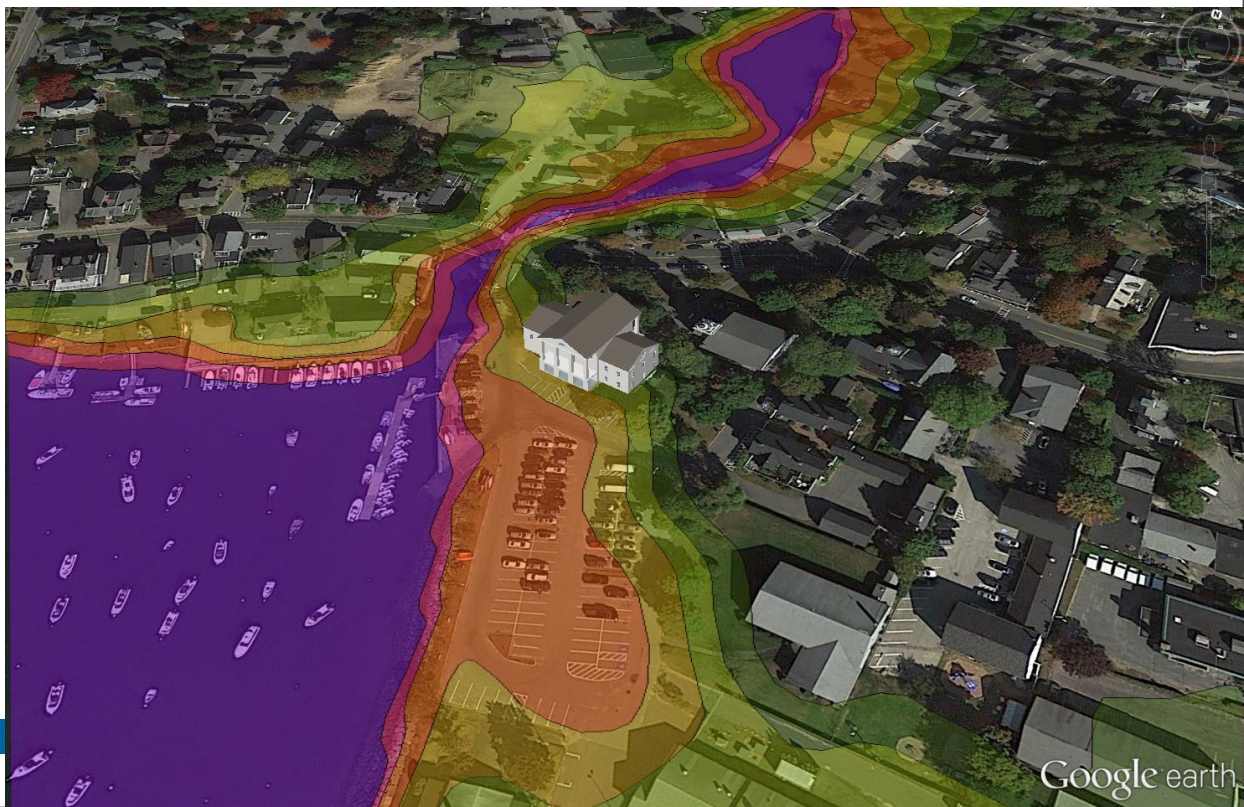


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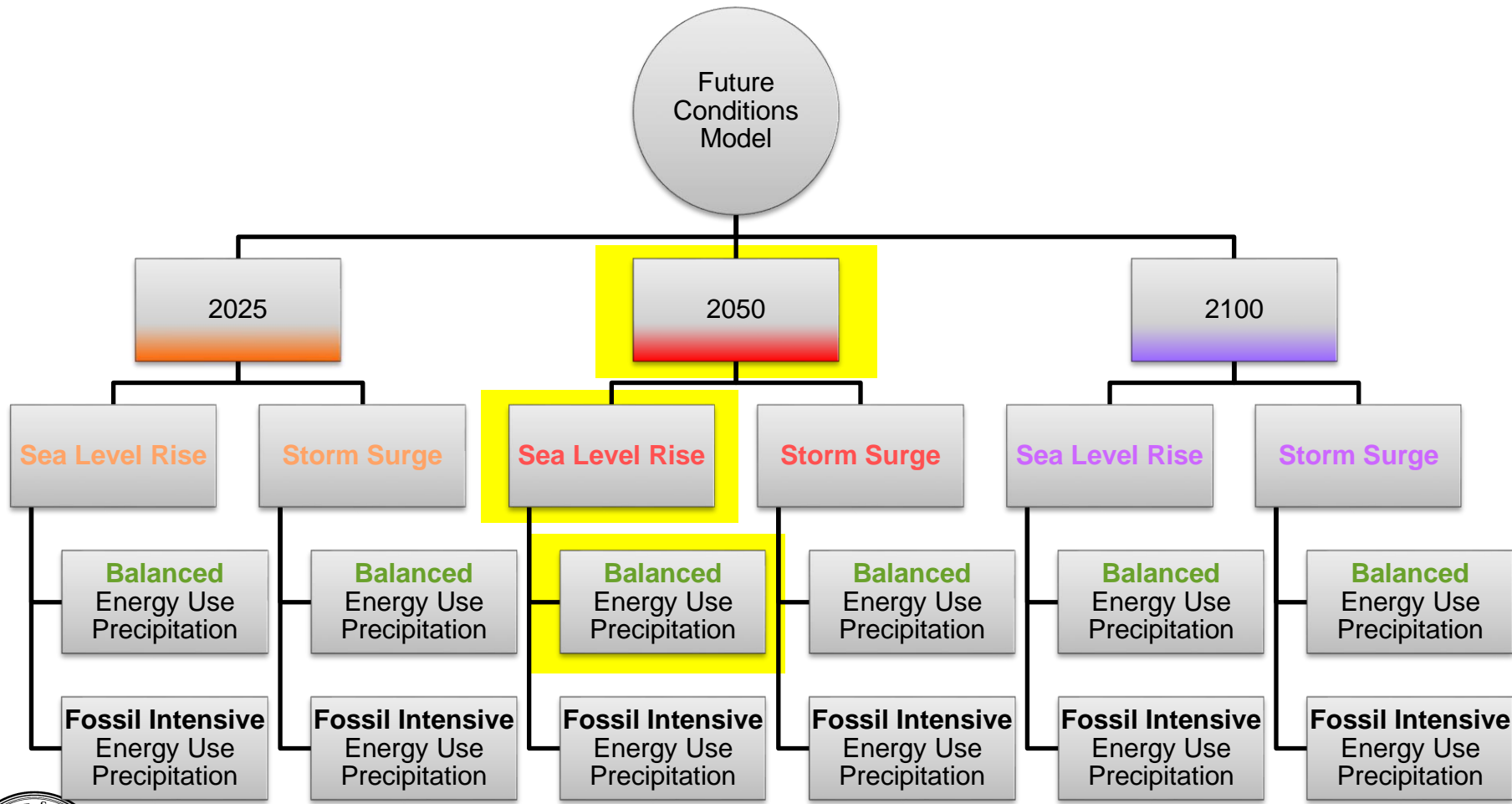
<http://www.geosciconsultants.com/projects/2015/5/27/coastal-risk-mapping-in-salem-sound>

