

TROUT BROOK

FLOOD RESILIENCE IMPROVEMENTS

BROCKTON, MA

JUNE 2024

**FUSS &
O'NEILL**



RESTORE
AMERICA'S
ESTUARIES

BROCKTON, MA

TROUT BROOK FLOOD RESILIENCE IMPROVEMENTS

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PROJECT TEAM & PARTNERS

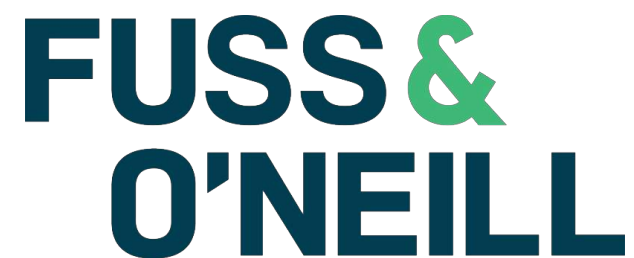
CITY OF BROCKTON

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FUSS & O'NEILL

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BACKGROUND & EXISTING CONDITIONS ANALYSIS

**Project Overview
Funding Sources
Project Background
Site Context
Field Observations
Modeling & Analysis**

PROJECT OVERVIEW

The City of Brockton, Massachusetts has ambitious goals to create a publicly accessible greenbelt, connecting several parks and open spaces through the City's center along the Trout Brook stream corridor. Many of these areas, including the former CSX Railyard property, would also benefit from infrastructure improvements and increased climate resilience alongside proposed redevelopment.

The overall vision of the greenbelt is to connect these spaces, provide public recreational amenities, encourage redevelopment where practical, and restore natural stream functions where possible to mitigate present-day and future flood risks.

This report focuses on the former CSX Railyard parcel as well as the Court Street bridge area and the potential improvements that could be implemented in each location.



