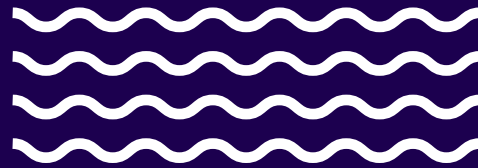


Town of Manchester Flood Resiliency Plan



Thornton Tomasetti

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This Plan is the result of the contributions of many individuals, organizations, and community members who gave their time, expertise, and input throughout the planning process.

The Town of Manchester is grateful to the residents, business owners, and stakeholders who participated in community engagement activities and provided valuable perspectives that shaped the Plan's priorities and recommendations. Their firsthand knowledge of flood conditions across Manchester was essential to grounding this Plan in local experience.

Manchester Engineering Division

Jeff LaMalva, PE - Town Engineer

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Supporting Organizations

Capitol Region Council of Governments (CRCOG)

Connecticut Department of Energy and Environmental Protection (CT DEEP)

Connecticut Institute for Resilience and Climate Adaptation (CIRCA)

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Executive Summary

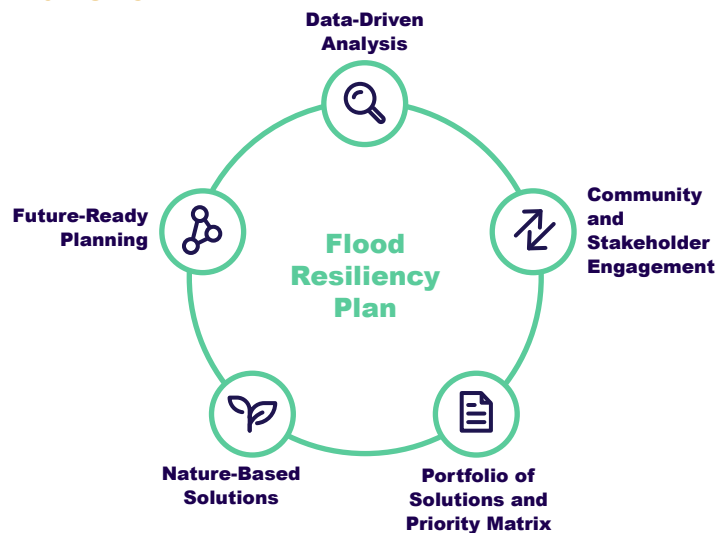
The Flood Resiliency Plan provides Manchester with a clear, data-driven framework to reduce flood risk, protect infrastructure and community assets, and guide future investment in long-term resilience.

The Plan responds to increasingly frequent and intense precipitation, aging drainage infrastructure, and long-standing drainage constraints that together have contributed to recurring flooding across Manchester. Recent storm events, including Tropical Storm Henri and Hurricane Ida in 2021, demonstrated the scale of these challenges and underscored the need for a coordinated, forward-looking approach to flood resilience.

Developed over a twelve-month period from May 2025 through April 2026, the Plan was informed by technical analysis, Town coordination, and focused community and stakeholder engagement. A broad outreach program was undertaken to ensure that the planning process reflected both data-driven assessment and local knowledge of flooding conditions across Manchester. More than 120 individuals and organizations were engaged through community meetings, stakeholder outreach, digital and print communications, and a dedicated project webpage. Community input helped identify recurring flood-prone locations, confirm flood-related impacts, and inform the development of mitigation priorities and recommendations.

The Plan includes a townwide flood risk assessment primarily focused on the pluvial flood mechanism affecting Manchester - flooding caused by stormwater accumulation when rainfall exceeds drainage system capacity. Pluvial flood exposure was evaluated using terrain-based screening to identify low-lying areas, overland flow paths, and locations susceptible to stormwater ponding across a range of storm events. The assessment considered both current and future climate conditions.

Framework



Community Engagement

120

**individuals and organizations
were engaged**

3

**community meetings
held**

The analysis found that flood risk in Manchester is distributed unevenly across the Town, with the most significant vulnerabilities concentrated at locations where topography, drainage deficiencies, historical flooding, and critical assets converge. Under current climate conditions, approximately 12 percent of Manchester's land area carries measurable flood risk. Under future climate conditions, that share increases to approximately 13.6 percent, with the highest-risk areas becoming more severe and more extensive. Historical flood locations identified through community engagement, Department of Public Works records, and media coverage aligned closely with the technical analysis findings, reinforcing the basis for targeted intervention.

Building on these findings, the Plan identifies Ten Priority Flood Risk Clusters representing the Town's highest-priority flood-prone areas. These clusters reflect the geographic convergence of elevated flood risk and documented flood history, and together represent the locations where focused investment can provide the greatest benefit. For each Priority Cluster, the Plan presents concept-level mitigation measures tailored to local conditions. Recommended actions draw from a broader Flood Resiliency Toolkit that includes stormwater conveyance upgrades, underground storage, green infrastructure, nature-based storage, and operations and maintenance measures. Together, these strategies provide the Town with a practical and flexible framework for reducing flood risk through both structural and non-structural approaches.

This Plan is intended to serve as both a planning framework and an implementation foundation. It provides the Town with a basis for prioritizing future capital improvements, advancing concept projects toward design and implementation, integrating flood resiliency into broader municipal planning efforts, and pursuing state and federal funding opportunities. As flood risks continue to evolve, the Flood Resiliency Plan establishes a clear path forward for protecting Manchester's residents, infrastructure, and community assets, while strengthening the Town's long-term resilience to future flooding.

Flood Risk Outlook

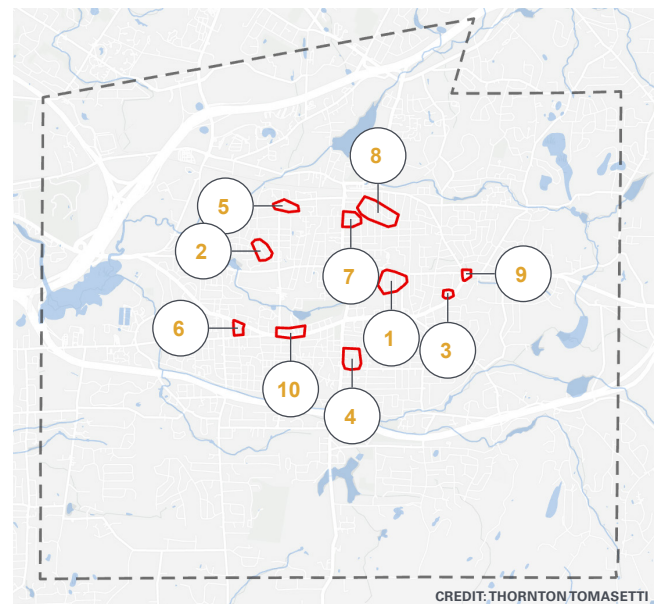
12%

of Manchester is exposed to flood risk
under current climate conditions

13.6%

of Manchester is exposed to flood risk
under future climate conditions

Priority Flood Risk Clusters



About the Flood Resiliency Plan



The Flood Resiliency Plan is a comprehensive, data- and community-driven initiative that will guide the Town in developing effective strategies to reduce flood risk across Manchester and protect properties, infrastructure, and vital community assets.

