



Johnson's Creek Living Shoreline, Bridgeport:

Final Report to the Connecticut Institute for Resilience & Climate Adaptation (CIRCA)

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METROCOG
Connecticut Metropolitan Council of Governments

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December 31, 2018

Mr. James O' Donnell
Executive Director
Connecticut Institute for Resilience & Climate Adaptation
University of Connecticut: Avery Point Campus
1080 Shennecossett Road
Groton, Connecticut 06340

Re: Final Report - Johnson's Creek Living Shoreline, Bridgeport
University of Connecticut Research Agreement: No. 155214
UConn Account #: 6365830

Dear Mr. O'Donnell:

Enclosed is the Final Report for the design of a Living Shoreline for Johnson's Creek in Bridgeport. This project was funded under University of Connecticut Research Agreement No. 155214. Our final invoice and deliverables are included with the transmittal of this final report. Of the \$75,000 that was awarded to us, MetroCOG expended a total of \$73,977.47.

We would like to thank the Connecticut Institute for Resiliency and Climate Adaptation for funding through the Municipal Resilience Grant Program. This project supported a collaborative design process with the City of Bridgeport and the project's consultants to develop three Living Shoreline design alternatives for a portion of land adjacent to Johnson's Creek in Bridgeport. Should you have any questions or require any additional information regarding the final project materials please contact me at 203-366-5405 or by e-mail at mfulda@ctmetro.org.

Sincerely,

Matthew Fulda
Executive Director



The Connecticut Metropolitan Council of Governments (MetroCOG) is a multi-discipline, regional planning organization made up of six member communities — Bridgeport, Easton, Fairfield, Monroe, Stratford and Trumbull. As a Council of Governments, the Region's Chief Elected Officers serve as MetroCOG's Board of Directors. MetroCOG is also the federally designated transportation planning organization for the region.

The Connecticut Metropolitan Region is situated approximately 50 miles from New York City and 150 miles from Boston and is part of the I-95 urban corridor that forms the "spine" of the megalopolis that stretches from Boston south to Washington, D.C. This close proximity to major population centers has enabled The Region to become one of the premier transportation hubs in southern New England, including an extensive highway network, rail facilities, intra-regional bus services, a regional airport, port facilities, and ferry services to Long Island. Within this compact region of 143 square miles is a diversity of people, natural features, culture, and recreational activities. Long Island Sound is the Region's dominant natural feature, adjoining coastal beaches, marshlands, and natural harbors.

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Cover: Master Plan concept for Johnson's Creek. Source: Milone & MacBroom

This publication was supported by a subaward agreement from the Connecticut Institute for Resilience and Climate Adaptation, the University of Connecticut with funds provided by Grant No. PO#43280, PS#2014-14249 from CT Department of Energy and Environmental Protection. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of UConn or CT Department of Energy and Environmental Protection.



A view of Johnson's Creek looking north.
Source: Milone & MacBroom

Project Overview & Summary

The East End is one of Bridgeport's most distressed neighborhoods and has suffered from disinvestment and environmental contamination. Due to its relatively low elevation and location in FEMA's 100-year floodplain, the neighborhood is vulnerable to extreme weather and sea level rise. Neighborhood access to the waterfront is limited due to industrial activities that have spread to public right of ways.

The West Branch of Johnson's Creek is an inlet of Bridgeport Harbor with low wave energy and existing tidal wetlands. Due to these conditions, a living shoreline is an ideal approach for habitat restoration, flood mitigation and waterfront access.

The ultimate goal for the Johnson's Creek area is the creation of a passive recreation trail along the water and restoration of the creek's predevelopment flood mitigation

