Resilient CT: Piper Brook and Webster Brook Flood Analysis

Berlin, New Britain, and Newington, CT

The Connecticut Institute for Resilience and Climate Adaptation (CIRCA)

1080 Shennecossett Road,
Groton, CT 06340

Prepared by:

SLR International Corporation

11 Beacon Street, Suite 735, Boston, Massachusetts 02108

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Executive Summary

SLR International Corporation (SLR), in partnership with the Connecticut Institute for Resilience and Climate Adaptation (CIRCA), has prepared this study to assess climate change vulnerabilities and identify flood resilience strategies for the Town of Berlin, the City of New Britain, and the Town of Newington, as part of the Resilient Connecticut Phase III.

Through the initial phases of Resilient Connecticut, CIRCA developed a Climate Change Vulnerability Index (CCVI), identified 178 Resilience Opportunity Areas (ROARs), targeting flood and heat risks. ROARs highlight the overlap between climate exposure, vulnerable populations, and critical assets, helping communities prioritize investments. The Piper Brook and Webster Brook corridors in Berlin, New Britain, and Newington were selected for further study based on identified flood vulnerabilities and community needs. The goal of the project was to develop implementable, site-specific strategies that mitigate flood risks and enhance long-term community resilience.

The project team carried out a comprehensive review of municipal plans and data, acquired available Federal Emergency Management Agency (FEMA) models for the region, and conducted onsite field visits to assess flood risks and identify critical hydraulic pinch points across the Piper Brook and Webster Brook corridors. An Advisory Committee was convened for the project, including representatives with expertise in the project area from each participating municipality and the Capitol Region Council of Governments (CRCOG). The Advisory Committee provided valuable insights to validate priority site selection and guide adaptation strategy development. The study incorporated extensive stakeholder engagement, including three Advisory Committee meetings, two public workshops, and targeted community outreach to ensure local priorities guided strategy development.

Flood mitigation strategies were evaluated across six key locations, informed by field visits, hydrologic and hydraulic analysis, advisory committee guidance, and input from public engagement events, emphasizing realistic, implementable actions. Concept alternatives were developed for six locations: Wilson Avenue and Coles Avenue in Newington, Xtreme Rides and Alvarium Beer Company on John Downey Drive in New Britain, Veterans Stadium Willow Brook Park on the New Britain/Berlin line, and Deming Road in Berlin.

A preliminary Benefit-Cost Analysis (BCA) was conducted using FEMA's BCA toolkit for three of the priority sites, providing high-level cost opinions for proposed mitigation actions and estimated benefits. Additionally, a Resilient Corridor Analysis identified roadways critical for emergency response, evacuation, and access to essential services such as hospitals, schools, grocery stores, and public transit.

This study provides a foundation for actionable, locally tailored flood resilience strategies that address current vulnerabilities and future climate risks throughout the Piper Brook and Webster Brook corridors. Continued collaboration among municipal agencies, regional partners, and stakeholders will be essential to advance these proposed mitigation measures.

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Acronyms and Abbreviations

BCA	Benefit-Cost Analysis
BCR	Benefit-Cost Ratio
BFE	Base Flood Elevation
CCVI	Climate Change Vulnerability Index
CIRCA	Connecticut Institute for Resilience and Climate Adaptation
CMP	Corrugated Metal Pipe
CRCOG	Capitol Region Council of Governments
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTDOT	Connecticut Department of Transportation
EDA	U.S. Economic Development Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FIS	Flood Insurance Studies
FMA	Flood Mitigation Assistance
GIS	Geographic Information Systems
HEC-RAS	Hydrologic Engineering Center River Analysis System
HMA	Hazard Mitigation Assistance
HMCAP	Multi-Jurisdiction Hazard Mitigation and Climate Adaptation Plan
HMGP	Hazard Mitigation Grant Program
IIJA	Infrastructure Investment and Jobs Act
NFIP	National Flood Insurance Program
NFWF	National Fish and Wildlife Foundation
NOAA	National Oceanic and Atmospheric Administration
POCD	Plan of Conservation and Development
ROAR	Resilience Opportunity Areas
SFHA	Special Flood Hazard Area
SLR	SLR International Corporation
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
WRDA	Water Resources Development Act

Project Background

1.0 Project Background

The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) launched the Resilient Connecticut initiative in 2018 to help communities plan for the impacts of climate change through data-driven, equity-centered approaches. Initially focused on New Haven and Fairfield Counties following Hurricane Sandy, the program has since expanded statewide. Through successive phases, CIRCA developed a Climate Change Vulnerability Index (CCVI), identified 178 Resilience Opportunity Areas (ROARs), and advanced a suite of adaptation strategies targeting flood and heat risks. These ROARs highlight the overlap between climate exposure, vulnerable populations, and critical assets such as affordable housing, infrastructure, and ecological systems. The Piper Brook and Webster Brook corridors in Berlin, New Britain, and Newington were selected for further study under this expanded effort, with the goal of developing implementable, site-specific solutions to reduce flooding and enhance long-term community resilience.

1.1 Piper and Webster Site Description

The Piper Brook and Webster Brook corridors flow through the neighboring communities of Berlin, New Britain, and Newington in central Connecticut, where recurring flooding threatens homes, businesses, and key infrastructure. The study area, shown in **Figure 1**, includes environmental justice communities with high social vulnerability, particularly in New Britain and parts of Newington. Along these waterways, several Resilience Opportunity Areas have been identified, including the Piper Brook ROAR and the Kensington and Mattabesset River ROAR, where flooding intersects with critical facilities, transportation networks, and flood-prone development.

Throughout the corridor, stormwater frequently overwhelms aging drainage systems, causing repeated flooding of homes, businesses, and roadways. Commercial properties and transportation infrastructure along John Downey Drive have been particularly affected by recurring flood events. The corridor's flood challenges are compounded by major infrastructure, including the Amtrak rail line and Route 9, which constrains natural drainage patterns and increases hydrologic stress during high-intensity rainfall events.

As climate change accelerates, these flood challenges are expected to intensify, with more frequent and severe storms increasing the risk to residents and businesses. The convergence of changing precipitation patterns, aging infrastructure, and ongoing development pressures underscores the urgency of site-specific flood mitigation. A resilient, community-informed approach is essential to reduce risk, protect critical infrastructure, and improve long-term safety and quality of life in the river corridor.

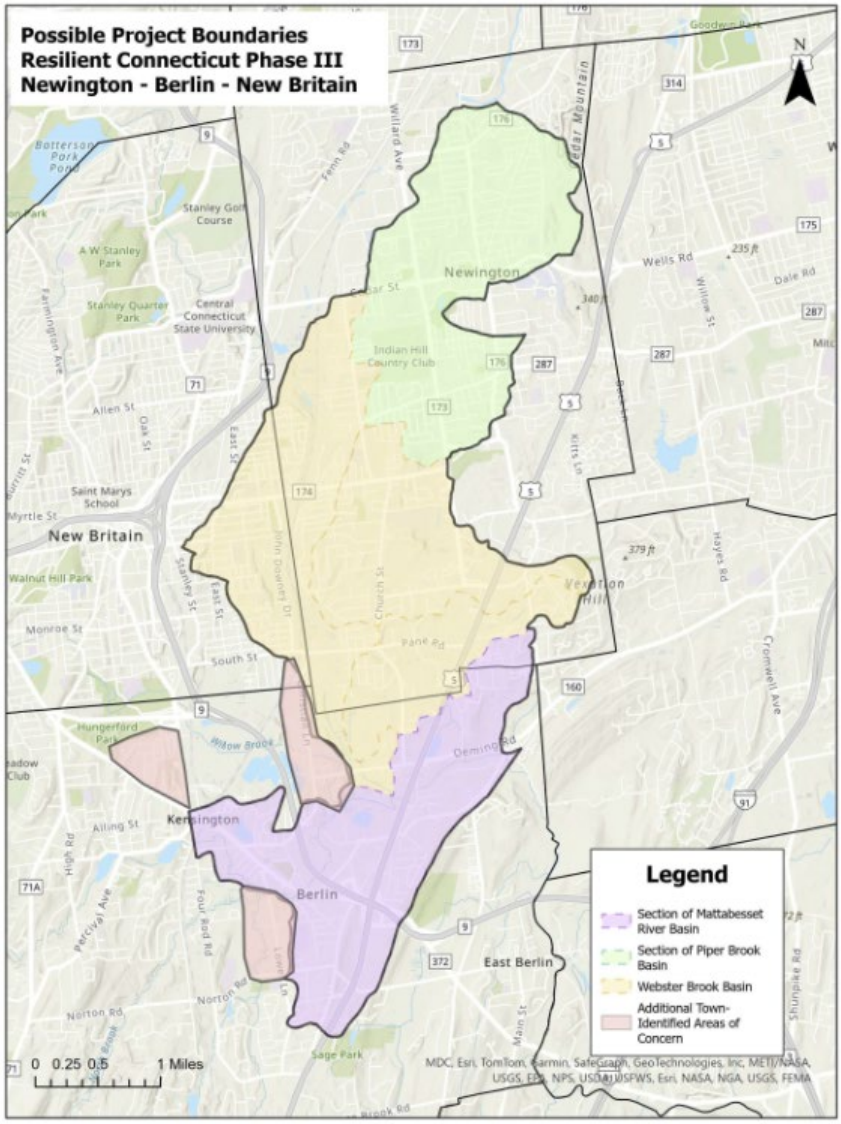


Figure 1: Project overview map

1.2 Project Objectives

The objectives of the Resilient CT Piper Brook and Webster Brook Flood Mitigation Project were to develop implementable climate adaptation strategies that reduce long-term flood risk and enhance the resilience of communities across Berlin, New Britain, and Newington. This effort focused on identifying and addressing critical flood pinch points within the corridor, using collected field data, hydrologic and hydraulic analysis, and community input, shaping local priorities. Central to this work was an Advisory Committee comprising representatives from each of the three municipalities, regional organizations, and CIRCA. Through Advisory Committee meetings, public workshops, and ongoing collaboration with municipal staff and CIRCA, the project team assessed existing flood conditions, evaluated future climate scenarios, identified key sites for mitigation, explored a range of strategies, and developed alternative flood mitigation and adaptation measures tailored to site-specific needs.

Project Objectives

Engage community stakeholders to understand flooding concerns and increase awareness.

Identify flood vulnerabilities along the river through field visits and model current and future flood conditions.

Develop and model concept alternatives for flood mitigation along the river corridor.

Key project objectives included identifying priority sites for flood mitigation measures, informed by extensive stakeholder input; evaluating site-level flood mitigation strategies via hydraulic modeling; creating conceptual designs for proposed priority site measures; providing a high-level benefit-cost analysis at select sites; and identifying resilient corridors critical for emergency response and community connectivity. The process encompassed a comprehensive review of existing data, municipal plans, and prior studies; evaluation and refinement of available FEMA flood models; extensive hydraulic modeling, and the generation of innovative design concepts. Together, these objectives supported the development of a roadmap for achieving long-term flood resilience within the Piper Brook and Webster Brook corridor.

Stakeholder Engagement

2.0 Stakeholder Engagement

2.1 Public Open Houses

A summary of key feedback, participant comments, engagement materials, and graphics from the two open houses is included in **Appendix A** of this report. Community input gathered through the open houses directly informed the identification and validation of priority sites and shaped the development of proposed flood mitigation concepts to ensure strategies reflected local needs and concerns.

2.1.1 Initial Open House

An initial public open house was held on April 2, 2025, from 5:30 p.m. to 7:00 p.m. at Alvarium Beer Company in New Britain to engage community members in the Resilient CT Piper Brook and Webster Brook Flood Mitigation Project. The event was facilitated by SLR staff and CIRCA representatives and attracted 21 attendees, including residents and business owners in the river corridor; municipal staff and elected officials from Berlin, New Britain, and Newington; and representatives from the Capitol Region Council of Governments. The event provided an opportunity for local stakeholders to learn about the project, share firsthand experiences with recurring flooding challenges, and discuss opportunities for flood mitigation measures and adaptation strategies.

Figure 2: Attendees participating in the River Corridor Walk Station

The open house was structured around four interactive engagement stations:

- A **Project Overview Station** outlining the project goals, timeline, overall approach, and opportunities for continued engagement through the project website
- A **Flood Risk Presentation Station** offering visual context on flood vulnerabilities, priority focus areas, and how outdated or undersized drainage systems and land use practices contribute to stormwater flooding
- A **Corridor Walk Station** using large-scale detailed maps to help participants virtually "walk" the river corridor, identify flooding hotspots, mark problem areas, and share site-specific observations (**Figure 2**)
- A **Resilience Solutions Station** showcasing a range of potential flood mitigation and adaptation strategies, including culvert upgrades, dam removal, stream daylighting, floodplain restoration, bed and bank stabilization, and stormwater detention

Attendees engaged in meaningful discussions with project representatives, contributed observations during the Corridor Walk activity by marking maps with notes and comments, and offered input on flooding issues and concerns at each station. Participants contributed detailed, location-specific feedback on recurring flood issues, including undersized or failing infrastructure, the effects of stormwater impacts on homes and businesses, parking lot flooding resulting in customer and revenue losses, debris accumulation at culverts, and downstream

constrictions that exacerbate flooding upstream. Several participants provided information about economic losses, shared videos and photographic documentation of flooding events, and identified specific problem locations such as the Amtrak culvert, Route 9 interchange constrictions, Christian Lane stormwater system, and Wilson Avenue crossing. Questions were raised about downstream impacts of proposed solutions, the role of detention areas, maintenance responsibilities, and the importance of public education on property maintenance and floodway management.

2.1.2 Final Open House

A second public open house was held on September 11, 2025, at Alvarium Beer Company in New Britain to present proposed flood mitigation measures and associated benefits at the priority project sites. The event served as a final engagement opportunity to close out the Resilient CT Piper Brook and Webster Brook Flood Mitigation Project. Over 12 attendees participated in the event, including residents and business owners in the river corridor; municipal staff and elected officials from Berlin, New Britain, and Newington; representatives from the Capitol Region Council of Governments; and a state representative serving Newington and New Britain.

The event began with a presentation facilitated by SLR and CIRCA that provided an overview of existing conditions at priority project sites, recommended strategies to mitigate flooding, benefits associated with proposed measures, and the methodology and key findings of the resilient corridors analysis. Following the presentation, attendees engaged in discussions with representatives from SLR and CIRCA on topics including strategies for engaging with Amtrak to expedite coordination on the railroad culvert improvements, possible funding sources for implementing the proposed projects, and next steps to realize some of the proposed measures. Large-scale maps of the priority sites and proposed mitigation measures were available throughout the event for participants to view and mark up with notes and comments.

The event featured:

- **Final Project Presentation** (*PowerPoint*) outlining the evolution of the project from initial conditions assessment through the development of final concept designs at the six priority sites
- **Project Overview Poster** outlining the project goals, timeline, and overall approach
- **Project Priority Sites Map** identifying the location of the six priority sites and the Amtrak crossing within the river corridor study area
- **Concept Design Posters** illustrating the flood mitigation measures and expected benefits at each of the six priority sites

2.2 Advisory Committee Meetings

Three Advisory Committee meetings were held virtually over the course of the project to guide the development of flood resilience strategies along the Piper Brook and Webster Brook corridors. The Advisory Committee included representatives from the Town of Berlin, City of New Britain, Town of Newington, and CRCOG along with project team members from CIRCA and SLR. These meetings served as critical checkpoints for reviewing technical findings, validating local priorities, providing site-specific feedback, and guiding the direction of the project through shared expertise and intermunicipal coordination.

Summaries of all Advisory Committee meetings, including agendas, presentation materials, attendance lists, and detailed committee feedback, are provided in **Appendix B** of this report.

2.2.1 Advisory Committee Meeting 1 – March 3, 2025

The first meeting focused on identifying flooding hotspots, assessing data availability and limitations, and establishing project priorities. The project team presented initial findings based on a windshield survey across the region, site visits, and existing FEMA models, initially identifying six candidate priority sites across the three municipalities:

- Wilson Avenue at Mill Brook crossing (Newington)
- John Downey Drive at Xtreme Rides, Webster Brook crossing (New Britain)
- Veterans Stadium Willow Brook Park, Willow Brook (New Britain/Berlin line)
- Christian Lane at Willow Brook crossing (Berlin)
- Deming Road at Willow Brook crossing (Berlin)
- Burnham Street at Mattabesset River crossing (Berlin)

Advisory Committee members provided important feedback, confirming the significance of identified problem areas and highlighting additional locations of concern. The John Downey Drive area, particularly the Amtrak railroad crossing, emerged as the most critical flood zone, causing backwater effects that impact businesses in both New Britain and Newington. Committee members described flooding along John Downey Drive as one of the most problematic areas in the region, with business impacts including property damage, tenant loss, and event disruptions. Hartford Health Care's relocation from the area due to flooding issues underscored the economic significance of addressing these challenges.

SLR representatives emphasized significant gaps in existing flood data, with many FEMA models being outdated or incomplete within the study area. This feedback reinforced the need for new modeling efforts and updated flood analysis to support effective mitigation strategies. The discussion also highlighted the critical importance of stakeholder coordination, specifically regarding the involvement of the Connecticut Department of Transportation (CTDOT) and Amtrak, to address railroad-related flooding issues.

Additional priority areas identified by the committee included **Stamm Road** in Newington (where the watercourse crosses the railroad at nearly 90 degrees, creating severe backwater conditions), the **Coles Avenue** triple-pipe culvert in Newington (prone to debris accumulation), and the **Webster Brook crossing at Deming Road** in Berlin (influenced by the Mattabesset River confluence).

The initial Advisory Committee meeting successfully aligned the project team's preliminary assessments with local knowledge and historical context, setting the stage for targeted flood analysis and development of actionable flood mitigation strategies.

2.2.2 Advisory Committee Meeting 2 – June 30, 2025

The second meeting presented results from updated hydrologic and hydraulic analysis and introduced adaptation strategies for high-priority sites. Input from the public open house on April 2, 2025, was also included to fine tune priority site identification and selection. Areas of focus and review included:

- John Downey Drive corridor
    - Railroad crossing at Webster Brook (highlighted in Advisory Committee #1)
    - Alvarium Beer Company (highlighted during the public open house on April 2)

    - Xtreme Rides (identified during initial windshield survey and corroborated during Advisory Committee #1)
- Stamm Road (highlighted in Advisory Committee #1)
- Veterans Stadium Willow Brook Park (identified during initial windshield survey and corroborated during Advisory Committee #1)
- Deming Road Webster Brook crossing (highlighted in Advisory Committee #1)
- Wilson Avenue (identified during initial windshield survey and corroborated during Advisory Committee #1)
- Coles Avenue (highlighted in Advisory Committee #1)
- Route 9 Mattabesset River crossing (highlighted during the public open house, April 2)

SLR presented findings from new and updated models, demonstrating how the Amtrak railroad culvert and embankment act as the primary control on flooding during large storm events (50- to 100-year) while culverts and site features at sites along John Downey Drive (such as the culvert at Xtreme Rides and Alvarium Beer Company parking lot flooding) drive more frequent nuisance-level flooding (2- to 10-year events). The team outlined adaptation options, including bridge and culvert resizing, floodplain benches, and embankment removal.

Committee members provided detailed, site-specific feedback on presented model results and adaptation measures.

Key findings and discussions included:

- **John Downey Drive Corridor**: While the Amtrak railroad culvert is the main driver of major flooding, local culvert replacements at Xtreme Rides and improvements at Alvarium Beer Company could provide significant benefits for more frequent floods. The committee discussed the challenges of engaging with Amtrak and explored alternative solutions, including potential property buyouts and distributed green infrastructure.
- **Stamm Road:** Alternatives such as splitting or moving the river to the opposite side of Stamm Road were discussed; however, a review of the topography and proximity to existing structures determined that this approach was not physically or economically practical.
- **Veterans Stadium Willow Brook Park**: Committee members suggested modeling floodplain benches at the ball fields and emphasized that resizing or removing the restrictive arch bridge could provide significant benefits for frequent storm events.
- **Deming Road**: The undersized bridge on Deming Road at Webster Brook and the downstream abandoned railroad embankment were identified as major contributors to flooding in this area.
- **Wilson Avenue**: Committee feedback confirmed the importance of addressing backwater effects affecting residential areas. The proposed culvert upsizing could reduce flooding and potentially remove homes from the 100-year floodplain.
- **Coles Avenue**: Committee feedback confirmed the importance of addressing undersized and clogged culverts in this area. A proposed culvert upsizing could reduce road flooding and impacts to homes in the area.
- **Route 9 Mattabesset River**: This site was identified as a frequently flooded area during the public open house on April 2. Committee members suggested modeling flood depths at this site; however, field measurements could not be acquired due to access issues at the Route 9 bridge and, thus, the site was not included in the modeling efforts.

The meeting concluded with a consensus on the six chosen priority sites for adaptation measures and concept design development; the need for targeted, implementable solutions; and coordination for potential multi-town grant efforts. Final priority sites selected for adaptation measures and concept design development included the following:

- Wilson Avenue (Newington)
- Coles Avenue (Newington)
- John Downey Corridor Sites, including:
  - Amtrak railroad crossing (New Britain)
  - Xtreme Rides (New Britain)
  - Alvarium Beer Company (New Britain)
- Veterans Stadium Willow Brook Park (New Britain/Berlin line)
- Deming Road, Webster Brook crossing (Berlin)

2.2.3 Advisory Committee Meeting 3 – August 25, 2025

The third and final meeting presented the final project results to Advisory Committee members. The project team provided an overview of the adaptation measures and proposed concept designs for the six priority sites listed below, preliminary benefit-cost analyses for three priority sites, and the resilient corridors analysis. Committee members provided valuable feedback on the proposed adaptation measures and concept designs for the six priority sites as well as the benefit-cost analysis assumptions and recommendations.

Key discussions and feedback on the six priority sites included the following:

- **Wilson Avenue (Newington)**: Committee members agreed the detailed analysis would be very useful for grant applications. Confirmation that the proposed bridge replacement does not create significant new water storage addressed concerns about potential downstream impacts.
- **Coles Avenue (Newington)**: A committee member noted a previous, more expensive bond request for this location had been turned down by voters, emphasizing the need for cost-effective solutions.
- **John Downey Corridor Sites including:**
  - **Amtrak Railroad Crossing**: The committee emphasized that this study provides the technical evidence needed to initiate conversations with Amtrak about long-term solutions despite the challenges of engaging with the railroad.
  - **Xtreme Rides (New Britain)**: Committee members reviewed both the culvert replacement option and an alternative involving property buyout and floodplain conversion, noting that both would provide similar flood reduction benefits.
  - **Alvarium Beer Company (New Britain)**: A concern was raised that the proposed floodplain bench would result in permanent parking loss rather than intermittent loss during floods, potentially making this a "difficult sell" to the business owner. Committee members suggested quantifying exact parking impacts, exploring parking reconfigurations, and promoting the floodplain as a green space amenity with trails or tables.
- **Veterans Stadium Willow Brook Park (New Britain/Berlin line)**: Committee members noted that the analysis showed complete removal of the arch bridge provides similar benefits to replacement at significantly lower cost and suggested exploring extended floodplain benching.

- **Deming Road (Berlin)**: Committee members supported embankment removal as a cost-effective, high-benefit measure. Discussion focused on whether to pursue embankment removal alone or combine it with full bridge replacement.

The committee also discussed the preliminary benefit-cost analysis results and their sensitivity to data inputs, particularly lowest floor elevations and basement finish status. Members recognized that more precise data from elevation certificates, documented damage costs, and business financial losses would be needed to strengthen grant applications. Discussion of funding opportunities included the Connecticut Department of Energy and Environmental Protection (CTDEEP) Climate Resilience Fund, Economic Development Agency resiliency grants, Connecticut Green Bank loans, and multi-town municipal bonding approaches.

The resilient corridors analysis was presented, identifying and scoring roadways critical for maintaining access to essential community services during and after flood events. Committee feedback confirmed the importance of this analysis for municipal capital improvement planning and prioritization of road segments critical for emergency response.

Existing Conditions

3.0 Existing Conditions Analysis

3.1 Review of Existing Reports and Tools

As part of the existing conditions analysis, the project team conducted a comprehensive review of existing plans, data sources, and geospatial tools to assess flood vulnerabilities and build upon previous planning efforts. This review was essential to ensure that recommendations for the Piper Brook and Webster Brook corridors were grounded in existing local and regional knowledge, aligned with past investments, and responsive to previously identified concerns.

3.1.1 Hazard Mitigation and Climate Adaptation Plan

The CRCOG Multi-Jurisdiction Hazard Mitigation and Climate Adaptation Plan (HMCAP) served as a foundational resource. The municipal annexes for Berlin, New Britain, and Newington each identified localized flooding as a major concern, particularly near watercourses and undersized infrastructure.

In New Britain, flooding was identified as the top natural hazard, with frequent issues reported along Willow Brook and West Canal. While Piper and Webster Brooks were not cited as the most damaging sources, city staff highlighted regular flooding near John Downey Drive, adjacent to Webster Brook, and along Allen Street near Piper Brook. Repeated infrastructure failures in these areas have impacted businesses and residents alike. Recommended actions included stream crossing vulnerability assessments, targeted outreach to repetitive loss property owners, and coordination with CIRCA to support ROAR planning.

Berlin's annex noted that recurrent flooding continues to impact known locations, including the town's Public Works facility, which is situated in a floodway and has incurred repeated damage. Although Webster Brook is recognized as a significant stream, few specific flooding locations were identified. Recommendations included a town-wide stream crossing assessment, coordination with CIRCA-led resilience planning efforts, and advancement toward Sustainable CT certification, with a focus on hazard mitigation practices.

In Newington, Piper Brook and Webster Brook were explicitly identified as principal watercourses. Flooding was regularly reported in the Stamm Road area, which is adjacent to both the Amtrak rail line and Webster Brook. Minor, but recurring, flood issues were also identified elsewhere in town, and the July 2023 storms prompted widespread complaints from residents. Recommendations included collaboration with Amtrak and CTDOT to address culvert capacity issues, assessments of flood detention areas, and a broader review of vulnerable crossings town wide.

3.1.2 Plan of Conservation and Development

Complementing the HMCAP findings, the municipal Plans of Conservation and Development (POCDs) provided longer-term guidance on stormwater management, land use, and environmental sustainability.

- **Newington's POCD** identified both Piper Brook and Webster Brook as important natural assets, and called for low-impact development strategies, continued implementation of hazard mitigation strategies, and the establishment of a greenway trail along Piper Brook to support multi-benefit investment.

- **New Britain's POCD** emphasized stormwater infrastructure challenges and noted flood risks along Webster Brook and other waterways. Vision themes included public health, sustainability, and equitable access to parks and open space.
- **Berlin's POCD** designated Webster Brook as one of five key subregional watershed basins and promoted resilient stormwater and floodplain management practices. Strategies included the adoption of low-impact development at town facilities, water conservation practices, and improved flood resilience through infrastructure planning.

3.1.3 Climate Change Vulnerability Index

The CIRCA CCVI was used to assess flood risk at the intersection of physical exposure, social sensitivity, and adaptive capacity.

Along the Piper Brook corridor, high exposure was linked to impervious surfaces and mapped flood zones, with vulnerable populations concentrated near Day Street and Hartford Avenue. Although some areas demonstrated stronger adaptive capacity due to proximity to transit and services, others faced barriers, including lower incomes and limited English proficiency.

The Webster Brook corridor exhibited even higher physical exposure, especially near the Amtrak rail corridor, John Downey Drive, and Stamm Road. Social vulnerability was more pronounced in these industrial zones, where lower homeownership rates and limited access to vehicles reduced community resilience.

3.1.4 GIS Datasets and Tools

To supplement the review of existing plans, the project team also evaluated Geographic Information Systems (GIS) datasets available through platforms hosted by the municipalities and regional partners. These datasets provided spatial information on FEMA-designated floodplains, inland wetlands, and sewer and stormwater infrastructure.

SLR requested additional data from municipal staff and CRCOG that were not publicly accessible, including stormwater drainage system data and repetitive and severe repetitive loss properties. Relevant drainage studies and recently completed reports were also collected and reviewed.

These resources offered valuable context for historic flooding patterns, limitations of existing models and datasets, and site-specific vulnerabilities. This information directly informed the project's technical analysis and modeling of current and future conditions.

3.1.5 FEMA Repetitive Loss Data

The project team obtained and reviewed FEMA repetitive loss data for the three municipalities to identify properties with documented histories of flood damage claims under the National Flood Insurance Program (NFIP). This data provides critical evidence of recurring flood impacts and helps prioritize areas where mitigation investments would address known vulnerabilities. Across Berlin, New Britain, and Newington, a total of 30 properties have been identified as repetitive loss properties, meaning they have filed two or more NFIP claims of more than $1,000 each.

These 30 properties have experienced a combined 88 individual flood loss events totaling more than $1.3 million in claims. Of these repetitive loss properties, a subset qualifies as severe repetitive loss properties, defined as those for which at least four separate NFIP claim payments exceeding $5,000 each have been made with cumulative payments totaling more than $20,000, or for which at least two separate claim payments have been made with the cumulative amount

exceeding the property's market value. Additionally, properties meeting specific damage thresholds are identified as Flood Mitigation Assistance (FMA) eligible properties, representing the highest-priority candidates for federal mitigation grant funding to implement permanent solutions such as property elevation, acquisition, or floodproofing.

The concentration of repetitive loss properties in these corridors underscores the chronic nature of flooding in the study area and validates the need for comprehensive flood mitigation strategies. **Table 1** summarizes the repetitive loss data by municipality and loss category.

Table 1: FEMA Repetitive Loss Data in the Study Area

Municipality	Total Net Payments USD (Total # of Losses)			
	All Repetitive Losses	NFIP Losses	NFIP Severe Losses	FMA Losses
Berlin	$238,487 (20 losses)	$235,153 (18 losses)	$71,688 (8 losses)	$71,688 (8 losses)
New Britain	$408,928 (48 losses)	$369,189 (42 losses)	—	—
Newington	$663,626 (20 losses)	$656,788 (18 losses)	$290,786 (5 losses)	$290,786 (5 losses)
Total	**$1,311,041 (88 losses)**	**$1,261,130 (78 losses)**	**$362,474 (13 losses)**	**$362,474 (13 losses)**

NFIP – National Flood Insurance Program insurance-related repetitive losses
FMA – Flood Management Assistance grant-related repetitive losses

3.2 Existing Flood Conditions

An evaluation of current flood conditions was conducted to document the extent and severity of flood risk along the Piper Brook and Webster Brook corridors, including flooding along tributaries and nearby watercourses. This analysis included a review of FEMA Flood Insurance Studies (FIS), effective Flood Insurance Rate Maps (FIRMs), and the hydrologic and hydraulic methodologies used to delineate flood zones and regulatory floodways. Existing FEMA models within the project area were obtained and reviewed to assess their coverage, data sources, and consistency with flooding patterns observed during the field assessment and reported by stakeholders.

Mapped AE zones and designated floodways along both waterways show that several segments of the corridor fall within areas expected to flood during 100-year and 500-year events. However, chronic flooding has also been observed outside of these mapped floodplains, particularly during lower-return interval events such as the 2-year and 10-year storms. This highlights the need to supplement regulatory data with localized observations and updated modeling. Available FEMA models for the project area are shown in **Figure 3** and are listed in **Appendix C**. FEMA models received by SLR included models in Hydrologic Engineering Center *River Analysis System* (HEC-RAS) and the United States Geological Survey (USGS) step-backwater formats.

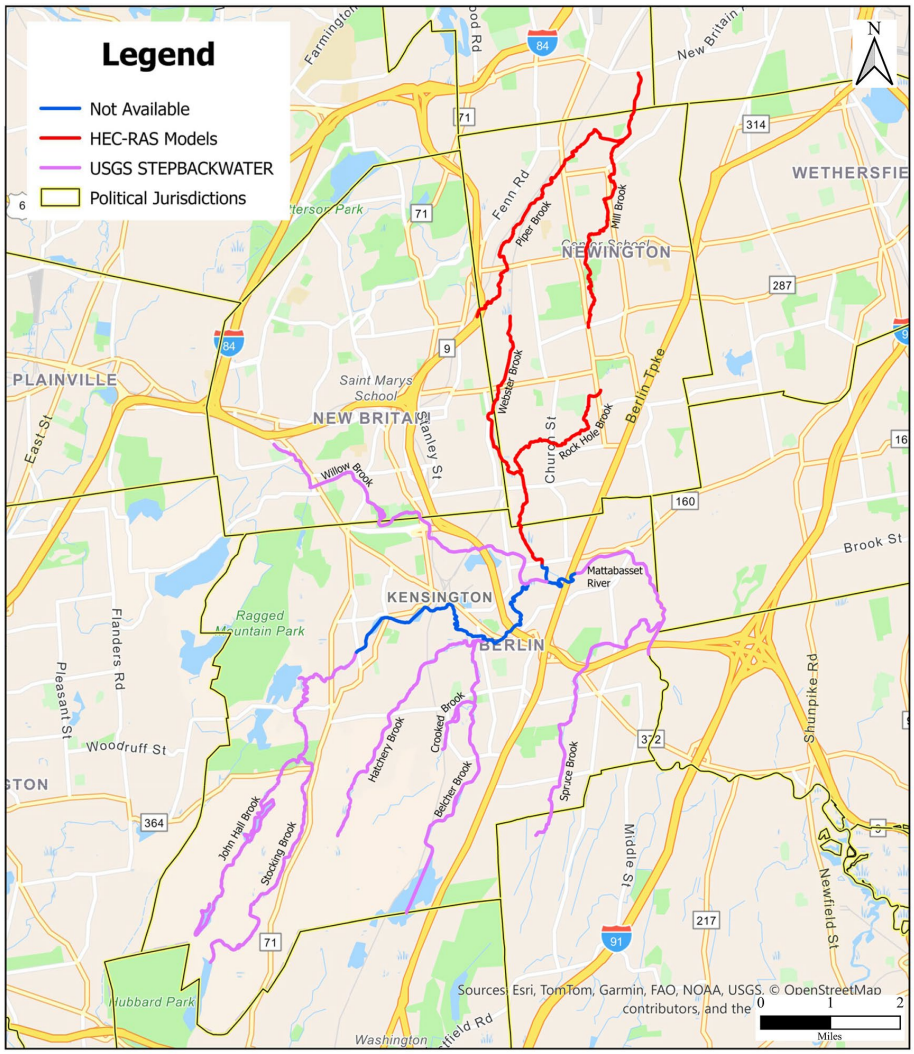


Figure 3: Available FEMA models for project area

In January 2025, the project team conducted a windshield survey along the Piper Brook and Webster Brook corridors to observe site conditions, identify flood-vulnerable areas, and document existing infrastructure such as culverts, bridges, and drainage systems. This initial reconnaissance in combination with FEMA FIS and FIRM reviews informed the selection of candidate priority sites and provided visual context for understanding flooding patterns and constraints.