- Sea Level Rise
- Shallow Coastal
- Flooding
- Storm Surge
- Hurricane

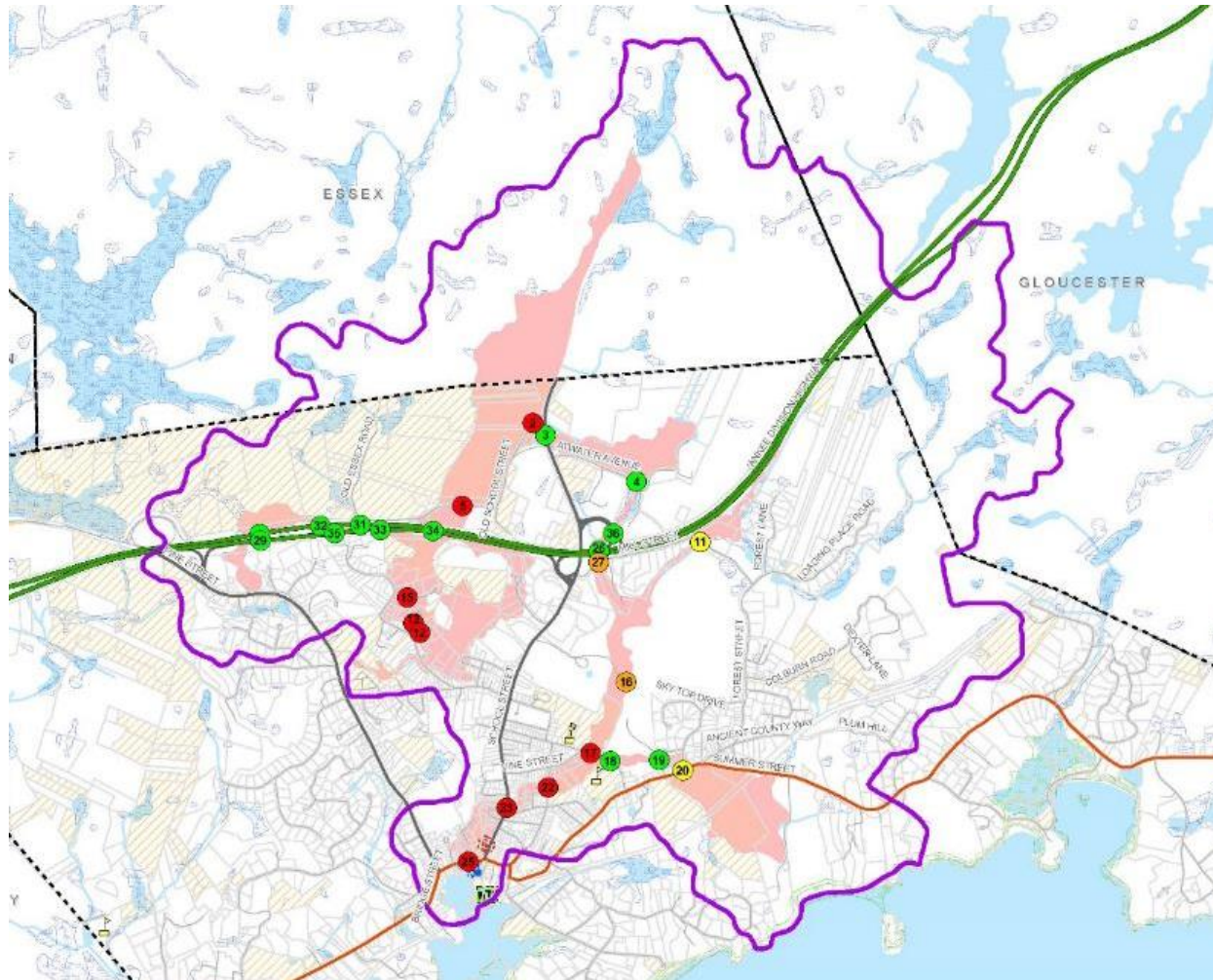




# Future Conditions Model Outputs

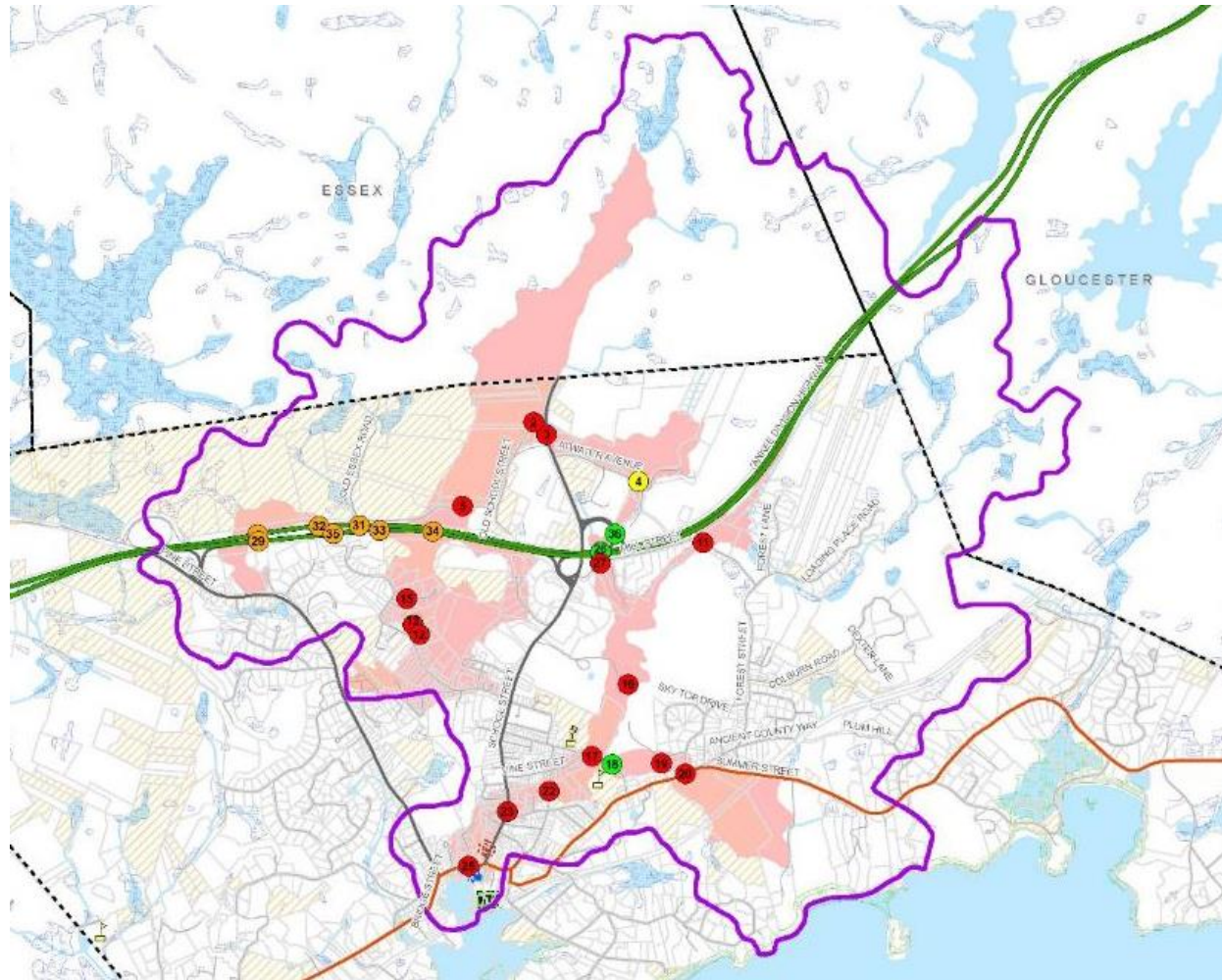