Flooding Challenges

Stormwater management has become one of the most critical infrastructure challenges facing municipalities throughout the Northeast, and the Town of Manchester is among them. Aging drainage systems and decades of incremental development, combined with the growing frequency and intensity of precipitation events due to climate change, have created conditions under which localized flooding is no longer an isolated occurrence, but a recurring and escalating concern.

The Town of Manchester has experienced significant and repeated flood events in recent years, underscoring the urgent need for a comprehensive flood resiliency strategy. In August 2021, Tropical Storm Henri brought approximately five inches of rainfall over a short period, resulting in extensive property damage to both municipal infrastructure and private residences. Among the most severe impacts was the structural failure of a section of Ambassador Drive, caused by the volume of stormwater exceeding the capacity of the existing culvert system. The storm also resulted in significant inundation impacting Gerard Street, where flooding was reported to have occurred within minutes of rainfall onset. On East Center Street, floodwaters caused notable traffic disruptions and impeded access to essential services, a particularly critical concern during extreme storm events that can result in emergency conditions.

Less than two weeks later, the Town was again impacted by significant flooding as Hurricane Ida made its way through the Northeast in early September 2021, bringing an additional five inches of rainfall. The effects of Hurricane Ida were compounded by already saturated soil conditions resulting from the prior storm event, amplifying both the extent and severity of flooding across the community. Charter Oak Park, which had sustained damage during Tropical Storm Henri, experienced repeated inundation during Hurricane Ida, ultimately resulting in further damage of playground facilities and athletic fields.

These successive storm events represent only a portion of the flood-related impacts the Town faced during recent storm seasons, and serve as a critical reference point for understanding the vulnerabilities this Plan is designed to address.



PHOTO CREDIT: GENE DEJOANNIS



2

**Major flood events within
10 days in August and
September 2021**

Purpose and Goals

The Flood Resiliency Plan provides a framework for the Town of Manchester to assess flood risk, identify vulnerable locations, and guide strategies that reduce the impacts of future storm events. Informed by technical analysis, community input, and nature-based strategies, the Plan identifies a toolkit of resiliency priorities and recommended actions. It is intended to support coordinated municipal decision-making in response to Manchester’s ongoing and evolving flood challenges.

Assess and document flood risk

throughout Manchester using available data, technical analysis, and community input to develop a comprehensive understanding of flood vulnerability.

Identify locations of highest flood risk

with particular attention to areas where flooding has resulted in, or is likely to result in, repeated impacts to public infrastructure, private property, and community function.

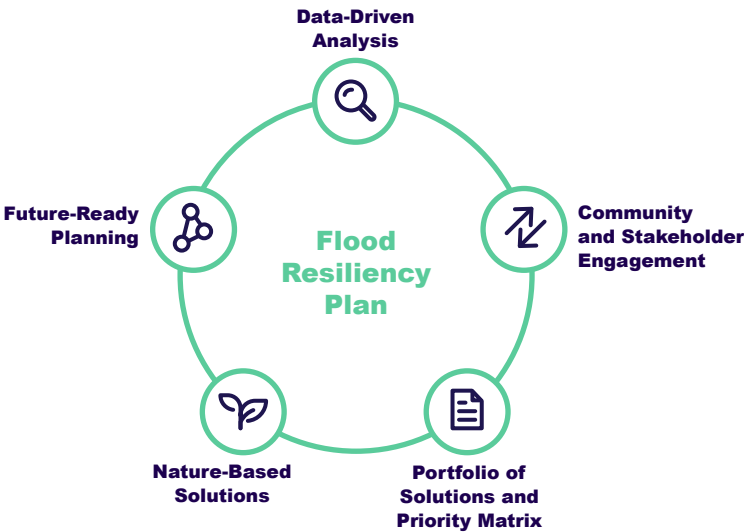
Develop practical and prioritized

flood mitigation strategies that respond to identified risks and are feasible for municipal implementation.

Position the Town

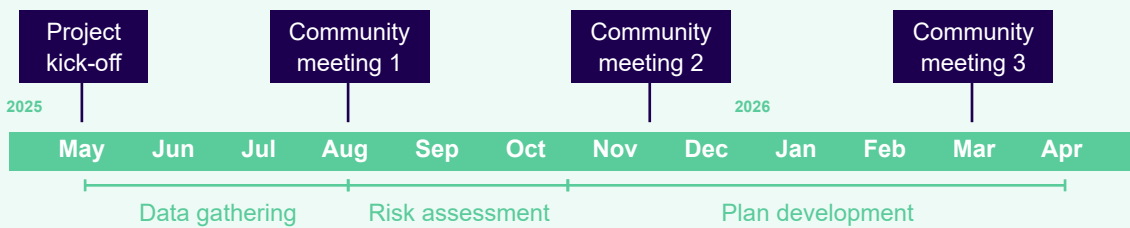
to pursue state and federal funding opportunities to support implementation of recommended projects and programs.

Collectively, the Plan establishes actionable next steps for reducing flood risk, protecting public infrastructure and private property, and strengthening Manchester’s long-term resilience to future flood events.



Timeline

The development of the Flood Resiliency Plan spanned twelve months, from May 2025 through April 2026. The process was led by the Town of Manchester in partnership with Thornton Tomasetti and included meaningful engagement with community members and stakeholders. This collaborative approach ensured that the Plan is grounded in both rigorous technical analysis and an informed understanding of local conditions and priorities.



Town Profile



Manchester, historically known as the Silk City, is a town shaped by its rich heritage, established neighborhoods, and connected natural systems. Its rivers, parks, and public spaces help define the Town's character and quality of life. Together, these features contribute to a community that is both strong and deeply rooted in place.

About the Town of Manchester

Manchester is an established community in Connecticut's Capital Planning Region, with approximately 60,000 residents across 27.3 square miles.