Additionally, water resources engineers from SLR conducted two detailed field visits in March and May 2025, to acquire site-specific measurements, assess hydraulic conditions, and gather additional information on priority locations. During these visits, the team measured culvert and bridge dimensions, collected elevation data at structure inverts, documented channel geometry and cross sections, photographed existing infrastructure and flood indicators, and observed site constraints such as access limitations, utility conflicts, and proximity to critical facilities. These field assessments were used to provide essential ground-truth information for hydraulic model development, to validate modeling assumptions, and to identify gaps requiring further data collection.

The assessment also included a review of critical infrastructure, public facilities, and roadways currently exposed to floodwaters. These areas represent both physical vulnerabilities, such as undersized culverts and low roadway elevations, and social vulnerabilities, where flood risks intersect with populations and essential services.

Where FEMA HEC-RAS hydraulic models were available (on portions of Mill Brook, Webster Brook, and Deming Road), the field measurements and elevation data collected by SLR were used to update the FEMA models to represent current conditions. In the absence of FEMA modeling on Willow Brook, a HEC-RAS hydraulic model was created by SLR based on field measurements and elevation data collected during the site visits in combination with 2023 State of Connecticut LiDAR elevation data. Coles Avenue over Mill Brook was evaluated using HY-8 culvert analysis software from the Federal Highway Administration.

The following sites were identified as experiencing notable flood impacts under existing conditions:

- **Wilson Avenue over Mill Brook (Newington)**
  Flooding affects residential neighborhoods upstream of an undersized culvert. The impacts of the constriction at Wilson Avenue extend to the downstream side of Robbins Avenue.
- **Coles Avenue over Mill Brook (Newington)**
  The existing three-barrel culvert is poorly aligned with the watercourse and prone to debris accumulation. Frequent overtopping has been reported during rain events, contributing to localized road closures and drainage backups.
- **Stamm Road and Rail Embankment over Webster Brook (Newington)**
  A longstanding flood-prone area characterized by sharp channel bends, restricted flow at the railroad crossing, and residential impacts. Observed backwater conditions and swirling patterns suggest hydraulic inefficiencies in culvert design and alignment. Due to the proximity to railroad infrastructure and complex challenges to implement effective flood mitigation measures in this area, this site was not chosen as a priority site for this analysis. We recommend further analysis in this area and coordination with the railroad to identify effective measures to address flooding in this area.
- **John Downey Drive Corridor along Webster Brook (New Britain)**
  Includes Alvarium Beer Company, Xtreme Rides, and adjacent commercial properties. Flooding is influenced by limited bridge culvert capacity at the downstream railroad crossing and inadequate site drainage. Property damage and business interruptions have been reported.
- **Veterans Stadium Willow Brook Park and New Britain Road over Willow Brook (New Britain/Berlin line)**
  Subject to recurring flooding during moderate storm events. Flooding affects recreational facilities, adjacent roadways, and parking areas used for public events.

- **Deming Road over Webster Brook and Abandoned Rail Embankment (Berlin)**
  Floodplain conveyance is restricted by an undersized bridge and an abandoned embankment downstream of the crossing.
- **Route 9 and Mattabesset River Crossing (Berlin)**
  This site was identified during the first public open house as an area of frequent flooding. Due to field access issues, this site was not modeled; however, visual inspections and high water marks support flooding concerns in this area.

These sites reflect a range of challenges related to aging infrastructure, constrained waterways, and the impacts of development within the floodplain. A summary of modeled flood depths and frequencies under existing conditions has been developed to support strategy selection and will inform stakeholder discussions around priority actions.

Proposed Mitigation Measures at Priority Sites

4.0 Proposed Mitigation Measures at Priority Sites

To support long-term flood resilience in the Piper Brook and Webster Brook corridors, a range of flood mitigation strategies were evaluated for the selected priority sites within the study area. These strategies were informed by site-specific hydraulic modeling, stakeholder input, and regional priorities, with an emphasis on identifying realistic, implementable actions that address both current vulnerabilities and projected future risks. The evaluation process considered engineered and nature-based solutions.

Six priority sites and the Amtrak crossing on John Downey Drive, shown in **Figure 4**, below were chosen to model potential flood mitigation measures. Recommended flood mitigation measures and concept designs were prepared for the six priority sites. Although the railroad crossing on John Downey Drive was modeled for flood impacts, specific flood mitigation measures were not recommended at this site as Amtrak owns and is responsible for any infrastructure changes. Concept designs for the six priority sites and the Amtrak crossing model are provided in **Appendix D**.

Table 2: Priority Sites and Proposed Measures

Site	Proposed Measure
Wilson Avenue	Bridge Replacement
Coles Avenue	Culvert Replacement
Xtreme Rides	Bridge Replacement, Channel Widening, Buyout
Alvarium Beer Company	Floodplain Bench
Veterans Stadium Willow Brook Park	Bridge replacement/removal, Floodplain Bench
Deming Road	Railroad Abutment /Embankment removal, Bridge Replacement

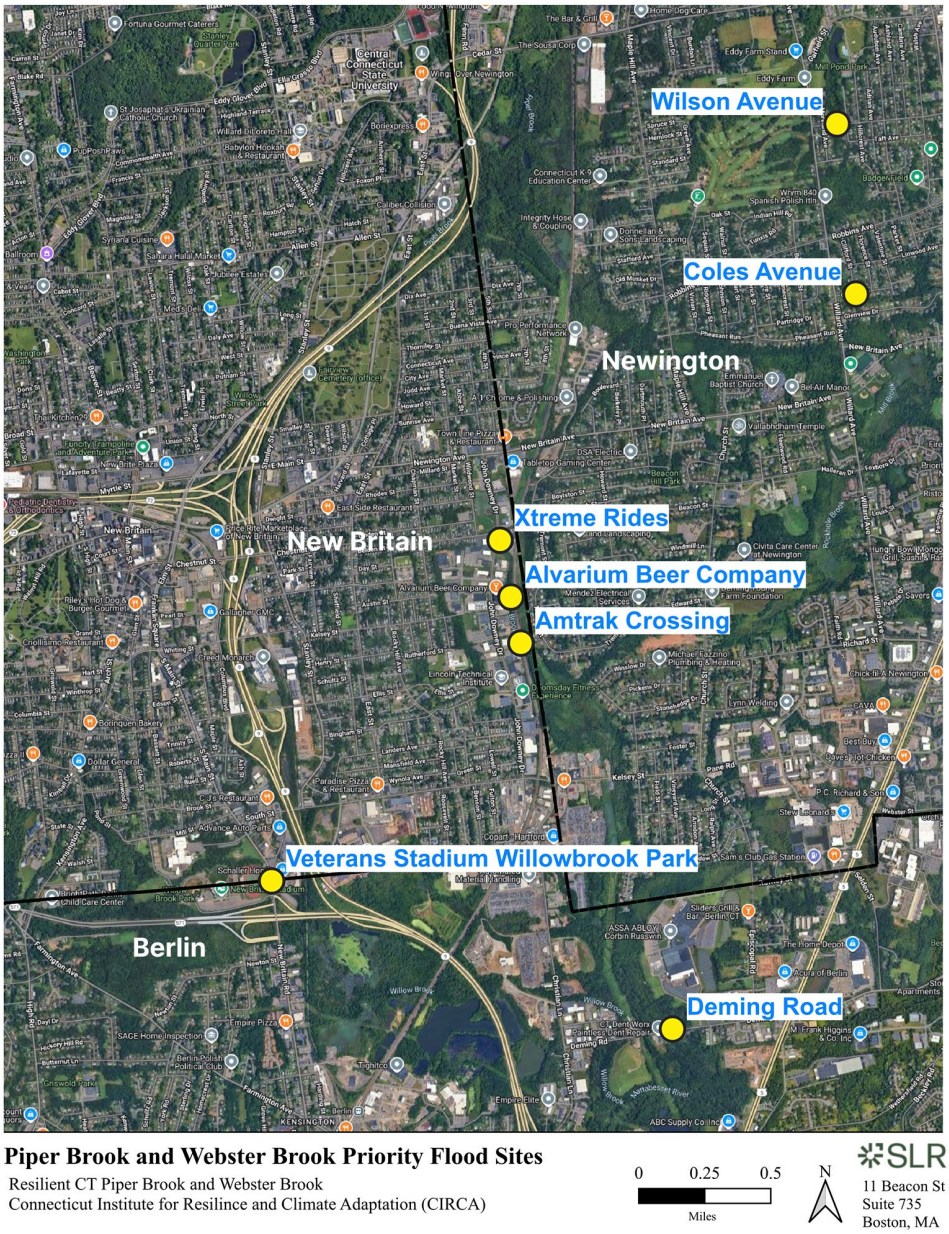


Figure 4: Location of project priority sites

4.1 Wilson Avenue

Existing Conditions and Flooding Issues

Wilson Avenue in Newington experiences significant upstream flooding caused by an undersized bridge crossing that creates a hydraulic constriction on Mill Brook. During storm events, backwater effects from this bottleneck result in flooding of residential areas, affecting properties up to the downstream side of Robbins Avenue. The current bridge structure, shown in **Figure 5**, restricts the natural flow of floodwaters, causing water surface elevations to rise and inundate homes that would otherwise remain dry with adequate hydraulic capacity at this crossing.

Figure 5: Existing bridge at Wilson Avenue

The increased flooding caused by the Wilson Avenue crossing impacts more than 30 residential properties located upstream, with some homes experiencing flood depths that place them within the 100-year flood zone. Recurring flood events cause property damage to homes, threaten structural integrity of the roadway and bridge, and create safety concerns for residents in the affected neighborhoods. The undersized crossing has been identified as a critical pinch point that exacerbates flood risk within the upstream watershed.

Proposed Mitigation Measure

The recommended mitigation measure at Wilson Avenue is to replace the existing undersized bridge with a new structure that provides adequate hydraulic capacity for Mill Brook. Based on hydraulic modeling conducted by SLR, the proposed bridge sizing was determined through iterative modeling to identify dimensions that would eliminate the hydraulic constriction while remaining structurally and economically feasible for implementation. Approximate dimensions of the existing bridge and the proposed bridge dimensions are given in **Table 3** below.

Table 3: Approximate Dimensions of Existing Bridge and Proposed Bridge Dimensions

Location		Type	Span (ft)	Opening Height (ft)	Length in Direction of Flow (ft)
Wilson Avenue	Approximate Dimensions of Existing Bridge	Bridge	12.0	4.8	35
	Proposed Bridge Dimensions	Bridge	30.0	5.0	35

The proposed bridge was designed to pass the 100-year flood, span approximately 1.25 times bankfull width of the channel, provide adequate freeboard to prevent overtopping during the 100-year flood event, and ensure the structure can pass accumulated debris without significant flow restriction. The proposed dimensions would allow floodwaters to pass through the crossing without significant backwater effects, thereby reducing upstream flood elevations. The proposed concept design for the Wilson Avenue bridge replacement is shown in **Figure 6**.

Figure 6: Concept design for proposed bridge replacement at Wilson Avenue

Flood Reduction Benefits

Hydraulic modeling demonstrates that replacing the Wilson Avenue bridge would significantly reduce flooding impacts for more than 30 homes across multiple upstream streets. The proposed bridge would lower water surface elevations by up to 1 foot on some properties during the 100-year flood event, with similar reductions observed for the 10-year and 50-year storm

events (**Figure 7**). These flood depth reductions are substantial enough to potentially remove several homes entirely from the 100-year floodplain, eliminating their flood insurance requirements and significantly reducing property damage risk.

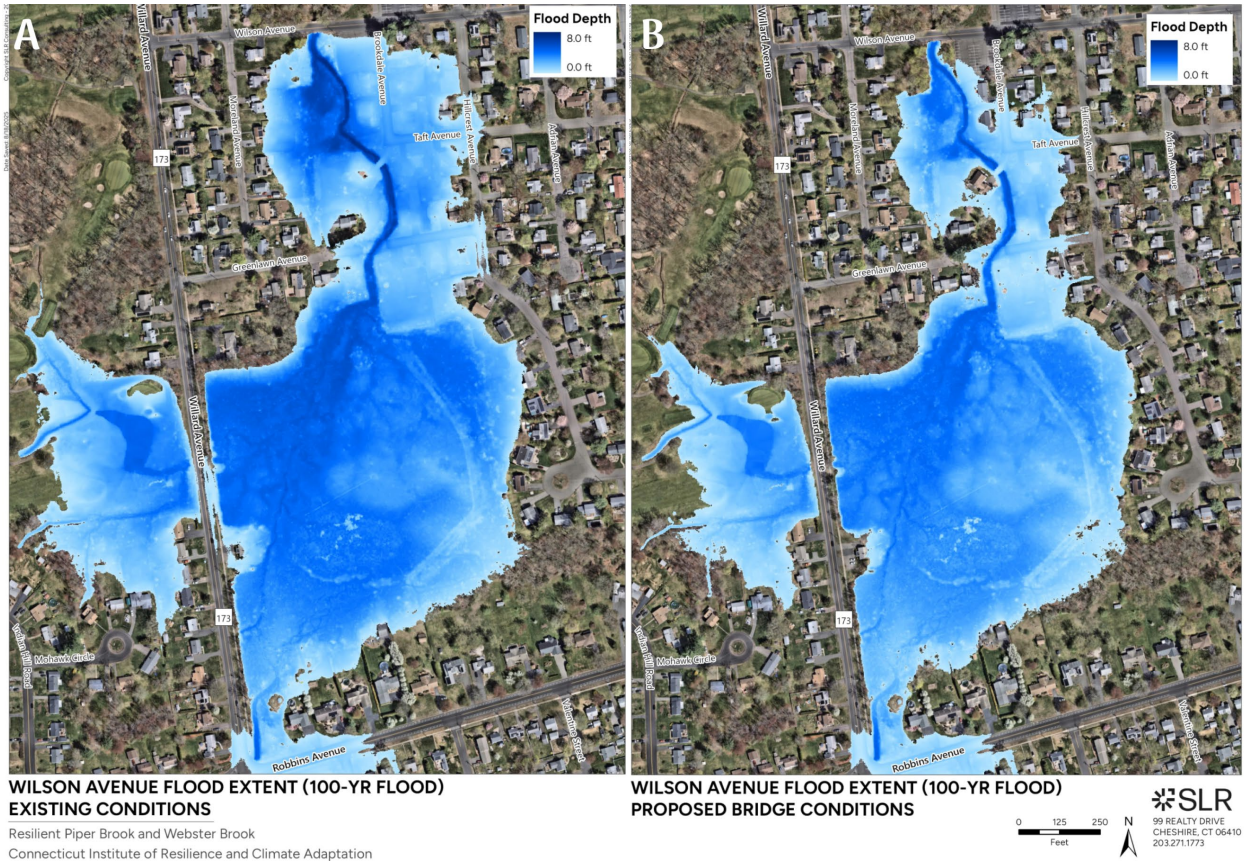


Figure 7: Water depth for 100-year flood for A) existing conditions and B) with proposed bridge replacement

The flood reduction benefits extend far upstream of Wilson Avenue, demonstrating the widespread nature of current backwater conditions caused by the undersized crossing. Properties located several hundred feet upstream would experience measurable flood depth reductions, highlighting the corridor-wide impact of this single infrastructure improvement (**Figure 8**). Advisory Committee members confirmed that this detailed hydraulic analysis would be extremely valuable for grant applications and implementation efforts.

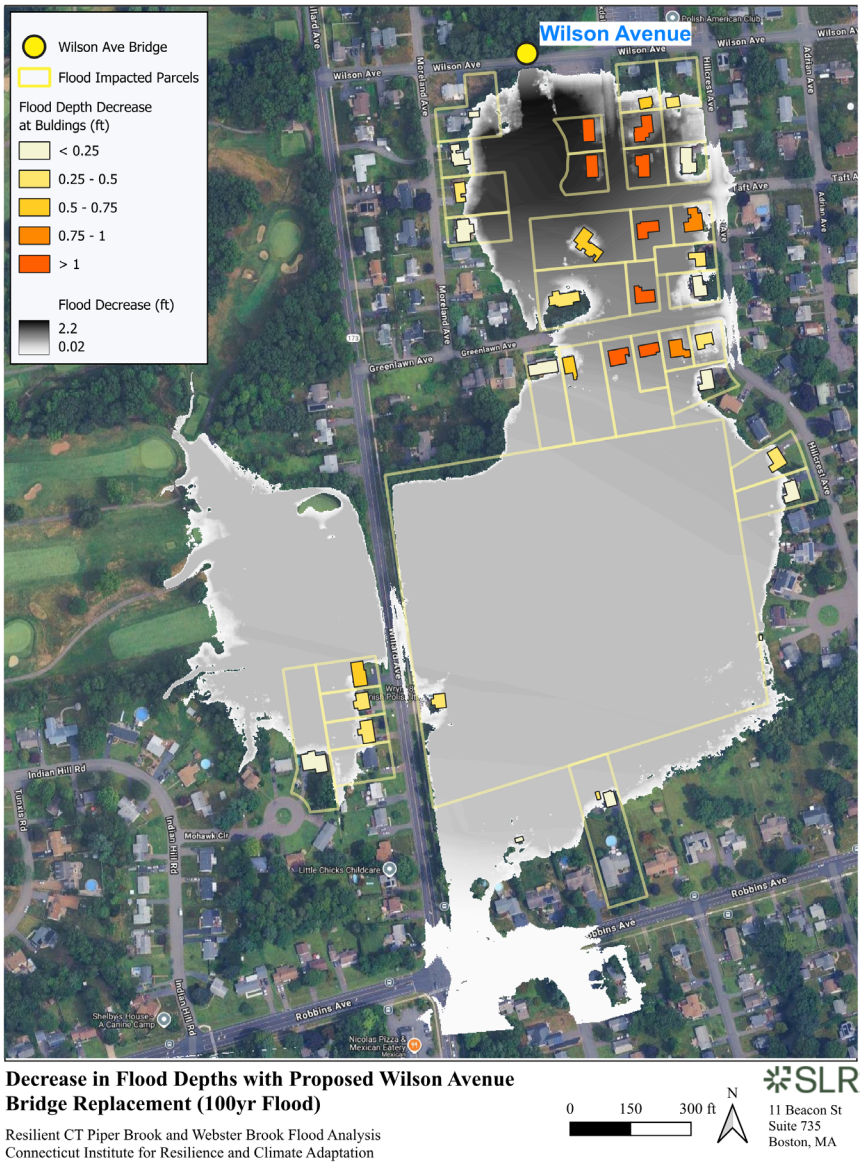


Figure 8: Impacted buildings upstream of Wilson Avenue bridge

In addition to reducing property damage from recurring flood events, the new bridge would improve structural performance and longevity compared to the existing aging structure. The bridge replacement would protect the roadway from erosion and structural wear caused by overtopping and high-velocity flows during flood events, reducing long-term maintenance costs for the Town of Newington. The project would also maintain critical road connectivity during and after storm events by preventing road closures due to flooding or structural failure.

Implementation Considerations

Because the existing bridge does not cause significant floodwater storage, there is low concern for negative downstream impacts. The project would remove an existing hydraulic constriction, allowing the natural floodplain to function more effectively without redirecting or increasing flood flows to downstream properties.

4.2 Coles Avenue

Existing Conditions and Flooding Issues

Coles Avenue in Newington experiences recurring roadway flooding and overtopping caused by an undersized culvert crossing that restricts the flow of Piper Brook. The existing crossing consists of a three-barrel corrugated metal pipe (CMP) culvert that is structurally undersized for the hydraulic capacity required during storm events (**Figure 9**). Advisory Committee members identified the Coles Avenue crossing as a problem area where the triple pipe configuration collects debris, causing blockages and exacerbating flood conditions.

Figure 9: Existing three-barrel pipe arch culvert at Coles Avenue

The culvert's susceptibility to sediment buildup and debris accumulation (including branches, leaves, and other material carried by stormwater) creates hydraulic constrictions that reduce flow capacity and elevate upstream water levels. When the culvert openings become partially or fully blocked, floodwaters overtop Coles Avenue, disrupting traffic, threatening roadway integrity, and creating safety hazards for motorists and residents.

While the immediate impact of flooding is roadway overtopping, the upstream backwater effects may also contribute to elevated water surface elevations in the surrounding residential areas. Advisory Committee members emphasized that addressing this crossing is essential for reducing both the frequency of road closures and the maintenance burden on the Town of Newington.

Proposed Mitigation Measure

To address the chronic flooding and maintenance issues at Coles Avenue, SLR recommends replacing the existing three-barrel CMP culvert with a concrete box culvert designed to provide adequate hydraulic capacity and resist debris accumulation (**Figure 10**). Based on hydraulic modeling, the proposed box culvert would have dimensions to optimize flow conveyance. Approximate dimensions of the existing culverts and the proposed culvert dimensions are given in **Table 4** below.

Table 4: Approximate Dimensions of Existing Culverts and Proposed Culvert Dimensions

Location		Type	Span (ft)	Opening Height (ft)	Length in Direction of Flow (ft)
Coles Avenue	Approximate Dimensions of Existing Culverts	Three-Barrel CMP Culverts	18	3.5	100
	Proposed Culvert Dimensions	Concrete Box Culvert	20.0	4.0	100

The concrete box culvert design was selected for several key advantages over the existing configuration. The larger opening provides significantly greater hydraulic capacity, reducing the backwater effects that currently cause road overtopping. The streamlined rectangular opening is less prone to debris blockages compared to the multiple pipe arches, which create flow turbulence and provide numerous surfaces for debris to catch and accumulate. The reinforced concrete construction offers structural durability and longevity, reducing long-term replacement and maintenance costs.

The proposed culvert was designed to pass the 100-year flood, span approximately 1.25 times bankfull width of the channel, provide adequate freeboard to prevent overtopping during the 100-year flood event, and ensure the structure can pass accumulated debris without significant flow restriction. Box culvert dimensions were determined through iterative hydraulic modeling to eliminate the bottleneck created by the existing undersized crossing while remaining feasible for roadway reconstruction.

Figure 10: Concept design for proposed culvert replacement at Coles Avenue

Flood Reduction Benefits

Hydraulic modeling demonstrates that replacing the Coles Avenue culvert would lower water surface elevations and significantly reduce the frequency of road overtopping during storm events. Hydraulic analysis indicates that flood depths on Coles Avenue could decrease by up to 0.7 feet, with the most significant improvements occurring during the more frequent 2-year, 5-

year, and 10-year flood events that currently cause nuisance-level roadway flooding. The proposed culvert replacement could also provide measurable flood reduction benefits for the surrounding residential area upstream of the crossing, reducing the risk of property damage and potentially removing some structures from regulatory floodplain designations.

Table 5: Road Flooding at Coles Avenue (Newington) Under Existing Conditions and Proposed Conditions

Return Period	Headwater Elevation (ft)		
	Existing Conditions	Sediment Removal	Upgrade Box Culvert
10-year	**83.4**	**82.8**	**83.1**
50-year	**85.6**	**84.8**	**84.9**
100-year	**85.8**	**85.5**	**85.6**
500-year	**86.2**	**86.1**	**86.1**

Note: Road overtopping occurs at 85.1 feet headwater elevation, as indicated by values in red.

An equally important benefit of the proposed culvert replacement is the elimination of chronic debris accumulation and the associated maintenance burden. The current three-barrel pipe arch configuration requires frequent inspection and clearing after storm events to prevent blockages from compromising hydraulic capacity. The larger, streamlined box culvert design would allow debris to pass through more readily, significantly reducing the frequency of maintenance interventions and the associated costs for the Town of Newington.

The project would also improve roadway safety and connectivity by reducing the frequency and duration of road closures due to flooding. Coles Avenue serves as an important local connector for residential neighborhoods, and repeated flood-related closures disrupt emergency response access, school bus routes, and daily commuting patterns. The proposed culvert upgrade would ensure that this critical roadway remains passable during storm events that currently cause overtopping.

Implementation Considerations

Advisory Committee members noted that a previous, more expensive bond request for improvements at the Coles Avenue location had been turned down by voters. This feedback highlights the importance of developing a cost-effective solution that provides substantial flood reduction benefits while remaining within a feasible budget for municipal implementation.

The project team emphasized during committee discussions that while sediment removal and debris clearing are options for maintaining the existing culvert's functionality, these measures require ongoing maintenance and do not address the fundamental hydraulic undersizing of the crossing. A culvert upgrade represents a more permanent and cost-effective long-term solution that eliminates the recurring maintenance burden and provides reliable flood reduction benefits for decades.

The relatively straightforward nature of the culvert replacement project, involving standard roadway reconstruction and drainage infrastructure installation, makes it well suited for traditional municipal bonding or state/federal grant programs focused on infrastructure resilience. The project does not require complex property acquisition, environmental permitting

beyond standard stream crossing requirements, or coordination with multiple stakeholders, enhancing its feasibility for near-term implementation.

4.3 John Downey Drive – Amtrak Railroad Crossing

Existing Conditions and Flooding Issues

The Amtrak railroad bridge and embankment crossing Webster Brook at John Downey Drive represents a primary hydraulic constraint controlling flooding throughout most of the John Downey Drive corridor. This infrastructure, which carries the active Amtrak Northeast Corridor rail line, creates a severe bottleneck that restricts natural flood conveyance and increases water surface elevations, causing widespread backwater flooding affecting multiple businesses, roadways, and properties in both New Britain and Newington.

Hydraulic modeling conducted by SLR demonstrated that the railroad bridge and embankment act as the dominant control on flooding during large storm events, particularly the 50- to 100-year floods, causing floodwaters to back up extensively upstream, inundating John Downey Drive, adjacent parking lots, and commercial properties throughout the corridor. The flooding affects businesses, including Xtreme Rides, Alvarium Beer Company, Peter Paul Electronics, and numerous other establishments that experience property damage, customer access problems, and operational disruptions.

Proposed Mitigation Measure: Modeling Analysis of Culvert Upsizing

Given the critical role of the Amtrak railroad culvert in controlling corridor-wide flooding (**Figure 11**), SLR conducted hydraulic modeling to evaluate the potential flood reduction benefits of increasing the bridge crossing capacity at this crossing. The modeling simulated removal of the railroad crossing as a proxy for substantially upsizing the bridge to provide adequate hydraulic capacity for Webster Brook flows. This modeling approach allowed the project team to quantify the maximum potential benefits achievable by addressing the railroad bottleneck, demonstrating what flood reduction could be realized if the railroad infrastructure were improved.

The modeling exercise was not intended to propose a specific design for railroad bridge replacement – which would require extensive coordination with Amtrak, detailed engineering analysis, and consideration of railroad operational and safety requirements – but rather to establish the technical evidence demonstrating the magnitude of flooding caused by the existing undersized crossing. By modeling the scenario with the railroad constraint removed, the analysis provides clear documentation of how the existing railroad infrastructure contributes to flooding and the substantial community benefits that could be achieved through improvements.

Figure 11: John Downey Drive railroad crossing

Flood Reduction Benefits

Hydraulic modeling with the railroad embankment removed (simulating an upsized bridge crossing) demonstrated dramatic flood reduction benefits throughout the John Downey Drive corridor. Model results show significant depth reductions across the affected area, with water surface elevations lowered by multiple feet in some locations during major (100-year) storm events (**Figure 12**). These flood depth reductions would substantially reduce property damages,

improve roadway access and safety, and protect commercial operations from the recurring disruptions that currently plague the corridor.

The modeling results demonstrated that addressing the railroad bottleneck would reduce flooding, not only immediately upstream of the crossing but far upstream, affecting many businesses and properties along John Downey Drive that currently experience flooding. Businesses would see reduced parking lot flooding, improved customer access, and decreased property damage during large storm events. The roadway itself would remain passable during some storms that currently cause overtopping and closures, maintaining critical access for emergency vehicles, deliveries, and daily traffic.

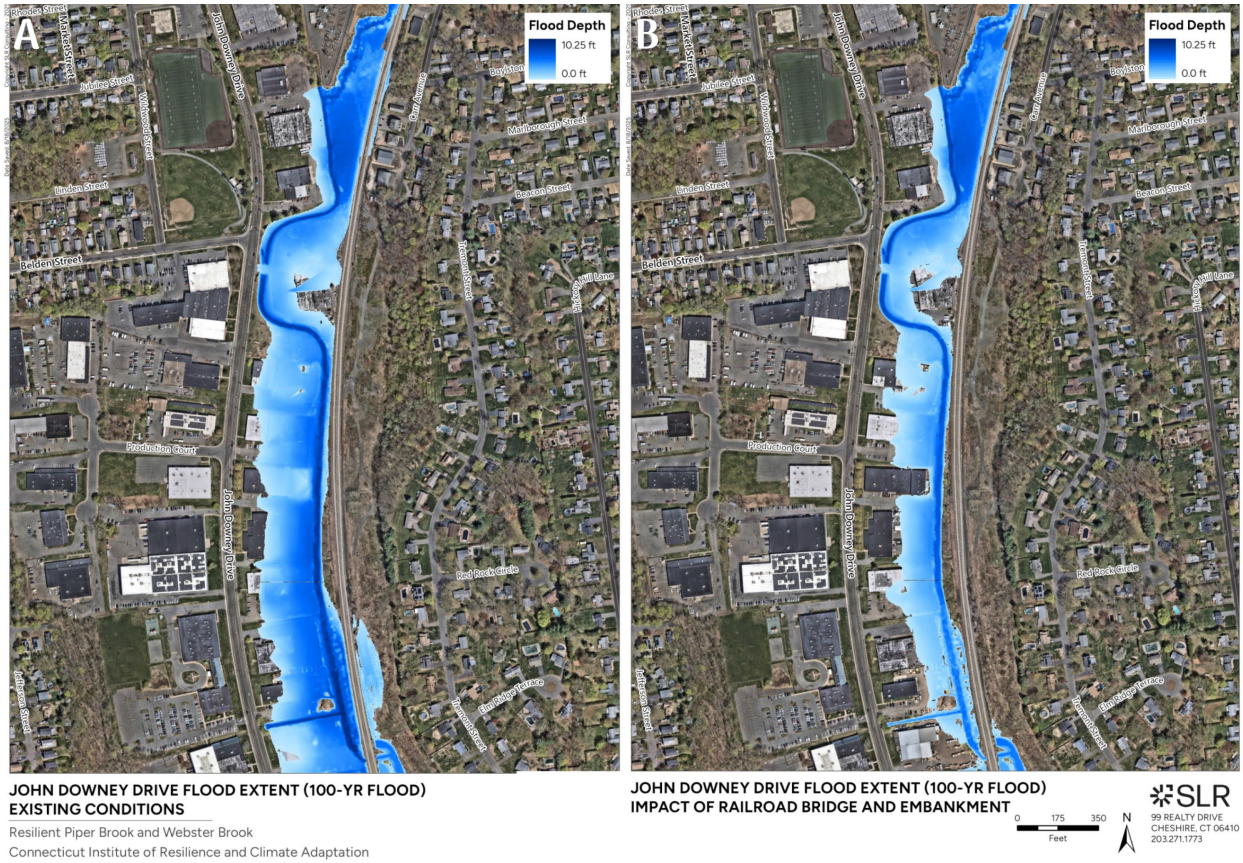


Figure 12: Water depth for 100-year Flood for A) existing conditions and B) with modeled railroad bridge replacement

Implementation Considerations

The most significant implementation challenge for addressing flooding caused by the Amtrak railroad crossing are the challenges of coordinating infrastructure improvements with the railroad company. Amtrak, as the owner and operator of the Northeast Corridor rail line, maintains control over any modifications to railroad infrastructure, including culverts and embankments. Advisory Committee members noted that engaging with Amtrak on infrastructure modifications can be challenging due to concerns about construction impacts on rail operations, liability for downstream flooding attributed to railroad infrastructure, incurred financial burdens, navigating jurisdictional complexities, and the railroad's limited responsiveness to local flooding issues.

Despite these challenges, Advisory Committee members emphasized that the technical analysis provided by this study is essential for initiating conversations with Amtrak about long-term solutions. The municipalities can use this technical documentation to engage state transportation officials and congressional representatives in advocating for railroad cooperation, document the public safety and economic impacts of railroad infrastructure on the community, establish the technical basis for potential future regulatory or legal actions, and support applications for federal funding programs that could incentivize railroad participation through cost-sharing arrangements.

In the interim, municipalities should pursue the implementable local improvements at properties like Xtreme Rides, Alvarium Beer Company, and other locations along the corridor. These projects provide meaningful flood reduction for frequent events and can proceed immediately without railroad coordination, securing near-term benefits while longer-term railroad discussions continue. Implementing local improvements first may strengthen the case for railroad action by demonstrating that municipalities have addressed all feasible local contributions to flooding and that remaining flood problems are attributable to railroad infrastructure.

4.4 John Downey Drive – Xtreme Rides

Existing Conditions and Flooding Issues

The Xtreme Rides property on John Downey Drive in New Britain experiences recurring flooding that severely impacts business operations and revenue. The site is located within the broader John Downey Drive corridor, which Advisory Committee members consistently identified as one of the most problematic flooding areas in the region. The flooding affects multiple businesses along this corridor, causing property damage and business disruptions severe enough that businesses relocated from the area due to chronic flood issues.