# Example Model Results 2025



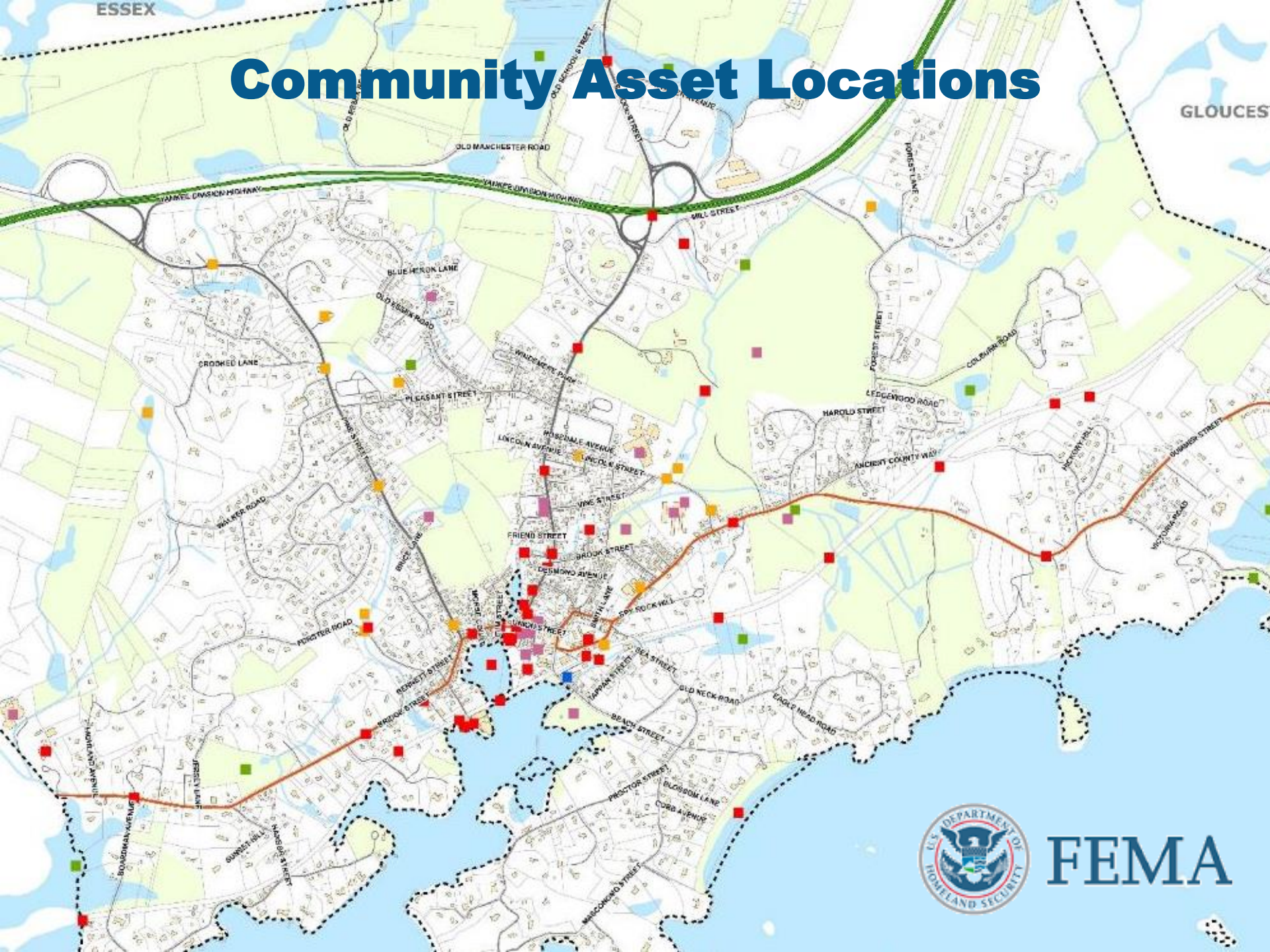


# Example Model Results 2100



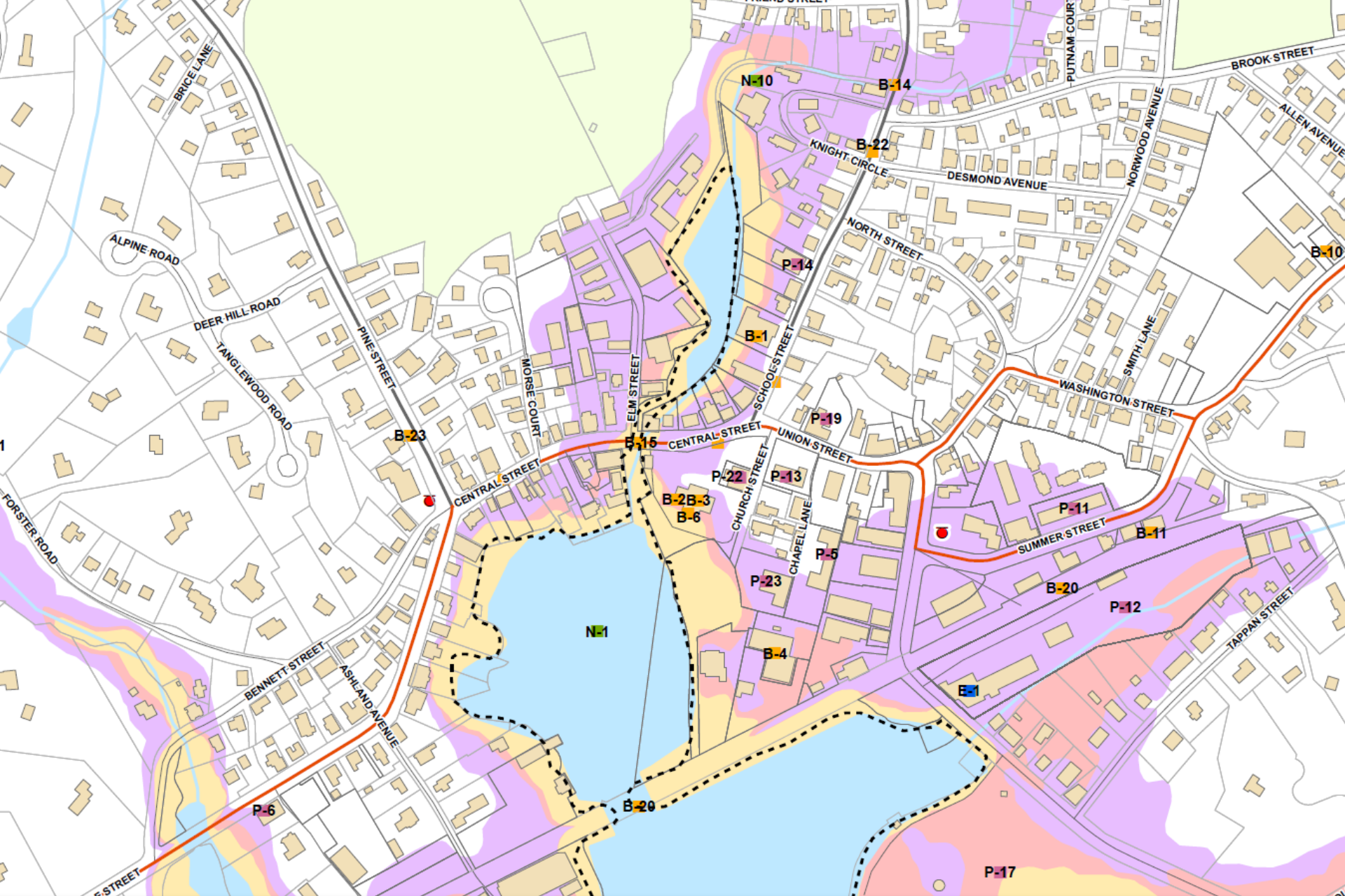