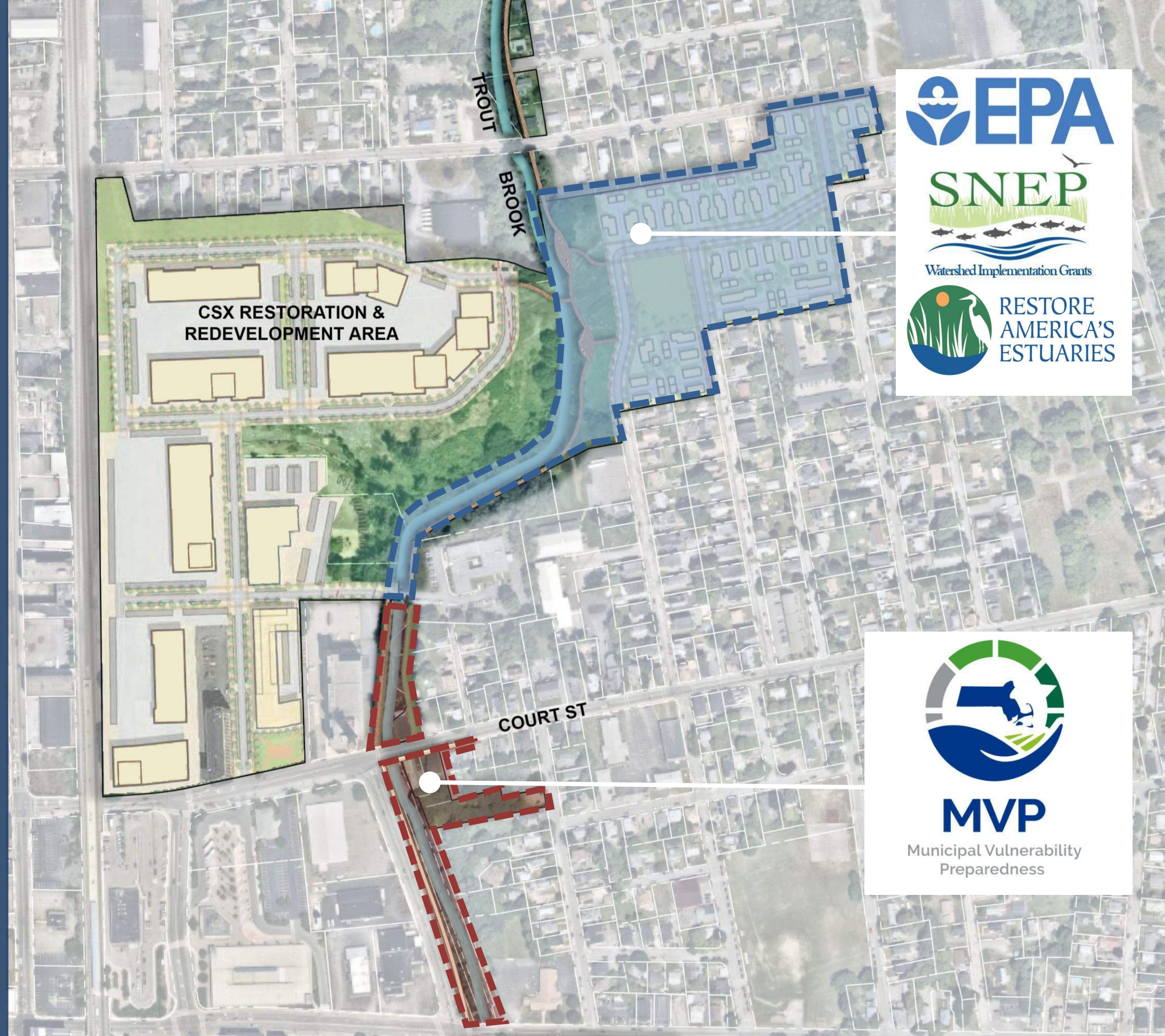
FUNDING SOURCES

This project was made possible through funding from the Environmental Protection Agency (EPA) via the Southeast New England Program (SNEP) Watershed Implementation Grant (SWIG) Program and Restore America's Estuaries, as well as the Massachusetts Municipal Vulnerability Preparedness (MVP) grant program. The graphic at right outlines the areas of the project covered by funding from each entity.

Improvements are proposed on the eastern portion of the CSX parcel, shaded blue in the figure at right. The background image represents a mixed-use redevelopment and restoration concept generated as part of the City's Trout Brook (CSX Area) Master Plan.

Infrastructure upgrades and stream daylighting are also proposed in the area of the Court Street bridge, shaded red in the figure at right.

Improvements to the western portion of the CSX parcel are anticipated as part of future coordination with a developer under the oversight of the Brockton Redevelopment Authority.



SCALE: 1" = 150'
0' 75' 150' 225' 300'



PROJECT BACKGROUND

As evidenced by recent floods throughout New England, extreme storm events are becoming more frequent and severe. Infrastructure in many communities is not designed to withstand exacerbated runoff rates associated with increased rainfall intensity. Further, many streams and rivers have been disconnected from their natural floodplains by berms, floodwalls, levees, or general development.

The City of Brockton has recognized an opportunity to remove hydraulic constrictions and enhance floodplain connection along Trout Brook, a stream running through the center of the City. The potential acquisition of a large parcel of land along Trout Brook could provide space for a multi-purpose stream restoration and community green space project.

Through state and federal grant funding, Fuss & O'Neill worked closely with the City of Brockton to study the potential for future flooding and how improvements within the project areas could increase flood resilience and provide recreation opportunities for nearby environmental justice (EJ) neighborhoods.



FITCHBURG, MA (WCVB/CHRIS GAUTHIER)



MONTPELIER, VT (JEN WALLACE-BRODEUR)

SITE CONTEXT

Trout Brook is approximately 1.8 miles long and generally runs north to south through the City of Brockton, MA. It is a tributary to the Salisbury Plain River that carries significant flows during large storm events. The Trout Brook watershed is largely developed urban residential land and commercial lots with islands of forested green space.

Trout Brook currently flows through multiple open spaces and parks within the City, including Tukis Playground, Puffer Playground, and Snow Park. Improving the City's flood resilience along the brook also provides an opportunity to enhance connectivity between the parks through a new network of trails. This project focuses on the former CSX railyard parcel and improvements to the undersized Court Street bridge; both are important components of the overall vision for improving flood storage and resiliency along Trout Brook while connecting public open spaces.

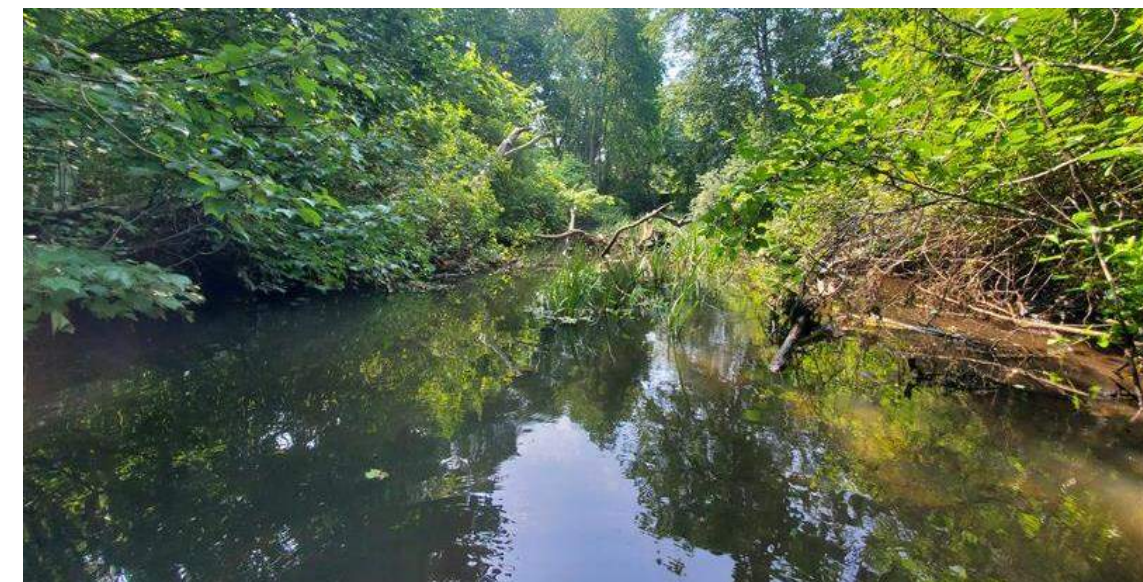


FIELD OBSERVATIONS

Fuss & O'Neill staff visited the former CSX railyard parcel and Court Street bridge sites to document existing conditions and take measurements for modeling and design of the proposed restoration projects.