Figure 13: Hardened channel at Xtreme Rides

At the Xtreme Rides property specifically, flooding is caused by a combination of a hardened, constrained channel that restricts natural floodwater conveyance (**Figure 13**) and an undersized twin box culvert crossing at the driveway entrance (**Figure 14**). During storm events, the inadequate hydraulic capacity of the culvert creates backwater effects that flood the parking lot, making the facility inaccessible to customers and forcing business closures. The hardened channel banks, forcing water into a narrower channel than in surrounding natural reaches, prevent the natural expansion of floodwaters and exacerbate flooding severity.

Field observations and participant feedback from the April 2025 public open house confirmed that flooding occurs in the side parking lots of Xtreme Rides, although the building itself remains dry. The parking lot flooding creates access problems for customers and can directly impact revenue as potential customers cannot reach the facility during and immediately following storm events. The economic impacts extend beyond Xtreme Rides to affect upstream and nearby businesses, particularly Peter Paul

Electronics, whose storm drainage system is compromised by elevated water levels caused by the undersized culvert crossing at Xtreme Rides.

While the culvert at Xtreme Rides is a significant contributor to flooding, hydraulic modeling revealed that the broader John Downey Drive corridor flooding is primarily controlled by the downstream Amtrak railroad culvert and embankment during large storm events. During the 100-year flood, the effects of the downstream railroad culvert extend beyond the Xtreme Rides culvert. However, for more frequent, nuisance-level flooding (2- to 10-year events), local culverts and site features, including the Xtreme Rides crossing, are the dominant controls on flood elevations. This means that improvements at Xtreme Rides would provide measurable benefits for the frequent flood events that most commonly disrupt business operations, even though they cannot fully address the large-scale flooding controlled by the railroad infrastructure.

Figure 14: Twin box culverts at Xtreme Rides

Two mitigation measures were explored for the Xtreme Rides priority site (**Figure 15**) and include 1) replacing the twin box culvert with a new bridge and widening the hardened channel, and 2) property buyout and returning the area to a natural floodplain. Each of these mitigation measures is described below.

Proposed Mitigation Measure 1: Bridge Replacement and Channel Widening

This recommended mitigation measure at Xtreme Rides includes replacing the existing twin box culverts with a new bridge and widening the channel along the eastern bank to accommodate the new bridge structure. Based on hydraulic modeling conducted by SLR, the proposed bridge dimensions were determined through analysis to provide adequate hydraulic capacity to significantly reduce backwater effects during the storm events that most frequently cause operational disruptions. Approximate dimensions of the existing culverts and the proposed bridge dimensions are given in **Table 6** below.

Table 6: Approximate Dimensions of the Existing Bridge and the Proposed Bridge Dimensions

Location		Type	Span (ft)	Opening Height (ft)	Length in Direction of Flow (ft)
Driveway at Xtreme Rides	Approximate Dimensions of Existing Bridge	Twin Box Culvert	20.0	4.2	45
	Proposed Bridge Dimensions	Bridge	50.0	5.5	28

The bridge design was selected over culvert replacement for several important reasons. A bridge structure eliminates the flow constriction created by the existing twin box culverts, allowing floodwaters to pass through with minimal hydraulic resistance. The larger opening reduces turbulence, decreases the likelihood of debris accumulation, and lowers upstream water surface elevations. Although the western bank of the channel is constrained by John Downey Drive, the proposed channel widening along the eastern bank further enhances flood conveyance by providing additional cross-sectional area for floodwater.

The proposed bridge replacement was designed to pass the 100-year flood, span approximately 1.25 times bankfull width of the channel, provide adequate freeboard to prevent overtopping during the 100-year flood event, and ensure the structure can pass accumulated debris without significant flow restriction. The proposed improvements were designed to work within these physical constraints while maximizing flood reduction benefits.

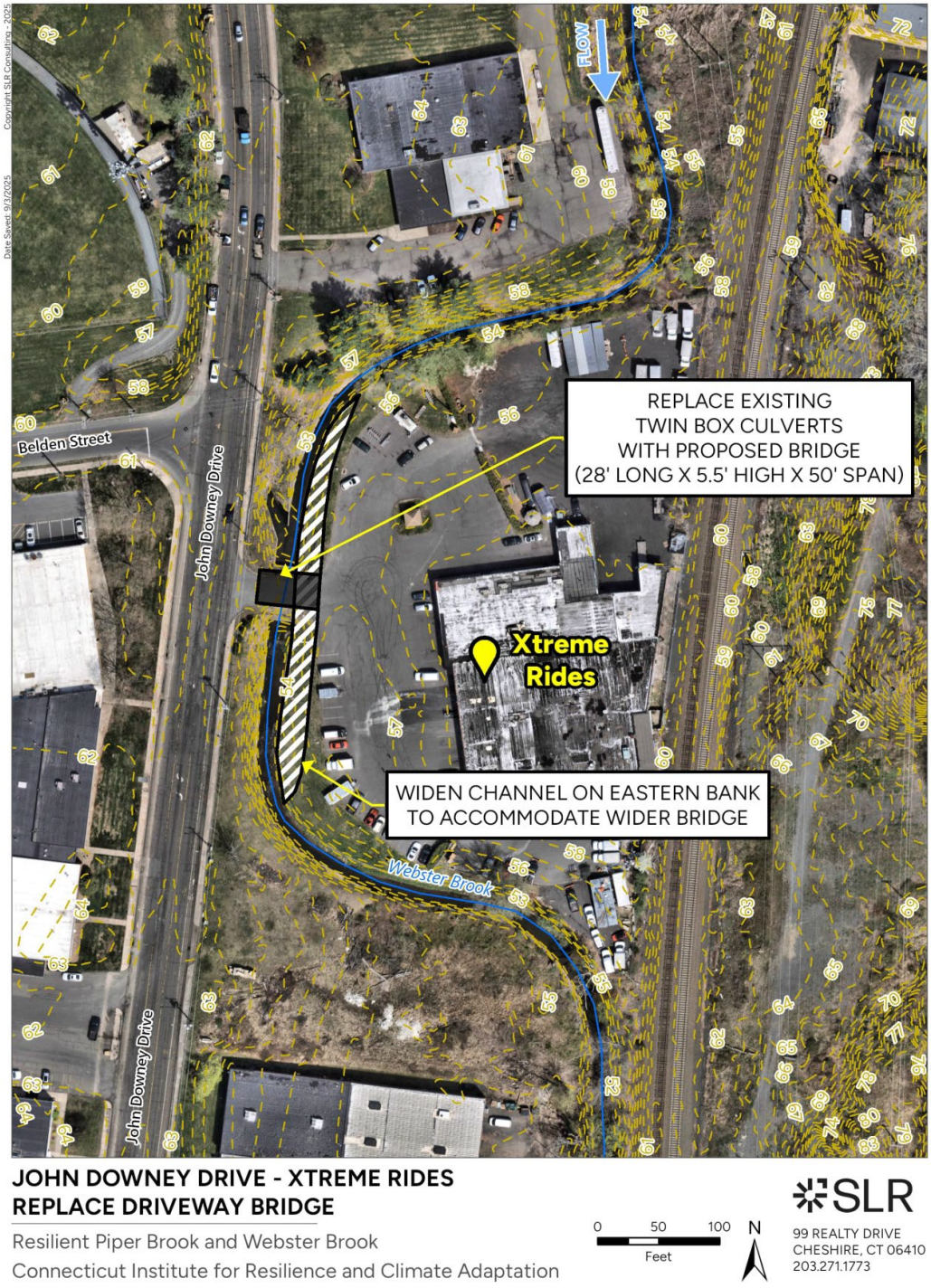


Figure 15: Concept design for Xtreme Rides bridge replacement and channel widening

Flood Reduction Benefits: Bridge Replacement and Channel Widening Option

Hydraulic modeling demonstrates that the proposed bridge replacement and channel widening would provide substantial flood reduction benefits for Xtreme Rides and surrounding businesses. SLR's analysis indicates that flood depths on the Xtreme Rides property could be reduced by up to 1.5 feet during the 50-year storm event and by approximately 0.75 feet during

the 10-year event (**Figure 16**). These depth reductions are significant enough to substantially reduce parking lot inundation frequency, improve customer access during storm events, and reduce business interruptions caused by flooding.

The flood reduction benefits extend beyond the Xtreme Rides property itself. Modeling showed that water surface elevation reductions of approximately 0.5 feet would benefit upstream businesses, including Peter Paul Electronics, which experiences flooding when stormwater drainage systems back up due to elevated water levels in Piper Brook. By lowering water surface elevations at the Xtreme Rides crossing, the proposed bridge could improve drainage for connecting storm drainage systems in the vicinity, reducing basement flooding and property damage at upstream commercial properties.

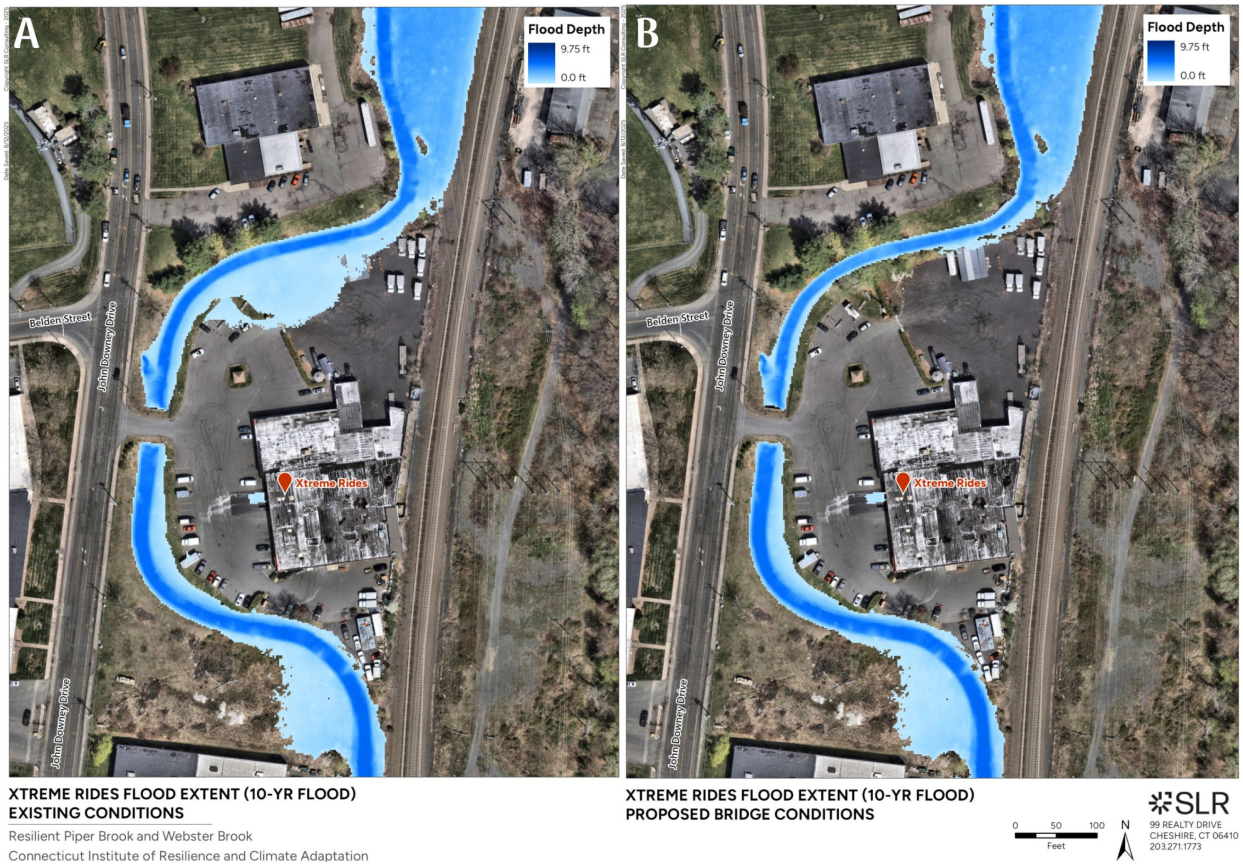


Figure 16: Water depth for 10-year flood for A) existing conditions and B) proposed measures

The improvements would enhance business access and safety for customers during flood events, reducing revenue losses caused by parking lot flooding and facility inaccessibility. For Xtreme Rides, which relies on customer access for operations, the ability to remain open and accessible during the frequent 2- to 10-year storm events represents a substantial economic benefit. The enhanced drainage would also protect building foundations and reduce long-term maintenance costs associated with repeated flood exposure.

An important technical finding from Advisory Committee discussions is that while the Xtreme Rides improvements provide localized benefits, they do not strongly interact with other proposed culvert replacements in the John Downey Drive corridor. Modeling showed that benefits are

mostly localized because the crossings are spaced too far apart for effects to propagate cumulatively. This means the project can be implemented independently without requiring coordination with other sites, although combined implementation would provide additive (although not synergistic) benefits throughout the corridor.

Proposed Mitigation Measure 2: Property Buyout and Floodplain Conversion

As an alternative to infrastructure improvements described in Measure 1 above, SLR evaluated a potential property buyout of the Xtreme Rides parcel, which would involve acquiring the property, removing structures, and restoring the entire site back to a functional floodplain. This alternative emerged from Advisory Committee discussions about the challenges of addressing flooding in the John Downey Drive corridor.

Under the property buyout alternative, the Xtreme Rides property would be converted to open space, with the hardened channel banks removed and a more natural floodplain restored. The parking lot would be removed or lowered to grade, and the site would be allowed to convey floodwaters naturally during storm events. This approach would eliminate the existing property's vulnerability to flooding while creating floodwater conveyance that benefits upstream and downstream businesses.

Flood Reduction Benefits: Property Buyout Option

Hydraulic modeling indicated that the property buyout and floodplain conversion alternative would offer similar flood reduction benefits to the bridge replacement option for the surrounding area. Both alternatives provide comparable water surface elevation reductions for upstream properties and with the potential to improve drainage for connected storm systems. The buyout option has the additional advantage of permanently removing a flood-vulnerable commercial property from the floodplain, eliminating future flood damage costs and flood insurance requirements for that parcel.

However, the buyout alternative also presents distinct challenges and trade-offs. It requires willing participation from the property owner and involves higher upfront acquisition costs compared to infrastructure improvements. The approach permanently removes a commercial property from the tax base and eliminates the economic activity and employment associated with the business. Funding for property acquisitions can be more complex than traditional infrastructure grants, although programs such as FEMA's Hazard Mitigation Grant Program (HMGP) and FMA do support buyouts for flood-prone properties.

Advisory Committee members discussed the concept of buyouts in the John Downey Drive corridor, noting that while large-scale storage basins would fill too quickly during major events to be effective, property acquisition could serve dual purposes – reducing future flood damages and enabling channel restoration improvements that would benefit remaining properties. The hydraulic modeling confirmed that the buyout alternative would allow for significant flood risk mitigation by removing buildings and lowering the parking lot, although this involves major structural changes and willing property owner participation.

Implementation Considerations

The appropriate mitigation strategy for the Xtreme Rides site depends on multiple factors, including the interests and priorities of the property owner, funding availability, and the City of New Britain's economic development objectives. The bridge replacement option preserves the existing business and provides immediate flood reduction benefits through infrastructure improvements, making it well suited for traditional municipal capital improvement programs. This

approach aligns with economic development goals by protecting an existing commercial property and maintaining the tax base.

The property buyout alternative offers a permanent solution that eliminates flood vulnerability for the parcel while creating long-term flood benefits for the corridor. This approach requires willing seller participation and is best pursued through FEMA mitigation grant programs that specifically fund acquisitions and demolitions of flood-prone properties. The buyout option may be particularly attractive if the property owner is interested in relocating due to chronic flooding impacts or if the City prioritizes long-term floodplain management over short-term tax revenue preservation.

A critical context for both alternatives is the dominant role of the Amtrak railroad infrastructure in controlling corridor-wide flooding for large storms. Any permanent resolution of flooding in the John Downey Drive corridor will ultimately require addressing the railroad crossing bottleneck; however, the Xtreme Rides bridge replacement and property buyout measures offer meaningful benefits for the more frequent nuisance floods.

4.5 John Downey Drive – Alvarium Beer Company

Existing Conditions and Flooding Issues

Figure 17: Parking lot at Alvarium Beer Company

Alvarium Beer Company, located at 365 John Downey Drive in New Britain, experiences frequent nuisance-level flooding that significantly disrupts business operations and results in measurable revenue losses. The brewery is situated within the John Downey Drive corridor, which has been consistently identified by Advisory Committee members, municipal staff, and affected business owners as one of the most problematic flooding areas in the region.

During storm events, the brewery's rear parking lot floods, making portions of the facility inaccessible to customers (**Figure 17**). According to the brewery owner, customers frequently turn around and leave when they encounter flooded parking areas, directly impacting business revenue. The brewery has documented this problem with a 24/7, 180-degree camera that captures videos of customers arriving, seeing the flooded parking lot, and departing without entering the establishment. Each customer lost represents immediate revenue loss, and the cumulative impact of frequent flooding events creates substantial economic hardship for the business.

Beyond customer access issues, the flooding disrupts brewing operations themselves. When flooding occurs, brewery staff may be sent home, halting beer production and creating labor and production scheduling challenges. The facility's floor elevation is reportedly a few inches too low to qualify for an elevation certificate, complicating flood insurance and mitigation options.

The frequent nuisance flooding at Alvarium is caused by multiple interrelated factors. The primary driver during large storm events (50- to 100-year floods) is the downstream Amtrak

railroad culvert and embankment, which acts as a major hydraulic bottleneck for the entire John Downey Drive corridor. However, hydraulic modeling revealed that for the more frequent 2- to 10-year flood events that most commonly disrupt business operations, local site features, including channel narrowing due to bedrock and adjacent development, play a more significant role than the railroad infrastructure. These smaller floods, while less severe than major events, occur multiple times per year and cause the repeated business interruptions that cumulatively create the most significant economic impacts.

The constrained channel at the Alvarium site, with hardened banks and limited floodplain connectivity, prevents natural floodwater conveyance and exacerbates parking lot inundation. The adjacent storm drainage system experiences backups during flood events, with water reportedly bubbling up from manholes even when the brook itself is not visibly overtopping. This indicates that the site's flooding is a complex interaction between direct overland flow from Piper Brook and compromised stormwater drainage capacity caused by elevated water levels in the receiving watercourse.

Proposed Mitigation Measure: Floodplain Bench

To address the frequent nuisance flooding that disrupts operations at Alvarium Beer Company, SLR recommends creating a floodplain bench to provide additional area for floodwaters to spread horizontally during storm events (**Figure 18**). The proposed floodplain bench would be constructed in the rear portion of the Alvarium parking lot, on the western bank of Webster Brook. The bench would extend the functional floodplain laterally, allowing floodwaters to spread across a larger area rather than being constrained within the narrow channel (**Figure 19**). This design mimics natural floodplain function, where rivers spread out horizontally during high flows rather than rising vertically within confined channels. The bench would be vegetated with flood-tolerant grasses or native plants, creating a green space amenity that remains dry during normal conditions while conveying floodwater flows that would otherwise flood the parking lot during storm events.

Physical constraints at the Alvarium site limit the extent of floodplain bench that can be constructed. The western side of the channel is limited by bedrock and the Amtrak railroad embankment, preventing any channel expansion in that direction. On the eastern side of the channel, parking needs for the business constrain how far the bench can extend.

The floodplain bench concept was designed specifically to target the frequent 2- to 10-year flood events that most commonly cause business disruptions at Alvarium. Hydraulic modeling showed that the bench would be most effective for these smaller, recurring floods, with limited impact during larger events when the downstream railroad infrastructure becomes the dominant hydraulic control. This targeted approach recognizes that while the bench cannot solve corridor-wide flooding during major storms, it can meaningfully reduce the nuisance flooding that creates the most frequent operational and economic impacts for the brewery.

Figure 18: Concept Design: Alvarium Beer Company floodplain bench

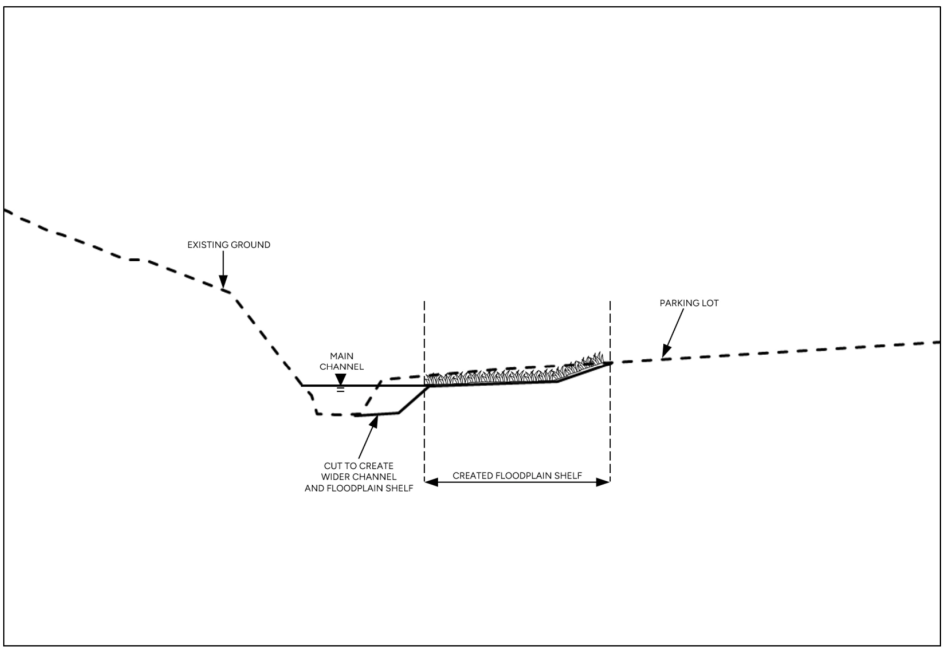


Figure 19: Alvarium Beer Company floodplain bench cross section

Flood Reduction Benefits

Hydraulic modeling conducted by SLR indicates that the proposed floodplain bench could reduce flood depths in the Alvarium parking lot by up to 0.5 feet during the 10-year storm event (**Figure 20**). The flood reduction benefits would be most pronounced for the 2- to 10-year storm events, which occur with sufficient frequency to create recurring problems for business operations. By reducing the severity of smaller, recurring floods, the floodplain bench would help prevent the business interruptions that have led to customer losses and halted beer production. Maintaining customer access during the frequent storm events that currently cause parking lot flooding would protect revenue streams and reduce the economic burden of repeated business closures.

Figure 20: Water depth for 10-year flood for A) existing conditions and B) proposed measures

An additional benefit of the floodplain bench approach is the creation of green space amenity adjacent to the brook. Rather than simply maintaining hardened parking lot surfaces that contribute to stormwater runoff, the vegetated bench would provide aesthetic value, potential outdoor seating areas with picnic tables, and improved stormwater infiltration during normal conditions. The new floodplain bench could be promoted as a green space amenity with trails or tables, reframing the parking conversion as an amenity rather than simply a parking loss.

The floodplain bench concept also serves as a demonstration project for distributed green infrastructure approaches along the John Downey Drive corridor. If Alvarium and other property owners along the corridor were willing to participate in coordinated floodplain restoration, a series of benches at multiple properties could provide cumulative flood reduction benefits along the corridor.

Implementation Considerations

One concern raised was the business currently loses parking spaces intermittently during floods, whereas the proposed floodplain bench would result in permanent loss of those parking spaces by converting paved parking to vegetated floodplain. Advisory Committee members noted that this could be a "difficult sell" to the property owner as it trades temporary, flood-related parking loss for permanent parking reduction. The project team recommended working with the brewery owner to determine whether parking can be reconfigured elsewhere on the property to maintain overall capacity, whether shared parking arrangements with adjacent

properties are feasible or whether the reduction in parking spaces is acceptable given the flood protection and green space amenity benefits.

Another implementation consideration raised during Advisory Committee discussions is whether water backed up in the adjacent storm drainage system would negate the floodplain bench's benefits. The site experiences flooding both directly from Webster Brook overtopping and from stormwater system backups, with manholes reportedly bubbling during flood events. Addressing the brook flooding without improving storm drainage connectivity could result in continued flooding from the storm system even if brook levels are reduced. A comprehensive solution may require both the floodplain bench to lower brook elevations and storm drainage improvements to prevent backups.

Similar to Xtreme Rides, the downstream Amtrak railroad culvert and embankment pose a primary hydraulic constraint during large storm events affecting many John Downey Drive corridor businesses, including Alvarium Beer Company. Any permanent resolution of flooding in the John Downey Drive corridor will ultimately require addressing the railroad crossing bottleneck; however, the proposed floodplain bench at the Alvarium parking lot can offer meaningful benefits to the business for the more frequent nuisance floods.

The project could also serve as a model for other property owners along the corridor to participate in distributed flood mitigation through coordinated floodplain restoration. The cumulative benefits of multiple small-scale green infrastructure projects could meaningfully improve flood resilience for the John Downey Drive business district, even if individual projects provide only localized benefits.

4.6 Veterans Stadium Willow Brook Park

Existing Conditions and Flooding Issues

Veterans Stadium Willow Brook Park, located on the New Britain/Berlin municipal boundary, experiences significant recurring flooding that impacts recreational facilities, parking areas, and surrounding businesses and neighborhoods. The complex includes baseball and soccer fields, a stadium, and associated parking lots, all of which are vulnerable to flooding from Willow Brook. Advisory Committee members and municipal staff consistently identified this location as a chronic flooding problem area that disrupts community recreation and stadium events.

Figure 21: Existing arch bridge at Veterans Stadium Willow Brook Park

During storm events, the parking lot floods rapidly, forcing event cancellations and creating safety hazards for visitors. Even during less intense storms, flooding occurs quickly enough to catch event attendees and facility users off guard. The baseball fields and soccer fields experience frequent inundation, with field flooding reported to occur during relatively minor storm events. Hydraulic modeling confirmed that while local topography limits the extent of flooding in some areas, the site's low-lying position adjacent to the watercourse makes it inherently flood prone. The fields are equipped with underdrains, but these systems become

overwhelmed during storm events when water surface elevations in the adjacent brook exceed drainage capacity.

The flooding at Veterans Stadium Willow Brook Park is caused by multiple factors. An undersized arch bridge crossing upstream (**Figure 21**) creates a hydraulic bottleneck that elevates water surface levels and causes backwater effects extending to the park and stadium area. The undersized bridge opening restricts natural flow conveyance, causing floodwaters to back up and spread across the low-lying recreational areas.

Flooding impacts extend beyond the immediate park and stadium facilities. During the April 2025 public open house, participants reported severe flooding around the New Britain Road crossing, including inundation of Burger King and neighborhoods south of State Highway 571 (Route 175). These downstream impacts demonstrate that flooding in this area affects both public recreational amenities and adjacent private properties and businesses.

Field visit observations and hydraulic modeling conducted during the study indicated that while complete flood elimination is unrealistic given the site's topography and proximity to the watercourse, targeted improvements could meaningfully reduce the frequency and severity of flooding. The most significant flooding impacts occur during the frequent 2-year and 5-year storm events that disrupt park use and event operations multiple times per year, rather than only during rare major floods.

Proposed Mitigation Measures

To alleviate the frequent nuisance flooding at Veterans Stadium Willow Brook Park, SLR recommends a combination of infrastructure improvements and green infrastructure measures designed to work in concert to reduce flood elevations and enhance drainage capacity. The recommended mitigation strategy shown in **Figure 22** includes (1) replacing or removing the restrictive arch bridge upstream and (2) installing a floodplain bench adjacent to the baseball fields.

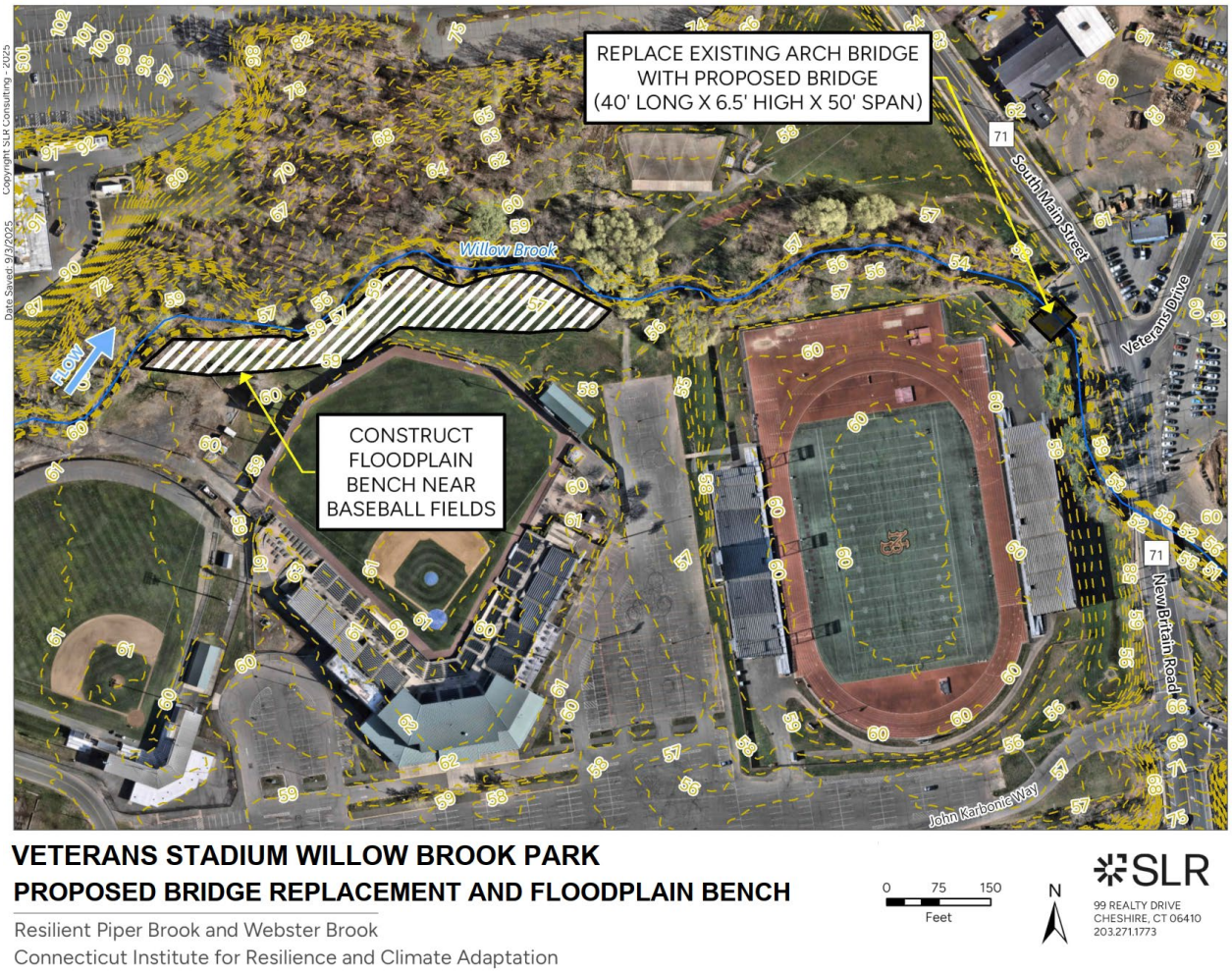


Figure 22: Concept design for Veterans Stadium Willow Brook Park

Bridge Replacement Option

Hydraulic modeling demonstrated that replacing the undersized arch bridge with a new structure would significantly improve flood conveyance and lower water surface elevations affecting the park facilities. The proposed replacement bridge dimensions were determined through iterative hydraulic modeling to eliminate the flow constriction while accommodating roadway geometry and structural requirements. Approximate dimensions of the existing bridge and the proposed bridge dimensions are given in **Table 7** below.

Table 7: Approximate Dimensions of the Existing Arch Bridge and the Proposed Bridge Dimensions

Location		Type	Span (ft)	Opening Height (ft)	Length in Direction of Flow (ft)
Access Road at Veterans Park	Approximate Dimensions of Existing Bridge	Arch Bridge	21.0	6.2	40
	Proposed Bridge Dimensions	Bridge	50.0	6.5	40

The bridge replacement design provides adequate hydraulic capacity to pass design storm flows without creating significant backwater effects. The larger opening reduces flow turbulence and decreases the likelihood of debris accumulation that can further compromise capacity during storm events. By lowering the hydraulic grade line at this crossing, the replacement bridge would reduce upstream flood elevations affecting the parking lot and recreational fields.

The proposed bridge was designed to pass the 100-year flood, span approximately 1.25 times bankfull width of the channel, provide adequate freeboard to prevent overtopping during the 100-year flood event, ensure the structure can pass accumulated debris without significant flow restriction, and coordinate with the existing roadway alignment. The bridge replacement would disrupt stadium access during construction but would provide long-term flood reduction benefits for the high-visibility public facilities.

Bridge Removal Alternative

Given there are multiple entry points to the stadium and park, completely removing the arch bridge would provide similar flood reduction benefits to replacing it but at a significantly lower cost. Bridge removal would eliminate the hydraulic constriction entirely, allowing the watercourse to flow unimpeded through the crossing location.

The bridge removal option would involve demolishing the existing arch bridge structure, grading the channel and banks to create a smooth transition, and closing the roadway crossing permanently. This approach has substantial cost advantages over bridge replacement, eliminating the need for new structural foundations, deck construction, and associated engineering while providing equivalent hydraulic performance. Advisory Committee discussions indicated openness to this alternative given its cost-effectiveness, although a final decision would require assessment of road network impacts and municipal priorities for maintaining versus eliminating the crossing.