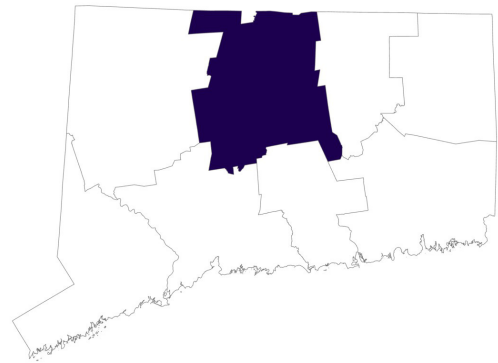
Settled in 1672 and incorporated in 1823, the Town's growth was shaped by its agricultural beginnings, later industrial development, and particularly the influence of the Cheney Brothers' silk mills which established Manchester's longstanding "Silk City" identity. This historic foundation continues to inform the Town's built character, institutional legacy, and sense of place.

Today, Manchester includes a diverse mix of established neighborhoods, downtown and commercial districts, employment centers, civic and institutional uses, and extensive parks and open spaces. Among them, the Hockanum River corridor and linear park system connects approximately 15 miles of trails to a broader network of open spaces central to community character.

Manchester also serves as a significant employment and service center within the greater Hartford region, with over 4,100 active businesses and over 28,800 jobs across government, healthcare, retail, and manufacturing sectors - all directly dependent on infrastructure and transportation networks vulnerable to flood impacts.

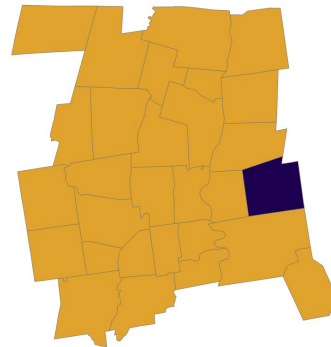
The Town's Manchester NEXT Plan of Conservation and Development (2023) establishes the long-range framework guiding future growth through 2033, organizing its vision around livability, economic vitality, mobility, recreation, employment, housing, and resilience. The emergence of resilience as a central planning priority directly reflects the flood challenges this Plan is designed to address and underscores that protecting Manchester's historic character, natural systems, and economic vitality depends on taking action now.

Hartford County



CREDIT: THORNTON TOMASETTI

Town of Manchester



CREDIT: THORNTON TOMASETTI



CREDIT: THORNTON TOMASETTI

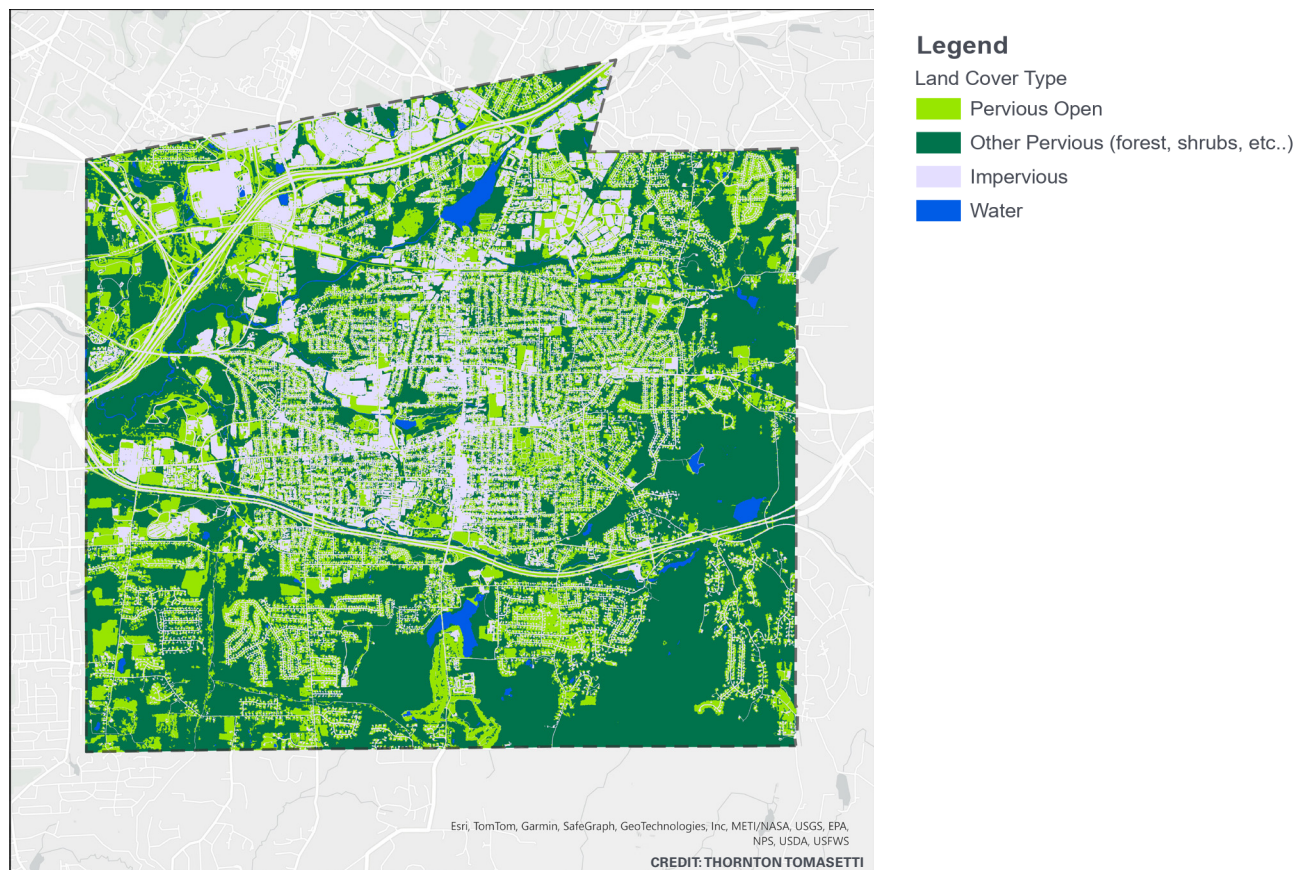
Land Cover

Land cover plays a direct role in how a community experiences flooding. Pervious surfaces - such as forests, fields, and vegetated areas - absorb rainfall and slow runoff, reducing the burden on drainage systems. Impervious surfaces such as pavement and rooftops do the opposite, generating runoff more rapidly and in greater volumes.

Manchester's land cover reflects its mixed suburban and urban character. Approximately 72% of the Town's land area consists of pervious surfaces - including open areas, forests, and shrublands - which provide a natural degree of stormwater management. The other 26% consist of impervious surfaces, concentrated in the Town's more developed neighborhoods and commercial corridors, where runoff is generated most rapidly and the risk of localized flooding is greatest. Understanding this distribution is essential to identifying where targeted mitigation investments will have the greatest impact across Manchester.