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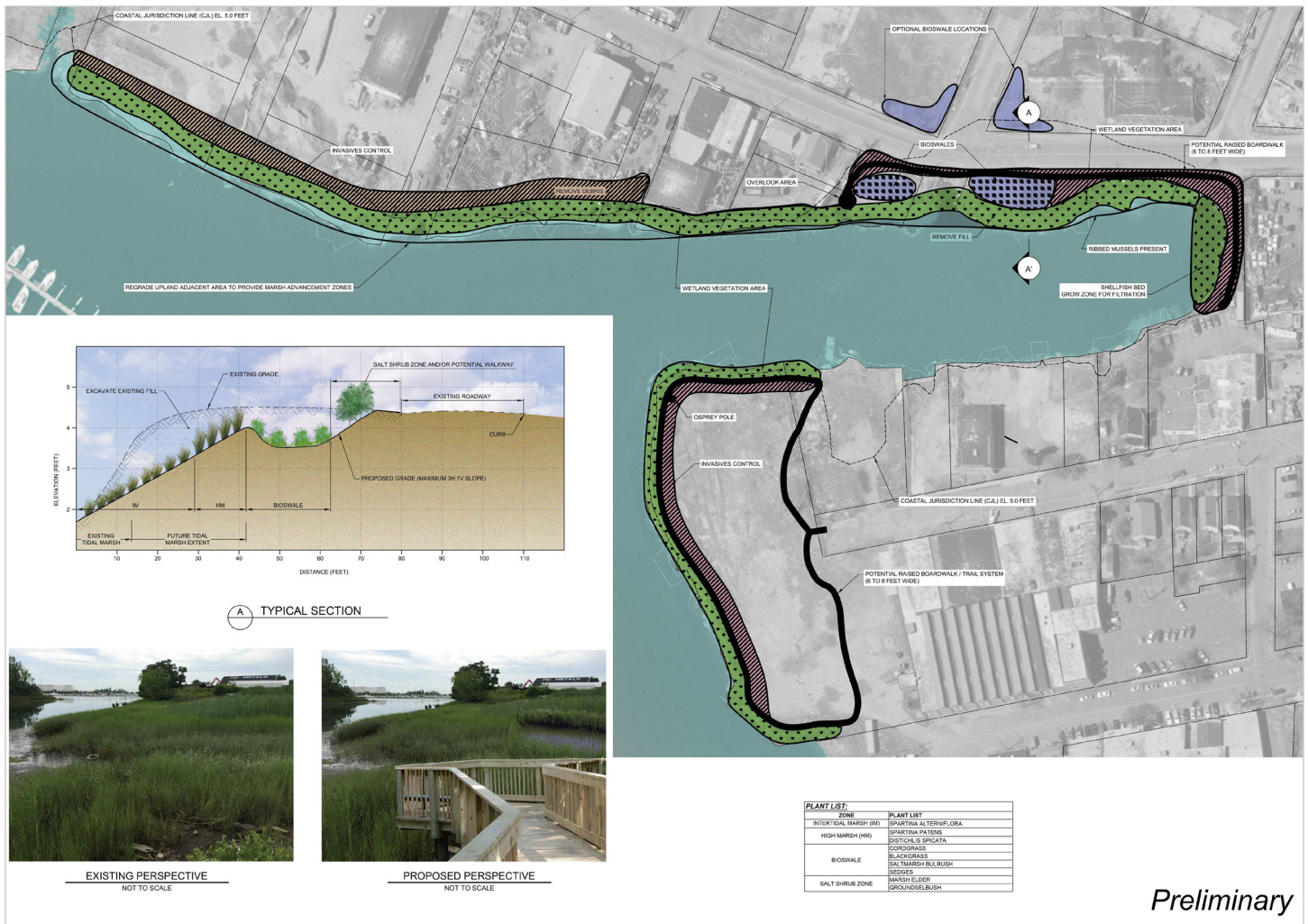
and ecosystem functions. This vision for a restored Johnson's Creek and accessible waterfront has been a long-term goal at the neighborhood, municipal and regional levels:

- The 2005 East End NRZ plan recommended a linear park, elevated walkway, wetland vegetation and a fishing pier along Johnson's Creek. Cleanup and improving public access were also recommended.
- Between 2014 and 2016, MetroCOG hafunded designs for coastal resilience projects in Bridgeport, through the National Fish and Wildlife Foundation-Department of Interior (NFWF/DOI) funded Regional Framework for Coastal Resilience in Southern Connecticut. After discussions with the City, the Johnson's Creek area was identified as a "high priority" area. The conceptual design is on page 5.
- Waterfront Bridgeport, completed in 2017, also identified the Johnson's Creek area as an area for short term activation. Cleanup, coastal vegetation and a boardwalk were recommended in the waterfront plan.

Restoring Waterfront Access

The City of Bridgeport has been active in working toward the neighborhood's vision for Johnson's Creek and has assembled several parcels in the area. Enforcing City right-of-ways for public access to the waterfront are underway.

CIRCA's award of \$75,000 to MetroCOG supported the development of an engineering design (and two alternatives) for a living shoreline along a portion of Johnson's Creek. Upon implementation of the final designs (pending CTDEEP permitting and funding), the neighborhood will have access to the waterfront, flooding will be mitigated and wetland habitat created. The preferred living



Preliminary

shoreline design includes the following:

- Reducing the grade of bank slopes to allow vegetative stabilization and support potential wetland migration. If sea level rises one foot within the design life of the wetland's edge, the vegetation could move up the bank into the bioswale areas.
- The removal of debris and invasive species and habitat creation for marsh species.
- Improved public access to the waterfront and views of the waterfront, including a boardwalk for passive recreation.