Floodplain Bench Installation

The second component of the recommended mitigation strategy involves installing a floodplain bench adjacent to the baseball fields. The floodplain bench would lower a portion of the existing ground surface near the stream channel, creating additional horizontal area for floodwaters to spread during storm events (**Figure 23**). This green infrastructure approach mimics natural floodplain function, allowing the watercourse to expand laterally rather than rising vertically and inundating the stadiums and parking areas. Hydraulic modeling demonstrated that floodplain benching would be most effective after addressing downstream culvert bottlenecks (specifically the restrictive arch bridge) due to backwater effects. Thus, the floodplain bench provides optimal benefits when combined with bridge improvements that address the primary hydraulic constraint.

The floodplain bench would be constructed by excavating and grading a portion of the area adjacent to Willow Brook, with the bench surface vegetated with flood-tolerant grasses or maintained as mowed turf compatible with recreational field uses. During normal flow conditions, the bench would appear as slightly lower ground that could potentially be used for passive recreation. During storm events, the bench would be inundated, giving floodwater room to spread laterally, reducing peak water surface elevations.

The Advisory Committee also suggested exploring extended floodplain benching beyond what was initially modeled, recognizing that maximizing floodplain restoration could provide additional floodwater conveyance and drainage benefits.

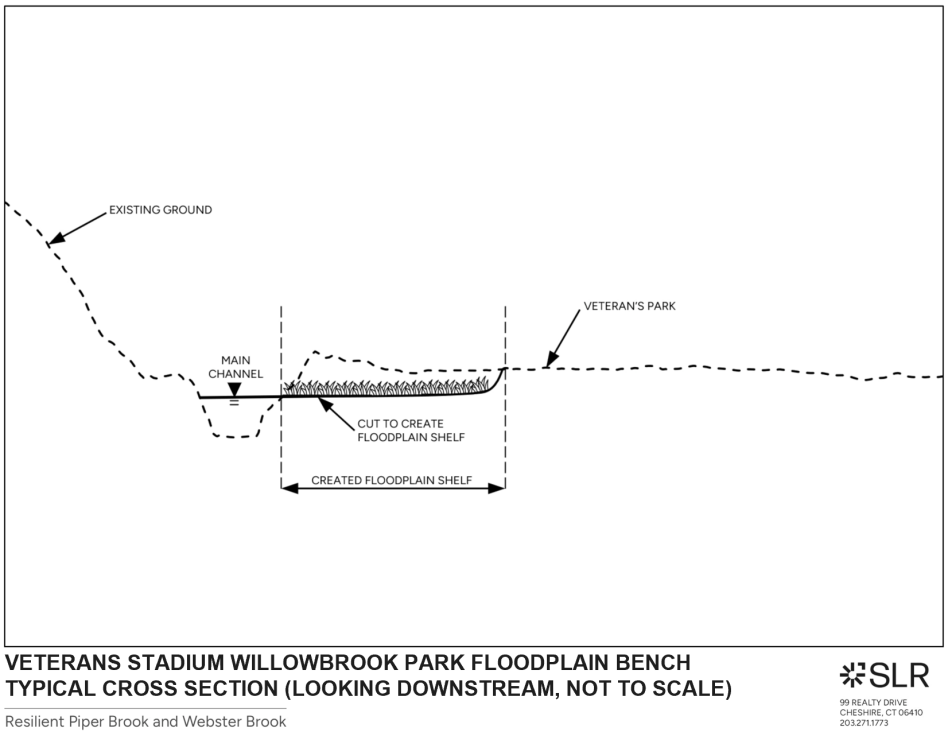


Figure 23: Floodplain bench cross section at Veterans Stadium Willow Brook Park

Flood Reduction Benefits

Hydraulic modeling demonstrates that the proposed combination of bridge replacement/removal and floodplain bench installation would provide flood reduction benefits for the park facilities and surrounding areas. The improvements would target the frequent 2-year and 5-year storm events that most commonly disrupt park use and stadium operations, addressing the nuisance flooding that creates the greatest cumulative impacts on community recreation.

SLR's analysis indicates that flood depths in the parking lot could be reduced by up to 0.5 feet during the 2-year and 5-year storm events (**Figure 24**). Even a modest flood reduction could determine whether events can proceed or must be canceled, whether vehicles are at risk of flood damage, and whether visitors can safely access the facilities. The proposed improvements would reduce the frequency and duration of field inundation, improving field availability for scheduled games, practices, and community events. The underdrains serving the fields would function more effectively when water surface elevations in the adjacent brook are lowered, enhancing drainage and reducing saturation periods that render fields unusable.

Advisory Committee discussions and public open house feedback indicated that flooding extends beyond the immediate park boundaries to affect neighboring businesses and neighborhoods. While the proposed bridge and floodplain bench primarily benefit the Veterans Stadium Willow Brook Park property, the possibility of additional floodplain benches along the channel could benefit neighboring properties.

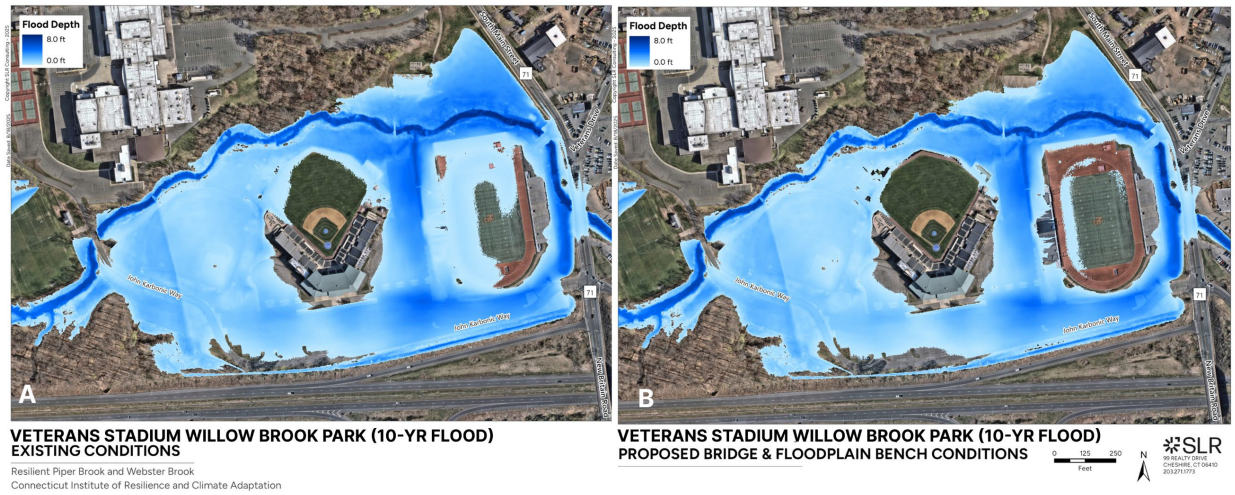


Figure 24: Water depth for 10-year flood for A) existing conditions and B) proposed bridge removal and floodplain bench

An important benefit specific to the bridge removal alternative is the cost savings compared to bridge replacement. Advisory Committee members noted that achieving similar flood reduction benefits at significantly lower cost makes bridge removal an attractive option that frees up limited municipal capital funds for other priority projects.

The floodplain bench component provides additional benefits beyond flood reduction. The restored floodplain area would enhance ecological function by reconnecting the watercourse with its natural floodplain, supporting aquatic and riparian habitat. The vegetated bench would improve water quality through infiltration and filtering of stormwater runoff from the parking lot and fields. If designed appropriately, the bench area could provide aesthetic and educational value, creating opportunities for interpretive signage about flood management and natural river processes.

Advisory Committee members discussed the inherent susceptibility of the Veterans Stadium Willow Brook Park area to flooding and acknowledged that complete flood elimination is unrealistic given the site's topography. However, the committee recognized that targeted improvements could meaningfully reduce damage and the frequency of flooding that disrupts recreational use and community events. The proposed measures strike a balance between achievable flood reduction and realistic expectations for a location that will always experience some level of flooding given its position adjacent to the watercourse.

Implementation Considerations

The project would benefit from phased implementation, with bridge improvements completed first to address the primary hydraulic bottleneck, followed by floodplain bench installation to maximize the bench's effectiveness. Advisory Committee members raised concerns about existing underground utilities that could constrain bench excavation. The presence of a sewer main along Willow Brook, potentially within the streambed, requires thorough utility mapping during the design phase to ensure the bench can be constructed without compromising critical infrastructure. Utility conflicts could necessitate design modifications such as limiting bench depth in certain areas or routing the bench around utility corridors.

Coordination with New Britain and Berlin municipal departments would be essential given the site's location on the town boundary. Both municipalities have interests in the park facilities and

would need to coordinate on funding, design, permitting, construction management, and long-term maintenance responsibilities. The project presents an opportunity for intermunicipal collaboration that could strengthen the grant application by demonstrating regional coordination and shared investment in flood resilience.

The public nature of the facilities and their high visibility in the community could generate strong public support for flood mitigation investments that protect valued recreational amenities. Demonstrating that improvements would reduce event cancellations and enhance field availability could build community backing for the project.

The broader context for Veterans Stadium Willow Brook Park flood mitigation is the need to manage community expectations about the inherent flood vulnerability of low-lying recreational areas adjacent to watercourses. While the proposed improvements would meaningfully reduce the frequency and severity of flooding, particularly for the 2-year and 5-year events that most commonly disrupt operations, the site will continue to experience some flooding during larger storm events. Effective communication with park users, municipal officials, and the broader community about what the improvements can and cannot achieve will be essential for building realistic expectations and sustained support for implementation.

4.7 Deming Road

The Existing Conditions and Flooding Issues

Deming Road in Berlin experiences recurring flooding that causes road overtopping, traffic disruptions, and impacts to nearby business and residential properties. The site is located where Webster Brook crosses under Deming Road, approximately 0.25 miles upstream of the confluence with the Mattabesset River. Municipal representatives specifically identified the Deming Road crossing of Webster Brook as a flood-prone area, noting the influence of the nearby Mattabesset River confluence on flooding conditions. The flooding impacts include frequent road overtopping during storm events, which closes Deming Road and disrupts local circulation and emergency vehicle access. A commercial building southeast of the Deming Road crossing may experience elevated flood risk, with some structures located within the 100-year floodplain. Residential properties in the upstream area also experience elevated flood levels that would be reduced if the infrastructure constraints were addressed.

Figure 26: Old railroad abutment/embankment and existing sewer line

Figure 25: Existing two-barrel culvert

Due to the proximity to the river confluence, flooding at the Deming Road crossing can be influenced by backwater effects from the Mattabesset River during high water events, creating complex hydrological conditions where both tributary flows and mainstem river levels contribute

to flooding. The FEMA flood profile and FIRM Mapping for Webster Brook include backwater effects from the Mattabesset River, which assume the Mattabesset River and Webster Brook flood events peak at the same time. This is a more conservative approach to predicting water surface elevations; however, the timing of flood peaks at this confluence will vary depending on the specific storm event.

The flooding near Deming Road is caused by two primary infrastructure constraints that together create a significant floodplain obstruction. The former railroad infrastructure crosses Webster Brook downstream of Deming Road, blocking the natural floodplain and forcing floodwaters to back up upstream (**Figure 25**). The existing two-barrel culvert at the Deming Road crossing is undersized, creating a constriction point. In addition, an abandoned railroad abutment and embankment owned by Metro Realty acts as a major barrier to natural flood conveyance (**Figure 26**). The combination of the downstream railroad embankment (which creates backwater conditions) and the undersized culvert (which provides inadequate local conveyance) results in elevated water surface elevations that overtop Deming Road during storm events and flood adjacent properties.

Hydraulic modeling for the Deming Road area assumed that the peaks of flooding on Mattabesset River and Webster Brook are not coincident and that the channel downstream of Deming Road is not influenced by backwater from the Mattabesset River. If flooding on the Mattabesset River occurs at the same time as flooding on Webster Brook, the backwater effects caused by the former railroad embankment and the undersized Deming Road crossing are still present, but backwater effects from the Mattabesset River would become the dominant factor downstream of Deming Road.

Proposed Mitigation Measures

To address flooding at Deming Road, SLR recommends two mitigation strategies shown in **Figure 27** that addresses both the undersized bridge and abandoned railroad embankment constraints. The measures can be implemented independently or in combination, with the embankment removal providing the most cost-effective flood protection and the combined approach delivering maximum benefits.

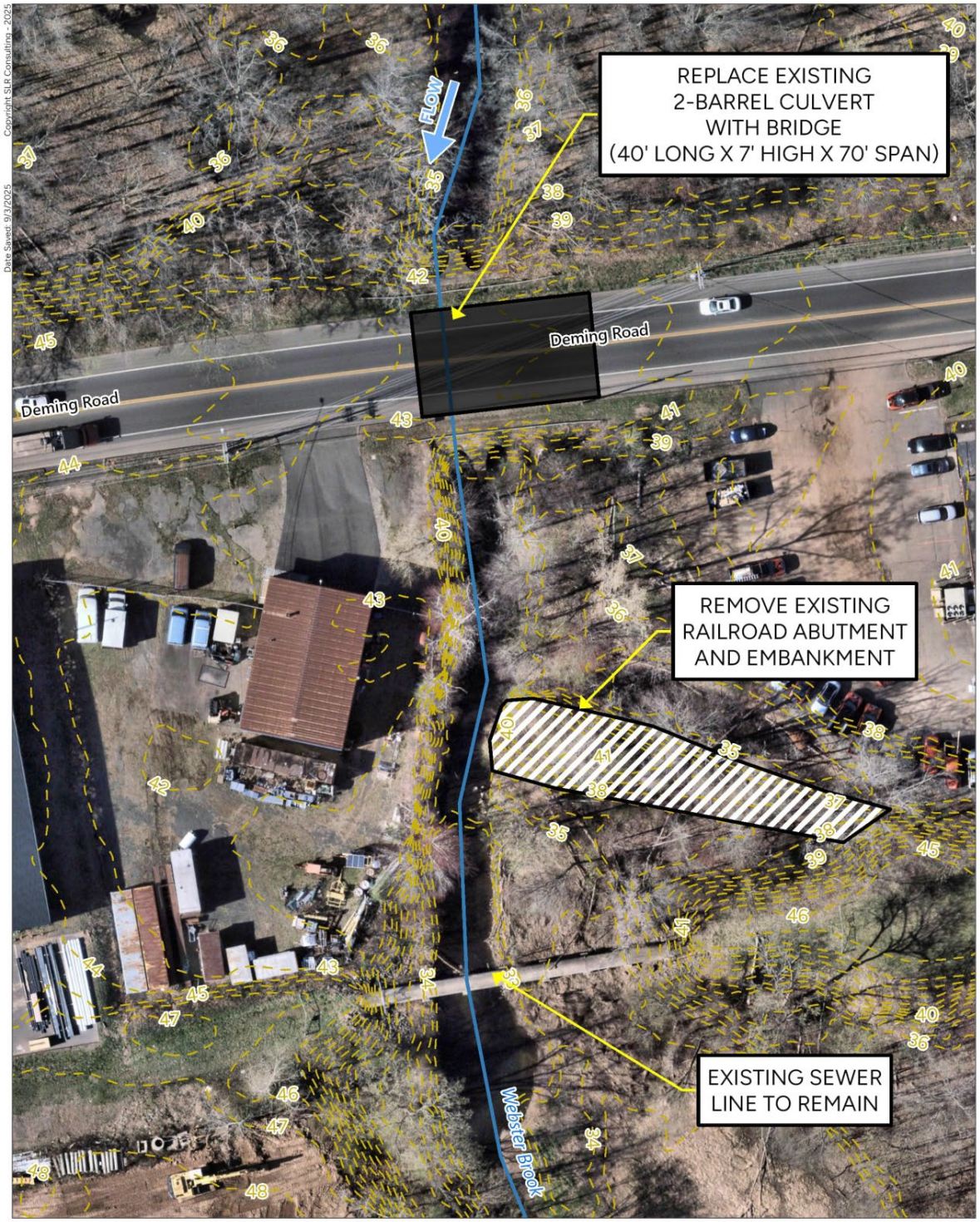


Figure 27: Concept design for Deming Road

Component 1: Abandoned Railroad Embankment Removal

This mitigation measure includes removing the abandoned railroad abutment and embankment owned by Metro Realty that crosses Webster Brook downstream of Deming Road. Hydraulic modeling demonstrated that this embankment represents a floodplain obstruction in the area, creating severe backwater effects that elevate upstream water surface elevations and contribute to flooding of Deming Road and adjacent properties.

The embankment removal would involve demolishing the abandoned railroad abutment structures, excavating the earthen embankment fill material, and restoring a natural channel profile and floodplain cross section at the former railroad crossing location. The existing sewer line that crosses Webster Brook downstream of the railroad embankment would remain in place and be protected during construction, with utility coordination required to ensure the sewer infrastructure is not compromised by embankment removal and channel restoration activities. The embankment removal would create a significant opening in what is currently a floodplain obstruction, allowing floodwaters to spread naturally across the restored floodplain rather than being constricted and forced to back up upstream.

The embankment removal alone, without any improvements to the Deming Road culvert, would provide substantial flood reduction benefits. Assuming that the Mattabesset River flood elevations are not peaking at the same time, removal of the embankment could lower upstream water surface elevations by 1 to 2 feet during the 10- to 100-year storm events, reducing road overtopping. If Mattabesset River flooding occurs at the same time as flooding on Webster Brook, the removal of the abandoned railroad embankment would still provide benefits to the upstream businesses and roadway; however, the backwater from the Mattabesset River would raise water surface elevations overall.

Component 2: Deming Road Bridge Replacement

This mitigation strategy involves replacing the existing two-barrel culvert with a bridge structure that provides adequate hydraulic capacity at the Deming Road crossing. Based on iterative hydraulic modeling, the proposed bridge dimensions were determined to eliminate the flow constriction created by the existing culvert while accommodating roadway geometry and structural requirements. The bridge will replace the sloping culverts that span nearly 15 feet along the length of Webster Brook on either side of the existing crossing. Approximate dimensions of the existing culverts and proposed bridge dimensions are given in **Table 8** below.

Table 8: Approximate Dimensions of the Existing Bridge and the Proposed Bridge Dimension

Location		Type	Span (ft)	Opening Height (ft)	Length in Direction of Flow (ft)
Deming Road	Approximate Dimensions of Existing Bridge	Twin CMP Culverts	20	7.2	85
	Proposed Bridge Dimensions	Bridge	70.0	7.0	40

The bridge design provides greater hydraulic capacity than the existing two-barrel culvert configuration, allowing floodwaters to pass through the crossing with minimal backwater effects.

The larger opening reduces turbulence, decreases the likelihood of debris accumulation, and lowers local water surface elevations even when the downstream embankment remains in place.

The proposed bridge was designed to pass the 100-year flood, span approximately 1.25 times bankfull width of the channel, provide adequate freeboard to prevent overtopping during the 100-year flood event, ensure the structure can pass accumulated debris without significant flow restriction, maintain the existing roadway alignment to minimize right-of-way impacts, and protect the existing sewer line that crosses Webster Brook at or near this location. The bridge length matches the existing road width to minimize construction impacts and costs while providing the hydraulic benefits of increased span.

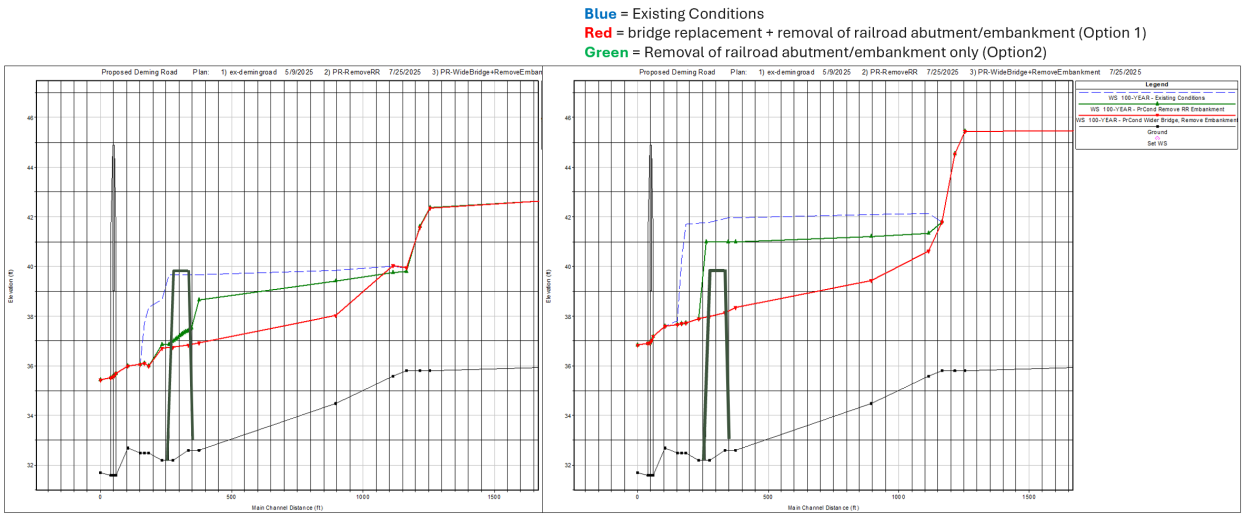
Combined Implementation Strategy

Hydraulic modeling evaluated both individual components and the combined implementation of embankment removal plus bridge replacement. Assuming that the Mattabesset River flood elevations are not peaking at the same time, combining embankment removal with resizing the Deming Road crossing yields even greater benefits, with water surface elevation reductions of up to 2 to 3 feet in some areas. This combined approach addresses both primary hydraulic bottlenecks associated with the undersized culvert and the downstream railroad embankment, maximizing flood protection for Deming Road and surrounding properties.

However, the modeling also demonstrated that the railroad embankment removal alone provides large flood reduction benefits, with the culvert replacement adding incremental improvements. This finding is important for implementation planning as a phased approach, beginning with the more cost-effective embankment removal and potentially proceeding to bridge replacement in a later phase if additional benefits are desired, could provide excellent value for investment while maintaining flexibility for budget constraints.

Flood Reduction Benefits

Hydraulic modeling conducted by SLR demonstrates that the proposed mitigation measures would provide substantial flood reduction benefits for Deming Road and the surrounding area. The analysis indicates that flood depths on Deming Road could be reduced by more than 1 foot during the 10-, 50-, and 100-year storm events, with even greater reductions possible when combining embankment removal with bridge replacement (**Figure 28**). The water surface elevations in Figure 28 assume that the Mattabesset River does not peak at the same time as Webster Brook. If the Mattabesset River creates a backwater downstream of Deming Road, the proposed alternatives would still provide reductions in water surface elevations, although water surface elevations, overall, would be higher.



10-yr recurrence interval 100-yr recurrence interval

Figure 28: Stream profiles for Deming Road measures

These flood depth reductions would help prevent road overtopping and closures during storm events, maintaining critical transportation connectivity for local residents, businesses, and emergency vehicles. Deming Road serves as an important local connector, and flood-related closures disrupt daily commuting, commercial deliveries, school bus routes, and emergency response access. Keeping the road passable during storm events that currently cause overtopping would provide substantial community benefits and reduce the economic costs of transportation disruptions.

Removing the abandoned railroad embankment alone could lower upstream water surface elevations by 1 to 2 feet during 10- to 100-year events, reducing road overtopping and potentially removing some buildings from the 100-year floodplain (**Table 4**). Commercial and residential structures currently subject to flood insurance requirements and flood risk could be removed from regulatory floodplain designations, eliminating insurance costs and improving property values.

Table 9: Water Surface Elevations for Deming Road

A. Existing Conditions	Water Surface Elevation (ft)			
Location	**10**	**50**	**100**	**500**
At Deming Road	39.7	41.5	42.0	44.3
Downstream of Deming Road	38.7	40.7	41.7	44.2

B. Removal of Railroad Abutment and Embankment	Water Surface Elevation (ft)			
Location	**10**	**50**	**100**	**500**
At Deming Road	38.7	40.5	41.0	41.9
Downstream of Deming Road	36.9	37.7	37.9	39.3

C. Bridge Replacement and Removal of Railroad Abutment/Embankment	Water Surface Elevation (ft)			
Location	**10**	**50**	**100**	**500**
At Deming Road	36.9	38.0	38.4	40.0
Downstream of Deming Road	36.7	37.6	37.9	39.3

Water Surface Elevations Given

At Road

Downstream Business/Residence

An additional benefit of the embankment removal is ecological restoration. Removing the abandoned railroad infrastructure and restoring natural floodplain connectivity would enhance stream habitat, improve sediment transport processes, and reconnect the channel with its natural floodplain. These environmental co-benefits could strengthen grant applications by demonstrating multiple project values beyond flood mitigation alone.

Advisory Committee members discussed whether to pursue embankment removal alone or combine it with full bridge replacement. The consensus favored prioritizing the embankment removal due to its superior cost-effectiveness, with bridge replacement considered as a potential future phase if additional flood reduction is desired and funding becomes available. This flexible implementation strategy allows the Town of Berlin to secure immediate, substantial flood benefits through the embankment project while maintaining the option to pursue further improvements based on observed performance and available resources.

Implementation Considerations

Advisory Committee members identified the abandoned railroad embankment removal as "low-hanging fruit" due to the feasibility of removal and the substantial flood reduction benefits it would provide. Metro Realty's ownership of the abandoned railroad embankment and their

reputation as a “known and cooperative developer” reduces property acquisition and coordination challenges that typically complicate abandoned infrastructure removal projects.

A phased implementation strategy would offer flexibility for budget constraints and allow the Town of Berlin to secure immediate benefits while maintaining options for future enhancements. Phase 1 could focus on the abandoned railroad embankment removal, which provides the greatest flood reduction benefits at the lowest cost. This initial phase would demonstrate flood mitigation effectiveness, potentially remove structures from the floodplain, and reduce road overtopping frequency. Phase 2, to be pursued if additional flood reduction is desired and funding becomes available, would involve the Deming Road bridge replacement to address the remaining local constriction and provide incremental flood benefits beyond what embankment removal alone achieves.

Construction sequencing and staging will require careful attention to utility protection. The existing sewer line crossing Webster Brook must be identified, surveyed, and protected throughout embankment removal and any bridge replacement activities. Coordination with Berlin municipal utility departments and the sewer district would be essential during design and construction to prevent damage to this critical infrastructure.

Environmental permitting for the embankment removal should be straightforward given the project's restorative nature. Removing an abandoned artificial obstruction and restoring natural floodplain function aligns with state and federal regulatory preferences for stream restoration and floodplain connectivity. The project would likely require standard Inland Wetlands and USACE permits for work in watercourses and floodplains, but the ecological benefits of the embankment removal should facilitate regulatory approvals.

Downstream impact assessment was raised as a concern during the April 2025 public open house, with participants inquiring about potential downstream flooding issues. Hydraulic modeling demonstrated that embankment removal and bridge replacement both improve conveyance without creating substantial new floodwater storage, suggesting that impacts would primarily be localized flood elevation reductions rather than changes to downstream flood timing or magnitude. However, detailed modeling extending to downstream constraints would be necessary to address community concerns and satisfy regulatory requirements.

4.8 Future Conditions

To assess long-term flood risk along the Piper Brook and Webster Brook corridors, SLR evaluated future flow scenarios at selected priority sites. In the absence of region-specific climate projections or published future precipitation factors for the Piper Brook and Webster Brook watersheds, the analysis applied a 20 percent increase in streamflow as a representative future condition scenario. This factor serves as a conservative estimate of increased runoff anticipated from more intense precipitation events projected under climate change. The future flow analysis was conducted for Veterans Stadium Willow Brook Park and the John Downey Drive corridor due to their high visibility, significant community impacts, and potential for infrastructure improvements to address both current and future flood risk.

The existing conditions hydraulic model was run with increased future flows, demonstrating that flood extents and depths would increase at both locations under future conditions, although the magnitude and spatial distribution of impacts varied by site. For the 1.5-mile John Downey Drive corridor from the Amtrak crossing to Newington/New Britain Avenue, flood extents increased by 7 acres for future flows (Figure 29a). More pronounced road overtopping and impacts to adjacent businesses were noted along the road corridor, highlighting the greater vulnerability of this corridor to intensifying storm events. At Veterans Stadium Willow Brook Park, flood extents

increased by 4.5 acres for future flows, with local topography limiting the extent of flooding expansion (Figure 29b). These future condition assessments can inform the sizing and design of proposed mitigation measures to ensure infrastructure improvements provide resilience not only for current flood conditions but also for the more severe flooding anticipated as climate change progresses.

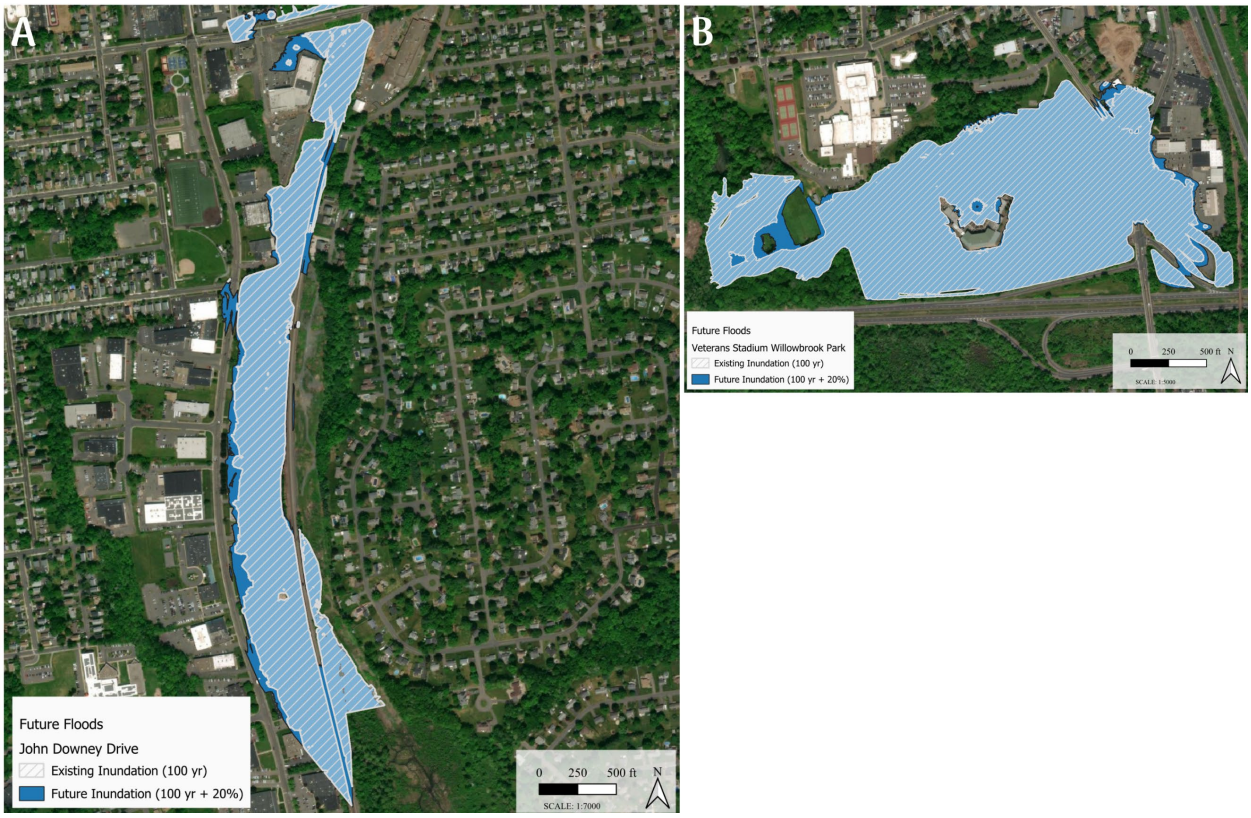


Figure 29: Future inundation extents for A) John Downey Drive and B) Veterans Stadium Willow Brook Park

Funding Pathways

5.0 Funding Pathways for Implementation

Advancing the recommended flood mitigation measures from conceptual designs to construction may require securing federal, state, and local funding through a combination of grant programs and municipal capital improvement budgets. This section identifies potential funding sources that align with the types of improvements proposed at the six priority sites, recognizing that successful implementation will likely involve layering multiple funding streams and coordinating applications across the three participating municipalities.

Advisory Committee discussions addressed funding opportunities, multi-town grant coordination strategies, data needs for strengthening benefit-cost analyses, and the unique challenges of funding improvements on private versus public property. A limited list of funding programs and pathways identified during the Advisory Committee discussions are provided below.

Funding Programs and Pathways

FEMA Hazard Mitigation Assistance Programs

The FEMA administers Hazard Mitigation Assistance (HMA) grant programs that support flood mitigation infrastructure and property-level improvements. These programs require benefit-cost analysis demonstrating that benefits exceed costs. HMA programs include **Flood Mitigation Assistance (FMA)** and the **Hazard Mitigation Grant Program (HMGP)**. FMA funds property acquisition and demolition, structure elevation and relocation, floodproofing, and minor infrastructure improvements, directly benefiting insured properties. FMA could support property buyouts, structure elevations, and targeted infrastructure improvements that remove insured buildings from floodplains. While HMGP availability depends on future disaster declarations, the program has historically been a significant funding source for Connecticut flood mitigation projects.

Infrastructure Investment and Jobs Act Programs

The Infrastructure Investment and Jobs Act (IIJA) established numerous grant programs supporting resilient infrastructure. Relevant programs include funding for bridge replacement, rehabilitation, and protection projects as well as grants supporting resilience of surface transportation infrastructure to natural hazards and climate change. Bridge replacements at Wilson Avenue, Coles Avenue, Xtreme Rides, Veterans Stadium Willow Brook Park, and Deming Road could potentially qualify for IIJA funding, particularly when applications emphasize the roads' roles as resilient corridors maintaining emergency access and community connectivity during flood events.

U.S. Army Corps of Engineers Water Resources Development Act Authorities

The U.S. Army Corps of Engineers (USACE) implements flood risk management and aquatic ecosystem restoration programs authorized under Water Resources Development Act (WRDA). These programs typically require non-federal cost-sharing and provide federal funding for locally sponsored projects that reduce flood risk or restore degraded aquatic ecosystems. The Deming Road railroad embankment removal, with its combined flood mitigation and stream restoration benefits, could potentially qualify under USACE authorities.