The former CSX railyard parcel, once the site of the Brockton Freight Yard, still bears the signs of past uses and disturbances. While little remains of any buildings that once existed on the property, berms, stone masonry arch bridges, and partially buried railroad ties indicate the path of historical rail lines. Further, based on historical USGS topographic maps, it is clear the Trout Brook channel was modified to follow a relatively straight course through the property. Stream width and profile characteristics were measured, along with dimensions of the existing stone arch stream crossing.

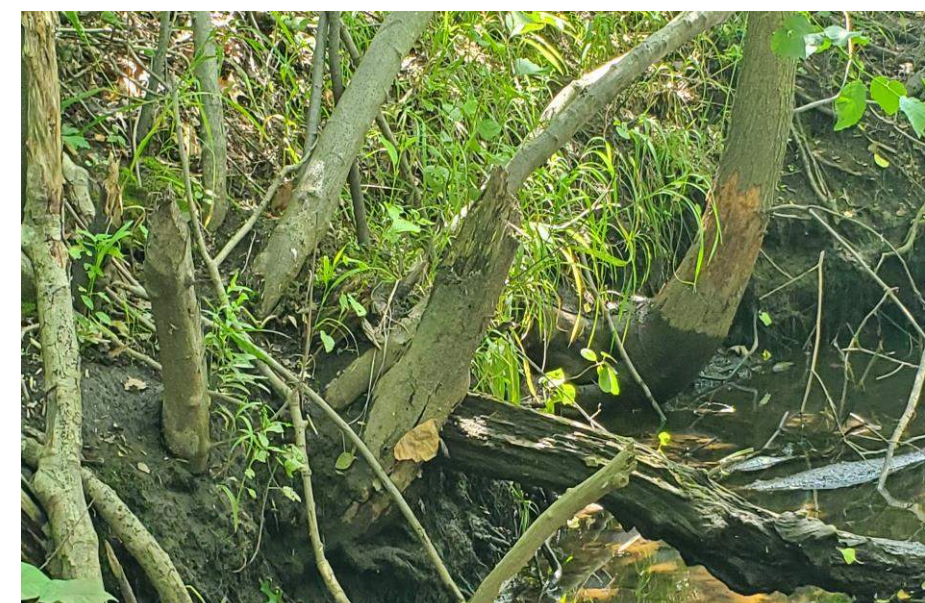
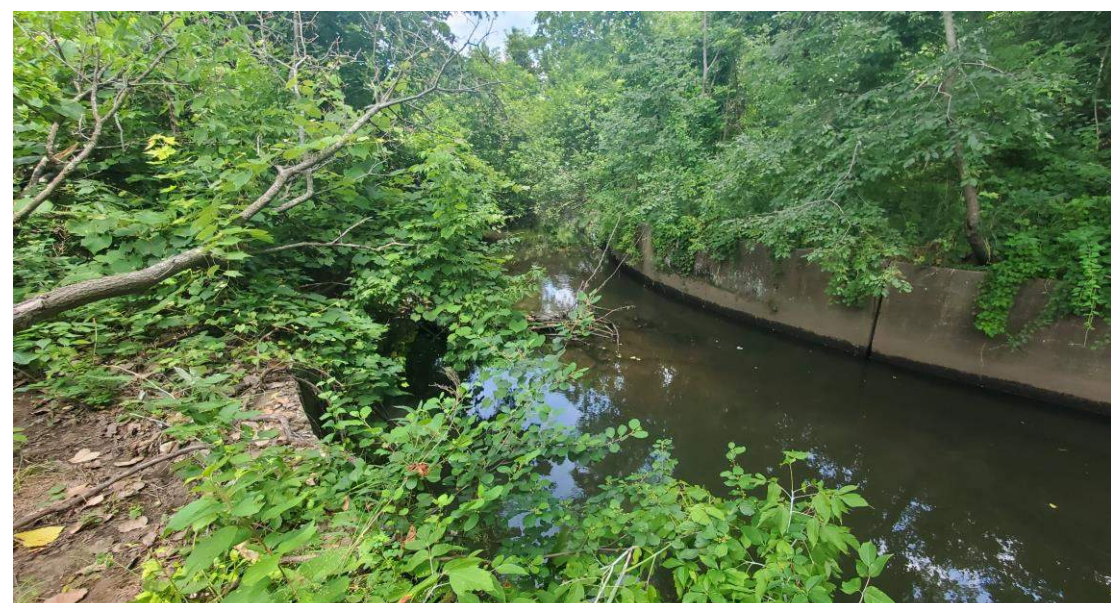
Current use of the property appears to include limited (unsanctioned) recreation via off-road vehicle, bicycle, and foot. In addition, multiple camps of unhoused individuals were observed.