Land Cover

Pervious (open)	47%
Pervious (forest, shrubs, etc.)	25%
Impervious	26%
Water	2%



Soil

Soil type is a key factor in flood resilience, directly controlling infiltration rates and surface runoff during storm events. Areas with well-drained soils absorb precipitation rapidly, reducing peak flows and downstream flooding, while poorly drained soils retain water longer, increasing saturation and overflow risks during intense rainfall.

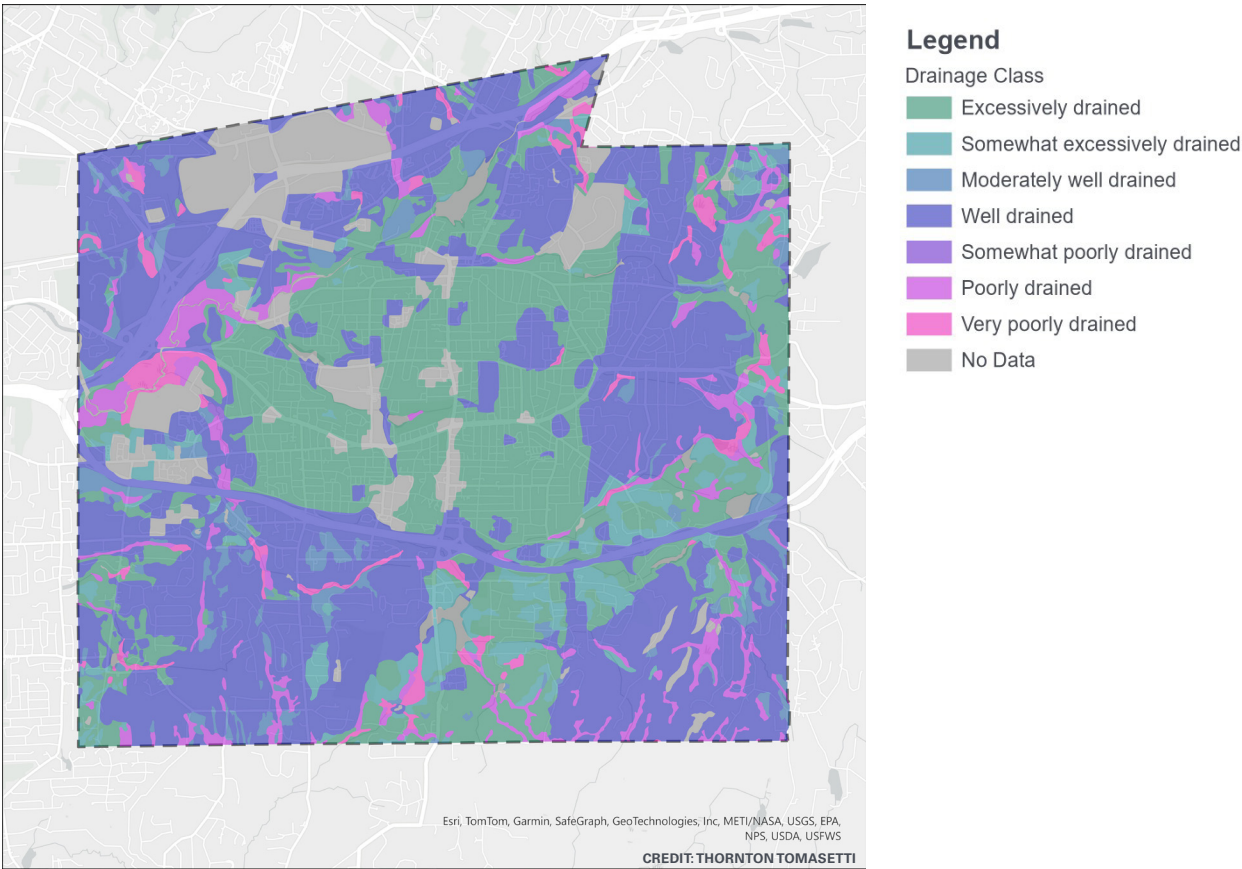
Manchester's soils span the full spectrum of drainage classes, from excessively drained uplands that minimize flood exposure to very poorly drained lowlands prone to ponding and prolonged saturation.

This soil diversity creates both challenges and opportunities. Well-drained areas support rapid recharge and nature-based solutions, while poorly drained areas are better suited for storage basins and floodplain restoration to manage excess water.

Understanding these patterns informs targeted resiliency investments that leverage local soil conditions for maximum effectiveness.

Soil Drainage Class

Excessively drained	30%
Somewhat excessively drained	6%
Well drained	50%
Moderately well drained	4%
Somewhat poorly drained	0%
Poorly drained	6%
Very poorly drained	4%



Critical Assets

Critical facilities and community assets are essential components of Manchester’s resilience planning framework.

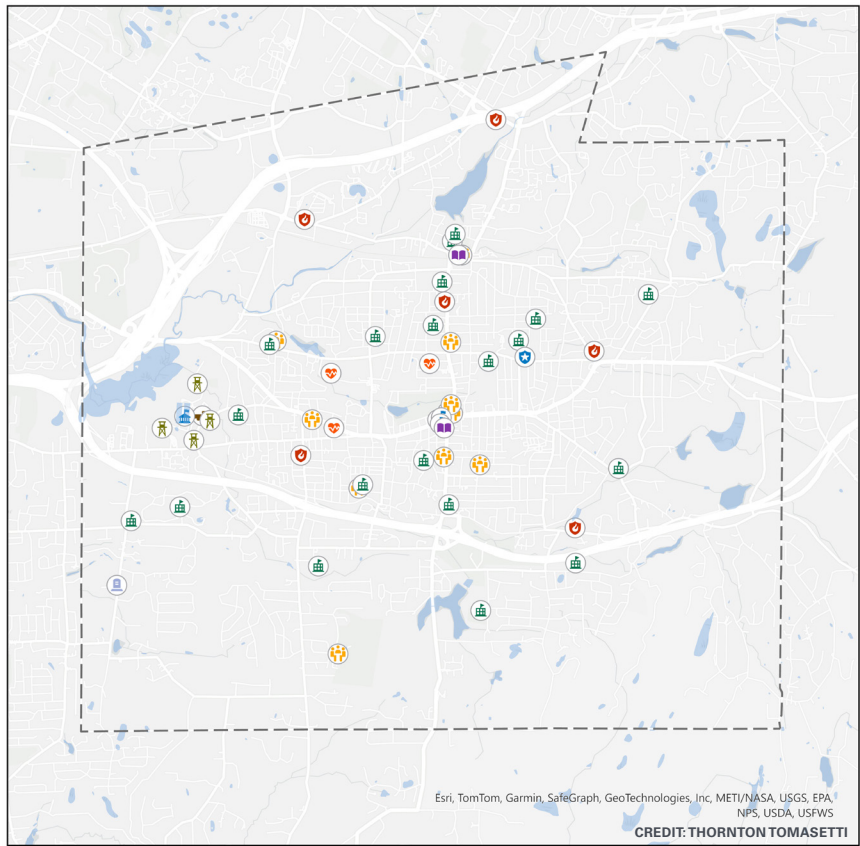
For this Plan, critical assets were compiled from the Capital Region Council of Governments Hazard Mitigation Plan (2024), digitized, and supplemented with facilities essential to public safety, emergency response, and community service continuity during flood events.