National Oceanic and Atmospheric Administration and National Fish and Wildlife Foundation Programs

The National Oceanic and Atmospheric Administration (NOAA) and the National Fish and Wildlife Foundation (NFWF) administer competitive grant programs supporting projects that restore or enhance natural ecosystems to increase resilience to hazards while improving habitat. Connecticut projects in watersheds may qualify when emphasizing ecological restoration benefits alongside flood mitigation, particularly for floodplain restoration projects such as the Veterans Stadium Willow Brook Park floodplain bench and Deming Road embankment removal.

The Connecticut Department of Energy and Environmental Protection Climate Resilience Fund

The Connecticut Department of Energy and Environmental Protection (CTDEEP) Climate Resilience Fund supports planning and implementation of nature-based solutions and green infrastructure projects that enhance community resilience to climate change impacts. The program prioritizes projects in environmental justice communities, those incorporating nature-based approaches, and those demonstrating co-benefits for water quality, habitat, and community health. Floodplain restoration projects align well with Climate Resilience Fund priorities.

The U.S. Economic Development Agency (EDA) Resiliency Grants

The U.S. Economic Development Administration (EDA) administers grant programs supporting economic development and disaster recovery, including economic adjustment assistance that can fund infrastructure protecting commercial districts and employment centers from climate hazards. The John Downey Drive corridor improvements (Xtreme Rides, Alvarium), which protect commercial businesses and employment, could potentially qualify for EDA support when applications emphasize economic resilience and job protection objectives.

Connecticut Green Bank

The Connecticut Green Bank offers low-interest financing and credit enhancement products for resilient infrastructure and green infrastructure projects. Green Bank financing could provide gap funding to supplement grant awards or finance projects that do not secure grant funding but demonstrate strong cost-effectiveness and municipal commitment.

Municipal Bonding and Multi-Town Coordination

Traditional municipal bonding through capital improvement programs remains a viable funding mechanism for public infrastructure projects such as bridge replacements, culvert upsizing, and roadway drainage improvements. Advisory Committee discussions emphasized the potential for multi-town grant applications and coordinated funding strategies. Given that flooding issues span municipal boundaries, coordinated applications submitted through the CRCOG through intermunicipal agreements could strengthen competitiveness and demonstrate regional collaboration.

Funding Suitability by Priority Site

The following table summarizes the funding programs most applicable to each priority site.

Table 10: Funding Programs Supporting Priority Site Proposed Measures

Priority Site	Applicable Funding Pathways
Wilson Avenue (Newington)	- FEMA FMA - Infrastructure Investment and Jobs Act - Municipal Bonding - Multi-town CRCOG application
Coles Avenue (Newington)	- Infrastructure Investment and Jobs Act - Municipal Bonding - Multi-town application
Xtreme Rides (New Britain)	- FEMA FMA/HMGP (buyout option) - Infrastructure Investment and Jobs Act - EDA Resiliency grants - Municipal/EDA partnership - Private-public cost-sharing
Alvarium Beer Company (New Britain)	- FEMA FMA/HMGP - Connecticut DEEP Climate Resilience Fund - EDA Resiliency grants - Connecticut Green Bank loans - Private-public partnership
Veterans Stadium Willow Brook Park (New Britain/Berlin)	- Connecticut DEEP Climate Resilience Fund - USACE WRDA - NOAA/NFWF - Infrastructure Investment and Jobs Act - Municipal bonding - Multi-town application
Deming Road (Berlin)	- Connecticut DEEP Climate Resilience Fund - USACE WRDA - Infrastructure Investment and Jobs Act - Municipal bonding - Phased implementation approach

To advance funding readiness, Advisory Committee members identified specific action items, including compiling flood damage cost data from businesses and property owners, submitting priority projects for state grant rounds, and engaging property owners to assess willingness to participate in projects requiring private property coordination. The conceptual designs, cost estimates, preliminary benefit-cost analyses, and stakeholder engagement documentation provided in this study help lay the foundation to pursue these funding pathways and advance recommended flood mitigation measures into implementation. In addition to the main funding pathways listed above, supplementary funding may be available to support aspects of proposed mitigation measures via other programs and grants.

Other Potential Funding Pathways that may support aspects of projects:

- *State of Connecticut Local Bridge Program* for municipally owned bridge replacements
- *IIJA PROTECT* Formula and Discretionary Grants for resilient transportation infrastructure
- *IIJA Bridge Investment Program* for bridge replacement and rehabilitation
- *USACE Section 205* (Small Flood Control Projects) and Section 206 (Aquatic Ecosystem Restoration) authorities
- *NOAA Coastal Resilience Grants* for watershed projects with coastal benefits
- *NFWF National Coastal Resilience Fund* for projects in Long Island Sound tributary watersheds

Other Flood Adaptation Options

6.0 Other Flood Adaptation Options

This study has identified infrastructure improvements and nature-based solutions, including bridge and culvert replacements, floodplain benches, and channel restoration, that can reduce flooding at priority locations throughout the Piper Brook and Webster Brook corridors. However, infrastructure upgrades and nature-based solutions are not always feasible for every flood-vulnerable property due to cost constraints, physical limitations, property ownership considerations, or implementation timelines. In situations where watershed-scale infrastructure improvements are not practical or until such improvements can be completed, property-level adaptation measures can limit the impacts of flooding on individual structures and reduce flood damages.

Along the Piper Brook and Webster Brook corridors, numerous residential and commercial properties fall within FEMA-designated 100- or 500-year flood zones while additional buildings experience impacts from more frequent 10- or 50-year flood events. For all these properties, individual flood adaptation strategies such as elevation, floodproofing, or structure relocation offer alternatives to infrastructure upgrades and nature-based solutions. Berlin, New Britain, and Newington should collaborate with property and business owners to implement floodproofing measures or, where appropriate, participate in flood buyout and relocation programs when property owners are interested and programmatic funding is available. Connecticut municipalities evaluate buildings for relocation based on substantial damage determinations (when repair costs exceed 50 percent of the structure's value), repetitive loss status (properties with multiple flood insurance claims), and cost-benefit analyses.

The two flowcharts below (**Figure 30** and **Figure 31**) provide examples for decision-making guidance to help municipalities determine the most appropriate property-level flood protection strategy at nonresidential and residential properties.

It is recommended that the municipalities identify priority areas and structures that are prone to the most frequent and deepest flooding. These areas should be considered the highest priority for individual flood protection measures as they experience recurring flood damages and disruptions that create the greatest cumulative economic and safety impacts.

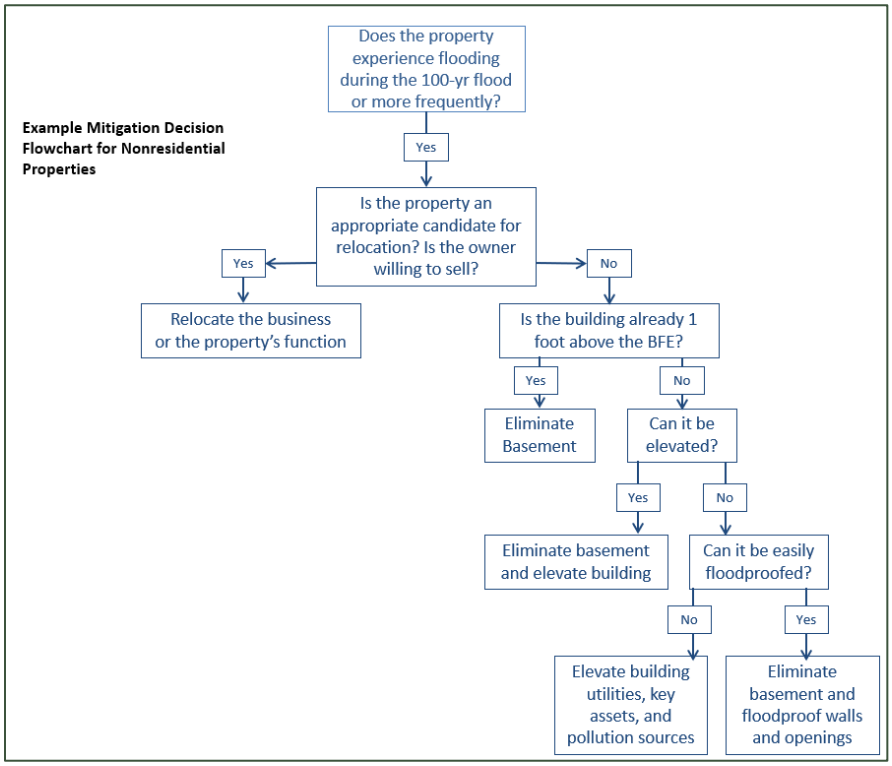


Figure 30. Example of property-specific mitigation measures for nonresidential properties

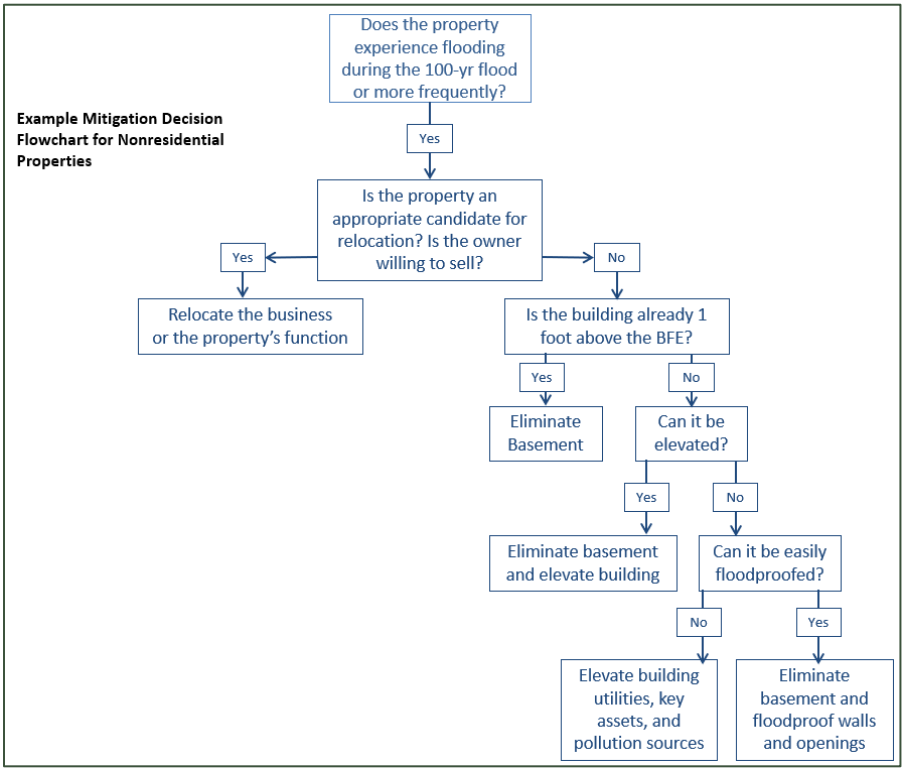


Figure 31. Example of property-specific mitigation measures for residential properties

Property-Level Flood Protection Strategies

In areas that are vulnerable to flooding, improvements to individual properties and structures may be appropriate to reduce flood risk and damages. All practices to protect property within a floodplain must comply with local flood damage prevention codes and may require approval from the local floodplain administrator or code enforcement officer. Potential measures for property protection include the following:

- **Structure Elevation:** Elevation of the structure reduces the risk of flood damage by raising the building above anticipated flood levels. Home elevation entails removing the building structure from the basement and elevating it on piers to a height such that the first floor is located 1 foot or more above the level of the 100-year flood event as per Connecticut state building codes and NFIP minimum requirements. The basement area is abandoned and filled to be no lower than the existing grade. All utilities and appliances located within the basement must be relocated to the first floor level or suspended from basement joists or similar mechanisms. The remaining enclosure must only be used for parking, access, and/or storage.
- **Dry Floodproofing**: Dry floodproofing keeps floodwaters from entering the structure by making areas below the flood level watertight. Walls may be coated with waterproofing compound or plastic sheathing. Openings such as windows and vents are either permanently closed or covered with removable shields. Flood protection should extend only 2 to 3 feet above the top of the concrete foundation because building walls and floors cannot withstand the pressure of deeper water without structural reinforcement.
- **Wet Floodproofing:** Wet floodproofing allows floodwaters to pass through the lower area of the structure unimpeded, intentionally letting floodwater into nonhabitable spaces to equalize interior and exterior water pressures. This approach reduces the risk of structural damage from hydrostatic pressure while accepting that flooding will occur in basement or crawlspace areas. Furniture and electrical appliances should be moved away or elevated above the 100-year flood elevation. Areas subject to wet floodproofing must be constructed with flood-resistant materials and designed to drain effectively after floodwaters recede.
- **Flood Insurance:** Encourage property owners to purchase flood insurance under the NFIP and to make claims when damage occurs. While having flood insurance will not prevent flood damage, it will help a family or business recover financially following a flood event. Property owners should be encouraged to submit claims under the NFIP whenever flooding damage occurs, which will increase the eligibility of the property for projects under various mitigation grant programs. Average claim payouts are far greater than average FEMA individual household assistance payments, and a documented history of flood claims strengthens applications for mitigation funding.
- **Barriers, Floodwalls, and Berms**: Construction of property improvements such as barriers, floodwalls, and earthen berms can prevent shallow flooding from reaching structures. There may be properties where implementation of such measures will serve to protect structures during frequent flood events. Such barriers must not be permitted unless designed by a qualified engineer and shown to comply with NFIP and local floodplain laws and regulations.
- **Fuel Tank Anchoring:** Anchoring of fuel tanks reduces or eliminates sources of hazardous pollution during flooding. It is recommended to relocate or secure fuel oil and tanks to prevent tip-overs and spills, reduce flood recovery costs, and help prevent water from

entering fuel supplies and damaging appliances. Both indoor and outdoor fuel tanks can be anchored using noncorrosive metal strapping and lag bolts.

- **Equipment Anchoring and Protection:** Anchor equipment that has the potential to be washed away in a flood, including generators, snowmobiles, All-Terrain Vehicles (ATVs), construction equipment, and outdoor HVAC units. Additional strategies include housing equipment in an elevated shed or garage or storing equipment outside of the 100-year flood boundary when not in use.
- **Home Improvements to Mitigate Flood Damage:** The following measures can be undertaken to protect home utilities and belongings from flood damage:
    - Relocate valuable belongings above the 100-year flood elevation to reduce the amount of damage caused during a flood event.
    - Relocate or elevate appliances like water heaters, heating systems, washers, and dryers to a higher floor or to at least 1 foot above the base flood elevation (BFE).
    - Anchor fuel tanks to the wall or floor with noncorrosive metal strapping and lag bolts.
    - Install a backflow valve to prevent sewer or septic backup into the home during flood events.
    - Install a floating floor drain plug at the lowest point of the lowest finished floor to prevent water intrusion.
    - Elevate the electrical panel, or relocate it to a higher floor, and elevate electric outlets to at least 1 foot above the high water mark or BFE.

Some of the homes and businesses in the Special Flood Hazard Area (SFHA) are rarely flooded or experience only shallow flooding. Residents and businesses in these areas may still benefit from minor individual property improvements that reduce the severity of flood impacts when they do occur. Providing landowners with information regarding individual property protection measures through community outreach and educational programs is recommended.

Route 9 and Mattabesset River Crossing Floodproofing Example

Figure 32: High water marks at the Town of Berlin Fleet Services

A site that should be considered for future modeling and evaluation for flood mitigation strategies is the Route 9 and Mattabesset River crossing in Berlin. This crossing was identified as a source of significant flooding by the Advisory Committee and representatives from Berlin, New Britain, and Newington. Flooding at this location impacts the Town of Berlin Fleet Services facility and nearby businesses, causing operational disruptions and property damage.

SLR visited the Town of Berlin Fleet Services to discuss flooding history with the fleet manager. A record of high water marks is maintained inside the Fleet Services garage building, documenting flood elevations during storm events on June 6, 1992, October 14, 2005, and September 2, 2021. The flood elevation inside the building nearly reached 23 inches on June 6, 1992, demonstrating the severity of flooding at this location.

Benefit-Cost Analysis

7.0 Benefit-Cost Analysis

To support implementation and funding readiness, itemized cost opinions and high-level benefit-cost analyses (BCA) were developed for three of the priority sites and their proposed adaptation strategies. These evaluations provide a foundational understanding of the feasibility, scale, and value of proposed interventions across the Piper Brook and Webster Brook corridors and establish the preliminary groundwork necessary for pursuing federal and state grant funding that requires demonstration of cost-effectiveness.

Cost Opinions for Mitigation Measures

Detailed opinions of probable cost were prepared for each of the three conceptual projects selected for BCA. These cost opinions included projected expenses for advanced and final project design and bidding, required technical studies such as geotechnical investigations, construction staging and preparation, demolition of existing structures, traffic and water control measures, earthwork, materials, labor, paving and landscape restoration, and repair or replacement of stormwater infrastructure, among other considerations. The estimates were informed by typical construction practices and regional market conditions in Connecticut, with consideration of project-specific constraints and implementation requirements identified through site assessments and stakeholder input.

Benefit-Cost Analysis

SLR performed preliminary BCA using the FEMA BCA toolkit for three priority sites and their proposed mitigation strategies: Wilson Avenue bridge replacement (Newington), Deming Road alternatives (Berlin), and Alvarium Beer Company floodplain bench (New Britain). The FEMA BCA methodology calculates benefits as the expected flood-related damages without mitigation minus expected damages with mitigation, expressed as avoided costs over the project useful life. Benefits considered in the analysis include avoided physical damage to structures, avoided loss of function and business interruption, and avoided costs associated with displacement and emergency response.

The three priority sites were selected for detailed BCA based on several factors identified through Advisory Committee discussions and project team evaluation:

- **Actionable benefits:** Each site demonstrates clear potential for flood reduction that can be quantified in terms of reduced structural damages and operational disruptions.
- **Geographic representation**: The three sites represent one priority project in each participating municipality (Berlin, New Britain, and Newington).
- **Data availability:** Each site had sufficient information available regarding existing flood conditions, benefiting properties, and flood damage history to support preliminary BCA.
- **Stakeholder prioritization:** Advisory Committee members identified these sites as high priorities for implementation and funding pursuit.

BCA Results for Priority Sites

The following table summarizes the results of the preliminary BCA for the three priority sites:

Table 11: Benefit-Cost Analysis Results for Three Priority Sites

Proposed Measure	Cost Opinion ($)	Estimated Benefits ($)	Benefit-Cost Ratio
Wilson Avenue Bridge Replacement	$2,324,090	$1,296,065 to $3,350,322	0.55 to 1.44
Deming Road – Option 1 Bridge Replacement and Railroad Embankment Removal	$3,490,090	$546,219	0.16
Deming Road – Option 2 Railroad Embankment Removal	$812,409	$518,410	0.64
Alvarium Beer Company Floodplain Bench	$870,409	$331,560	0.38

Wilson Avenue (Newington): The bridge replacement provides substantial flood reduction for over 35 upstream properties, with some homes potentially being removed from the 100-year flood zone entirely. The wide range in the benefit-cost ratio (BCR) (0.55 to 1.44) reflects significant uncertainty in basement characteristics of benefiting residential properties. The lower-bound estimate assumes unfinished basements with minimal contents value while the upper-bound estimate assumes finished basements with higher contents and furnishings subject to flood damage. With refined data from property elevation certificates and accurate basement finish characterization, a more accurate BCR can be produced.

Deming Road (Berlin): Two implementation alternatives were evaluated. Option 1 (full bridge replacement plus embankment removal) yields a BCR of 0.16, indicating that costs significantly exceed quantified benefits using available data. Option 2 (embankment removal only) provides a BCR of 0.64, representing better cost-effectiveness by focusing on the highest-benefit, lowest-cost component. Advisory Committee members described the embankment removal as "low-hanging fruit" that provides significant benefits to businesses and the road at substantially lower cost than full bridge replacement.

Alvarium Beer Company (New Britain): The floodplain bench yields a BCR of 0.38, indicating that traditional property damage benefits do not exceed project costs based on preliminary analysis. The brewery owner documented revenue losses occurring when customers cannot access the parking lot during flood events and staff must be sent home when production facilities cannot operate. However, these business losses can be difficult to quantify for traditional BCA frameworks that focus on physical property damage, and the real economic damages may not be fully reflected in the BCA. The project also demonstrates nature-based solutions and green infrastructure approaches that provide value to the community and are increasingly prioritized by federal and state grant programs, which may receive favorable consideration even with BCRs below 1.0.

Details of the BCAs at each priority site are provided in Appendix E.

Benefit-Cost Analysis Data Sensitivity and Limitations

The preliminary BCA results are highly sensitive to specific data inputs, with significant variability depending on assumptions about building characteristics and damage estimation. Key data uncertainties affecting the BCA results include:

- **Lowest floor elevations**: Precise first floor and basement elevations are critical for determining whether structures experience flooding in various storm scenarios and the depth of flooding that occurs. Preliminary analysis relied on topographic data and estimated floor elevations; actual elevation certificates would provide definitive measurements.
- **Basement characteristics**: Whether basements are finished or unfinished dramatically affects contents value and damage estimates. Preliminary analysis relied on incomplete state parcel database information where elevation certificates may provide definitive definitions.
- **Building replacement values and contents:** Accurate assessment of structure replacement cost and contents value requires detailed property data. Preliminary analysis used generalized valuation methods; property-specific appraisals and inventories would improve accuracy.
- **Flood damage history:** Documented historical flood damages from insurance claims, municipal records, and property owner reports provide empirical evidence of actual losses that can strengthen BCA. Limited historical damage documentation was available for the preliminary analysis.
- **Business interruption and operational losses:** Traditional BCA frameworks focus on physical property damage and may undervalue or exclude business revenue losses, operational disruptions, and economic impacts that do not result in structural damage.
- **Avoided maintenance and emergency response costs:** Annual costs for bridge and culvert maintenance, emergency road closures, detour expenses, and flood response activities represent recurring costs that infrastructure improvements would reduce or eliminate. Quantifying these avoided costs requires detailed records from municipal public works and emergency management departments.

Recommendations for Strengthening Benefit-Cost Analysis

To strengthen grant applications and improve the robustness of BCA for implementation, the municipalities should pursue the following data collection and analysis enhancements:

- Obtain elevation certificates for benefiting properties: Certified surveys documenting actual first floor elevations, basement elevations, and lowest adjacent grade provide definitive data for flood depth calculations and damage estimation.
- Document historical flood damages: Compile insurance claim records, municipal damage assessments, property owner reports, and photographic documentation of historical flood events.
- Quantify business financial losses: Work with affected businesses to document revenue losses, operational disruptions, employee hour losses, and other economic impacts during flood events.
- Assess avoided maintenance and infrastructure costs: Municipal public works departments should compile data on annual bridge and culvert maintenance costs,

emergency road closure expenses, flood response costs, and other recurring expenditures that infrastructure improvements would reduce or eliminate.

- Engage property owners and stakeholders: Property owners can provide valuable information about flood damage history, contents values, disruption costs, and other impacts not readily available through municipal records.
- Refine cost estimates: More detailed engineering design and site-specific investigations will refine cost estimates and reduce uncertainty in the cost component of BCR.

It is recommended that municipal staff refine the BCA using enhanced data inputs as projects are considered for funding applications. The FEMA BCA toolkit spreadsheets can be updated iteratively as better data becomes available, allowing the municipalities to track improvements in cost-effectiveness and identify the threshold at which projects achieve favorable BCR for grant competitiveness.

The preliminary BCA presented in this study establish a foundation for funding pursuit while acknowledging significant data limitations and opportunities for improvement. With targeted data collection and refinement of analysis assumptions, several of the priority projects have strong potential to demonstrate cost-effectiveness sufficient to meet federal and state grant program requirements and advance to implementation.

Resilient Corridors

8.0 Resilient Corridors

A high-level Resilient Corridors Analysis was performed to identify and score roadways that not only support emergency response and evacuation but also ensure continued access to essential community services such as schools, senior housing, hospitals, emergency shelters, grocery stores, and public transit during and after extreme flooding events. These roadways should be prioritized for future investment as they are vital for access during emergencies and maintaining daily mobility, economic activity, and community connectivity. Resilient corridors were identified across the three project communities: Berlin, New Britain, and Newington.

Data Inputs for Resilient Roads Analysis

- CTtransit Bus Stops
- CRCOG Regional Land Use
- Emergency Shelter Locations
- Pharmacies
- Hospitals
- Urgent Care Facilities
- CTtransit Bus Routes
- Public and Private Schools
- Grocery Stores
- Senior Centers
- Nursing Homes
- FEMA Flood Hazard Areas

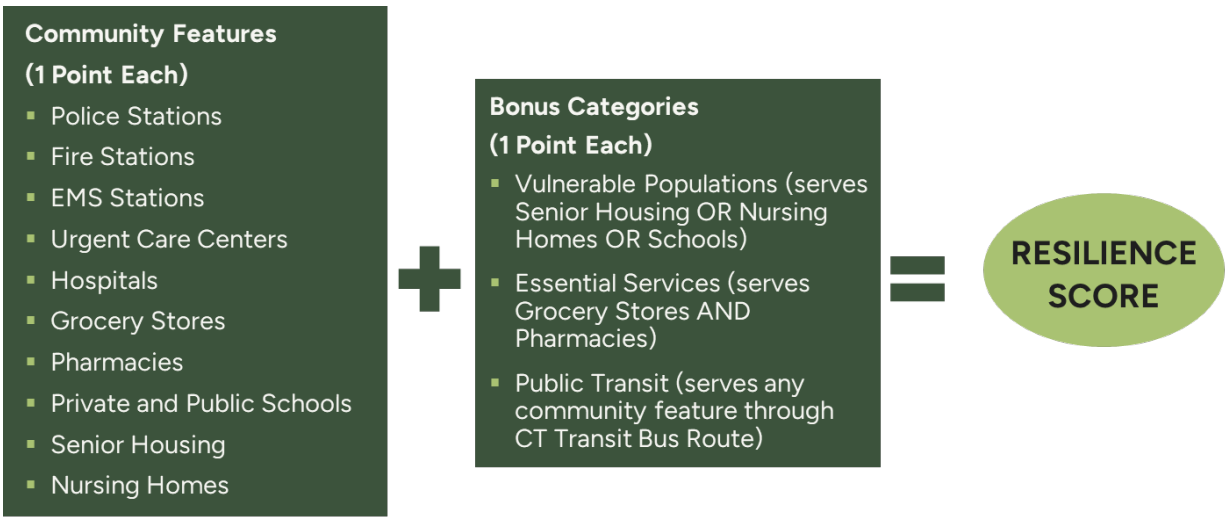
A data-driven approach was used to identify road segments within Berlin, New Britain, and Newington that are critical to community connectivity and resilience. The methodology and scoring system prioritize roads that serve a higher number of critical facilities and community services like hospitals, schools, emergency shelters, and grocery stores.

Buffers of 500 feet were drawn around the following community features:

To assess roadway resilience in relation to the listed community assets, a dataset of local, minor, and major roads from CTDOT was cross referenced with the 500-foot buffer zones created around the selected community features. CTtransit bus routes were also analyzed to identify roadways that serviced community features through public transportation.

Each roadway segment received one point for every asset type it serviced. To emphasize the value of roadways that serve vulnerable populations and essential services, roadways received additional points for servicing the following categories:

- Vulnerable Populations: Senior Housing *OR* Nursing Homes *OR* Schools
- Essential Services: Grocery Stores *AND* Pharmacies
- Public Transit: CTtransit Bus Routes servicing any of the listed community features



For example, if a roadway intersected the 500-foot buffer zone of a public school, it receives a total of two points, one point for servicing the school and an additional point for serving a vulnerable population. If another roadway intersects the 500-foot buffer zone of a grocery store, pharmacy, and was along a CTtransit Bus route, it receives a total of four points, two points for serving community assets, an additional point for serving both grocery stores and pharmacies, and another point for providing public transportation to essential services. The resilience score reflects the extent to which each roadway supports multiple critical services. **Figure 33** below shows the resilient corridor scores across Berlin, New Britain, and Newington.

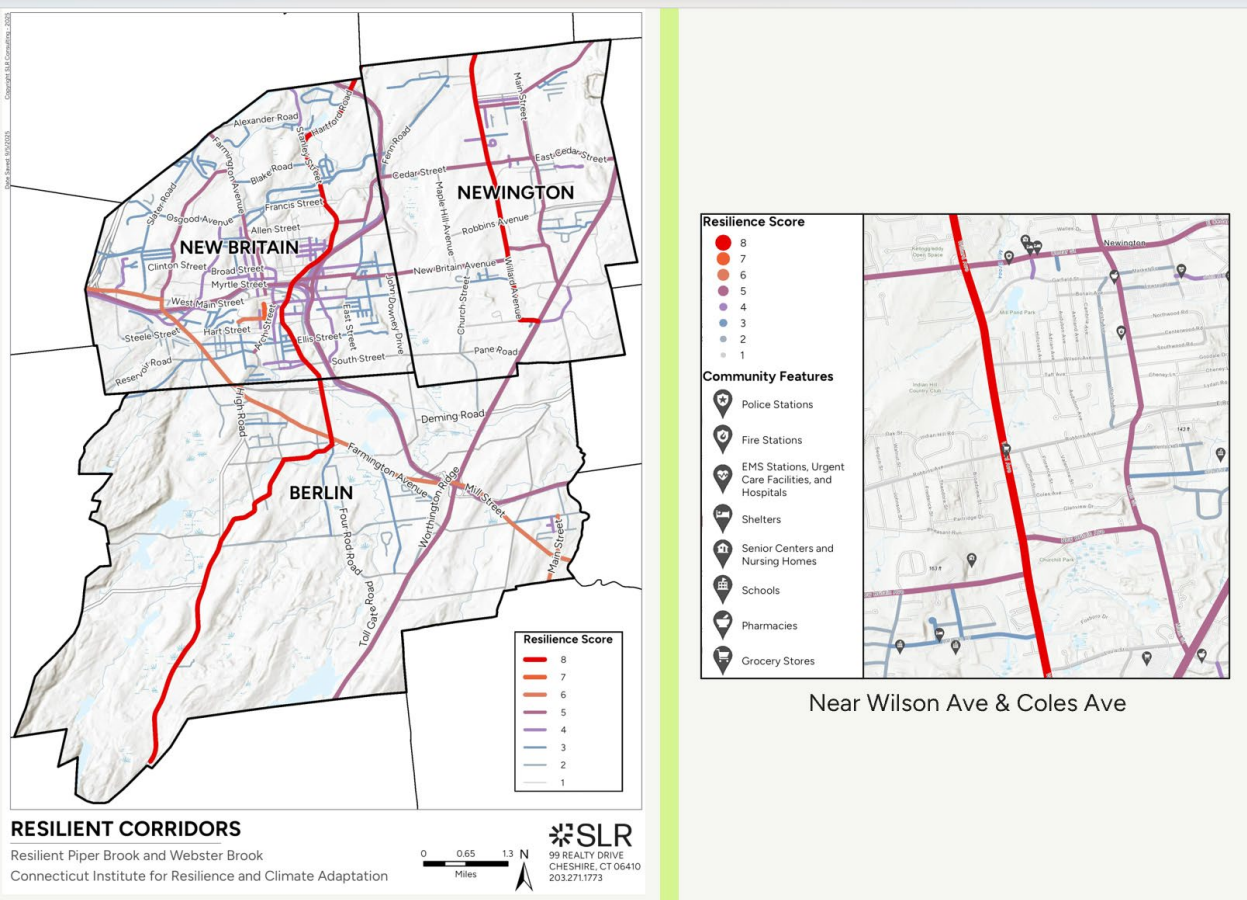


Figure 33: Resilient roads scores for project municipalities

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Appendix A: Public Open House Memos

Memorandum

To:	John Truscinski, Nicole Govert, Mary Buchanan	**From:**	Pamela Green
Company:	CIRCA, University of Connecticut		**SLR International Corporation**
cc:		**Date:**	April 14, 2025
		Project No.:	142.056643.00001
		SLR Client No.:	11958
RE:	**Resilient Connecticut Piper Brook and Webster Brook Public Open House Report**		

The following memorandum summarizes the key takeaways from the Resilient Connecticut Piper Brook and Webster Brook public open house held on April 2, 2025, at Alvarium Beer Company.

Event Purpose

The Resilient Connecticut Piper Brook and Webster Brook public open house took place on Wednesday, April 2, 2025, from 5:30 p.m. to 7:00 p.m. at Alvarium Beer Company, 365 John Downey Drive B, New Britain, Connecticut. The event provided an opportunity for community members to learn about the ongoing issues with flooding along the Piper Brook and Webster Brook corridors affecting communities in Newington, New Britain, and Berlin, Connecticut. The event was facilitated by Mark Carabetta and Jenabay Sezen from SLR International Corporation (SLR) and John Truscinski, Nicole Govert, and Mary Buchanan from Connecticut Institute for Resilience & Climate Adaptation (CIRCA) at the University of Connecticut.

Attendees shared their experiences with flooding along the river corridors and engaged with project partners, including CIRCA and SLR. Community input gathered during the event will help shape project site priorities and decisions and will ensure proposed solutions reflect local needs.

List of Attendees

The open house was attended by residents and business owners in the river corridor and the Newington, New Britain, and Berlin communities, staff and elected officials from the three municipal regions, and Capitol Region Council of Governments. The list of participants is listed below:

Name	Town
Jason Outlaw	New Britain
Adam Eckenroth	New Britain, MicroCare
Steve Ganci	New Britain, MicroCare
John Truscinski	CIRCA
Charles Paonessa	Berlin
Lecia Paonessa	Berlin
Mike Ahern	Berlin
Katara Jones	Newington
Paige Cossal	Newington
Kathleen Hoerner	Newington
Richard Hoerner	Newington
Liam Mitchell	Berlin
Cindy Mitchell	Berlin
Mark Mangiafico	New Britain
Brian Bugnacki	New Britain

Paul Dickson	Newington
Chris Zibbideo	Newington
William Jackson	Berlin
Kerrin Jeromin	
AJ Pollicito	Newington
Candyce Scott	New Britain

Station Overview

The open house event was structured around four interactive stations designed to inform and engage the public on flooding issues along the Piper Brook and Webster Brook corridors. Attendees could explore project overview poster boards, view a presentation on flood issues and review selected priority sites in the region, participate in a "river walk" using detailed maps to identify flooding locations, and review a resilience solutions poster showcasing potential approaches to address flooding. Two representatives from our consulting firm along with CIRCA staff were present to answer questions and facilitate meaningful discussions throughout the event. Each station is described in detail below.