FIELD OBSERVATIONS

Despite the fact that the Trout Brook channel appears to have been dredged, straightened, and in some places confined by concrete walls on one or both sides, wildlife or wildlife activity was documented in the stream. Fuss & O'Neill staff confirmed the presence of fish, turtles, and beavers, among others. Clearly, the brook remains an important natural habitat resource in addition to a potential feature of a future public park.

The Court Street bridge, currently a 19-foot-span structure, constricts the natural channel through the area, particularly during high flows. A concrete retaining wall along the eastern bank of Trout Brook upstream of the Court Street bridge has been severely undermined and spalled, likely due to high flow velocities.

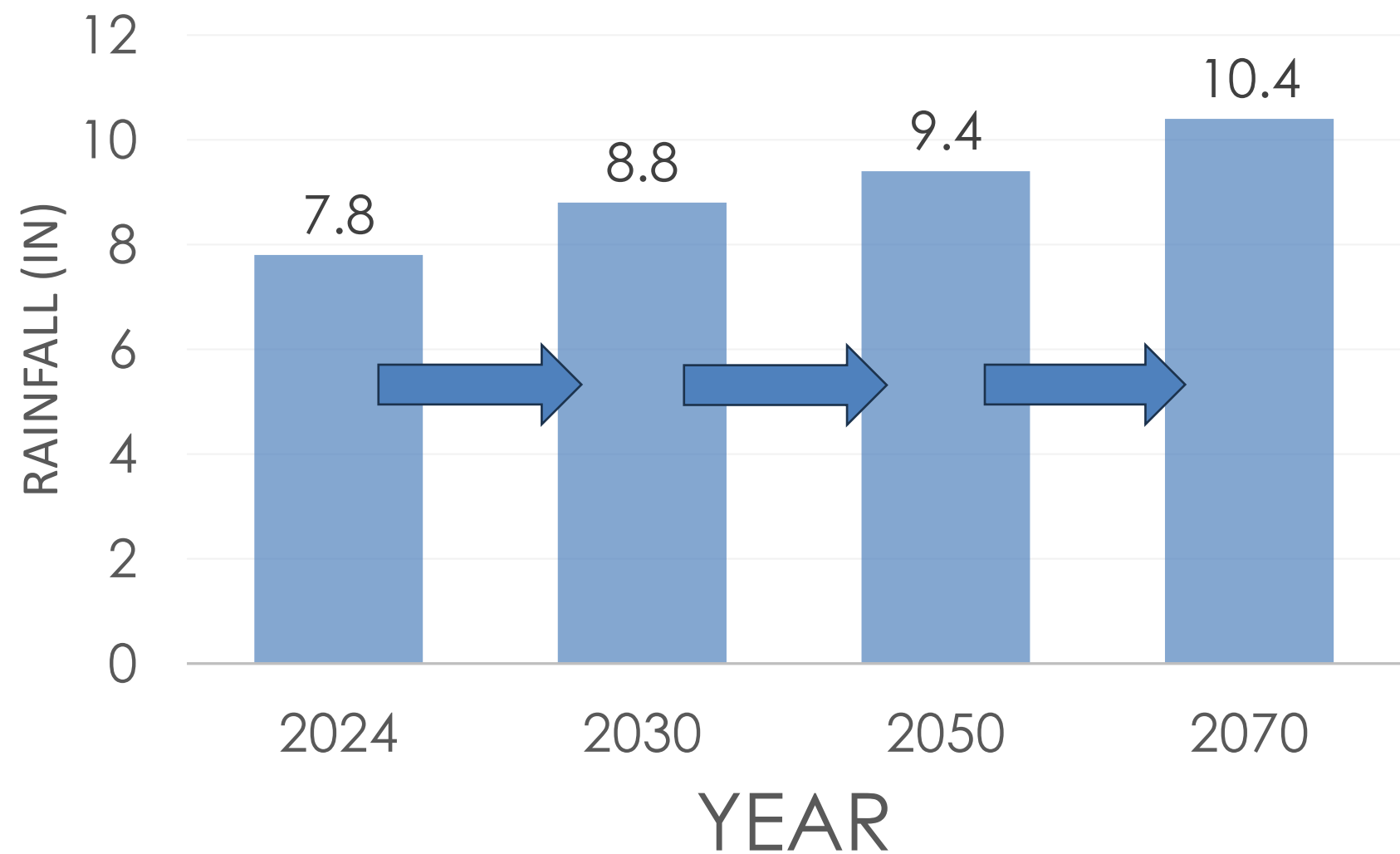


MODELING & ANALYSIS

Climate conditions are expected to change throughout the northeast in the coming decades. The Resilient Mass Action Team (RMAT) provides data for projected future precipitation values during a range of storm events. In the Brockton area, the 100-year precipitation value (that is, the amount of rainfall associated with a storm that has a 1% chance of occurrence in any given year) is expected to increase by approximately 2.6 inches by the year 2070. Increased precipitation rates result in larger peak flow rates in streams and rivers. As such, a bridge designed to accommodate the present-day 100-year storm may be undersized for the 100-year storm in 2030, 2050, 2070, and beyond.

In alignment with the goals of the MVP program, Fuss & O'Neill carried out hydrologic and hydraulic modeling for the project considering both present-day conditions and anticipated future climate conditions.