# Community Asset Locations

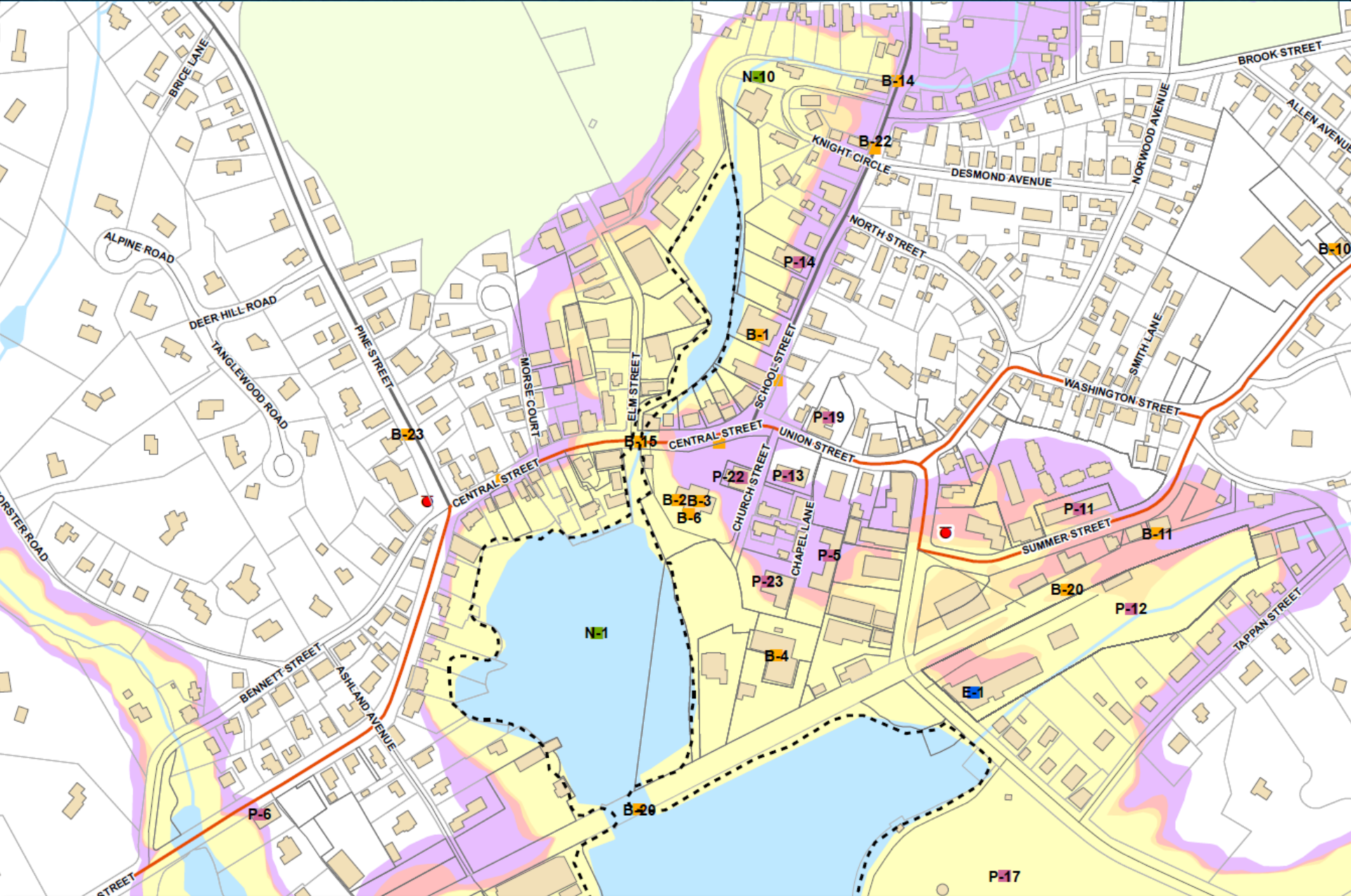


FEMA





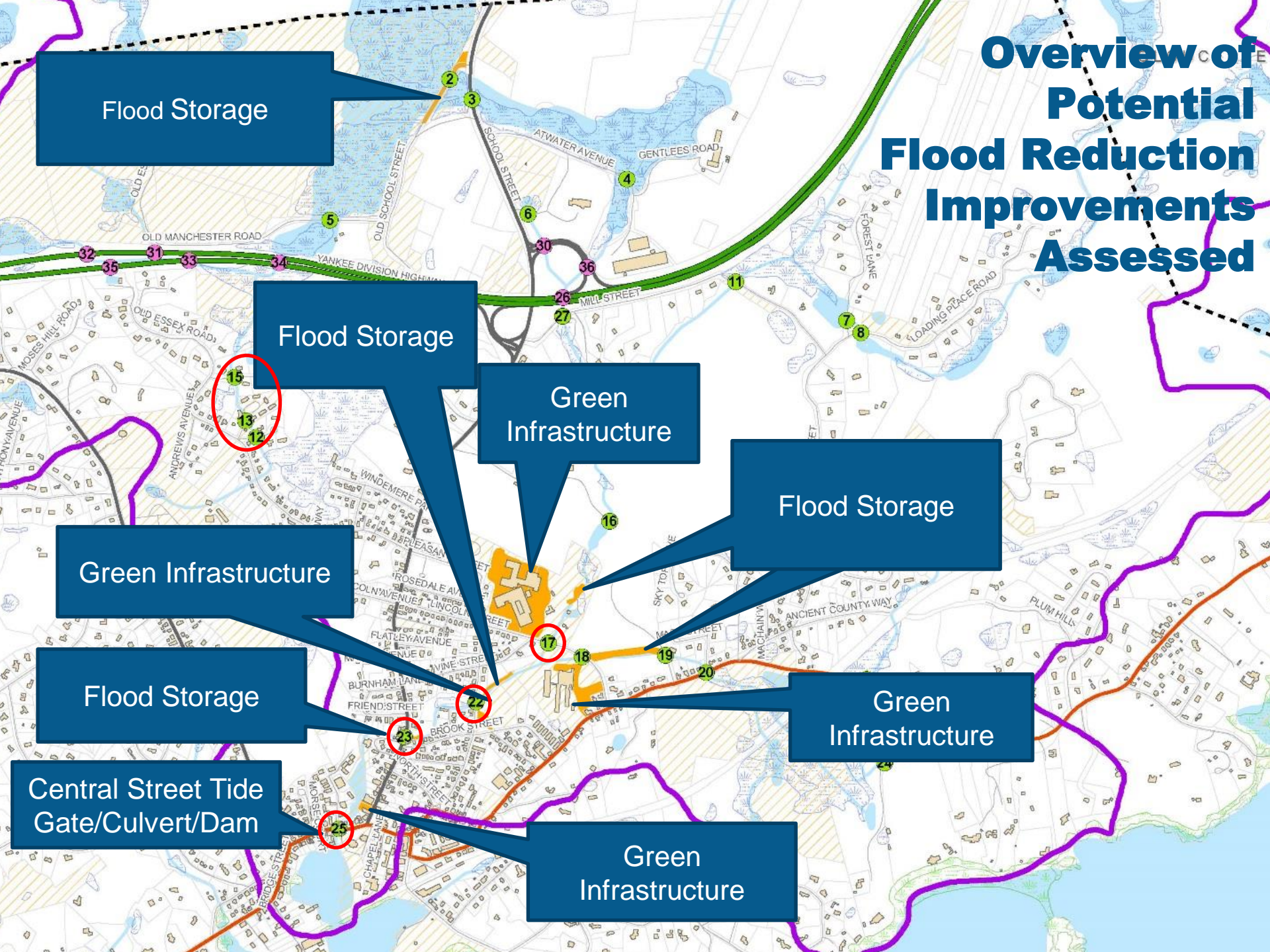
Sea level rise affects 23% of community assets in the near term (2025)  
Affects almost 37% of the community assets by 2100



Storm Surge affects 33% of community assets in the near term (2025)  
Affects over 50% of the community assets by 2100