Station 1 – Project Overview Board

Station 1 featured a project overview poster board (included in Appendix A) that provided a high-level summary of the Resilient Connecticut Piper Brook and Webster Brook project. The poster highlighted the project's primary goals as follows:

1. Engage community stakeholders to understand flooding concerns and increase awareness.
2. Identify flood vulnerabilities along the river and model current and future conditions.
3. Develop concept alternatives for restoration and flood mitigation plans along the river.
4. Prepare a Benefit/Cost Analysis for the proposed concept designs.

Emphasizing the importance of community engagement, the poster noted the project's focus on gathering insights from the community to develop and prioritize mitigation strategies. A link and QR code to the project website was included on the poster to help attendees learn more about the project and stay informed about upcoming events.

Station 2 – Open House Presentation

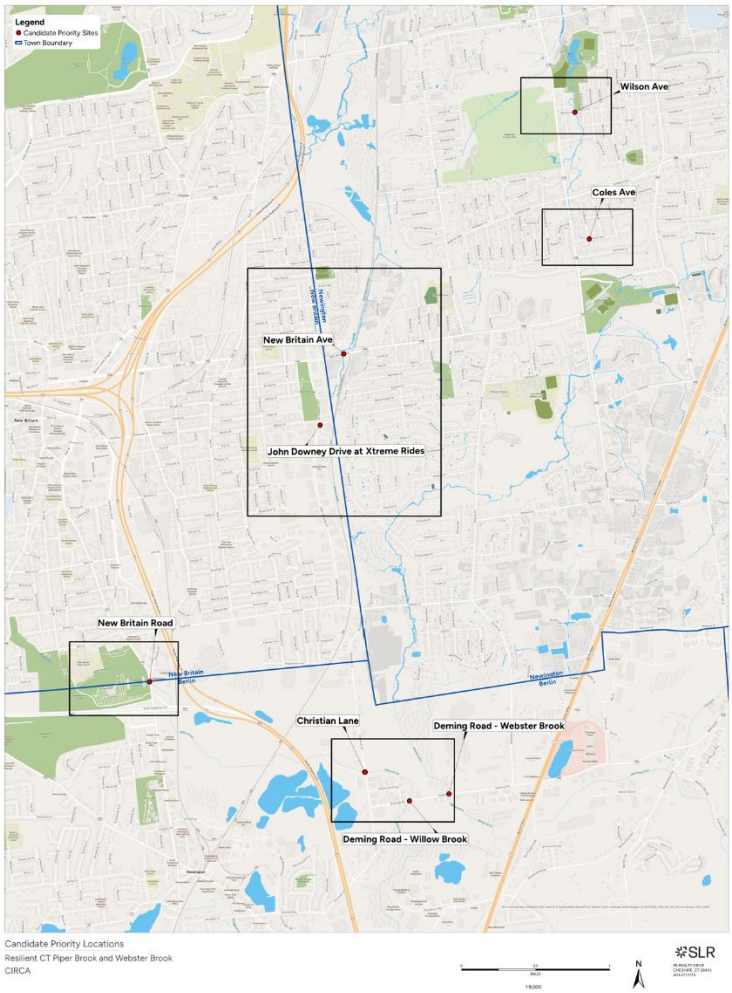
Station 2 featured a presentation by SLR staff, displayed on a large screen, offering an in-depth exploration of flooding in the project area and the highlighted priority sites identified during a site windshield survey and validated by the project Advisory Committee. The presentation examined how outdated or undersized drainage systems and land use practices contribute to stormwater flooding. Visuals of the watershed were included to illustrate how impervious surfaces exacerbate runoff and flooding issues. Additionally, the presentation included a link to the CIRCA project website and a dedicated email address for attendees to follow up with comments, pictures, and video.

Station 3 – Corridor Walk

As part of the community engagement efforts for the Resilient Connecticut Piper Brook and Webster Brook project, participants took part in a "Corridor Walk" activity, offering an interactive way to explore and assess the river's conditions. Using large-scale maps provided by SLR (referenced in the "Engagement Summary" below), community members were invited to virtually "walk" the river corridor, examining its current state and identifying areas with problematic spots prone to flooding, erosion, or other environmental challenges. This activity encouraged participants

to share their experiences and observations, providing valuable local insights into the issues affecting the Piper Brook and Webster Brook corridors.

Figure 1: Corridor Walk Site Overview Map



Station 4 – River Resilience Solutions Poster

Station 4 showcased a resilience solutions poster board (included in Appendix B) that outlined a range of potential river resilience strategies for the project. Proposed solutions included culvert upgrades, dam removal, stream daylighting, floodplain restoration, bed and bank stabilization, and stormwater detention. Each strategy was accompanied by an explanation of its benefits, focusing on flood management, habitat restoration, water quality improvement, and enhanced public accessibility.

Open House Engagement Summary

The engagement activities during the open house provided valuable opportunities for participants to share their insights, concerns, and feedback on the Resilient Connecticut Piper Brook and Webster Brook project. Attendees engaged in meaningful discussions with project representatives, contributed observations during the Corridor Walk activity by marking maps with notes, and offered input on flooding issues and concerns at each station. Any written feedback directly on the map

posters that was received from participants are displayed in the following figures. The key takeaways from engagement efforts are summarized below.

Corridor Walk Activity and Feedback

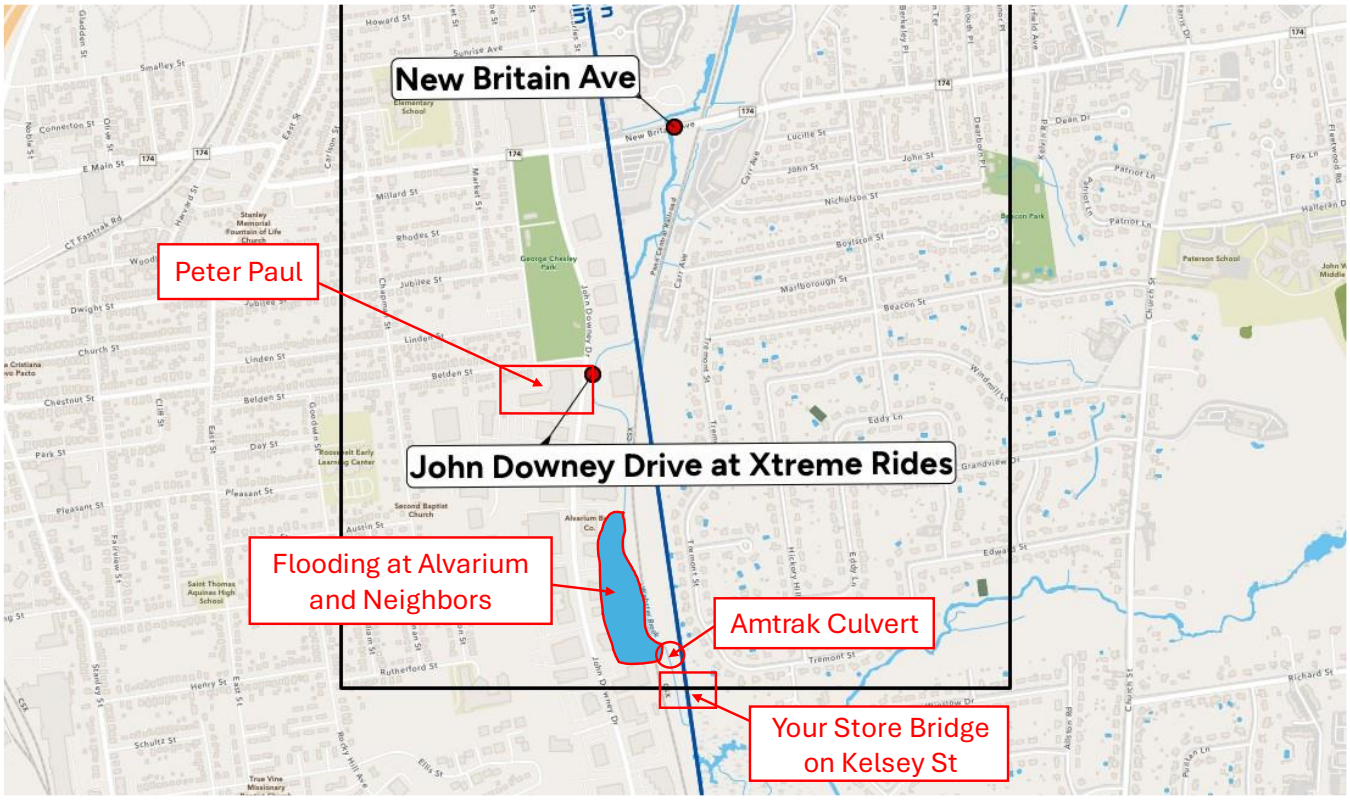


Figure 2: John Downey Drive at Xtreme Rides

- Participants highlighted the Amtrak culvert, reporting that the City of New Britain clears out the debris with a backhoe.
- Flooding was reported in portions of the Alvarium Brewing lot. Alvarium reported $8,000 per year in flood insurance. Brian Bugnacki, owner of Alvarium Brewing, will share videos from the parking lot flooding. He stated that customers are frequently turned away because they cannot park due to flooding.
- Brian Bugnacki commented that the floor of the brewery building is a few inches too low for an elevation certificate.
- Flooding was reported at the Peter Paul building, with problems associated with stormwater under the building. Water backed up through the floor around two to three times last year, and flooding has occurred more frequently lately. Participant reported that water bubbles up from the manhole cover during large storm events, sharing that the river is not overtopping in these events but the back parking lot and building will flood. Peter Paul has been in their current building since 1986.
- Participant highlighted flooding of the side parking lots of Xtreme Rides and no flooding of the building.

- Participants highlighted a portion of Kelsey Street that crosses over Webster Brook downstream of the railroad crossing near Your Store. The site reportedly experiences whirlpools on the upstream side and flooding downstream.
- Severe flooding around the New Britian Road crossing was highlighted.

Figure 3: New Britain Road

- Jason Outlaw from the City of New Britain noted that the fields have underdrains.
- Participants highlighted significant flooding of the fields and stated that sometimes the parking lot floods, but this occurs less often.
- Jason Outlaw from City of New Britain reported that a sewer main runs along the north side of Willow Brook, and it may be in the streambed. The New Britain website hosts Geographic Information System (GIS) data for the community, including sewer main locations.
- Flooding of Burger King and the neighborhood south of State Highway 571 was highlighted.

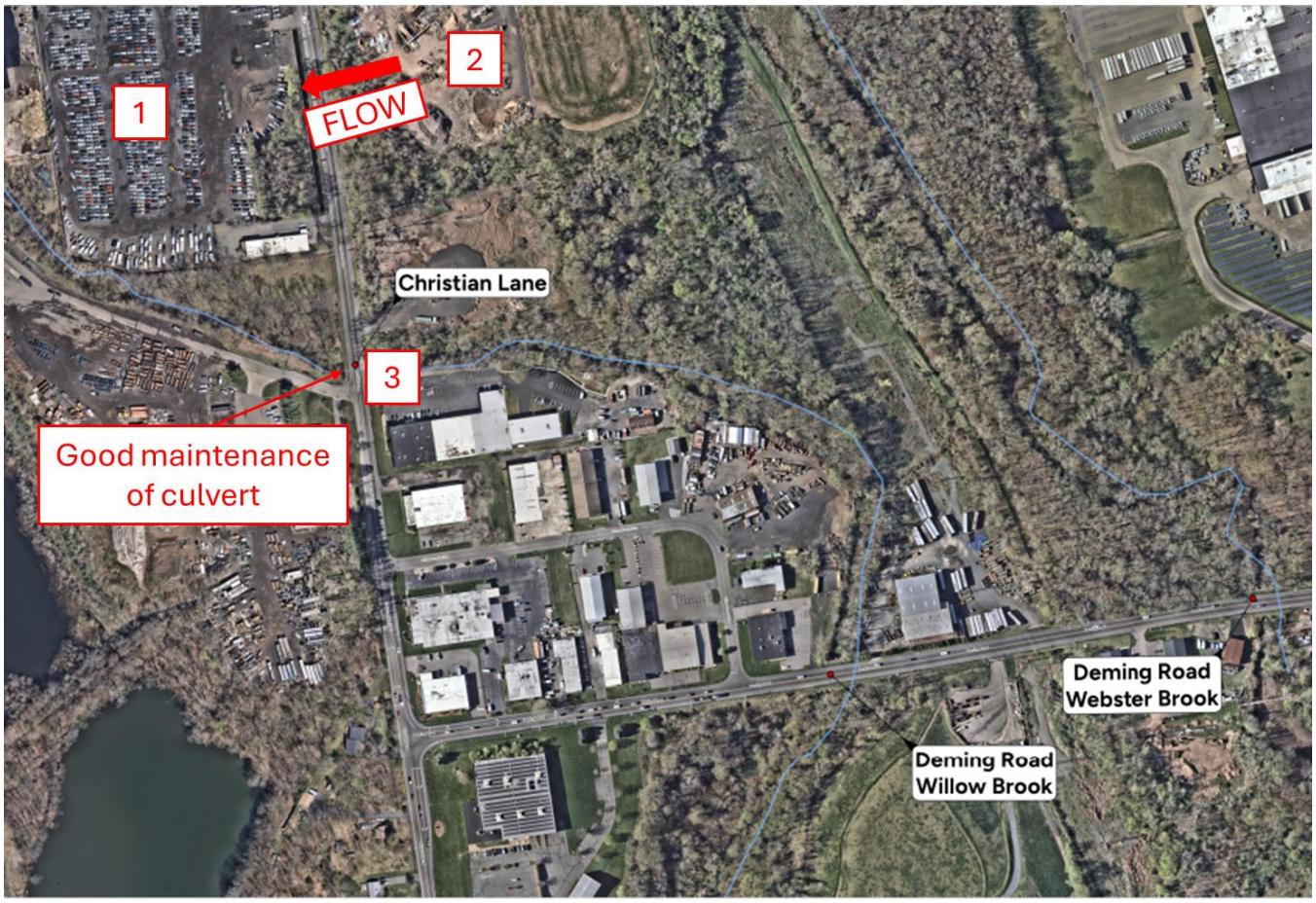


Figure 4: Christian Lane and Deming Road

- Chris Zibbideo from Newington will share a map of the area from the Berlin Highway Department.
- Participant noted that this entire area is a perennial problem.
- South of Deming Road, a participant highlighted that there are two constrictions at the Route 9 interchange with Route 5 on Willow Brook and the Mattabesset River.

The numbers on the map correspond to the following comments:

1. Participant noted that Christian Lane parking lot has a lot of impervious surface cover, and water runs off from the lot into the river.
2. Participant highlighted that the Christian Lane Landfill is being converted, and there is a solar project in the area. The landfill has a steep driveway, generating a lot of turbidity in water as it flows down. Water flows from higher elevation to lower elevation (displayed by the red arrow on the map).
3. Participant stated that the Town of Berlin ran cameras down the Christian Lane stormwater system and found that the last segment before the culvert, near #3 on the map, has water backing up. It was noted that the Town of Berlin has been trying to maintain the culvert, but it is possible there is a constriction creating additional challenges or the amount of flow from the parking lot and landfill overwhelms the system.

Figure 5: Wilson Avenue

- Problem area downstream of the Wilson Avenue crossing was highlighted.
- Participants from the River Camp Condos along Piper Brook were curious if upstream changes would cause flooding at the condos.

Additional Feedback

Participants were given the opportunity to talk directly with consultants and CIRCA representatives or to submit additional comments or suggestions via a project email address. Additional feedback and comments from participants are summarized below.

- An attendee suggested including insurance loss records when calculating losses, pointing out that insurance carrying costs and loss of property values are both costs that residents incur from flooding. Participants were asked to submit any information about economic losses, even if it is not an official insurance claim. SLR has provided an email address to send information to.
- Brian Bugnacki, from Alvarium Brewing, stated that Alvarium does not have documented insurance losses. They have seen people turn around and leave when the parking lot is flooded. Every person who leaves is a revenue loss. Brian has a 24/7 180-degree camera in the parking lot and has videos of people turning around.
- Resident from Berlin reported that the Berlin Town Hall has a map of all rivers with a focal point at Route 9. The culvert at Route 9 on the Mattabesset River is reported to be undersized and needs attention. If the bottleneck does not get taken care of, the resident expressed concern that any work upstream will shift flooding impacts downstream.

- Berlin resident commented that he has experienced a lot of flooding and reported that the water elevation has increased from 41 to 42 after the Route 9 bottleneck took effect. Resident asserts that the biggest issue is the Route 9 culvert; when it was installed, the water level increased a foot. Resident previously spent $6,000 to $7,000 on a survey to submit to the Federal Emergency Management Agency, but it did not make progress or amount to change. Additional comments from this resident were as follows:
    - Rights-of-way are overgrown and need to be cleared of trees.
    - They thought the state had previously appropriated some funding to study the Route 9 issue.
    - Sewer plan that was done for the district included modeling the effects of the 100-year and 500-year floods.
    - Commented that culverts are not the solution, but rather “straighten out the river,” keep the banks for reservoir water, and keep the fringes free of trees.
- Participant commented on the importance of educational components, suggesting that people need to know how to maintain properties, keep floodways clear, and prevent vegetation from becoming overgrown.
- Participant reported that the flooding of the ballfields is due to undersized infrastructure and lack of maintenance.
- Participant raised a question about how well the streams are maintained. How much of the flooding impacts and challenges are due to debris? Participant highlighted trees growing in the floodway.
- Recommended that project team connect with the following individuals:
    - John Dunham, previous chairman of the Mattabesset District
    - Art Simonian, Executive Director of Mattabesset District and previous Berlin Engineer

Additional Questions

Q: Mike Ahern, Berlin Town Engineer: If you come up with a solution for a larger culvert, for example, how far downstream will the project model to evaluate downstream impacts?

A: Mark Carabetta: The model will be able to show which structures are holding back water and what the effect would be if water was no longer being held back at that point. Nearly everything affects something else.

Q: Is one solution to construct detention areas to hold water?

A: Mark Carabetta: This could be a part of the solution but not the only solution.

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Event Photos

Figure 5: Participants discussing priority sites and reviewing prepared mapping materials

Figure 6: Mark Carabetta, SLR US Manager of Climate Resilience Planning, presenting to event participants

Appendix A: Project Overview Poster

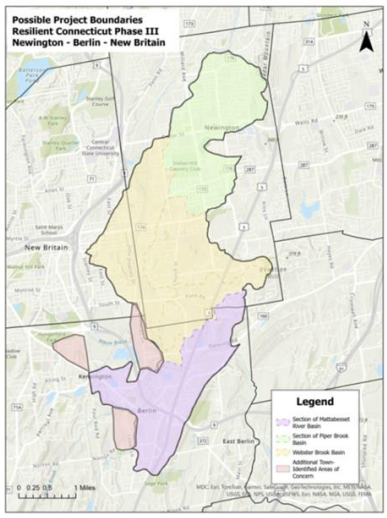
Resilient Piper Brook & Webster Brook

Project Overview

The Resilient Piper Brook and Webster Brook project, part of CIRCA's Resilient Connecticut program, seeks to develop flood mitigation strategies that address current flooding challenges and are resilient to future severe weather events impacting residents and businesses along the Piper Brook and Webster Brook corridor in the Newington, Berlin, and New Britain communities.

FIELD VISIT OF EXISTING CONDITIONS

Study Area



Project Goals

- Engage community stakeholders to understand flooding concerns and increase awareness
- Identify flood vulnerabilities along the river and model current and future conditions
- Develop concept alternatives for restoration and flood mitigation plans along the river.
- Prepare a Benefit/Cost Analysis for the proposed concept designs

Get Involved!

We are gathering valuable insights from the community to help develop and prioritize mitigation strategies. This includes understanding community needs related to the project area, and eventually interactive discussions of specific adaptation alternatives in the project area.

To learn more, visit our project website at https://bit.ly/43Lwy8o or scan the QR code! Stay tuned for information about future events and opportunities to provide additional input. Your participation is essential to creating a more resilient Piper Brook and Webster Brook corridor.

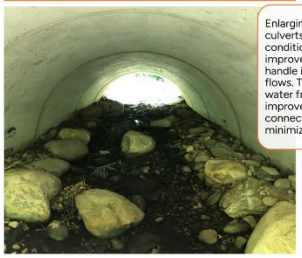
SCAN HERE

SLR CIRCA

Appendix B: River Resilience Solution Poster

River Resilience Options

CULVERT UPGRADES



Enlarging and designing culverts with natural conditions in mind improves their ability to handle increased water flows. This prevents water from backing up, improves aquatic habitat connectivity, and minimizes erosion risks.

DAM REMOVAL

Removing outdated or harmful dams restores natural river flow, eliminates impoundment areas, improves fish passage and habitat quality, and can enhance recreational access.

STREAM DAYLIGHTING

Uncovering buried streams restores them to their natural, open channels. This can increase flow capacity, improve water quality and habitat, and create new opportunities for community access to waterways.

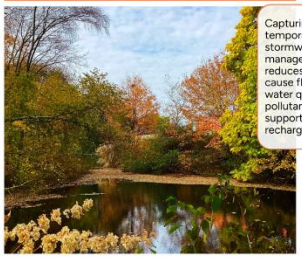
FLOODPLAIN CONNECTION

Expanding or restoring floodplains provides space for rivers to overflow naturally. This reduces flood severity, enhances habitat for fish and wildlife, and can create areas for recreation and education.

BED & BANK PROTECTION

Stabilizing river channels using nature-based techniques like planting vegetation or installing woody or stone flow structures. This can reduce erosion and sedimentation, support habitats, and maintain safe river access points.

DETENTION



Capturing and temporarily storing stormwater can helps manage runoff. This reduces peak flows that cause flooding, improves water quality by filtering pollutants, and can support groundwater recharge.

SLR

SLR

Memorandum

To:	John Truscinski, Nicole Govert, Mary Buchanan	**From:**	Pamela Green
Company:	CIRCA, University of Connecticut		**SLR International Corporation**
cc:		**Date:**	September 11, 2025
		Project No.	142.056643.00001
RE:	**Resilient Piper Brook and Webster Brook Public Open House Report**		

The following memorandum summarizes the key takeaways from the Resilient Connecticut Piper Brook and Webster Brook public Open House held on September 11, 2025 at Alvarium Beer Company.

Event Purpose

The second Resilient Connecticut Piper Brook and Webster Brook public open house took place on Wednesday, September 11, 2025, from 5:30 p.m. to 7:00 p.m. at Alvarium Beer Company, 365 John Downey Drive B, New Britain, Connecticut. The event provided an opportunity for community members to learn about the proposed flood mitigation measures developed for the six priority sites, review the benefits and preliminary costs of the recommended strategies, understand the resilient corridors analysis, and discuss next steps for implementation. The event was facilitated by representatives from SLR International Corporation and the Connecticut Institute for Resilience and Climate Adaptation (CIRCA).

Event Format

The open house followed a presentation and discussion format designed to share project results and gather final feedback from local stakeholders. The event included:

- **Welcome and Introductions:** SLR and CIRCA representatives welcomed attendees and provided an overview of the evening's agenda.
- **Final Project Presentation:** A PowerPoint presentation facilitated by SLR and CIRCA staff provided an overview of:
    - Project background and objectives
    - Existing flood conditions at the six priority sites
    - Recommended flood mitigation strategies for each site
    - Expected benefits and preliminary cost estimates
    - Methodology and key findings of the resilient corridors analysis
    - Potential funding pathways and next steps for implementation
- **Q&A and Discussion:** Following the presentation, attendees engaged in discussion with SLR and CIRCA representatives on topics including strategies for engaging with Amtrak to expedite coordination on railroad culvert improvements, possible funding sources for implementing proposed projects, and next steps to realize the proposed measures.
- **Interactive Engagement:** Large-scale maps and concept design posters were displayed throughout the venue, allowing participants to review the priority sites and proposed mitigation measures in detail and provide written comments or questions.

Engagement Materials

The following materials were made available to participants at the open house:

- **Final Project Presentation (PowerPoint):** Outlining the evolution of the project from initial conditions assessment through the development of final concept designs at the priority sites
- **Project Overview Poster:** Outlining the project goals, timeline, and overall approach
- **Project Priority Sites Maps and Concept Designs:** Identifying the location of the six priority sites and the Amtrak crossing within the river corridor study area. Illustrating the flood mitigation measures, expected benefits, and preliminary cost estimates at each of the six priority sites:
    - Wilson Avenue, Newington
    - Coles Avenue, Newington
    - Xtreme Rides at John Downey Drive, New Britain
    - Alvarium Beer Company at John Downey Drive, New Britain
    - New Britain Stadium and Veteran's Park, New Britain/Berlin
    - Deming Road, Berlin

All materials were also made available on the project website following the event.

List of Attendees

The open house was attended by residents and business owners in the river corridor and the Newington, New Britain, and Berlin communities, staff and elected officials from the three municipal regions, and CRCOG. The list of participants is listed below:

Name	Town
Gary Turco	State Representative serving Newington and New Britain
Jason Outlaw	New Britain
Heidi Samoka	CRCOG
Chris Zibbideo	Newington
Paul Dickson	Newington
David Murphy Resilient Land and Water	Greater Hartford
Mayra Rodríguez González	New Britain
Mary Buchanon	CIRCA
Brian Bugnacki	New Britain
Resident	Project area

Key Themes and Feedback

Participants provided valuable feedback during the Q&A session and through written comments on maps and posters. Key themes that emerged from the discussion included:

Amtrak Coordination:

- Multiple attendees expressed interest in understanding the process for engaging with Amtrak regarding the railroad culvert, which has been identified as a significant constriction point contributing to flooding

- Discussion focused on strategies to expedite coordination with Amtrak and whether municipal or state officials could facilitate this process
- State Representative Gary Turco stated he would follow up with key representatives to expedite coordination with Amtrak
- Questions were raised about Amtrak's maintenance responsibilities and liability for flooding impacts associated with undersized infrastructure

Funding Opportunities:

- Attendees inquired about available funding sources to implement the proposed flood mitigation measures
- Discussion included federal programs such as FEMA's Hazard Mitigation Assistance grants, Infrastructure Investment and Jobs Act funding, and state resilience programs
- Interest was expressed in understanding the grant application process, matching requirements, and timelines

Implementation and Next Steps:

- Participants asked about the timeline for advancing priority projects from conceptual design to construction
- Discussion focused on which municipalities would take the lead on specific projects and how regional coordination would be maintained
- Questions were raised about maintenance responsibilities for proposed infrastructure improvements

Site-Specific Comments:

- Attendees provided feedback on individual priority sites, including refinements to proposed designs and additional considerations for implementation
- Business owners expressed strong support for flood mitigation measures along John Downey Drive
- Residents near Wilson Avenue and Coles Avenue provided additional context on localized flooding issues
- Resident expressed concern about ongoing maintenance of proposed floodplain benches to effectively work and potential downstream impacts associated with flood mitigation projects

Resilient Corridors:

- Interest was expressed in the resilient corridors analysis and how this information could inform municipal capital improvement planning
- Discussion included prioritizing road segments critical for emergency response and access to essential services

Conclusion

The September 11, 2025 open house successfully engaged community members in reviewing the final flood mitigation concepts developed through the Resilient CT Piper Brook and Webster Brook Flood Mitigation Project. Feedback received during the event affirmed community support for the proposed measures and provided valuable insights on implementation priorities and coordination needs. The information gathered will support the three municipalities, CRCOG, and CIRCA as they work to advance these strategies into design and construction phases.

Appendix B: Advisory Committee Meeting Memos

Meeting Minutes

Resilient CT Piper Brook & Webster Brook Flood Analysis Advisory Committee Meeting

Date:	March 3, 2025	**Time:**	1:00-2:00pm EDT	**Location:**	Microsoft Teams
Client:	CIRCA			**SLR Project No.:**	149.000006.00001

	CIRCA	SLR	Advisory Committee Members
Attendees	John Truscinski Mary Buchanan Nicole Govert	Pamela Green Mark Carabetta Elizabeth McCarthy	Chris Zibbideo (Newington) Paul Dickson (Newington) Mike Ahern (Berlin) James Horbal (Berlin) Charles Paonessa (Berlin) Ryan Curley (Berlin) Jason Outlaw (New Britain) Mark Moriarty (New Britain) Heidi Samokar (CRCOG)

Agenda

Time	Item
1:00 – 1:05	**Welcome & Brief Introductions** • CIRCA & SLR introductions • Welcome to Advisory Committee members
1:05 - 1:10	**Project Overview** • Overview of project ○ FEMA models
1:10-1:20	**Windshield Survey Review** • Overview of observed pinch points at 6 locations • Feedback on observed crossings
1:20-1-40	**Input from Advisory Committee** • Input on priority flood-related issues in your areas
1:40-1:55	**Review Existing tools, plans, reports, and studies** • Existing materials & request list • Connecting us with existing materials (what, where, who) **Public Workshop Planning** • Proposed date - first week in April • Suggestions for location, outreach
1:55-2:00	**Next Steps and Action Items.**

Narrative Recap

The advisory committee meeting for the Piper Brook and Webster Brook flood analysis project brought together representatives from Newington, Berlin, and New Britain to discuss flood vulnerabilities and mitigation strategies. The project team presented their initial findings based on existing FEMA models and a recent field survey, identifying six potential flood hazard points across the three municipalities.

Town representatives provided crucial feedback, confirming the significance of identified problem areas and highlighting additional locations of concern. The discussion revealed that the John Downey Drive area, particularly the railroad crossing, is a critical flood zone affecting both New Britain and Newington. Business impacts, including property damage and tenant loss, underscore the economic importance of addressing these issues.

The meeting also exposed gaps in existing flood data, with many models being outdated or incomplete. This necessitates new modeling efforts, especially in areas like New Britain Road and Willowbrook Park. The project team plans to develop more accurate hydraulic models to evaluate current conditions and potential mitigation strategies.

Coordination with multiple stakeholders emerged as a key theme, particularly regarding the involvement of DOT and Amtrak for addressing railroad-related flooding issues. The committee also discussed plans for a public workshop in early April to gather input from residents and businesses affected by flooding.

The meeting successfully aligned the project team's initial assessments with local knowledge, setting the stage for more targeted analysis and the development of actionable flood mitigation strategies for the region.

Action Items

1. Obtain existing flood models and studies from towns, including:
    a. Webster brook study forwarded by Jim Orwell
    b. Burnham Street Bridge project information and evaluations from Berlin, including the flood modeling data for 700 feet up and downstream of the new Burnham Street Bridge
        i. Improvements to the bridge may preclude this site from being an area of flood concern; SLR will evaluate existing models to determine if this location should be included as a candidate priority site
2. Investigate additional flood-prone areas identified by town representatives:
    a. Coles Road triple pipe culvert in Newington
    b. Webster Brook crossing at Deming Road in Berlin
    c. Stamm Road area in Newington
    d. Webster Brook crossing after railroad crossing (90-degree turn)
3. Coordinate with DOT and Amtrak regarding railroad crossings and potential improvements
    a. Confirm who owns and maintains the tracks in the problem areas
    b. John Truscinski to provide connections and information
4. Organize a public workshop in early April
    a. Confirm Alvarium Brewery in New Britain as the venue
    b. Prepare social media posts and flyers for public outreach
    c. Obtain community organization and local stakeholder contact information from towns to distribute advertisements and event information through existing networks

    d. Notify Commissioner's office, Representatives, and State Senator about the event (confirm names and contact information town staff)
5. Collect economic loss data from affected businesses, particularly along the identified site at John Downey Drive

Key Takeaways

- The project focuses on watercourse flooding along Piper Brook and Webster Brook corridors in Newington, Berlin, and New Britain.
- Existing FEMA models are outdated (25+ years old) or incomplete for some areas, necessitating new modeling efforts.
- Six potential flood hazard points were identified during the initial survey, with John Downey Drive and the railroad crossing emerging as critical areas of concern.
- Town representatives confirmed and expanded on the identified problem areas, providing valuable local knowledge and historical context.
- The railroad crossing near John Downey Drive is a significant bottleneck, causing backwater effects and impacting businesses in both New Britain and Newington.
- Economic impacts on local businesses, including tenant loss and event disruptions, were identified
- Coordination with multiple stakeholders, including DOT and Amtrak, will be crucial for implementing effective flood mitigation strategies.