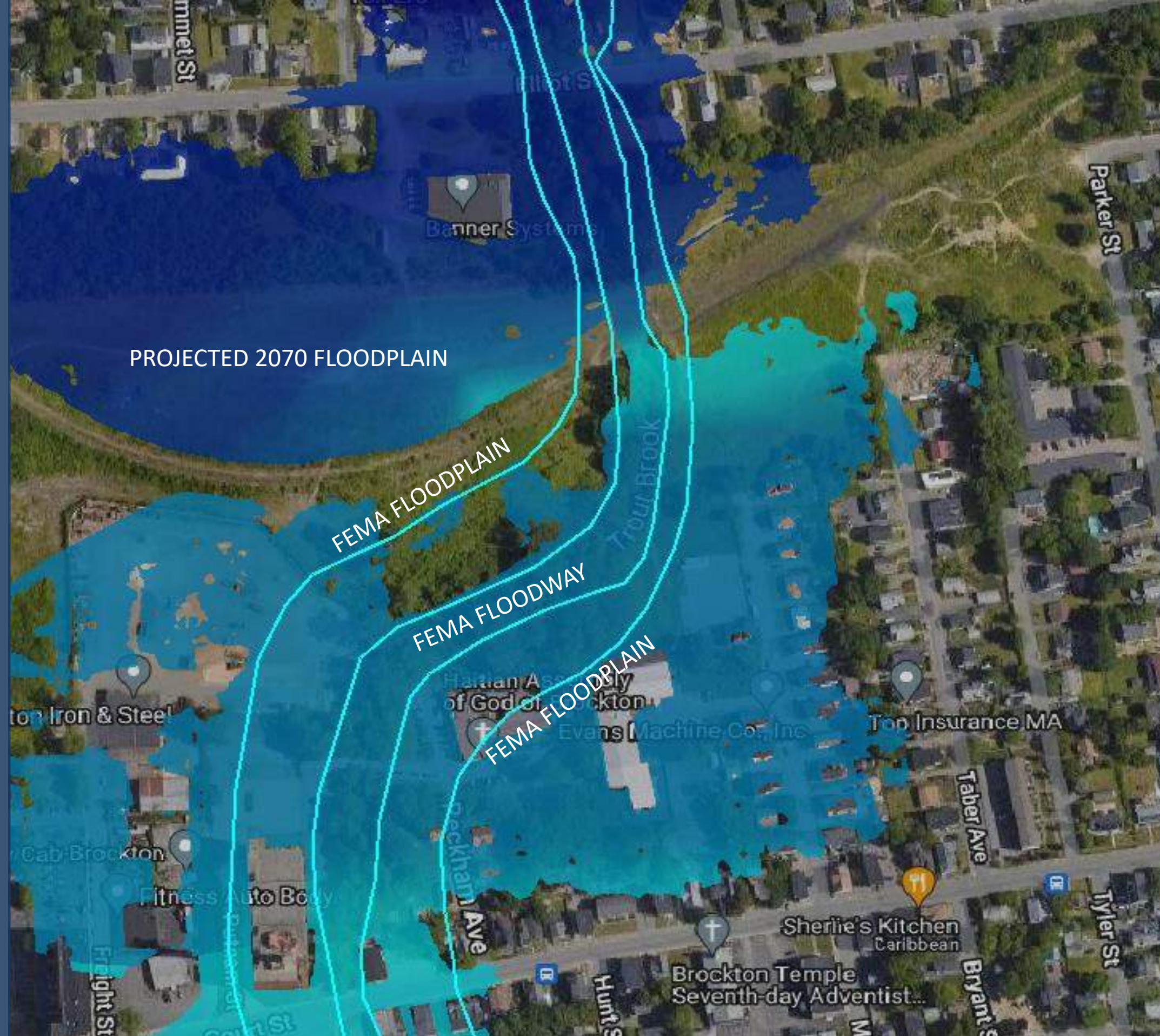
100-YEAR RAINFALL VALUES



MODELING & ANALYSIS

The figure at right displays the potential difference between the present-day effective Federal Emergency Management Agency (FEMA) floodplain (aqua-colored lines) and the projected 2070 floodplain as modeled by Fuss & O'Neill (shaded area, with darker colors indicating areas of deeper water). It is clear the project area and surrounding neighborhoods could benefit from infrastructure improvements and floodplain storage and/or restoration.

Fuss and O'Neill's modeling of existing and proposed conditions during this phase of the project advanced concept designs for the former CSX parcel and the Court Street area to a preliminary (30%) design plan set. The design focused on balancing floodplain restoration on the eastern side of Trout Brook with the provision of public access and open space. At Court Street, the design focused on ensuring the improved bridge and reconstructed roadway could accommodate present-day and future storm events.