# Overview of Potential Flood Reduction Improvements Assessed



Flood Storage

Flood Storage

Green Infrastructure

Flood Storage

Green Infrastructure

Flood Storage

Green Infrastructure

Central Street Tide Gate/Culvert/Dam

Green Infrastructure



# Nine Planning Level Designs

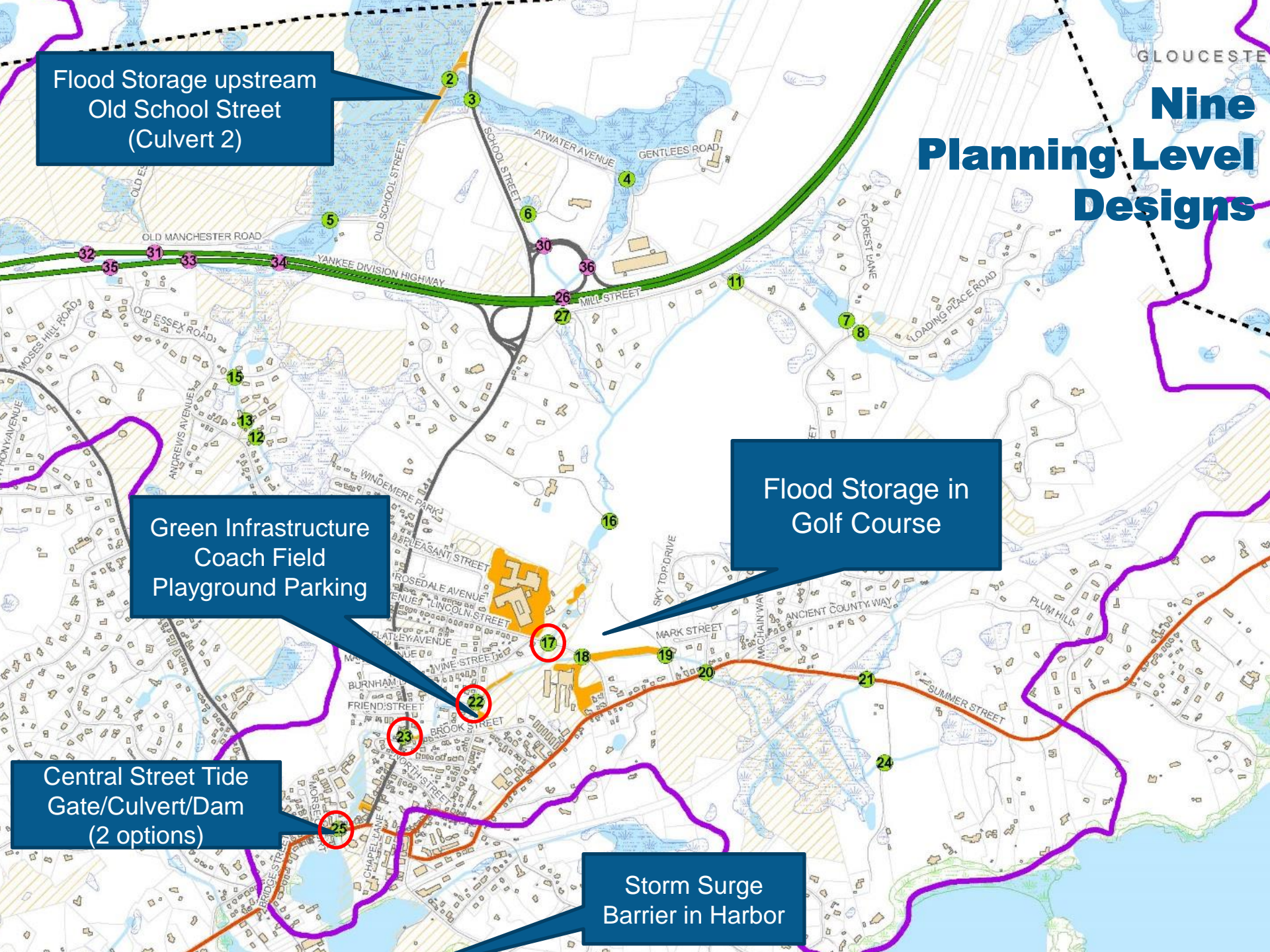
Flood Storage upstream Old School Street (Culvert 2)

Flood Storage in Golf Course

Green Infrastructure Coach Field Playground Parking

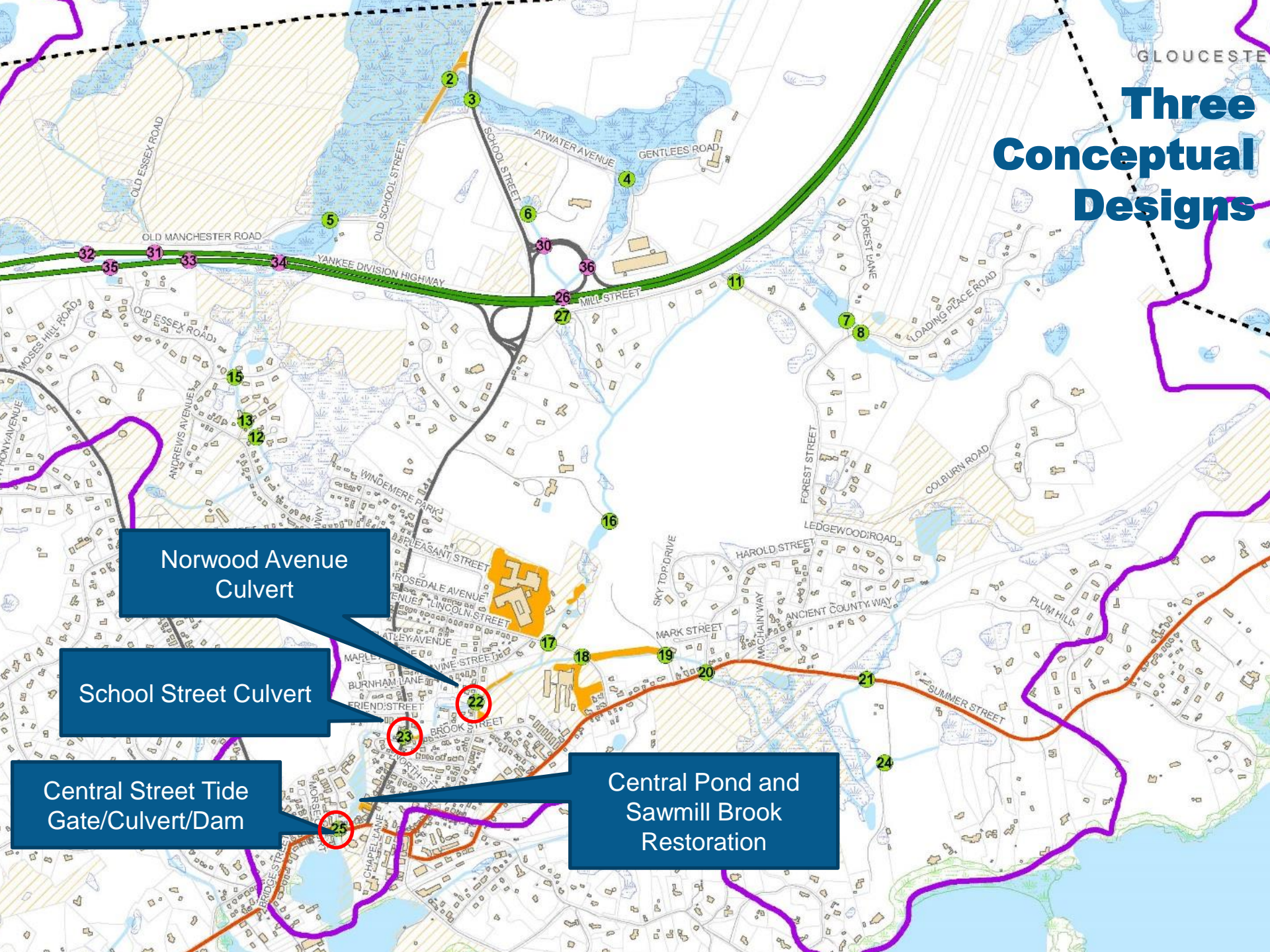
Central Street Tide Gate/Culvert/Dam (2 options)