Project Goals & Methods

Goals

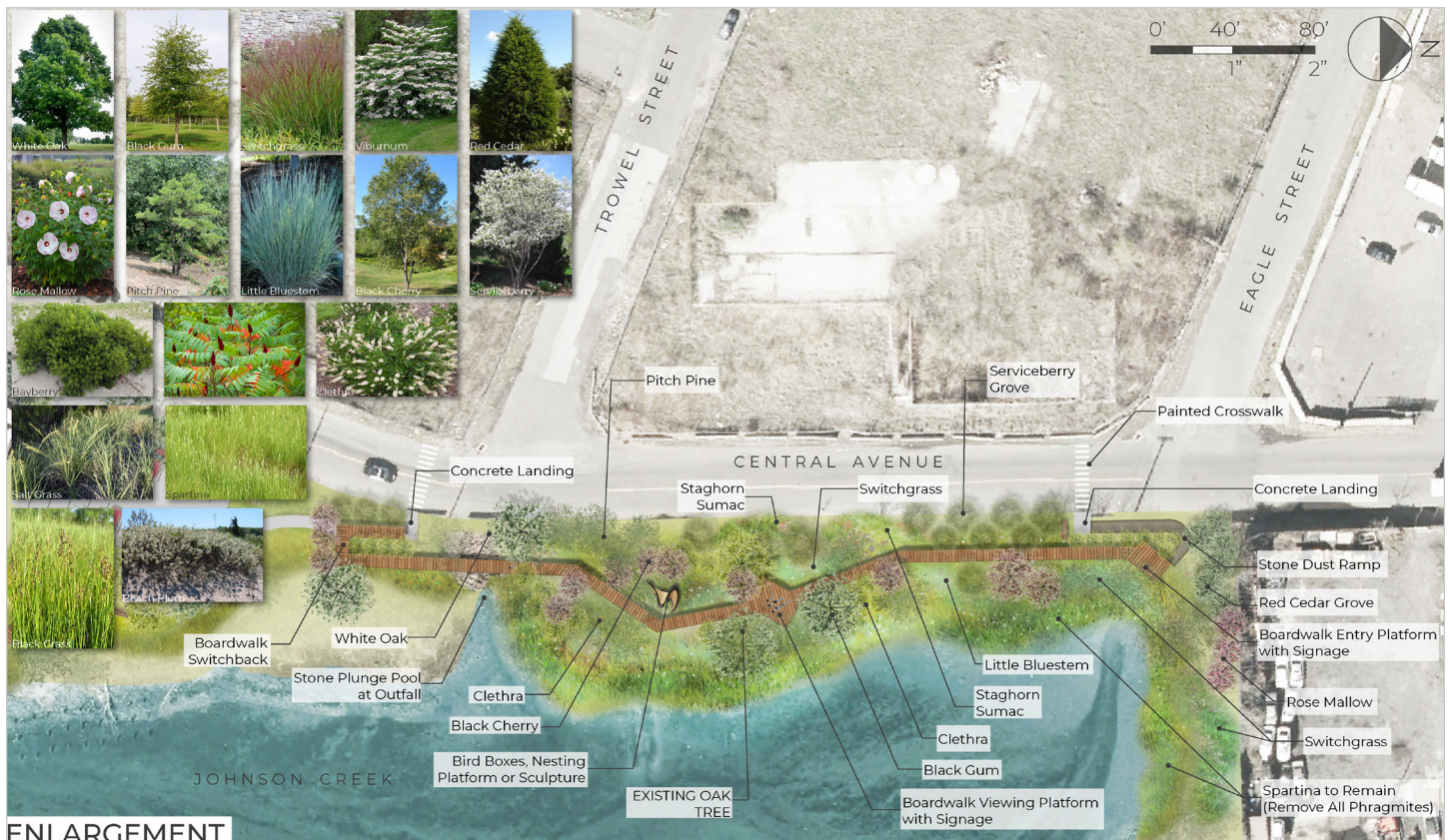
The goal of the CIRCA-funded project was to develop a complete set of engineering designs and secure all required permits for a Living Shoreline along Johnsons Creek. As a shovel-ready project, the Johnson's Creek Living Shoreline would be well-positioned for future construction funding.

With the exception of a permit, all tasks were completed. Three engineering design alternatives were developed.