TWO

COMMUNITY ENGAGEMENT

COMMUNITY DESIGN EVENT

In collaboration with the Brockton Planning & Economic Development Department, the Fuss & O'Neill team hosted a public event at the Haitian Assembly of God to present project updates to community members, including:

- Project context
- Overview of future flood risks
- Design ideas to mitigate future flood risks
- 3-D renderings of the proposed improvements

Following the presentation, community members were asked to provide thoughts and feedback regarding the proposed design. Feedback gathered included the following:

- Enthusiasm and support for the proposed multi-functional open space designed to accommodate flooding, passive and active recreation, and wildlife habitat.
- Support for a shared use path and boardwalk network that connects to other open spaces in the area.
- Concerns about site remediation and homeless encampments.



COMMUNITY DESIGN EVENT

The Fuss & O'Neill team presented questions to community members through a gallery style forum. Questions were translated into Haitian Creole, Spanish, and Cape Verdean and posted to presentation boards for community members to write comments.

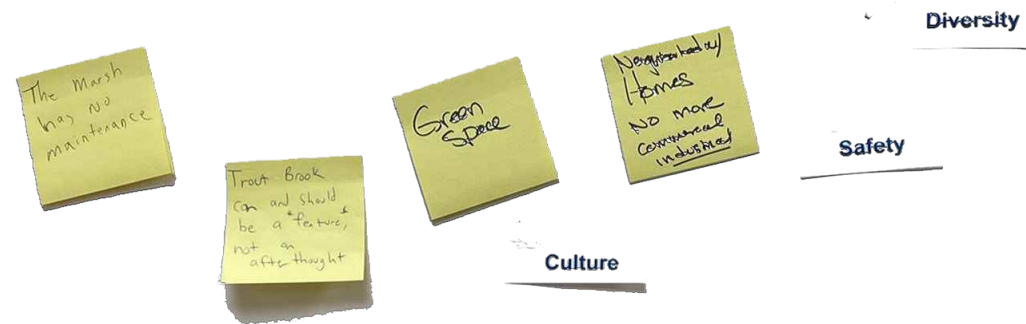
In addition to the questions shown, community members were asked if they had experienced flooding in their home or neighborhood. None of the community members in attendance had experienced flooding in the study area neighborhood.

What aspects of the neighborhood do you most value and like to see preserved in future developments?

Ki aspetus di vizinhansa más bu ta valoriza i gusta di odja prizervadus na futuris impiendimentus?

¿Qué aspectos del vecindario valora más y le gustaría que se conservaran en futuras urbanizaciones?

Ki aspè nan katye a ou pi apresye epi ou renmen wè konsève nan pwochen devlopman yo?

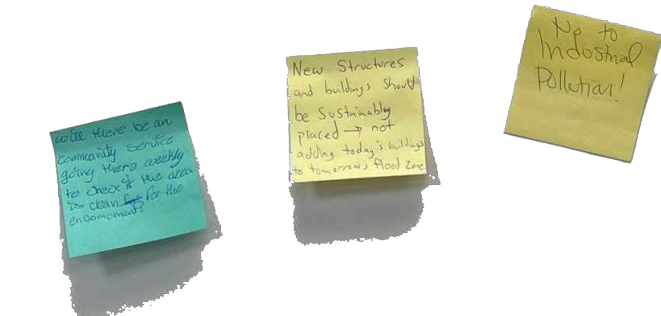


Are there potential challenges or negative impacts of future developments that you are concerned about?

Ten dizafius putensial ou impaktus negativus di futuris dizinvolvementus ki busta priokupadu ku el?

¿Existen posibles problemas o repercusiones negativas relacionados con urbanizaciones futuras que le preocupen?

Èske gen defi potansyèl oswa enpak negatif nan devlopman n an lavni ki konsène w?

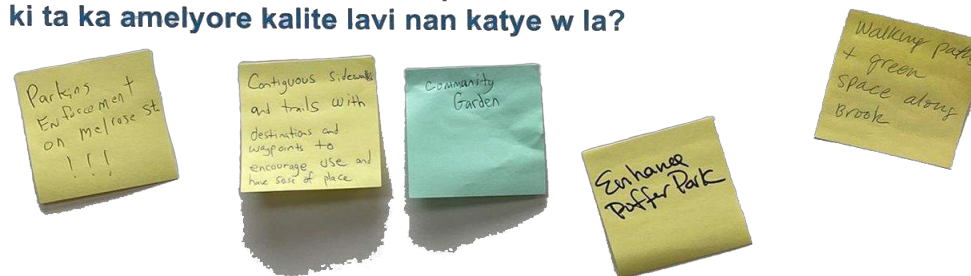


What types of community facilities or amenities do you feel are lacking that would enhance the quality of life in your neighborhood?

Ki tipus di ikipamentus ou komodidadi kumunitarius ki ta xinti ki sta falta pa midjora kualidadi di vida na bu vizinhansa?

¿Qué tipos de instalaciones o servicios comunitarios cree que hacen falta para mejorar la calidad de vida en su vecindario?

Ki kalite enstalasyon oswa ekipman kominotè ou santi ou manke ki ta ka amelyore kalite lavi nan katye w la?

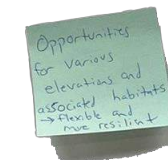


What do you like or dislike about the concept in the 3D model?

Kuzé ki bu gusta ou não sobri konseitus na mudelu 3D?

¿Qué le gusta o disgusta del concepto del modelo 3D?