The inventory encompasses life-safety facilities such as fire and police stations; government administration and health services; public utilities; and community-serving assets including schools, libraries, senior centers, and community centers that provide shelter, heat relief, public information, and recovery support functions. Together, these assets form a vital public infrastructure network supporting both daily municipal operations and emergency management capacity.

Mapping their locations informs infrastructure protection priorities and resiliency investments that safeguard essential services town-wide.

Mapped Critical Assets

Community Centers	11
Education Facilities	21
Fire Department Stations	7
Police Stations	2
Government Facilities	3
Health Facilities	3
Utilities	4
Libraries	2
Garages	2



Legend

- Critical Facilities
- Community Center
 - Education
 - Fire Department
 - Police
 - Government
 - Health
 - Utilities
 - Library
 - Garage

Watersheds

Manchester's drainage system operates within six primary watersheds that shape stormwater conveyance, storage, and flood risk accumulation across the Town.

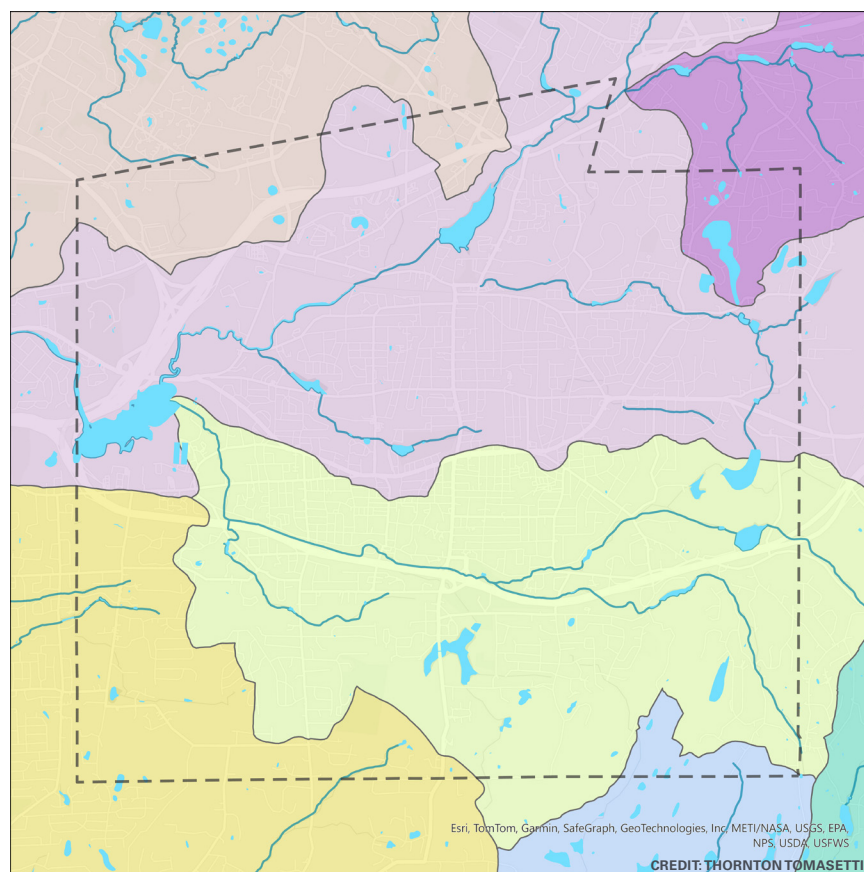
These watersheds encompass an interconnected network of rivers, brooks, ponds, wetlands, and receiving waters. Primary watercourses include the Hockanum River and its key tributaries - Bigelow Brook, Lydall Brook, Hop Brook, Birch Mountain Brook, Porter Brook, Pewterpot Brook, and Folly Brook - that form the natural framework for overland flows, downstream capacity, and flood-prone locations.

As impervious cover has increased with the Town's urbanization, these natural corridors now convey larger runoff volumes to local streams and drainage features, placing greater pressure on both existing natural systems and constructed stormwater infrastructure.

This interaction between watershed hydrology, land use patterns, and the built environment directly informs flood vulnerability assessment and resilience planning priorities for the Town.

Watershed Areas

Hockanum River	30%
South Fork Hockanum River	6%
Salmon Brook	50%
Tankerhoosen River	4%
Podunk River	0%
Roaring Brook	6%



Legend

Subregional Drainage Basins	
	Hockanum River
	South Fork Hockanum River
	Salmon Brook
	Tankerhoosen River
	Podunk River
	Roaring Brook

Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc./METI/NASA, USGS, EPA, NPS, USDA, USFWS

CREDIT: THORNTON TOMASETTI

Stormwater Infrastructure

Manchester's stormwater infrastructure plays a critical role in managing surface runoff and reducing the risk of localized flooding throughout the Town. The system is intended to collect, convey, and, where appropriate, temporarily store stormwater generated by rainfall events.

Under current Town regulations, storm drainage systems are generally designed to convey runoff from at least the 25-year storm event, while storage facilities must be evaluated for storms up to the 100-year event to inform appropriate sizing and capacity. These standards are intended to inform the appropriate sizing and subsequently mitigate flood risk and impacts for public safety, downstream impacts, and environmental considerations.