Method

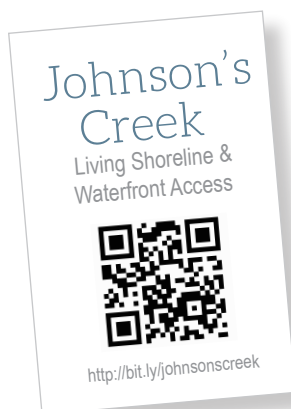
Milone and Macbroom, Inc. were engaged by MetroCOG to develop the engineering

Conceptual design developed through the Regional Framework for Coastal Resilience in Southern Connecticut, funded by the National Fish and Wildlife Foundation-Department of Interior (NFWF/DOI) funded



Above: Site and landscape plan for 179 Trowel Street. Source: Milone & MacBroom

Below: QR code & link distributed at September 18th, 2018 presentation to the East End NRZ



designs for Johnson's Creek. As the CIRCA grant could not cover both the full design and the permitting process for the entire Johnson's Creek area, full engineering designs were prepared only for 179 Trowel Street, which is owned by the City of Bridgeport. The site is on the east facing part of the Johnson Creek inlet at Central Avenue between Eagle and Trowel Streets.

Some remaining funds were available to develop a conceptual Master Plan for the overall area. The Master Plan includes a boardwalk, pedestrian paths and a vegetated living shoreline extending from Eagle Street, through city-owned parcels along the eastern side of Central Avenue, and along the waterfront to DeKalb Avenue. In addition to the greenway and amenities behind industrial properties, the Master Plan includes connections to the pathway along public rights of way. Natural landscaping, benches, gathering places and stormwater storage east from

the Central Avenue intersections with Jefferson Street, Adams Street, DeForest Avenue and DeKalb Avenue further enhance these connections.

After further review of the design by the City of Bridgeport, staff requested that metal or a composite, engineered material be used to construct the boardwalk, rather than wood.

Outreach Method

The project webpage is available at <http://bit.ly/johnsonscreek>.

As mentioned in an earlier section, the East End Neighborhood Revitalization Zone (NRZ) had identified Johnsons Creek as a natural asset but with limited access. Preliminary designs were presented at a meeting of the NRZ on September 18th, 2018 at the Ralphola Taylor Center in Bridgeport's East End. Links and QR codes to the project webpage were distributed at the meeting. NRZ members expressed support for the Living Shore-

line design on the eastern side of Central Avenue, including the raised boardwalk. The NRZ did not support a concept for a park on a parcel west of Central Avenue.

Submission to the Connecticut Department of Energy and Environmental Protection (CTDEEP)

Certificate of Permission

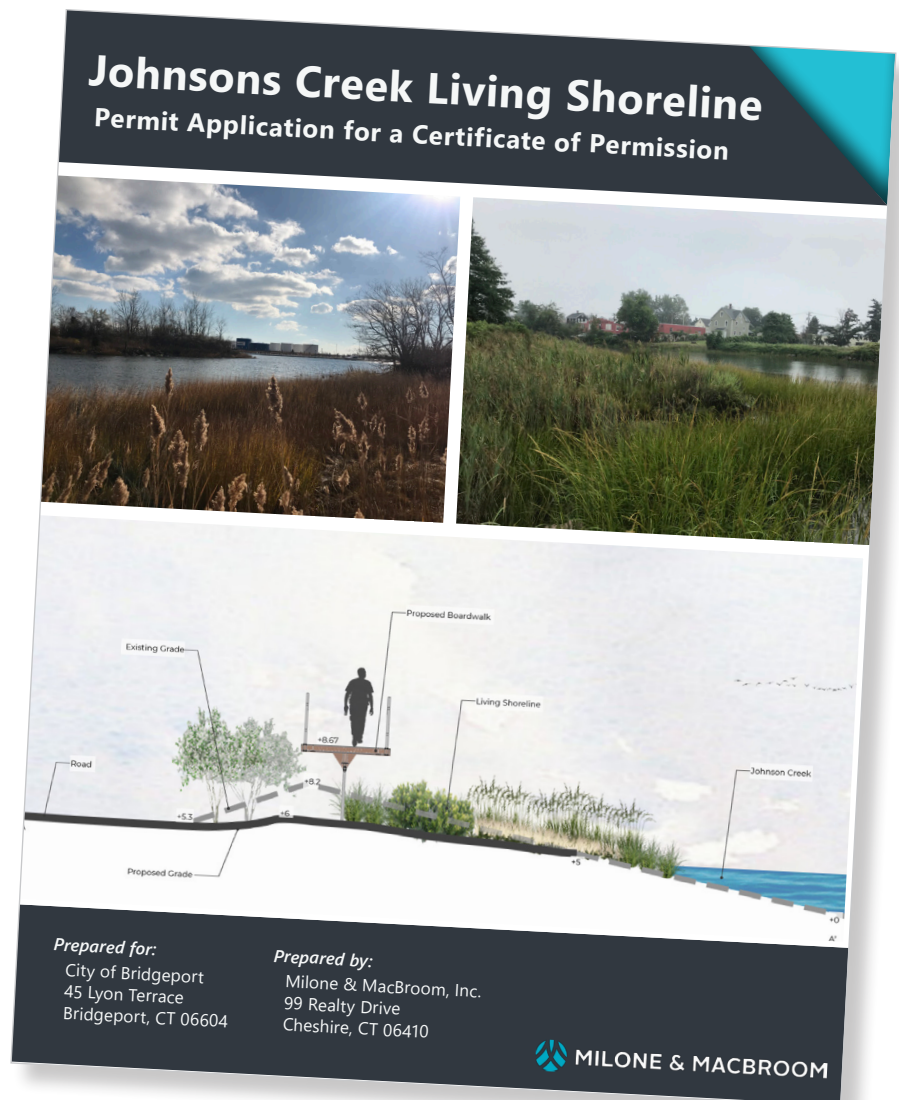
The initial Certificate of Permission application was submitted to CTDEEP in early November of 2018. Part IV/Question 13 of the COP stated:

“Johnsons Creek is a Coastal Water and Estuarine Embayment, and the project area contains Nearshore Waters, as well as the General Resources associated with a vegetated shoreline along coastal waters of the state. The portion of the site which borders and lies beneath tidal waters is Tidal Wetland, as determined by vegetation and position. Adjacent to the site, seaward of the proposed project area, are Intertidal Flats, which are exposed during low tide.”

Located within a Coastal Hazard Area, portions of the site and neighboring roadway experience flooding or inundation during coastal storm events. Because it is located along Developed Shorefront, the site is disturbed, as evidenced by the presence of a berm and neighboring industrial land uses, as well as a thick stand of invasive common reed throughout. The condition and function of the tidal wetland is impaired by this invasive vegetation.”

CTDEEP Response

Initially, CTDEEP staff responded that the project was not eligible for a COP since the boardwalk pilings were a structure within the Coastal Jurisdiction Line. Further, CTDEEP



staff stated that the design of the walkway would be too low to allow the colonization of tidal wetland vegetation beneath it. CTDEEP suggested the following alternatives:

- An at-grade path with pavers to provide public access to the site, rather than a boardwalk.
- Install the boardwalk entirely landward of the 7.2' NAVD88. Or, if the documented vegetation does not contain any of the plants listed in CGS 22a-29, the boardwalk may be installed at 6.2' NAVD88.
- Application for a Structures, Dredge and Fill permit, rather than a COP.

The project team was hesitant about this alternative for the following reasons:

Certificate of Permission submitted to CTDEEP

“Because it is located along Developed Shorefront, the site is disturbed, as evidenced by the presence of a berm and neighboring industrial land uses, as well as a thick stand of invasive common reed throughout. The condition and function of the tidal wetland is impaired by this invasive vegetation.”

- *Part IV/Q.13 of COP application*

- Visitors to the site would be likely to stray off an at-grade path; a boardwalk would support the integrity of the Living Shoreline by discouraging visitors from disturbing vegetated areas.
- The design of a boardwalk landward of 6.2' NAVD88 would require a narrower walkway with fewer public amenities. Landward of 7.2' NAVD88 was found to not be feasible.
- Application for a Structures, Dredge and Fill permit was not in the original scope of work or budgeted. The performance period had already been extended to December 31st, 2018 and could not accommodate the additional time needed to prepare the application and DEEP review.
- The current condition of the site (see above). The maximum elevation of the site is currently 9' and would allow for a boardwalk. By regrading the site to 6' and returning the site to a functioning tidal wetland, CTDEEP's requirement precludes a component of the initial concept: the boardwalk.
- There are limited opportunities for public recreation and access to the waterfront in the East End neighborhood.
- The 2005 East End NRZ plan recommended an elevated walkway and fishing pier along Johnson's Creek. The NRZ also expressed support for the boardwalk

when the design was presented at a September 18th, 2018 meeting.

- Due to the community's preference for a boardwalk, this concept was furthered through the Regional Framework for Coastal Resilience in Southern Connecticut (completed in 2017). CTDEEP staff attended several meetings and had an opportunity to review concepts developed through the framework.