Notes

John Downey Drive at Xtreme Rides

- Mark M: John Downey Drive is one of the most problematic flooding areas in New Britian
    - Flooding affects businesses along John Downey Drive, causing property damage and tenant loss
    - Alvarium Beer Company has been involved in discussions about the problem area and previously hosted meetings at their location
    - Hartford Health Care left the area due to flooding issues
    - Culvert under the railroad appears to be where back up starts to occur
    - Issue spans multiple communities as it is close to the town lines for Newington and New Britian
    - Possible that beaver dams present on the other side of the railroad may be a contributing factor
- Chris Z: One of the largest pinch points and problem areas
    - During a meeting last year with state representatives to discuss the flooding in this area, water started to flood the parking lot area
- Paul D: Stamm Road north of the John Downey Drive site is another area of concern for flooding
    - Encouraged property owners in the area to put together loss estimates
- Amtrak must be involved in addressing the flood challenges at this site, which may be a barrier to solutions

New Britain Road at Veteran's Stadium

- Jason O: Significant flooding occurs around Veteran Stadium, nearby soccer fields, and Willowbrook Park

    - Dealership across the street is submitting a LOMR as part of changes in the area, and noticed that there exists a gap in the model/mapping as it moves from New Britain to BERLIN
    - Unsure if the High School sees direct impact of flooding as it is elevated
    - Flooding happens quickly, even during less intense storms
    - Events at the stadium are often affects, with the parking lot getting flooded quickly

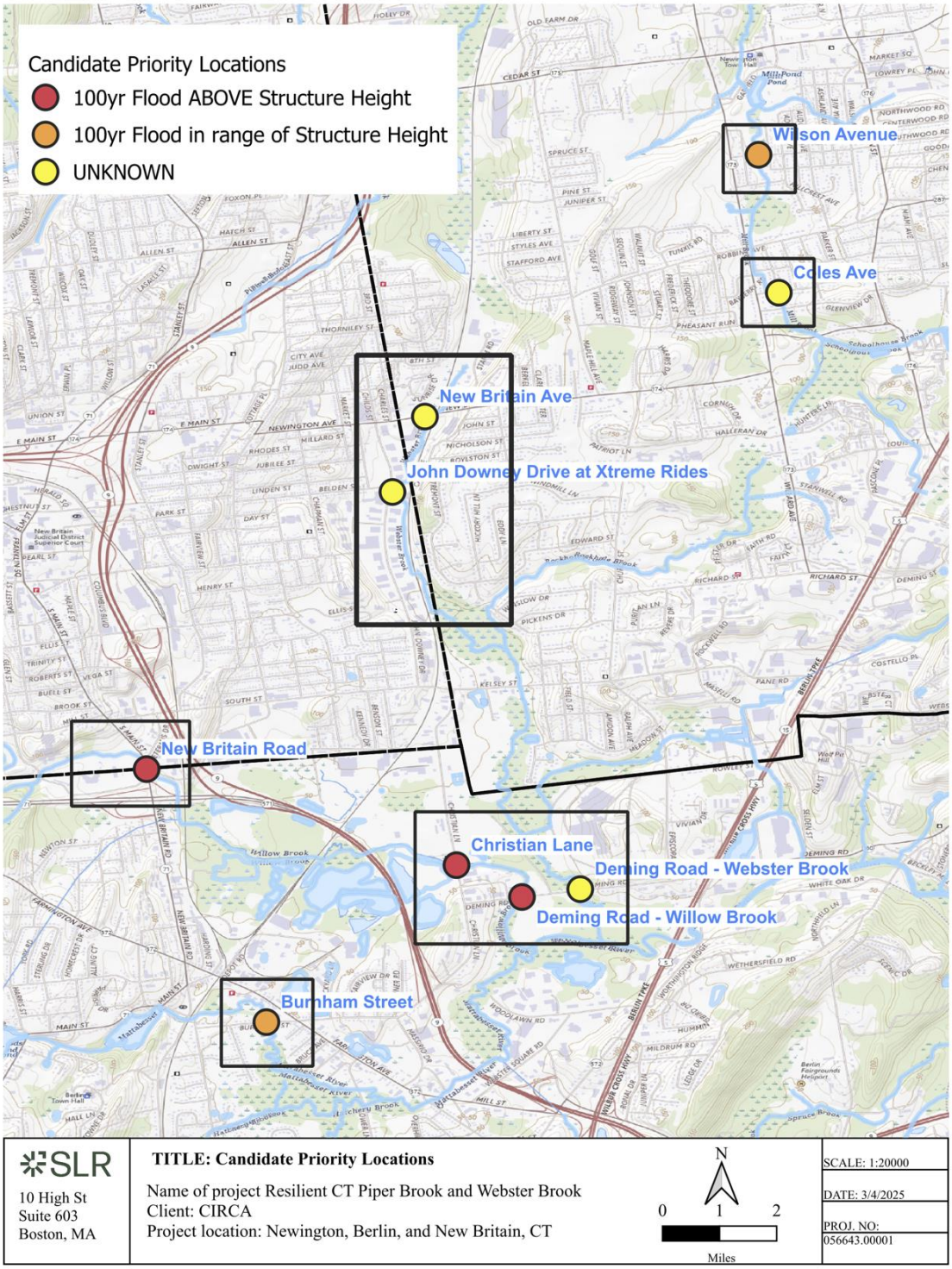
Burnham Street near Walgreens

- Ryan C: recently updated Burnham Street Bridge, which included modeling and geometry for the channel upstream and downstream of the bridge

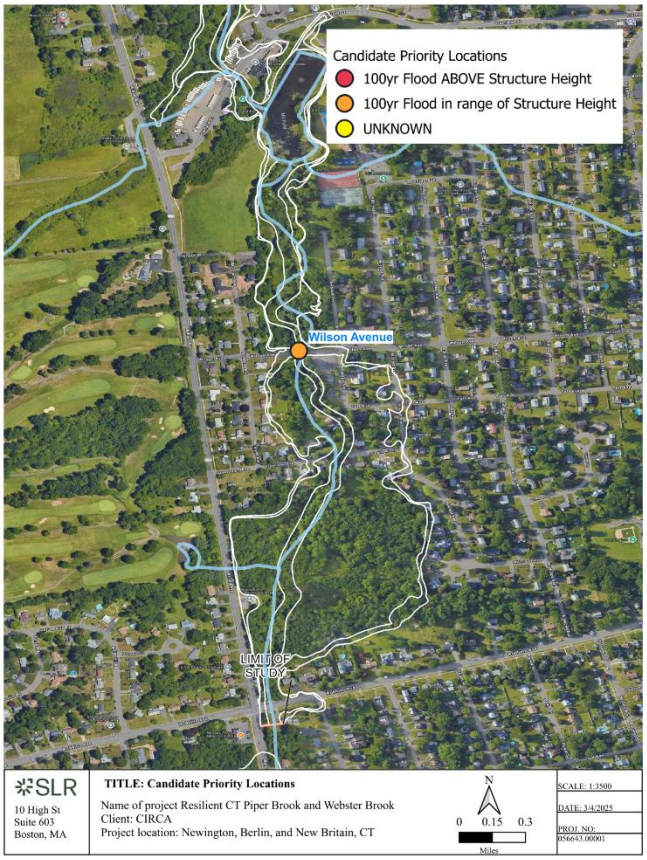
Additional Observations

- Wilson Avenue in Newington was confirmed as a valuable area to examine
- Coles Avenue in Newington was described as a problem area, with a triple pipe culvert that collects debris and causes backups
- Stamm Rd has been identified as a historic flooding issue for Newington
    - Flooding is connected to issues on New Britain Avenue and affects neighborhoods draining to that area
    - Watercourse crosses at almost 90 degrees at the railroad crossing and then travels under the street at another 90 degrees angle, creating backwater and observed swirling above the inlets to the culverts
    - Described 90 degree turns of the watercourse near Stamm Road and New Britain Avenue
    - Suggest realigning the culverts and straightening the brook to address headwater conditions at Stamm Road
- Christian Lane in Berlin noted as a perennial problem area, it was mentioned that the existing five chamber unit may not be the best approach for stormwater management and the town needs to focus on clearing the culverts
- Flooding where Webster Brook crosses Deming Road in Berlin is a concern
    - May be influenced by Mattabesset River due to their confluence about 100 feet downstream
    - Requested analysis of Deming Road crossing of Webster Brook
- Multiple representatives emphasized the interconnected nature of flooding issues across town boundaries
- Consensus on John Downey Drive and railroad crossing area being critical concern, affecting both Newington and New Britain
- Representatives showed willingness to share existing studies and data, such as Burnham Street Bridge project information and study of Webster Brook
- Economic impacts on businesses were highlighted, particularly along John Downey Drive
- Need for coordination with DOT and Amtrak regarding railroad crossings

Maps of Possible Sites for Models



Newington


Candidate Priority Locations
100yr Flood ABOVE Structure Height
100yr Flood in range of Structure Height
UNKNOWN
Wilson Avenue
LIMIT OF STUDY
SLR
10 High St
Suite 603
Boston, MA
TITLE: Candidate Priority Locations
Name of project Resilient CT Piper Brook and Webster Brook
Client: CIRCA
Project location: Newington, Berlin, and New Britain, CT
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DATE: 3/4/2025
PROJ. NO: 056643.00001


Candidate Priority Locations
100yr Flood ABOVE Structure Height
100yr Flood in range of Structure Height
UNKNOWN
LIMIT OF STUDY
Coles Ave
SLR
10 High St
Suite 603
Boston, MA
TITLE: Candidate Priority Locations
Name of project Resilient CT Piper Brook and Webster Brook
Client: CIRCA
Project location: Newington, Berlin, and New Britain, CT
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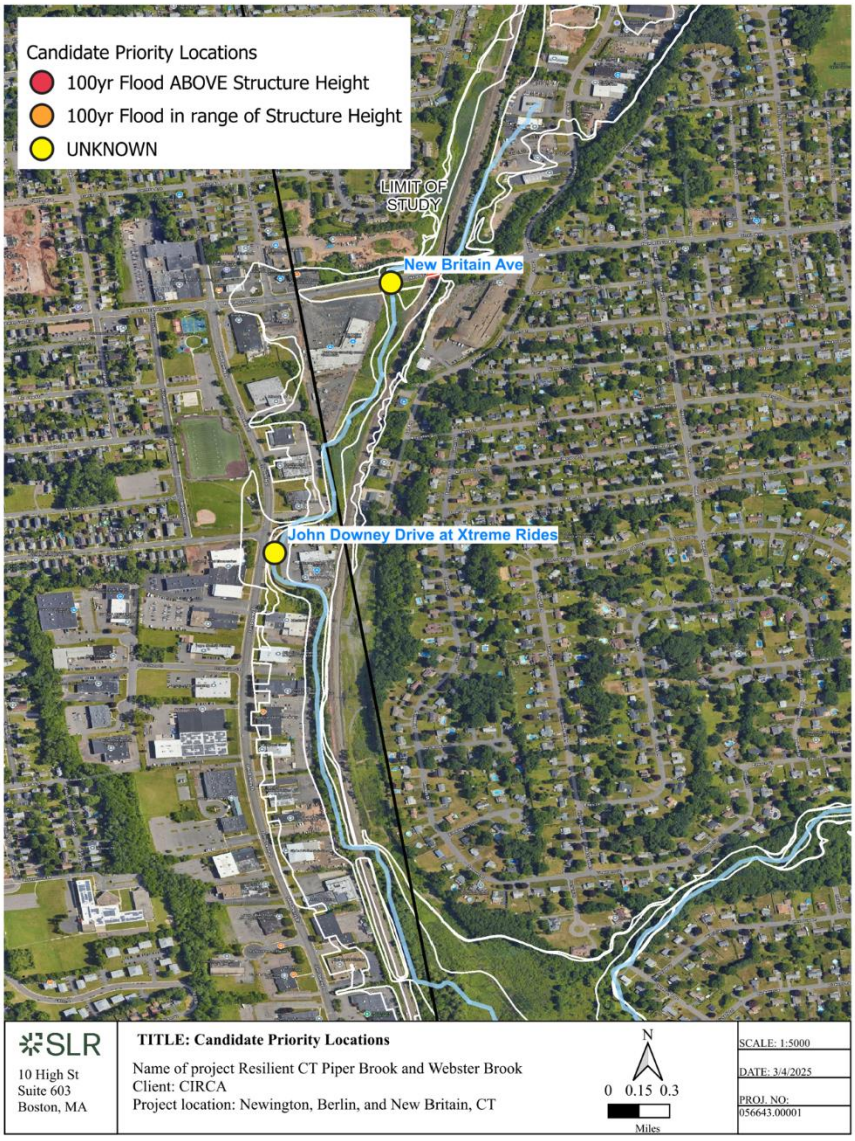
DATE: 3/4/2025
PROJ. NO: 056643.00001

New Britain/Newington



New Britain/Berlin

Berlin


Candidate Priority Locations
100yr Flood ABOVE Structure Height
100yr Flood in range of Structure Height
UNKNOWN
Christian Lane
Deming Road - Webster Brook
Deming Road - Willow Brook
SLR
10 High St
Suite 603
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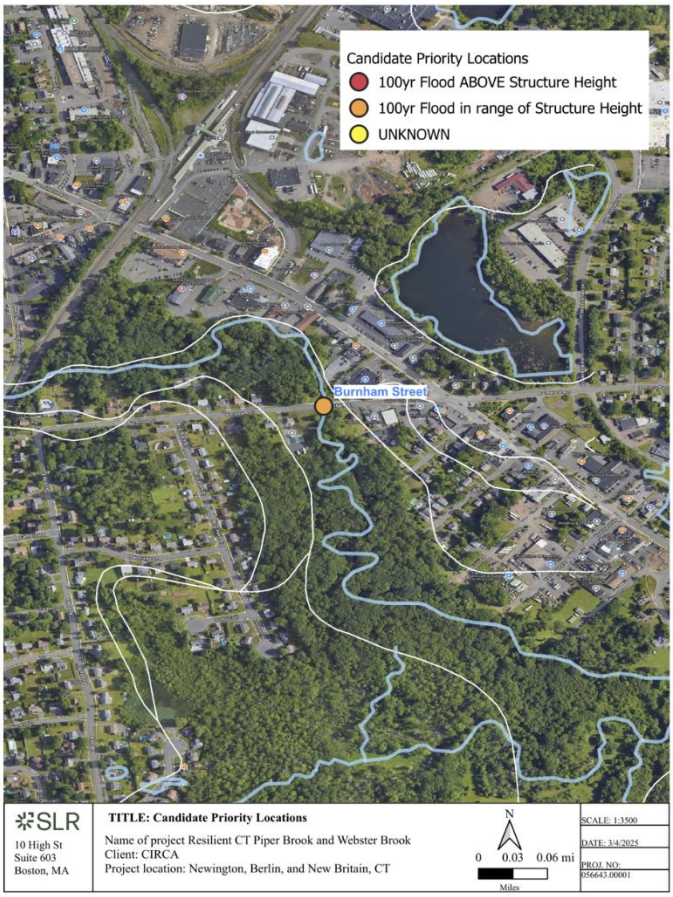
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PROJ. NO: 056643.00001

Meeting Minutes

Resilient CT Piper Brook & Webster Brook Flood Analysis Advisory Committee Meeting #2

Date:	June 30, 2025	**Time:**	1:00-2:30pm EST	**Location:**	Microsoft Teams
Client:	CIRCA			**SLR Project No.:**	149.000006.00001

	CIRCA	The SLR Team	Advisory Committee Members
Attendees	John Truscinski Mary Buchanan Nicole Govert	Pamela Green (SLR) Mark Carabetta (SLR) Jenabay Sezen(SLR)	Chris Zibbideo (Newington) Paul Dickson (Newington) Dennis Kern (Berlin) Michael Ahern (Berlin) James Horbal (Berlin) Charles Paonessa (Berlin) Ryan Curley (Berlin) Jason Outlaw (New Britain) Mark Moriarty (New Britain) Heidi Samokar (CRCOG)

Time	Item
1:00 – 1:05	**Welcome**
1:05 - 1:15	**Project Status, Progress, & Accomplishments** • Status and work complete to date: Open House, Field work, Flood Analysis
1:15-2:00	**Review of Flood Analysis Results & Proposed Adaptation Measures** • Overview of model results and proposed measures at selected sites • Feedback from Advisory Committee
2:00-2:15	**Selection of Sites for Future Flood Conditions Analysis** • Discussion on future flood conditions analysis and priority sites selection
2:15-2:25	**Next Steps** • Future Flood Conditions Analysis • Finalize Adaptation Concept Designs • Cost-Benefit Analysis • Resilient Roads Analysis
2:25-2:30	**Upcoming Meetings & Workshops** • Final Advisory Committee Meeting • Final Public Open House to Present Project Outcomes

Narrative Recap

The June 30 Advisory Committee meeting brought together representatives from New Britain, Berlin, and Newington, along with CIRCA and SLR project team members, to review detailed flood modeling results, discuss adaptation strategies at priority sites, and set direction for next steps. The meeting focused on the John Downey Drive corridor, Stamm Road, Veterans Stadium ball fields, Deming Road, Wilson Avenue, Coles Avenue, and the Route 9/Mattabesset River crossing. SLR presented findings from new and updated models, highlighted the influence of railroad and local culverts on flood extents, and outlined adaptation options. Committee members provided targeted feedback on presented model results and adaptation measures. The group discussed the challenges of engaging with Amtrak, the limited feasibility of large-scale storage in the project area, and the importance of cost-benefit prioritization. The meeting concluded with consensus on the need for targeted, scalable solutions and coordination for multi-town grant efforts.

Key Takeaways

1. John Downey Drive Corridor (Railroad crossing, Alvarium Brewing, Extreme Rides, up to New Britain Ave)

- **Railroad Culvert's Role:** The downstream railroad culvert is the primary control on flooding during large events (50-100 year), but for more frequent, nuisance-level flooding (2-10 year), local culverts and site features are more influential.
- **Alvarium Brewing Floodplain Bench:** SLR modeled a floodplain bench in the first row of parking, reducing water surface elevations by ~0.7 feet during frequent floods. This would mitigate nuisance flooding affecting business operations. The bench would replace parking with a grassy area that could have picnic tables.
- **Physical Constraints:** Bedrock and railroad embankment prevent widening the channel on the opposite side of Alvarium.
- **Cumulative Effects of Culvert Replacements:** SLR modeled resizing all three key crossings (downstream railroad, Extreme Rides driveway, New Britain Ave). Results showed that benefits are mostly localized; effects are not strongly cumulative because the crossings are too far apart to propagate effects.
- **Extreme Rides Culvert:** Upsizing the driveway culvert reduces 50-year flood elevations by ~1.5 feet and 10-year floods by ~0.75 feet, benefiting not only the parking lot but also upstream storm drainage (notably for Peter Paul Electronics).
- **Regional Storage/Buyouts:** The committee discussed buying out Extreme Rides property for flood storage. SLR noted that storage in this corridor would fill too quickly during large events to be effective, but buyouts remain an option for reducing future damages and enabling channel improvements.
- **Green Infrastructure:** SLR and committee members agreed that distributed, small-scale green infrastructure and stormwater management would cumulatively provide more benefit for frequent events than large storage basins.

2. Stamm Road and Railroad Embankment

- **Culvert/Embankment Constraints:** The railroad embankment, not just the culvert, is the main constraint. Resizing the culvert provides only minor benefit; the embankment itself is the real bottleneck.
- **Dual Channel Concept:** Committee suggested exploring a secondary channel along the power line corridor to bypass the railroad embankment. SLR agreed to look at the model to assess the feasibility of an analysis.
- **Upstream Storage:** Committee inquired about upstream storage to alleviate Stamm Road flooding. However, like Extreme Rides on John Downey Road, storage in this area would fill too quickly during large flood events to be effective. Buyout of Weber Nursery property could reduce future damages and alleviate smaller floods.
- **Railroad Engagement:** Only limited, unproductive contact with railroad so far. Committee emphasized the need to engage Amtrak/railroad for culvert maintenance and possible improvements.

3. Veterans Stadium Ball Fields (at New Britain Road)

- **Floodplain Benching:** Committee suggested modeling floodplain benches at the ball fields to increase capacity. SLR had not yet modeled this but agreed to look at the impacts of floodplain benching in conjunction with other measures below.
- **Culvert Replacements:** Resizing the arch bridge (vehicular crossing with an obelisk) could lower 5-year flood elevations by over a foot, offering significant benefit for frequent events. Removing or consolidating crossings was also discussed.
- **Sequence of Improvements:** SLR noted that floodplain benching would only be effective after upstream culvert bottlenecks are addressed, due to backwater effects.
- **Floodplain Use:** Recognized that the area is inherently flood-prone and that complete flood elimination is unrealistic, but targeted improvements could reduce damage and frequency.

4. Deming Road (Webster Brook)

- **Abandoned Railroad Embankment:** SLR found that the abandoned embankment is a major floodplain obstruction. Removing it could lower upstream water surface elevations by 1–2 feet in the 10- to 100-year events, reducing road overtopping and removing some buildings from the floodplain.
- **Combined Measures:** Combining embankment removal with resizing the Deming Road crossing yields even greater benefits (up to 2–3 feet reduction).
- **Ownership:** The embankment is owned by Metro Realty, a known and cooperative developer, making this a feasible, high-benefit project.

5. Wilson Avenue (Newington)

- **Culvert Resizing:** Backwater upstream of Wilson Avenue affects residential areas. SLR modeled removing the constriction (sizing to 1.2x bankfull width), which would significantly reduce flooding in 10-, 50-, and 100-year events, potentially removing homes from the floodplain.
- **Next Steps:** SLR to develop specific culvert sizing for grant applications.

6. Coles Avenue

- **Culvert Issues:** Small, misaligned, and sediment-prone culvert. SLR suggested that sediment removal and upsizing to a box culvert could reduce overtopping.

7. Route 9/Mattabesset River Crossing

- **No Model, Field Assessment Only:** SLR visited the site and noted frequent flooding and high water marks, but lacks a model for this area. General floodproofing recommendations will be made.

Action Items

1. **Modeling & Analysis**
    - Model floodplain benches at Veterans Stadium ball fields to quantify additional capacity and benefit.
    - Finalize Wilson Avenue culvert sizing (1.2x bankfull width) for grant applications.
    - Integrate repetitive-loss data (if obtained)
2. **Stakeholder Coordination**
    - Include recommendations for Amtrak/DOT to improve culvert maintenance and sediment clearance.
    - Advisory Committee members to engage Metro Realty (Deming Road) and Alvarium Brewing on land-use adjustments (embankment removal, parking-lot modifications).
3. **Cost-Benefit Analysis**:
    - Prioritize Alvarium (floodplain bench), Deming Road (abandoned railroad removal), and Wilson Ave (culvert resizing) due to actionable benefits.
4. **Funding (Advisory Committee actions)**
    - Compile flood-damage cost data (business/property losses) for grant mutli-town applications on Amtrak Corridor.
    - Submit Deming Road/Wilson Avenue projects for CT DEEP's July 2025 grant round.
5. **Project Next Steps**
    - Complete Concept Designs for top priority sites
    - Complete "resilient roads" analysis (critical evacuation routes)
    - Complete Cost-Benefit analysis for 3 priority sites
    - Plan Final Advisory Committee meeting (late August 2025)
    - Host public workshop (early September 2025)

Meeting Recap

Resilient CT Piper Brook & Webster Brook Flood Analysis Advisory Committee Meeting #3

Date:	August 25, 2025	**Time:**	1:00-2:30pm EST
Location:	Microsoft Teams		
Client:	CIRCA	**SLR Project No.:**	149.000006.00001

	CIRCA	**The SLR Team**	**Advisory Committee Members**
Attendees	John Truscinski Mary Buchanan Nicole Govert	Pamela Green Mark Carabetta Jenabay Sezen Elizabeth McCarthy	**Chris Zibbideo (Newington)** **Paul Dickson (Newington)** Dennis Kern (Berlin) **Michael Ahern (Berlin)** James Horbal (Berlin) Charles Paonessa (Berlin) **Ryan Curley (Berlin)** **Jason Outlaw (New Britain)** **Mark Moriarty (New Britain)** **Heidi Samokar (CRCOG)**

Agenda

Time	Item
1:00 – 1:05	**Welcome**
1:05 - 1:10	**Project Status, Progress, & Accomplishments** • Status and work complete to date
1:10-1:45	**Review of Concept Designs and Costs** • Overview of Concepts Designs for Priority Sites • Discussion on Proposed Adaptation Measures and costs
1:45-2:15	**Benefits-Cost Analysis** • Overview of BCAs for 3 Priority Sites • Discussion on BCAs
2:15-2:25	**Resilient Roads Analysis** • Overview of Resilient Roads
2:25-2:30	**Next Steps** • Final Public Open House to Present Project Outcomes • Final report

On August 25, 2025, the project team held the third and final Advisory Committee meeting for the Resilient CT Piper and Webster Brook Flood Analysis project. The purpose of this meeting was to present the final project results to the committee members from Newington, New Britain, and Berlin. The team provided an overview of the concept designs, benefit-cost analyses, and the resilient roads analysis for the study area, and gathered crucial feedback before the final public workshop and report.

Key Takeaways & Discussion

Priority Site Concepts

1. Wilson Avenue (Newington)

- **Problem/Solution**: Address upstream flooding by replacing an undersized bridge.
- **Impact**: Provides substantial flood reduction for over 35 upstream properties, with some homes being removed from the 100-year flood zone entirely.
- **Discussion & Feedback**: Committee members agreed this analysis would be very useful for grant applications. It was confirmed that since the project does not create significant new water storage, there is low concern for negative downstream impacts.

2. Deming Road/Webster Brook (Berlin)

- **Problem/Solution**: Mitigate flooding from an old railroad embankment and undersized culverts by either removing the embankment alone or performing a full bridge replacement.
- **Impact**: Benefits downstream businesses and reduces the frequency of road flooding.
- **Discussion & Feedback**: Removing the embankment was described as "low-hanging fruit" that provides significant benefits to businesses and the road at a lower cost than a full bridge replacement.

3. Alvarium Brewery (John Downey Drive, New Britain)

- **Problem/Solution**: Address frequent, nuisance-level flooding that disrupts business by installing a floodplain bench in the rear parking area.
- **Impact**: Reduces the smaller, more frequent floods that cause the brewery to lose customers and halt beer production due to drainage issues.
- **Discussion & Feedback**:
    - A key concern was raised about the solution: the business currently loses parking *some* of the time due to floods, whereas the proposed bench would mean losing that parking *all* of the time. It was suggested this framing could make this a "difficult sell."
    - Another concern was whether backed-up water in the adjacent storm system would negate the project's benefits.
    - Suggestions included quantifying the exact number of parking spaces impacted, exploring reconfigurations to offset the loss, and promoting the new floodplain as a green space amenity with trails or tables.

4. Extreme Rides (John Downey Drive, New Britain)

- **Problem/Solution**: Address flooding from an undersized culvert and hardened channel by replacing the culvert with a bridge and widening the channel.
- **Impact**: Lowers water surface elevations, which improves drainage for all connecting storm systems and benefits nearby businesses.
- **Discussion & Feedback**: An alternative solution involving a property buyout and converting the entire parcel into a floodplain was presented, which would provide similar flood-reduction benefits.

5. Veterans Stadium & Ball Fields (New Britain)

- **Problem/Solution**: Alleviate frequent parking lot and ballfield flooding by replacing or removing a restrictive arch bridge and installing a floodplain bench.
- **Impact**: Reduces nuisance flooding in the parking lot during more frequent 2- and 5-year storm events.
- **Discussion & Feedback**: The analysis showed that completely removing the arch bridge provides similar benefits to replacing it, but at a significantly lower cost. A suggestion was made to explore extending the floodplain benching even further. Concerns about existing underground utilities were raised.

6. Coles Avenue (Newington)

- **Problem/Solution**: Address road overtopping by replacing undersized culverts that are prone to sediment buildup.
- **Impact**: Reduces water surface elevation and the frequency of road overtopping.
- **Discussion & Feedback**: A committee member noted a previous, more expensive bond request for this location had been turned down. The project team emphasized that while sediment removal is an option, it requires ongoing maintenance, making a culvert upgrade a more permanent solution.

7. Critical Finding: Railroad Impact

The analysis clearly identified that the Amtrak railroad bridge and embankment on John Downey Drive is a primary driver of major flooding for the entire corridor. While engaging with the railroad is a challenge, this study provides the technical evidence needed to initiate conversations about long-term solutions.

Benefit-Cost Analysis (BCA)

The team used the FEMA BCA toolkit to analyze three priority sites (Wilson Avenue, Deming Road, and Alvarium Brewery). The discussion highlighted that the results are highly sensitive to specific data inputs, particularly the lowest floor elevation of impacted buildings and whether basements are finished or unfinished. This uncertainty was most evident at Wilson Avenue, where the Benefit-Cost Ratio (BCR) varied widely depending on the basement assumptions. To secure grants, more precise data from elevation certificates, real-world damage costs (e.g., furnace replacements), business financial losses, and annual bridge maintenance costs will be needed to strengthen the analysis.

Benefit-Cost Analysis Results

- Wilson Avenue: BCR 0.55-1.44 (wide range due to basement data uncertainty)
- Deming Road: BCR 0.61 (embankment removal only)
- Alvarium Brewery: BCR 0.38
- Note: Results heavily dependent on accurate data

Funding Challenges & Opportunities

The committee discussed the path forward for funding and implementation. It was noted that public works projects like bridge replacements often fit into traditional funding sources more easily than projects on private property like the Alvarium floodplain bench. The Resilient Connecticut team advised that multi-town projects are complex, but that Councils of Government (COGs) can play a key role in championing the concepts and pursuing funding.

Potential opportunities mentioned:

- DEEP Climate Resilience Fund (opening in Fall 2025)
- Economic Development Agency (EDA) resiliency grants
- Connecticut Green Bank (low-cost loans)
- Multi-town corridor Municipal bonding across three towns
- Private property projects (like Alvarium) will face unique funding challenges

Resilient Roads Analysis

A high-level Resilient Roads Analysis was performed to identify and score roadways critical for maintaining access to essential community services during and after flood events. The scoring system prioritizes roads that serve a higher number of critical facilities like hospitals, schools, and emergency shelters. The analysis for Newington and New Britain is complete, while the analysis for Berlin will be finalized for the report after resolving minor GIS data issues.

Action Items

- Finalize and distribute the project report.
- Host the final public workshop on **Thursday, September 11, from 5:30-7:00 p.m. at Alvarium Brewery, 365 John Downey Drive, New Britain, CT**.
- Invite the interested legislative delegation to the public workshop.
- Develop and distribute promotional materials for the workshop.
- Conduct a preliminary conversation with the owner of Alvarium Brewery about the concept design and parking feedback *before* the public meeting.
- Share the FEMA BCA toolkit spreadsheets with CIRCA for distribution to the towns to allow them to refine the analysis with more precise local data.
- The towns will work to gather more accurate data for the BCA, including elevation certificates and estimates for annual bridge maintenance.

Appendix C: FEMA Model List

Piper Brook and Webster Brook Project Study Area Available FEMA Models

Flooding Source:	FEMA Cross Sections	Community ID	Community	County	Eff. Date	Hydraulic Model or Method	Format	Notes
Piper Brook	A-AK	09003C	Hartford Co.	Hartford Co.	May-99	HEC-RAS	Digital	Piper Brook HEC-RAS for x sects A-AK, FIS plot and CAD files.
Rock Hole Brook	A-T	09003C	Hartford Co.	Hartford Co.	May-99	HEC-RAS	Digital	Rock Hole Brook HEC-RAS for x sects A-T; hydrology information, CAD files, RAS-Plot AND UNVERIFIED Hec-2 data.
Webster Brook	A-AH	09003C	Hartford Co.	Hartford Co.	Jul-98	HEC-RAS	Digital	Webster Brook HEC-RAS for x sects A-AH; FIS plot; unverified Hec-2 data, hydrology information.
Mill Brook	A-AN	09003C	Hartford Co.	Hartford Co.	May-99	HEC-RAS	Digital	Mill Brook HEC-RAS for x sects A-AN.
Belcher Brook		90022	City of Berlin	Hartford Co.		USGS STEPBACKWATER	Scanned Microfiche (PDF)	Unverified USGS modeling from microfiche for Belcher Brook. Scan is difficult to read in some areas.
Spruce Brook		90022	City of Berlin	Hartford Co.		USGS STEPBACKWATER	Scanned Microfiche (PDF)	Unverified USGS modeling from microfiche for Spruce Brook. Scan is difficult to read in some areas.
Willow Brook		90032	City of New Britain	Hartford Co.		USGS STEPBACKWATER	Scanned Microfiche (PDF)	Unverified USGS modeling from microfiche for Willow Brook.
Hatchery, Belcher, Willow, Spruce, Crooked, Stocking and John Hall Brooks		90022	City of Berlin	Hartford Co.	5/3/1993	USGS STEPBACKWATER	PDF	Unverified LMMP with USGS modeling for Hatchery Brook, Belcher Brook, Stocking Brook, Willow Brook, Spruce Brook, Crooked Brook and John Hall Brook. Discharges for the models match the FIS.
Mattabesset River	Possibly H-Q and AK-AP	90022	Town of Berlin	Hartford Co.	Dec-78	USGS STEPBACKWATER	Scanned Microfiche (PDF)	USGS modeling for Mattabesset River. The model was filmed poorly and some of the scans are not readable. The scans possibly contain x sects H-P and AK-AP.