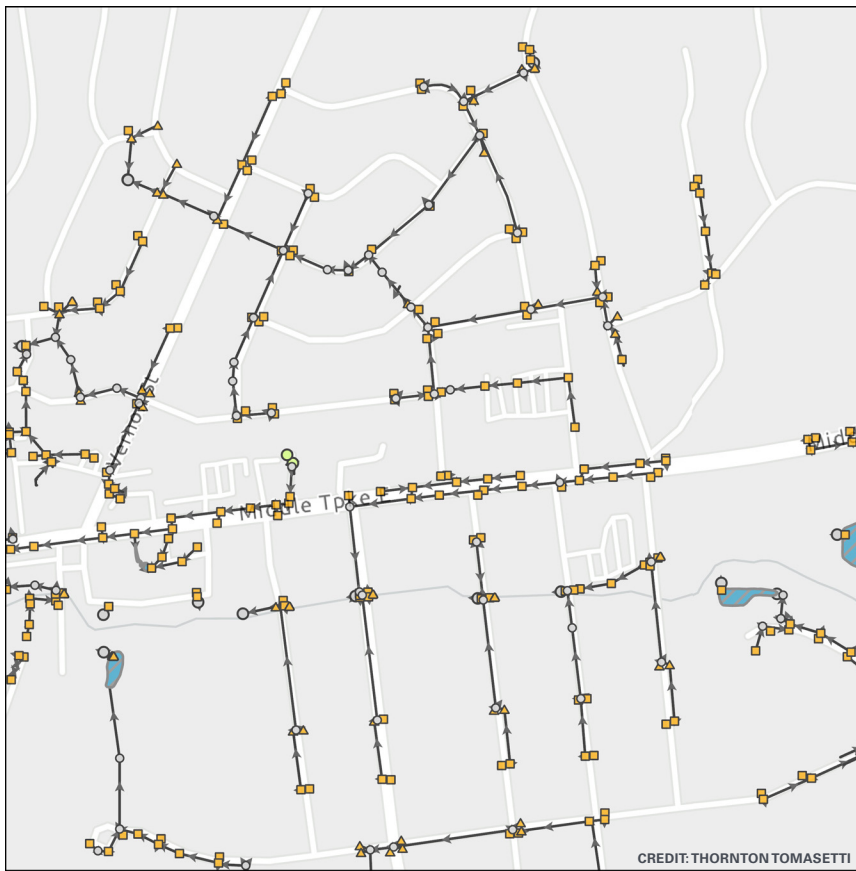
The performance of the existing system reflects the combined effects of infrastructure age, historic design practices, changing development patterns, and evolving precipitation conditions.

In older portions of Manchester, some drainage infrastructure predates modern engineering standards, with certain pipes understood to date back to the 1840s. As a result, portions of the system may not provide the level of service expected under current design criteria.

In areas where drainage infrastructure is limited or absent, runoff is conveyed overland, which can reduce system performance and contribute to localized flooding.

Over time, urbanization and the expansion of impervious surfaces have increased the volume and rate of runoff entering the stormwater system. More intense rainfall events also result in higher peak flows, further stressing existing infrastructure.

These conditions underscore the need for continued evaluation of the Town's stormwater system in the context of current and future flood risk.



970+

Acres of directly
connected impervious
area

150+

Miles of town-maintained
drainage pipe

5,700+

Town-maintained
catch basins including 5,334 in
MS4 priority areas

Community Engagement



The community and stakeholder engagement program for the Flood Resiliency Plan was designed to ensure broad, inclusive participation, with particular attention to reaching residents and stakeholders who are most vulnerable to flooding and who may not typically engage in planning processes.

Engagement Goals

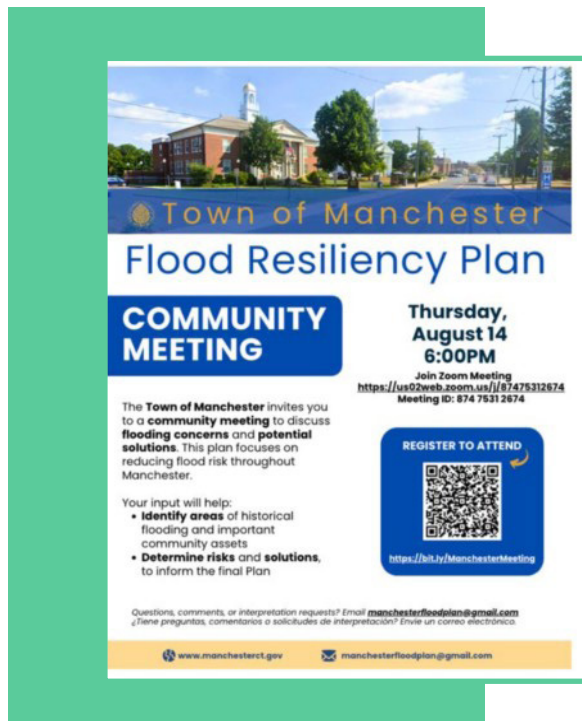
- Identify flood-prone locations, affected properties, and critical assets through community knowledge
- Gather qualitative data on residents' and businesses' direct experiences with flooding events
- Understand community priorities and preferences for flood risk reduction strategies
- Ensure community members, regardless of language, income, or background, have the ability to participate
- Build trust between the Town and community by demonstrating responsiveness and transparency
- Incorporate community input into the development of flood resiliency recommendations

Equity and Accessibility

A core principle of the engagement program was ensuring equitable access to participation. Measures taken to advance equity and accessibility include:

- Materials were available in English and Spanish.
- Flyers and other outreach materials were mailed to culturally-specific businesses serving Manchester's South Asian, Southeast Asian, Latino, and African American communities.
- Ads were placed in publications including Manchester Matters and Manchester Patch.
- Interpretation services were offered at community meetings upon request.
- Digital materials were designed to meet accessibility standards.
- Meetings were held virtually via Zoom to support participation.





Engagement Channels

To maximize awareness and participation across the community, a broad mix of outreach channels throughout the engagement process were employed, which included:

- Local e-newsletters and news outlets.
- Social media postings.
- A dedicated Town project webpage with meeting announcements and presentation materials.
- Physical flyer distribution at more than 15 community locations.
- Direct mail packages to partner organizations, and
- Repeated stakeholder email blasts sent in advance of each event.

A dedicated project email inbox was also established to allow community members to submit comments, photos, and questions at a time that was most convenient for them.

Stakeholder Outreach

A comprehensive stakeholder list of over 120 individuals and organizations was established and leveraged to maximize the stakeholder outreach.

The stakeholder list was organized to ensure broad cross-sector representation and included state and regional partners, elected officials, environmental organizations, community-based organizations, schools, public safety agencies, healthcare providers, houses of worship, media outlets, and other civic partners.

120+
individuals and
organizations were
engaged.

Community and Stakeholder Engagement Events

Three formal engagement events were conducted to obtain input required for the Flood Resiliency Plan. Each event was preceded by targeted advertising, stakeholder outreach, and distribution of promotional materials.