Kisa ou renmen oswa pa renmen sou konsèp nan modèl 3D la?



THREE

DESIGN RECOMMENDATIONS

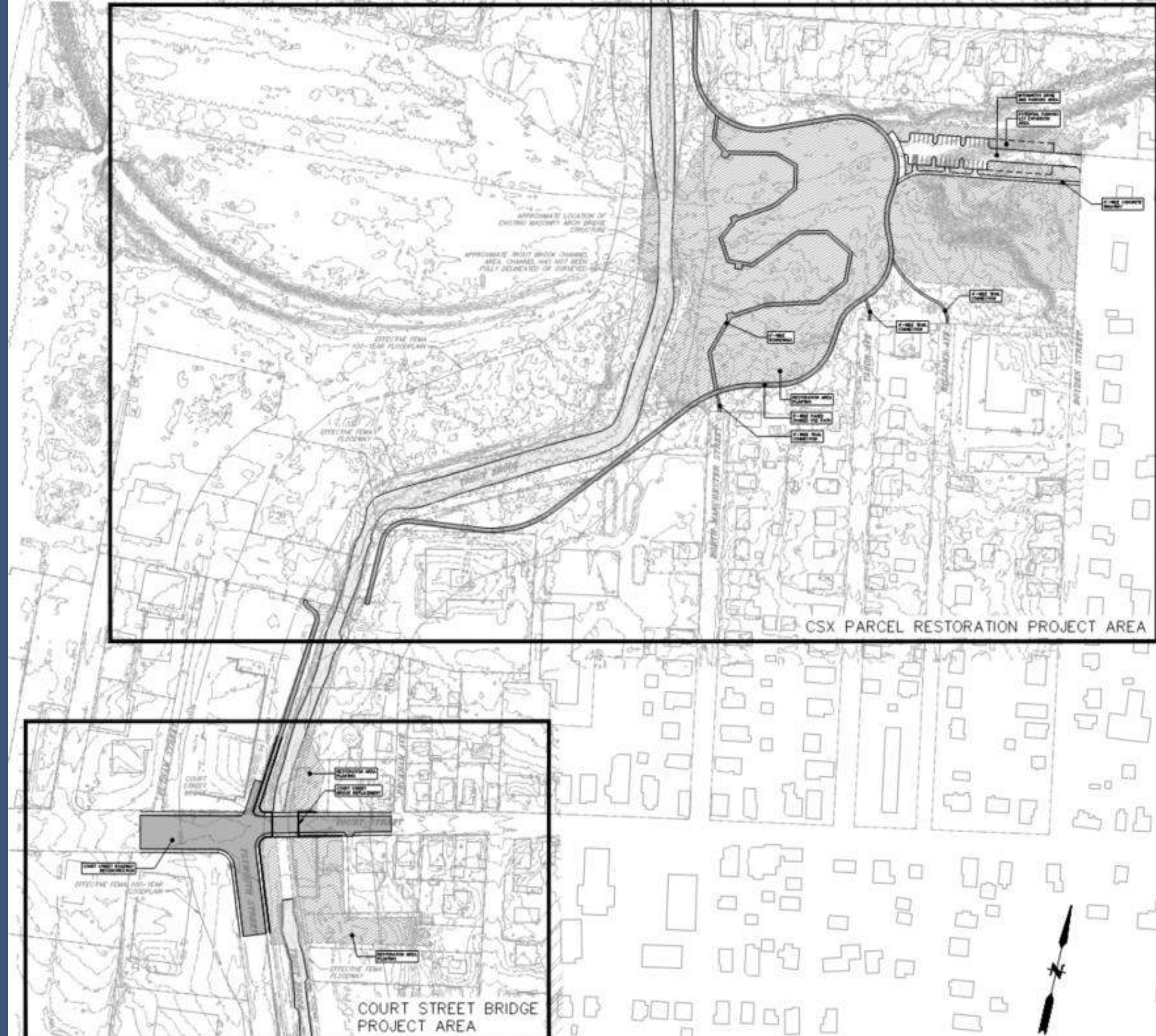
Proposed Improvements
Court Street Improvements
CSX Parcel Improvements
CSX Parcel Renderings

PROPOSED IMPROVEMENTS

The proposed improvements put forward as a result of this study incorporated information gathered in the field, at the public engagement session, and through hydraulic modeling of existing and proposed conditions.

At Court Street, proposed improvements to reduce the risk of road overtopping during future climate conditions include a 50-foot span rigid-frame bridge, raising and reconstruction of the roadway, removal of abandoned concrete structures to daylight buried sections of the stream, and improved floodplain connection for the brook upstream and downstream of the crossing.