Appendix D: Priority Sites Concepts Designs and Models

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Date Saved: 9/3/2025

WILSON AVE - PROPOSED BRIDGE REPLACEMENT

Resilient Piper Brook and Webster Brook

Connecticut Institute for Resilience and Climate Adaptation

0 50
Feet

N

SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773

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Date Saved: 9/3/2025

COLES AVENUE - PROPOSED BRIDGE REPLACEMENT

Resilient Piper Brook and Webster Brook

Connecticut Institute for Resilience and Climate Adaptation

0 50

Feet

N

SLR

99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773

JOHN DOWNEY DRIVE
DOWNSTREAM RAILROAD CROSSING

Resilient Piper Brook and Webster Brook

Connecticut Institute for Resilience and Climate Adaptation

0 125 250
Feet

N

SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773

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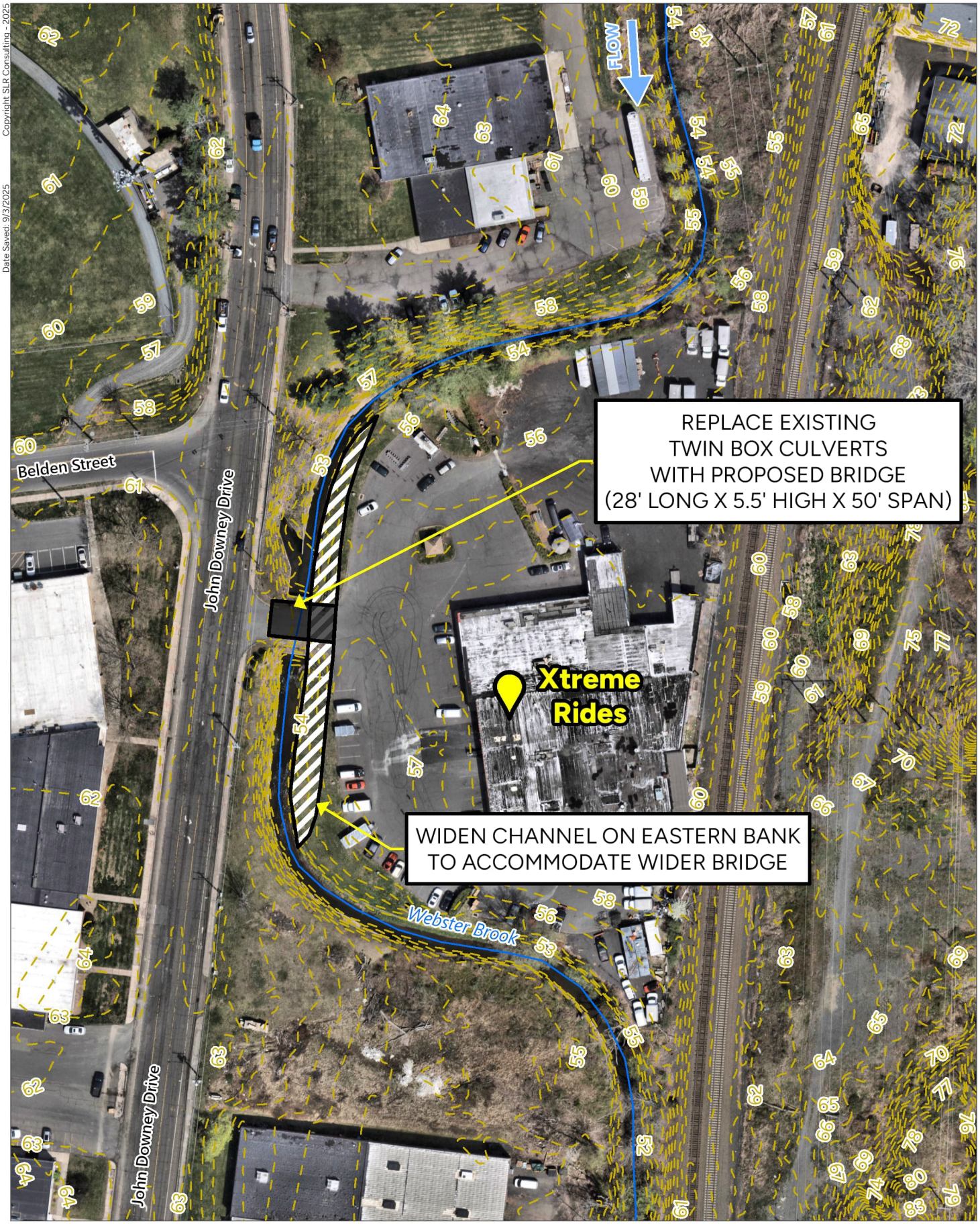
Date Saved: 9/3/2025



JOHN DOWNEY DRIVE - XTREME RIDES
REPLACE DRIVEWAY BRIDGE

Resilient Piper Brook and Webster Brook

Connecticut Institute for Resilience and Climate Adaptation

0 50 100
Feet

N

SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773

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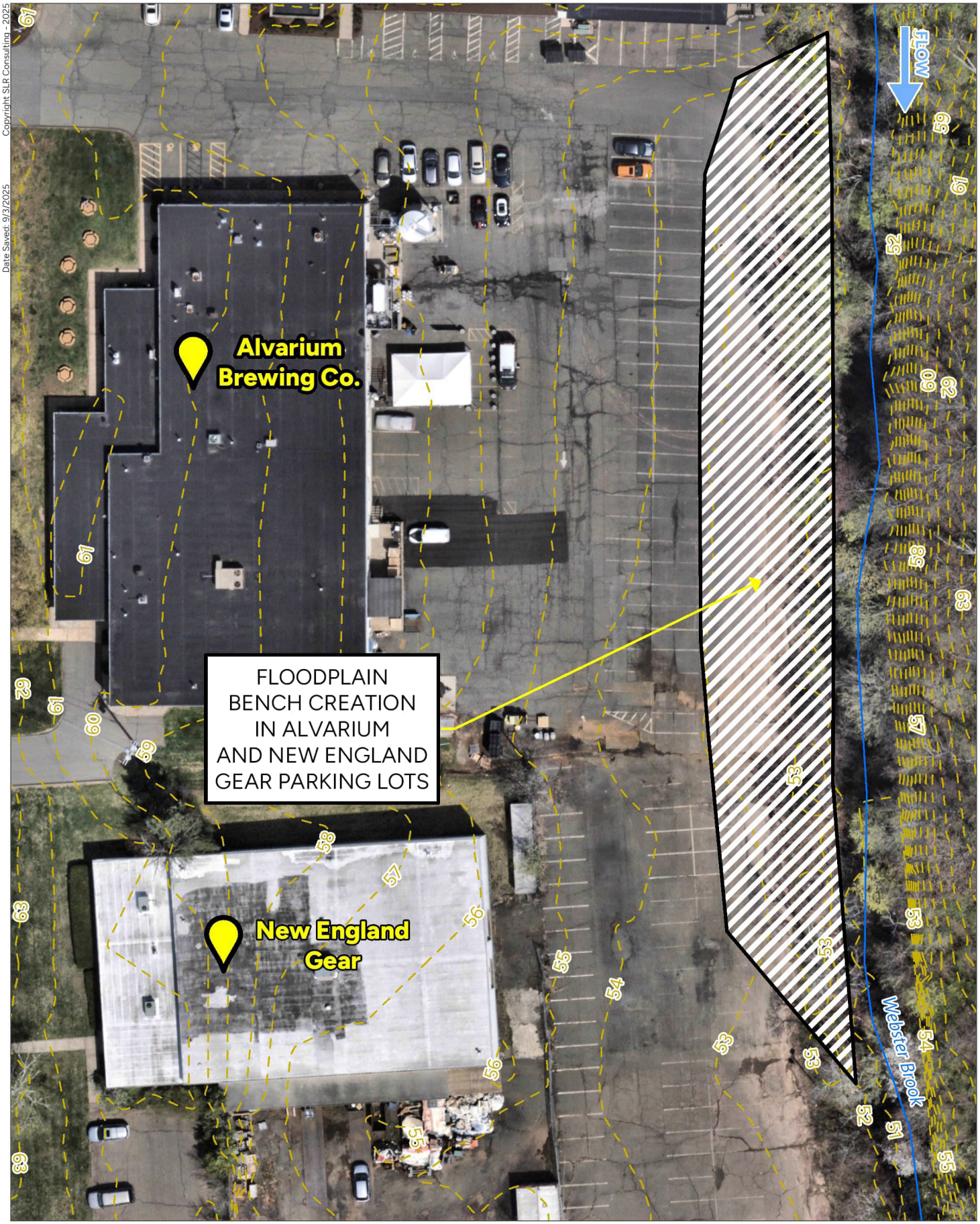


JOHN DOWNEY DRIVE - PROPOSED FLOODPLAIN BENCH NEAR ALVARIUM BEER CO.

Resilient Piper Brook and Webster Brook

Connecticut Institute for Resilience and Climate Adaptation

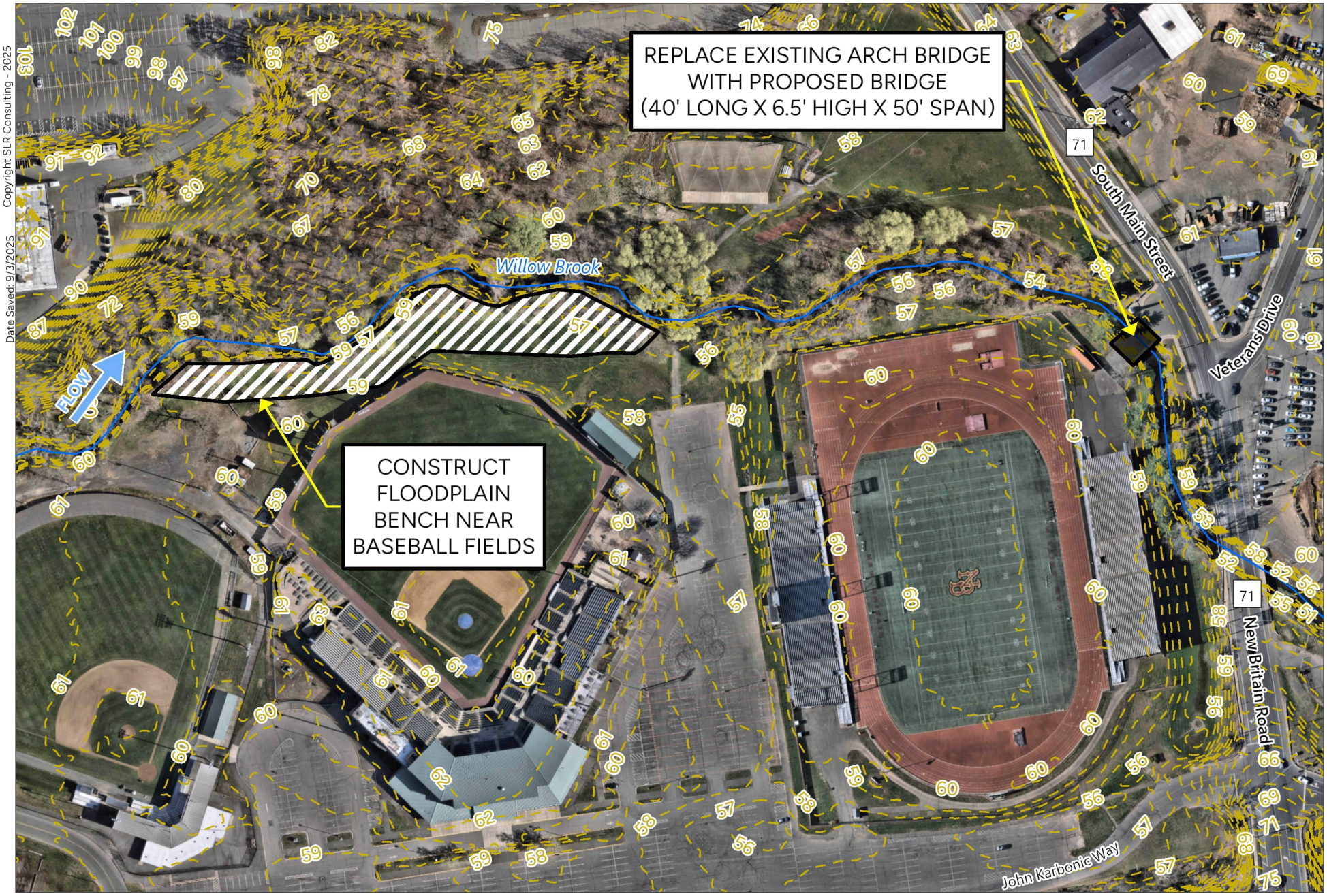
0 25 50

Feet

N

SLR

99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773



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VETERANS STADIUM WILLOW BROOK PARK

PROPOSED BRIDGE REPLACEMENT AND FLOODPLAIN BENCH

Resilient Piper Brook and Webster Brook

Connecticut Institute for Resilience and Climate Adaptation

0 75 150

Feet

N

SLR

99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773

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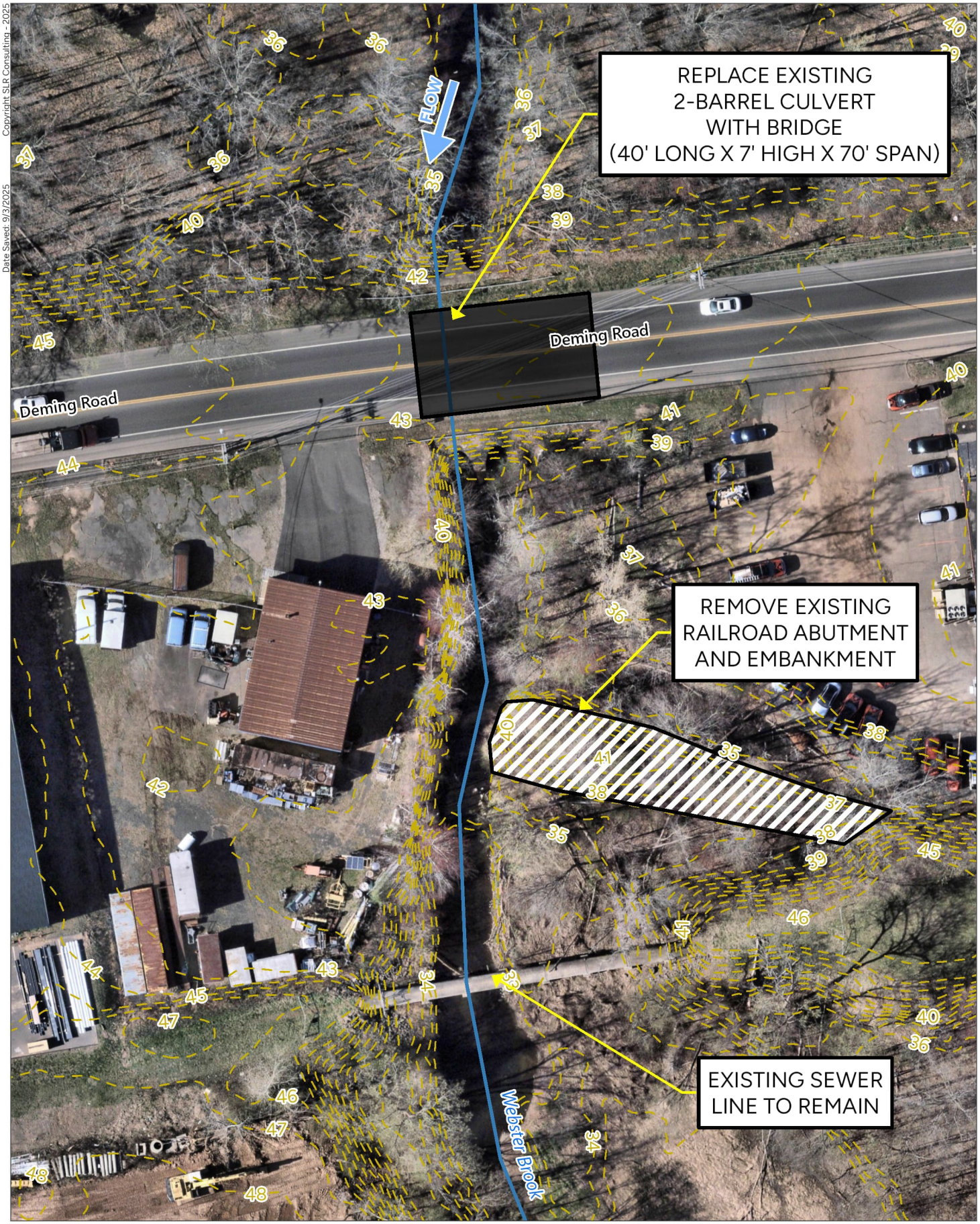
Date Saved: 9/3/2025



DEMING ROAD - PROPOSED REMOVAL OF RAILROAD EMBANKMENT AND REPLACEMENT OF DEMING ROAD BRIDGE

Resilient Piper Brook and Webster Brook

Connecticut Institute for Resilience and Climate Adaptation

0 50 Feet

N

SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773

Appendix E: Benefit-Cost Analysis Details

Resilient CT Piper Brook and Webster Brook Flood Analysis Benefit-Cost Analysis (BCA) Analysis at 3 Priority Sites

FEMA BCA Toolkit

Hazard Probability Parameters - Flood

Enter the Lowest Floor Elevation of the Property (ft): 70.65

Enter the Streambed Elevation at the Property Location (ft): 72

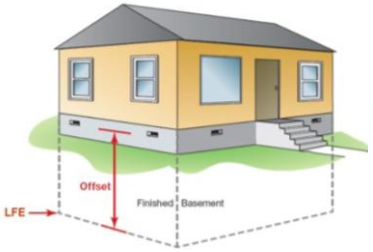
Enter below the Recurrence Interval, corresponding Water Surface Elevation, and Discharges:

Use Default Recurrence Intervals? Yes

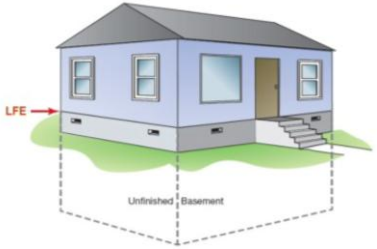
BEFORE MITIGATION		
Recurrence Interval (years)	Water Surface Elevation (ft)	Discharge (cfs)
10	76.5	219
50	78.2	416
100	78.8	515
500	79.8	875

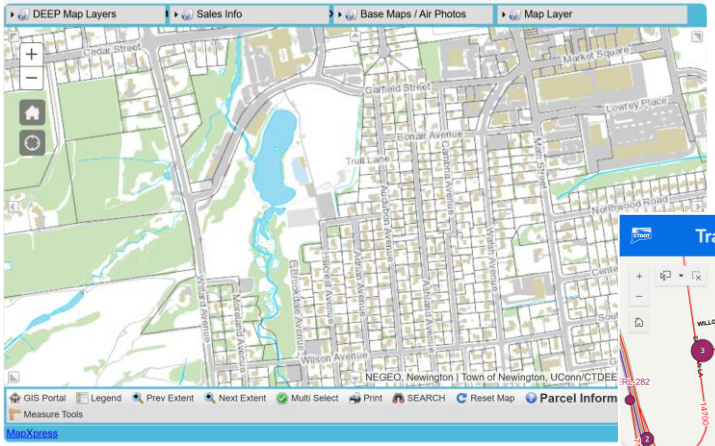
AFTER MITIGATION		
Recurrence Interval (years)	Water Surface Elevation (ft)	Discharge (cfs)
10	76	219
50	77.1	416
100	77.4	515
500	79	875

Finished Basement



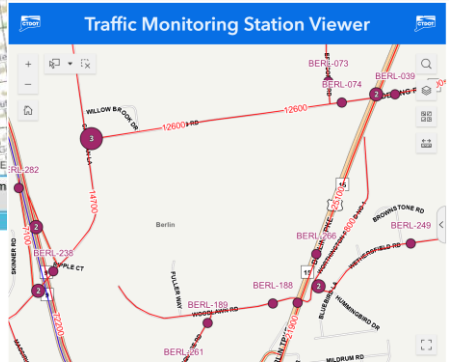
Unfinished Basement





2024 Connecticut Parcel and CAMA Data

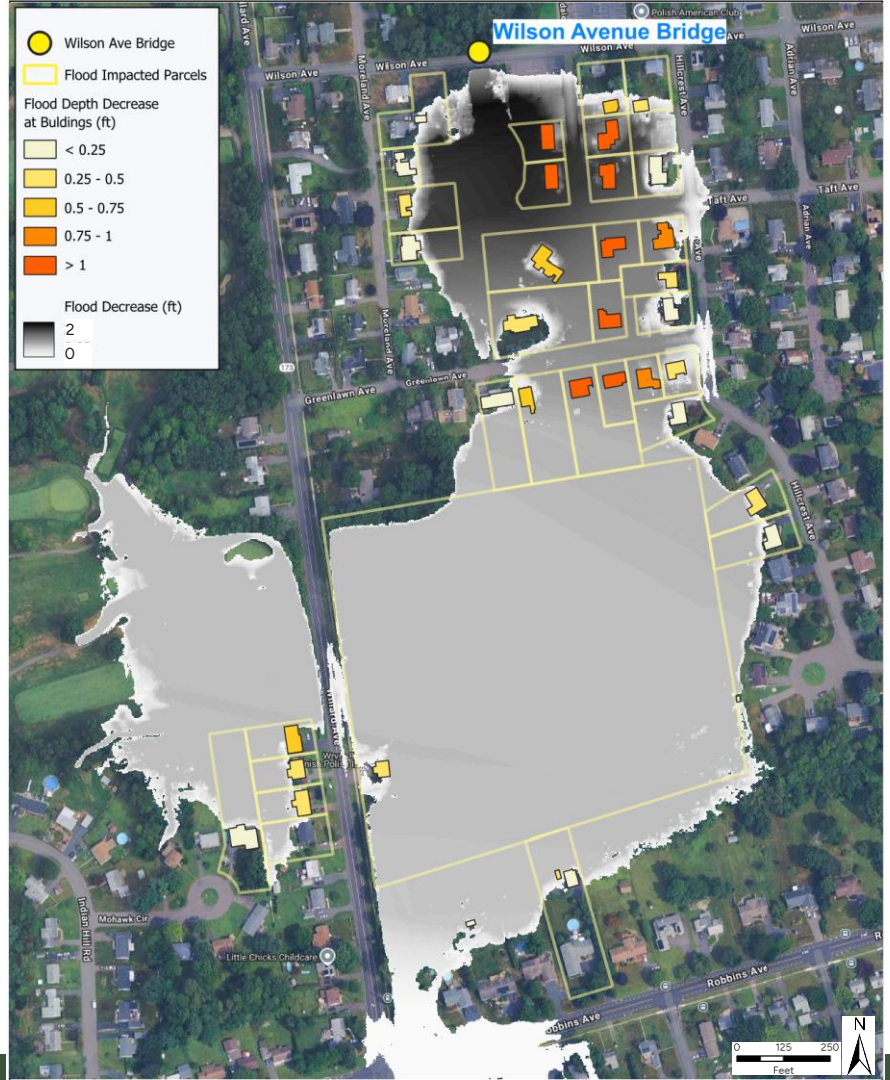
Connecticut DOT Traffic Monitoring



Wilson Avenue, Newington (BCA)

FEMA BCA Inputs:

- Water Surface Elevation = HEC-RAS Model
- LFE = DEM LIDAR + Google Maps + CAMA
- Building details = CAMA



Wilson Avenue Impacted Structures

All Basements

Map Marker	Mitigation Title	Property Type	Hazard	Discount Rate (%)	Benefits (B)	Costs (C)	BCR (B/C)
1	Drainage Improvement @ 200-246 Wilson Ave, Newington, CT, 06111, USA		DFA - Riverine Flood	7.0	$ 37,103	$ 2,324,090	0.02
2	Drainage Improvement @ 98 Brookdale Ave, Newington, CT, 06111, USA		Riverine Flood	7.0	$ 201,511	$ 0	0.00
3	Drainage Improvement @ 3 Greenlawn Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 61,586	$ 0	0.00
4	Drainage Improvement @ 154 Robbins Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 320	$ 0	0.00
5	Drainage Improvement @ 9 Greenlawn Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 47,918	$ 0	0.00
6	Drainage Improvement @ 35 Greenlawn Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 60,145	$ 0	0.00
7	Drainage Improvement @ 30 Greenlawn Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 96,417	$ 0	0.00
8	Drainage Improvement @ 6 Greenlawn Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 52,831	$ 0	0.00
9	Drainage Improvement @ 115 Taft Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 129,009	$ 0	0.00
10	Drainage Improvement @ 139 Wilson Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 714	$ 0	0.00
11	Drainage Improvement @ 29 Greenlawn Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 15,910	$ 0	0.00
12	Drainage Improvement @ 26 Mohawk Cir, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 57,493	$ 0	0.00
13	Drainage Improvement @ 245 Hillcrest Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 61,193	$ 0	0.00
14	Drainage Improvement @ 263 Hillcrest Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 47,415	$ 0	0.00
15	Drainage Improvement @ 84 Moreland Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 115	$ 0	0.00
16	Drainage Improvement @ 221 Hillcrest Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 134,319	$ 0	0.00
17	Drainage Improvement @ 237 Hillcrest Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 152,380	$ 0	0.00
18	Drainage Improvement @ 147 Wilson Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 1,196	$ 0	0.00
19	Drainage Improvement @ 100 Moreland Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 100,468	$ 0	0.00
20	Drainage Improvement @ 98 Moreland Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 91,902	$ 0	0.00
21	Drainage Improvement @ 92 Moreland Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 116,570	$ 0	0.00
22	Drainage Improvement @ 104 Brookdale Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 223,779	$ 0	0.00
23	Drainage Improvement @ 103 Brookdale Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 444,900	$ 0	0.00
24	Drainage Improvement @ 1055 Willard Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 81,608	$ 0	0.00
25	Drainage Improvement @ 1061 Willard Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 79,242	$ 0	0.00
26	Drainage Improvement @ 1065 Willard Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 33,389	$ 0	0.00
27	Drainage Improvement @ 1051 Willard Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 43,571	$ 0	0.00
28	Drainage Improvement @ 291 Hillcrest Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 96,420	$ 0	0.00
29	Drainage Improvement @ 283 Hillcrest Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 49,257	$ 0	0.00
30	Drainage Improvement @ 97 Brookdale Ave, Newington, Connecticut, 06111		Riverine Flood	7.0	$ 396,550	$ 0	0.00
31	Drainage Improvement @ 1056 Willard Ave, Newington, Connecticut, 06111		Riverine Flood				
TOTAL (SELECTED)							
TOTAL							

Benefits	Costs	BCR
$3,350,322	$2,324,090	1.44

CAMA Finished Basements

ste (%)	Benefits (B)	Costs (C)	BCR (B/C)
	$ 37,103	$ 2,324,090	0.02
	$ 15,978	$ 0	0.00
	$ 47,964	$ 0	0.00
	$ 320	$ 0	0.00
	$ 10,610	$ 0	0.00
	$ 1,508	$ 0	0.00
	$ 1,281	$ 0	0.00
	$ 2,729	$ 0	0.00
	$ 3,969	$ 0	0.00
	$ 714	$ 0	0.00
	$ 2,288	$ 0	0.00
	$ 23	$ 0	0.00
	$ 2,122	$ 0	0.00
	$ 33,793	$ 0	0.00
	$ 115	$ 0	0.00
	$ 2,995	$ 0	0.00
	$ 2,312	$ 0	0.00
	$ 1,196	$ 0	0.00
	$ 86,846	$ 0	0.00
	$ 78,280	$ 0	0.00
	$ 102,948	$ 0	0.00
	$ 210,157	$ 0	0.00
	$ 16,529	$ 0	0.00
	$ 110	$ 0	0.00
	$ 65,620	$ 0	0.00
	$ 517	$ 0	0.00
	$ 173	$ 0	0.00
	$ 82,798	$ 0	0.00
	$ 338	$ 0	0.00
	$ 382,928	$ 0	0.00
	$ 471	$ 0	0.00

Benefits	Costs	BCR
$1,296,065	$2,324,090	0.56

Deming Road Impacted Structures

- Deming Road
- Artisan Building and Remodeling, LLC
- Residence + Outbuilding at 244 Deming Rd

Deming Road Impacted Structures (BCA)

Option 1
Bridge Replacement and Railroad Embankment Removal

Map Marker ▲	Mitigation Title	Property Type	Hazard	Discount Rate (%)	Benefits (B)	Costs (C)	BCR (B/C)
1	Drainage Improvement @ 197-199 Deming Rd, Berlin, CT, 06037, USA		DFA - Riverine Flood	7.0	$ 346,200	$ 3,490,090	0.10
2	Drainage Improvement @ 230 Deming Rd, Berlin, Connecticut, 06037		Riverine Flood	7.0	$ 50,051	$ 0	0.00
3	Drainage Improvement @ 244 Deming Rd, Berlin, Connecticut, 06037		Riverine Flood	7.0	$ 148,663	$ 0	0.00
4	Drainage Improvement @ 244 Deming Rd, Berlin, Connecticut, 06037		Riverine Flood	7.0	$ 1,305	$ 0	0.00
TOTAL (SELECTED)							
TOTAL							

Benefits	Costs	BCR
$546,219	$3,490,090	0.16

Option 2
Railroad Abutment/ Embankment Removal only

Map Marker ▲	Mitigation Title	Property Type	Hazard	Discount Rate (%)	Benefits (B)	Costs (C)	BCR (B/C)
1	Drainage Improvement @ 197-199 Deming Rd, Berlin, CT, 06037, USA		DFA - Riverine Flood	7.0	$ 320,885	$ 850,409	0.38
2	Drainage Improvement @ 230 Deming Rd, Berlin, Connecticut, 06037		Riverine Flood	7.0	$ 50,600	$ 0	0.00
3	Drainage Improvement @ 244 Deming Rd, Berlin, Connecticut, 06037		Riverine Flood	7.0	$ 145,642	$ 0	0.00
4	Drainage Improvement @ 244 Deming Rd, Berlin, Connecticut, 06037		Riverine Flood	7.0	$ 1,283	$ 0	0.00
TOTAL (SELECTED)							
TOTAL							

Benefits	Costs	BCR
$518,410	$850,409	0.61

Alvarium Brewery Impacts (BCA)

Interview with Brian Bugnacki, owner Alvarium Brewery, August 2025

- Over the past 3-5 years it has flooded 15-20 times impacting business
- Lost revenue during flood events impacting parking (~$3,000 per flood event)
- Payroll losses due to drainage issue (~$1,300 per flood event)

Map Marker ▲	Mitigation Title	Property Type	Hazard	Discount Rate (%)	Benefits (B)	Costs (C)	BCR (B/C)
1	Floodplain and Stream Restoration @ 365 John Downey Dr, New Britain, Connecticut, 06051		DFA - Riverine Flood	7.0	$ 331,560	$ 870,409	0.38
TOTAL (SELECTED)							
TOTAL							

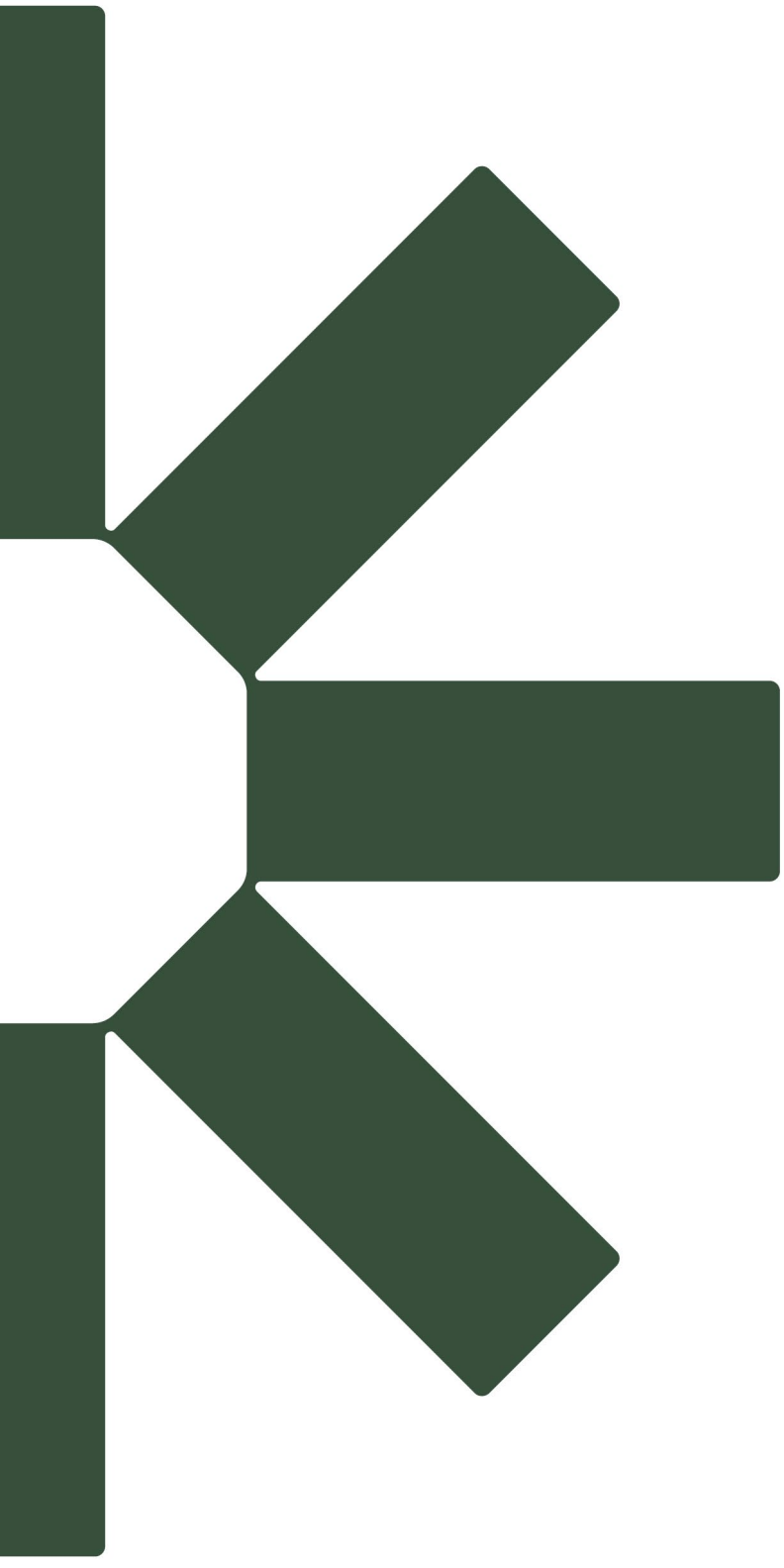
Benefits	Costs	BCR
$331,560	$870,409	0.38

BCAs at 3 Priority Sites recap

Proposed Measure	Total cost ($)	Total benefits ($)	Benefit-cost ratio (BCR)
Wilson Ave Bridge Replacement	$2,324,090	$1,296,065-$3,350,322	0.55 - 1.44
Deming Road			
Option 1: Bridge Replacement + Railroad Embankment Removal	$3,490,090	$546,219	0.16
Option 2: Railroad Embankment Removal	$812, 409	$518,410	0.64
Alvarium Flood Bench	$870,409	$331,560	0.38

Caveats and considerations..

- Need more accurate and properly sourced data (Elevation Certificates for LFEs)
- Expert input on assumptions (annual maintenance costs)
- Company specific data (contact companies)
- Cost estimates based on detailed assessments



Making Sustainability Happen