Resubmission of Certificate of Permission to CTDEEP

An altered design with the boardwalk pilings outside of the CJL was resubmitted to CTDEEP for a COP in early December 2018. CTDEEP responded that the project was not eligible for a COP since the pilings were located waterward of 6.2' NAVD88. Due to the end of the performance period approaching, the project team agreed with the consultants that three semi-final designs would be prepared that could be submitted to CTDEEP in the future:

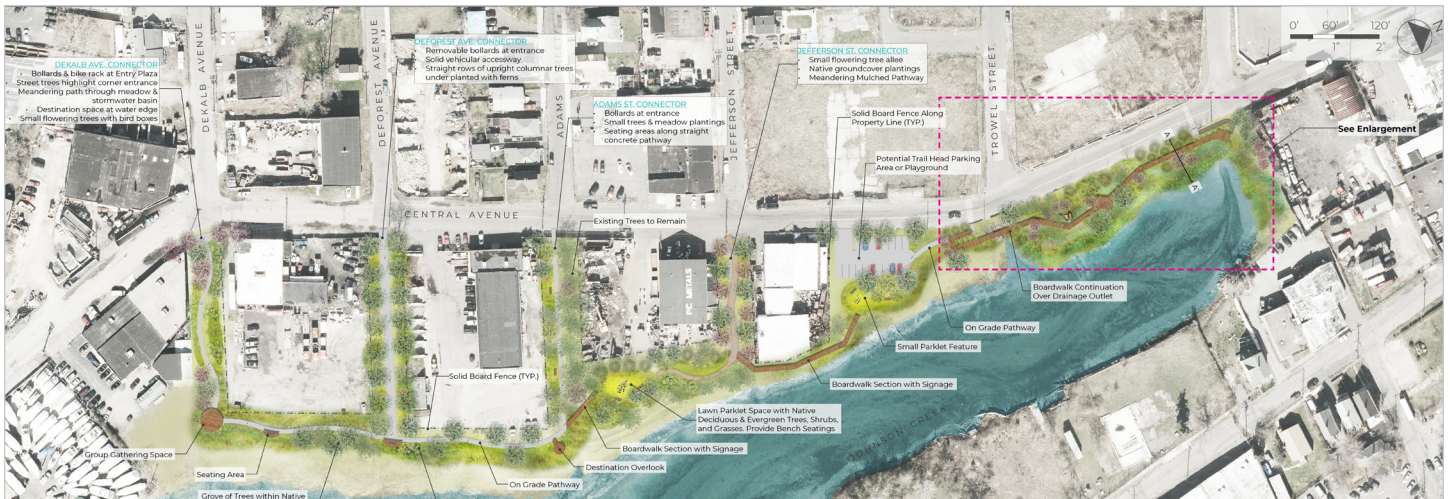
- The original design with a boardwalk landward of the CJL but partially within the tidal wetland of 6.2' NAVD88.
- A design with a narrower boardwalk landward of 6.2' NAVD88.
- A design without a boardwalk, rather, an at-grade path would provide public access.

Project Outcomes

Through CIRCA's funding, three living shoreline engineering designs were developed for several City-owned parcels along the western branch of Johnson's Creek.

Three Living Shoreline Alternatives

With the completion of the project designs, funds to implement a living shoreline in a portion of the Johnson's Creek area will be eas-



ier to secure. After a permit and funds have been secured and construction completed, the following outcomes are anticipated for any of the three designs:

- Enhancement of the existing marsh and habitat for intertidal and upland marsh species.
- Vegetated stabilization of the bank slope and a reduced slope angle.
- Removal of invasive plants and replace with native species to further encourage biodiversity.
- Accommodation of potential marsh migration due to sea level rise: the wetland vegetation can move up the bank.

Potential Benefits

If the final, permitted design includes a boardwalk and is constructed, the following outcomes are also anticipated:

- Community access to the shorefront through a raised boardwalk and pedestrian paths.
- Preservation and enhancement of coastal views and view sheds.
- Revitalizing this portion of Central Avenue as a neighborhood asset/place, rather than its current status as a service street.