Storm Surge Barrier in Harbor





# Three Conceptual Designs



Norwood Avenue Culvert

School Street Culvert

Central Street Tide Gate/Culvert/Dam

Central Pond and Sawmill Brook Restoration



# Tide Gate & Culvert Improvements

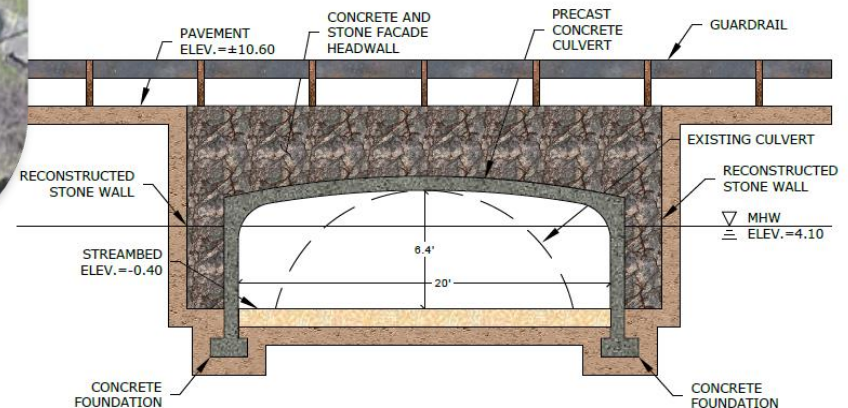




# Central Street Tide Gate and Culvert Improvements

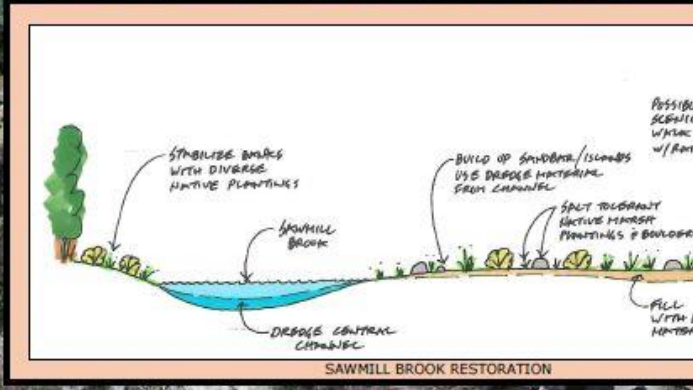
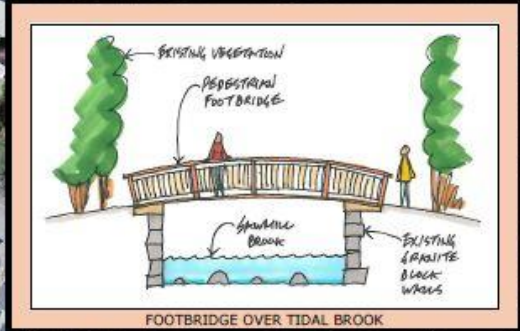
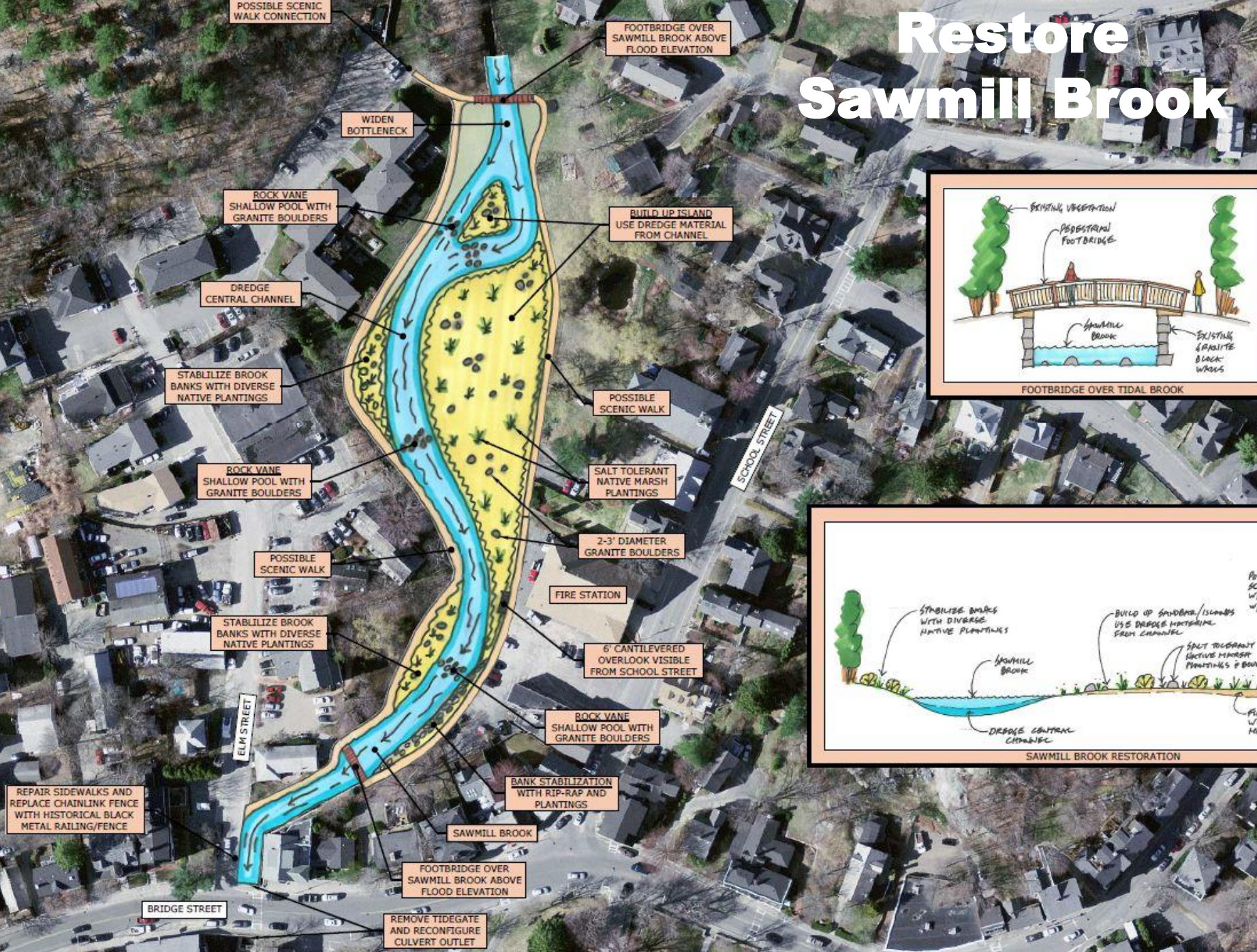