Event	Date	Purpose
Community Meeting #1	August 14, 2025	Introduce the plan; gather resident input on flooding experiences and priorities
Community Meeting #2	November 13, 2025	Present progress and findings from flood risk assessment; share next steps
Community Meeting #3	March 12, 2026	Present recommended flood resiliency solutions and implementation strategies

Community Engagement Findings

The following themes emerged consistently and represent the most salient concerns and priorities expressed by the Manchester community throughout the engagement process.

- Undersized or failing culverts and stormwater pipes unable to handle modern storm intensities
- Chronic debris accumulation blocking drains, culverts, and brook channels
- Aging infrastructure with deferred maintenance
- Lack of routine maintenance inspections and cleaning of stormwater infrastructure
- Private property drainage connections that are difficult to regulate but impact public systems
- Inadequate stormwater detention capacity in urbanized watersheds



Photos of historical flood events in Manchester shared by community residents during community meeting

Town's Flood Risk Profile



Effective flood mitigation begins with knowing where risk is greatest and understanding what is driving it. Through a comprehensive, data-driven assessment of historical flood locations, climate trends, and flood risk exposure across the Town, this Plan identifies and prioritizes the locations where targeted intervention will deliver the greatest benefit to Manchester's communities.

Historical Flood Locations

Historical flooding in Manchester has been documented through multiple sources, including community input, Department of Public Works (DPW) records, and local media coverage.

Through community engagement, residents identified 13 recurring flood hotspots and described their associated impacts. These findings were corroborated by DPW mapping and flood locations documented in local press coverage.

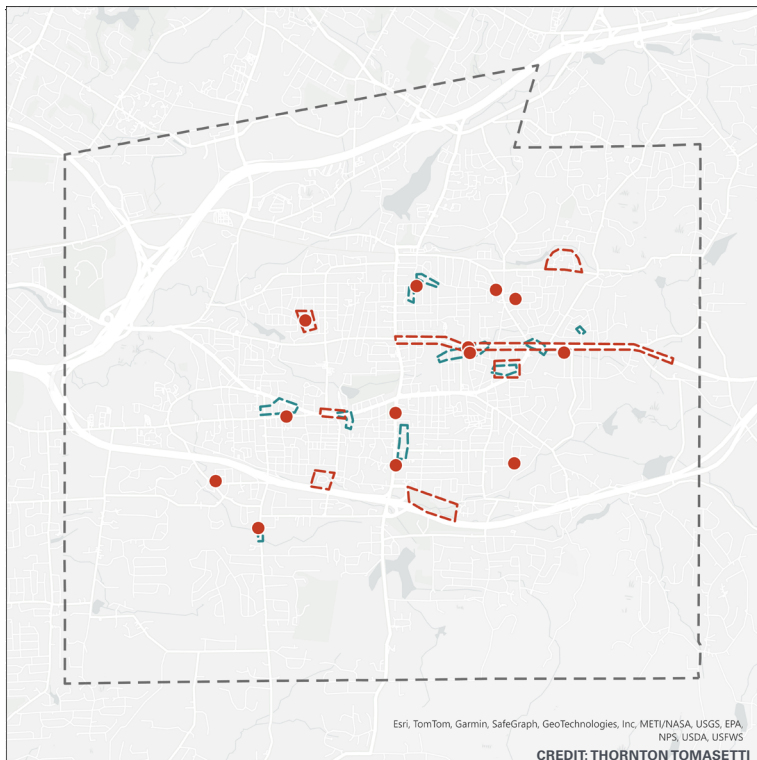
Collectively, these sources identified consistent hotspots and Manchester's highest-priority flood vulnerabilities, while also revealing additional locations not captured through any single source alone, demonstrating the value of multi-source analysis for comprehensive risk identification.

13

Flood locations identified through community engagement

8

Additional flood locations identified by the Town and through media coverage



Legend

- Community Submitted Flood Issues
- ▭ Areas with Historical Flooding from Reports and Media
- ▭ Department of Public Works Identified Areas of Concern

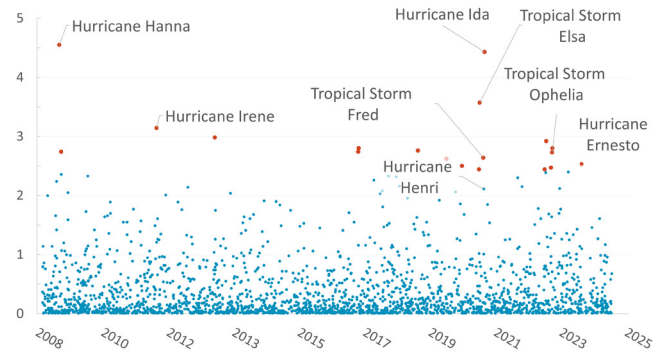
Climate

A thorough understanding of climate conditions - past, present, and future - is fundamental to developing effective flood mitigation strategies. Historical storm events spanning the past two decades were analyzed alongside current and projected climate trends to establish the design parameters that underpin every flood mitigation recommendation in this Plan.

Historical Storm Events

Precipitation data from the closest National Oceanic and Atmospheric Administration (NOAA) rain gauge at Hartford Brainard Airport (2008–2025)¹ shows 99% of Manchester storm events produced under 2.51 inches of rain in 24 hours, with 91% below 1 inch.

Fifteen high-impact events exceeded these norms, including Hurricane Hanna (2008), Hurricane Irene (2011), Tropical Storm Elsa (2021), Tropical Storm Fred (2021) and Hurricane Ida (2021).



Current Climate Conditions

Twenty-four-hour rainfall depths for current climate conditions were developed for a range of return periods using NOAA Atlas 14 and the Extreme Precipitation Dataset for New York and New England.

Return periods were selected in accordance with stormwater design criteria set forth in Section 3.06.04 of the Town of Manchester’s current Public Improvement Standards.

For each return period, the higher, more conservative rainfall depth from the two datasets was applied for Manchester. This approach provides a robust and protective basis for the Flood Risk Assessment.

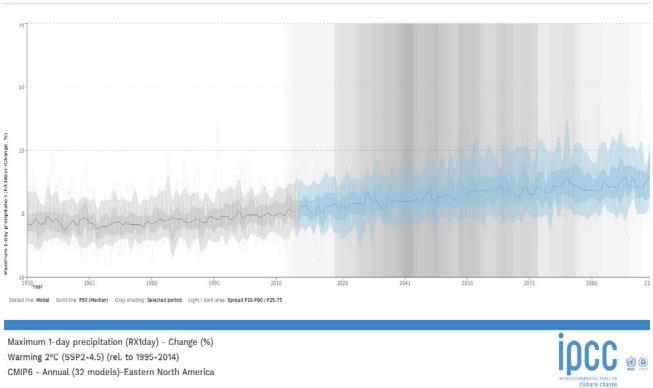
Storm Frequency	24-hr rainfall (in)
-----------------	---------------------

2-year	3.1
10-year	4.9
25-year	6.0
50-year	7.0
100-year	8.3

Future Climate Conditions

Future climate conditions for the Flood Risk Assessment were developed using the Intergovernmental Panel on Climate Change (IPCC)² Atlas projections for maximum 1-day precipitation change.