Master Plan

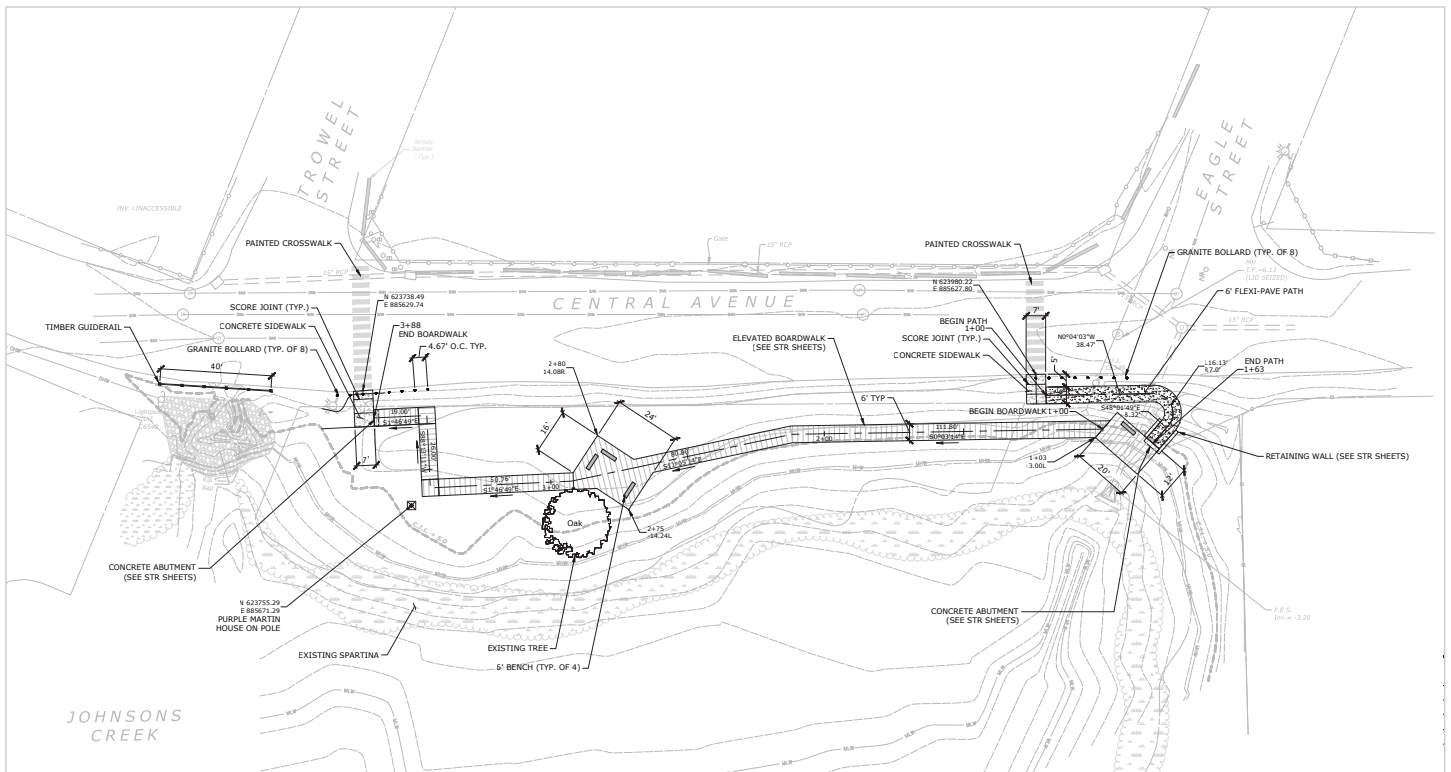
The Master Plan for the entire Johnsons Creek area may provide an additional means of engaging the community. The visualization will assist the City of Bridgeport with maintaining right of way access and community support as future funds become available. Rather than the existing blighted area, the community will have a blueprint for transformation to a neighborhood asset and wetland ecosystem. However, as the initial concepts and design that were presented to the community included a boardwalk, local support for an altered project design may be limited. Future implementation of the Master Plan may be received with some justified skepticism by the East End community.

Master Plan for Johnson's Creek area. Source: Milone & MacBroom

How Project Advanced CIRCA's Mission

CIRCA's mission is to *"increase the resilience and sustainability of vulnerable communities along Connecticut's coast and inland waterways to the growing impacts of climate change on the natural, built, and human environment."*

Like most neighborhoods along the Connecticut coastline, residents of Bridgeport's East End neighborhood are vulnerable to regular occurrences of flooding caused by



Layout Plan of the preferred design for the Johnson's Creek Living Shoreline. Source: Milone & Mac-Broom

extreme weather and sea level rise. A large number of the neighborhood's residents live in poverty, which further exacerbates vulnerability to flooding. Building and development patterns have also negatively impacted residents. Private, industrial properties along the waterfront have expanded into the public right of way and prevents local access to the waterfront. Combined with lax enforcement of these encroachments and little public investment, opportunities to access and enjoy the waterfront are limited.

Living Shorelines in New England: State of the Practice

Living Shorelines in New England: State of the Practice (2017, Woods Hole Group Inc and The Nature Conservancy) provides the following explanation of a Living Shoreline:

"A living shoreline has a footprint that is made up mostly of native material. It incorporates natural vegetation or other living, natural 'soft elements alone or in combination with some type of harder

shoreline structure, like oyster reefs, rock sills, or anchored large wood for added stability. Living shorelines connect the land and water to stabilize the shoreline, reduce erosion, and provide ecosystem services, like valuable habitat, that enhances coastal resilience."