- Remove tide gate
- Replace culvert
- Restore seawall
- Restore Central Pond





# Restore Sawmill Brook











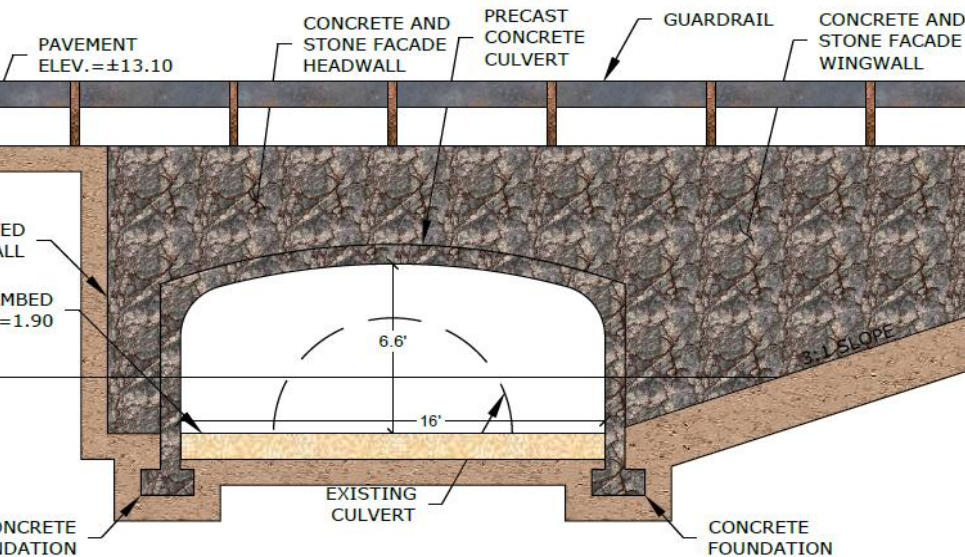
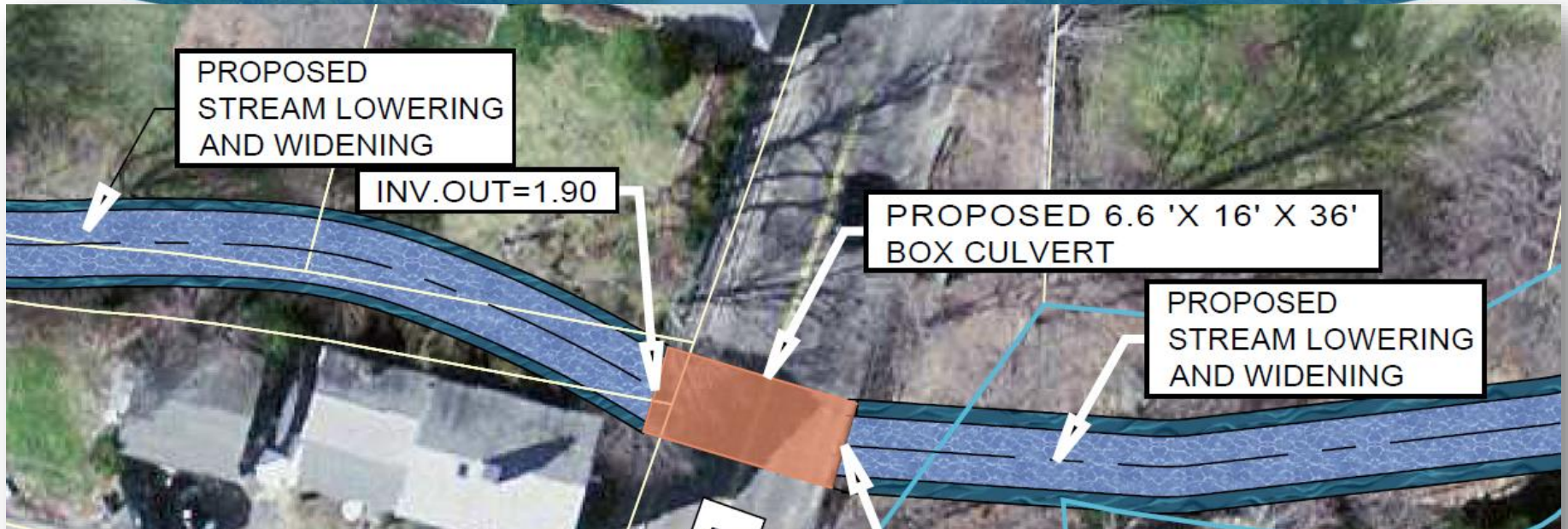


# Culvert Improvements



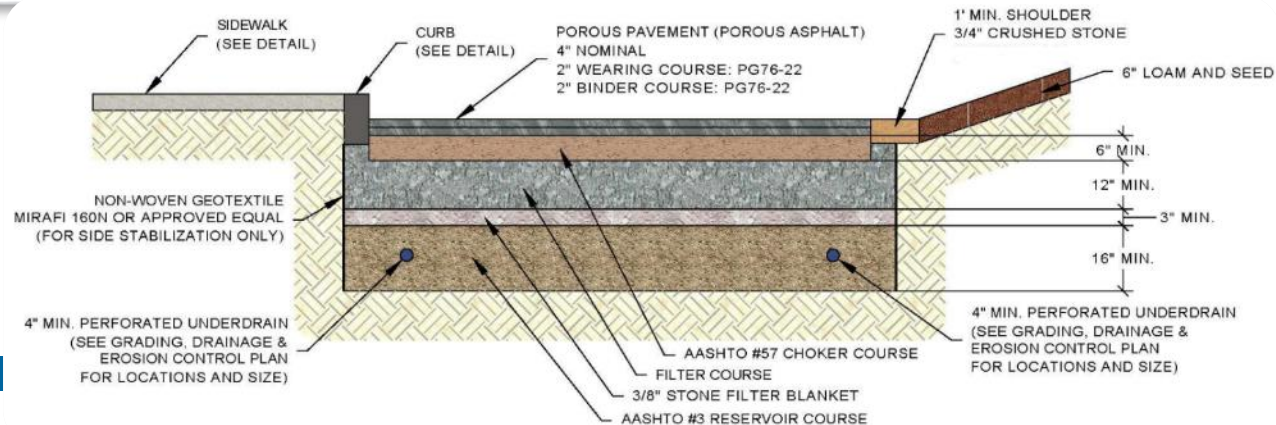


# Culvert Improvement at School Street





# Porous Asphalt Parking Area at Coach Field Playground







**NEXT STEPS**

**Funding**

**Permitting**

**Discussions with regulators**





# Questions?

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- Email: [reillym@manchester.ma.us](mailto:reillym@manchester.ma.us)