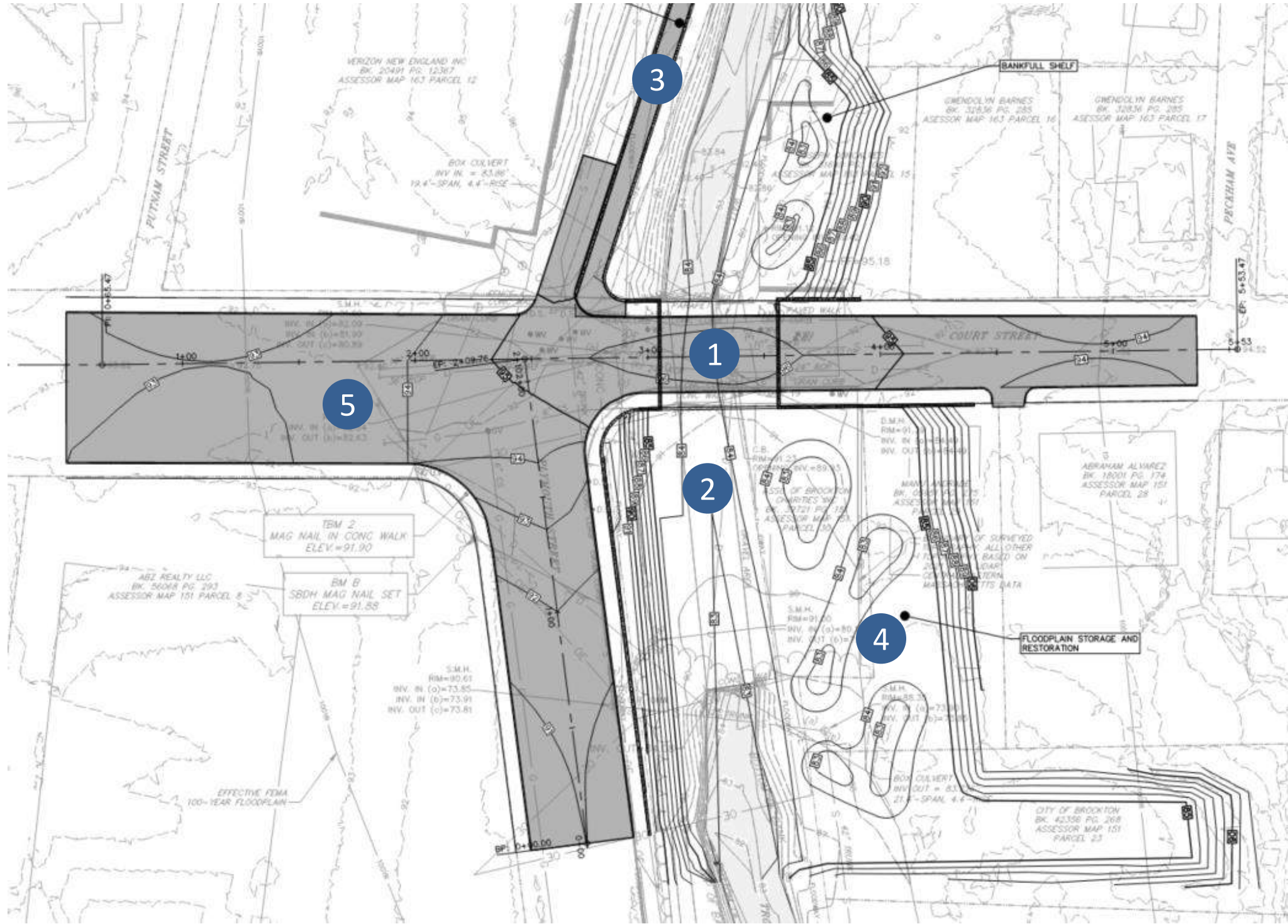
Proposed improvements on the CSX parcel include the removal of a brick masonry arch bridge, subsequent stream channel restoration, and connection to a newly-created floodplain and wetland area. In addition, a shared use path is proposed through the project area from Court Street to Elliot Street. Public parking, connector trails to nearby neighborhoods, and a proposed boardwalk through the floodplain restoration area will provide for public access and enjoyment of the property.



COURT STREET IMPROVEMENTS

Proposed Improvements

- 1. Bridge Replacement & Roadway Raising
- 2. Daylighting of Trout Brook
- 3. Shared Use Path
- 4. Floodplain Connection & Restoration
- 5. Roadway Reconstruction



CSX PARCEL IMPROVEMENTS

- 1. Parking Area (30 spaces)
- 2. Open Lawn Area
- 3. Shared Use Path
- 4. Boardwalk Trail
- 5. Restored Landscape & Flood Storage
- 6. Trail Connections to Neighborhood
- 7. Future Re-Development Area





Boardwalk trail network

Floodable landscape

FLOOD RESILIENT OPEN SPACE

View During Low-Water/Sunny Day Conditions



Boardwalk trail network

Floodable landscape

FLOOD RESILIENT OPEN SPACE

View During Pondered Condition



Boardwalk trail network

Floodable landscape

FLOOD RESILIENT OPEN SPACE

View During Flooded Conditions/Large Storm Event



Parking lot & trailhead access

Passive recreation space

FLEXIBLE OPEN SPACE



Floodplain restoration

Accessible trail for walking and biking

SHARED USE TRAIL



Educational signage

Accessible boardwalk trail

Floodable materials

BOARDWALK TRAIL



Accessible
boardwalk
trail

BOARDWALK TRAIL



Accessible boardwalk trail

BOARDWALK TRAIL



SCAN QR CODE FOR AN
IMMERSIVE EXPERIENCE



TAKE A LOOK AROUND



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