Connecticut's Statutes

CGS 22a-92 (e) explains that

"feasible, less environmentally damaging alternative" includes, but is not limited to, relocation of an inhabited structure to a landward location, elevation of an inhabited structure, restoration or creation of a dune or vegetated slope, or living shorelines techniques utilizing a variety of structural and organic materials, such as tidal wetland plants, submerged aquatic vegetation, coir fiber logs, sand fill and stone to provide shoreline protection and maintain or restore coastal resources and habitat; and "reasonable mitigation measures

CIRCA has provided sea level rise projections for planning, and the projections were incorporated into State Statute by Public Act 18-82. The projections are 50 cm (1.64 feet) by the year 2050. These projections are to be used for planning, and as such, they are appropriate for design of a living shoreline.

and techniques” includes, but is not limited to, provisions for upland migration of on-site tidal wetlands, replenishment of the littoral system and the public beach with suitable sediment at a frequency and rate equivalent to the sediment removed from the site as a result of the proposed structural solution, or on-site or off-site removal of existing shoreline flood and erosion control structures from public or private shoreline property to the same or greater extent as the area of shoreline impacted by the proposed structural solution.’

Designs for the Future Permitting Process

The State of the Practice report cited an uncertain permitting process for Living Shorelines as an impediment to implementation. The Johnson’s Creek project experience with CTDEEP reinforces this finding. Further, the permitting experience highlights the need to reassess current state regulations for Living Shorelines. Some allowance for limited hybrid solutions, especially in areas with impaired tidal wetlands due to past coastal development, should be considered as an eligible activity under a COP.

The three engineering designs will support implementation of the project under the three scenarios described earlier (boardwalk, modified boardwalk and no boardwalk). The project is in a good position for future funding

opportunities, since the designs are close to complete and an alternative has been developed (no boardwalk) that is more likely to receive a COP from CTDEEP.

2018 Sea Level Rise Projections

CIRCA has provided sea level rise projections for planning, and the projections were incorporated into State Statute by Public Act 18-82. The projections are 50 cm (1.64 feet) by the year 2050. These projections are to be used for planning, and as such, they are appropriate for design of a living shoreline.

Strengthened Resiliency

Implementation of designs for the city owned parcels will serve as a “pilot” Living Shoreline along Johnson’s Creek. The suitability of this approach in an urban, industrial area and its ability to mitigate flooding, provide wetland habitat and improve water quality can be assessed after construction. Depending on the success of the application, a Living Shoreline could be expanded to other areas along Johnson’s Creek and possibly duplicated in communities with similar conditions. Impacts on local biodiversity, flooding severity and water quality will also be evaluated. Assessing the stability of the vegetated bank, especially after severe weather, will be useful for future applications.

Combined with the City of Bridgeport’s recent efforts to purchase vacant land and enforce right of ways, a Living Shoreline will strengthen local resiliency to climate change. A design that is sensitive to and consistent with the community’s expectations could become neighborhood asset for recreation, socializing, education and enjoyment of the waterfront.

Final Project Schedule & Budget

Activity	Time Period
Performance period begins.	June 1st, 2017
MetroCOG and CIRCA agreement executed.	August 16th, 2017
Presentation to the Waterfront Advisory Board.	September 28th, 2017
MetroCOG and Milone & MacBroom (MMI) agreement executed.	November 30th, 2017
MMI completes landscape plan.	May, 2018
Extension requested submitted to and approved by CIRCA. Performance period extended from July 1, 2018 to December 31, 2018.	May 2, 2018
MetroCOG and City of Bridgeport execute access agreement for geotechnical work.	May 15th, 2018.
MetroCOG and MMI present designs to the East End NRZ at the Ralphola Taylor Center in Bridgeport.	September 18th, 2018
Certificate of Permission Plans were submitted to CTDEEP.	November, 2018
Certificate of Permission Plans revised and resubmitted to CTDEEP.	December, 2018
Project concludes with the receipt of the three design alternatives and completion of final report.	December 31, 2018

Task	Amount
Personnel	\$9,977.47
Contractual (MMI)	\$64,000
Total	\$73,977.47

Acknowledgments

Council of Governments



City of Bridgeport:
Mayor Joseph P. Ganim



Town of Easton:
First Selectman Adam W. Dunsby
Secretary



Town of Fairfield:
First Selectman Mike Tetreau
Chair



Town of Monroe:
First Selectman Ken Kellogg



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MetroCOG staff are entirely responsible for the design and format of this report, using a style guide developed through SRMC (Susan Rubinsky Marketing Consulting). The opinions, findings and conclusions expressed in this publication are those of MetroCOG and do not necessarily reflect the official views or policies of the federal and state agencies through which MetroCOG is funded.



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