Consistent with guidance provided by Connecticut DEEP, the assessment applies the RCP 4.5 medium-term scenario (2041–2060), which indicates an approximate 9 percent increase in daily precipitation. This adjustment was used to represent future storm conditions and to account for the anticipated influence of climate change on flood risk in Manchester.



1 Data source: NOAA National Centers for Environmental Information (NCEI) (<https://www.ncsl.noaa.gov/access/search/data-search/local-climatological-data-v2>)
2 Data source: Intergovernmental on Panel Climate Change (IPCC) Atlas (<https://interactive-atlas.ipcc.ch/>)

Flood Exposure

Understanding Manchester's flood exposure is fundamental to a comprehensive flood risk assessment. The Town is subject to two primary flood risk mechanisms - pluvial flooding driven by stormwater accumulation and fluvial flooding associated with river and stream overflow - both of which were analyzed using available flood risk data to characterize the extent and distribution of flood risk across the Town.

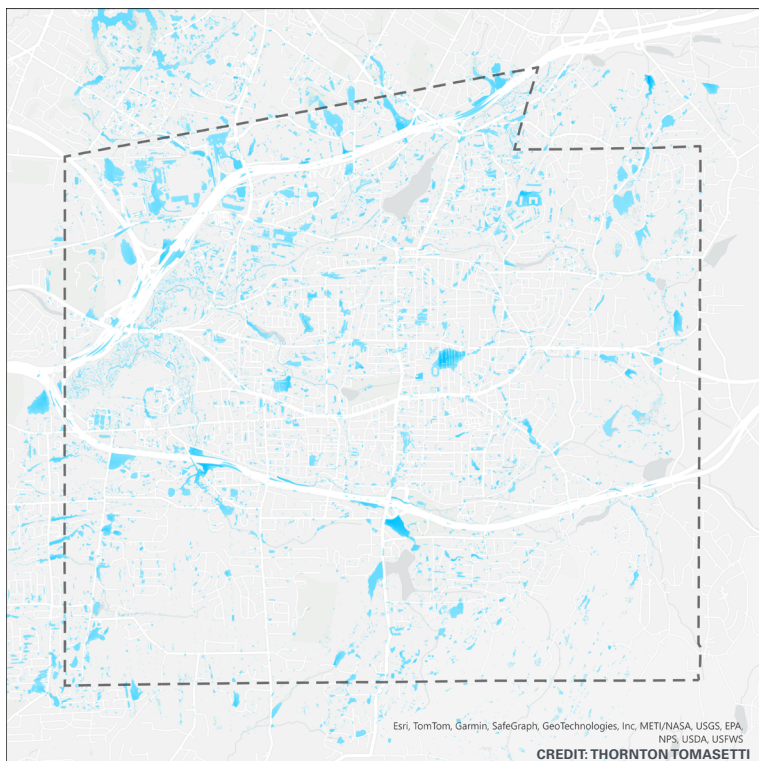
Pluvial Flooding

Pluvial flooding occurs when intense rainfall exceeds the capacity of existing drainage systems to manage stormwater runoff, resulting in surface water accumulation. Pluvial flooding is the predominant flood mechanism across Manchester.

To assess pluvial flood conditions across Manchester, SCALGO Live¹ was utilized - a platform that analyzes detailed terrain data to identify natural depressions, overland flow paths, and areas susceptible to stormwater accumulation. By inputting rainfall depths corresponding to a storm scenario, the platform provides flood depth data suitable for a planning-level screening of flood-prone areas where drainage constraints or ponding may occur.

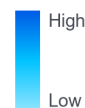
10 flood scenarios were studied.

These 2 to 100-year storm events were analyzed using SCALGO Live to screen flood-prone areas under current and future storm conditions.



Legend

Cumulative Flood Depth



¹ Data source: SCALGO Live (<https://scalgo.com/>)

Fluvial Flooding

Fluvial flooding occurs when river or stream flows exceed the capacity of the channel, causing water to overflow onto adjacent floodplains and low-lying areas. In Manchester, fluvial flood risk is primarily associated with the Hockanum River, South Fork Hockanum River and their tributaries, which traverse the Town and pose fluvial flood risk to properties and infrastructure located in their floodplain.

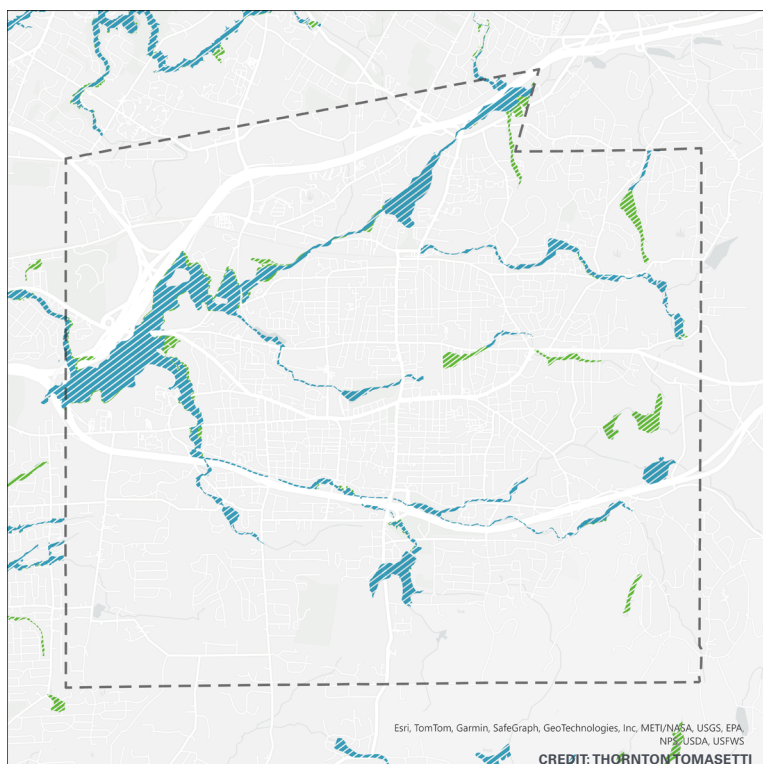
The Federal Emergency Management Agency (FEMA) Effective Flood Hazard Layers representing the effective regulatory floodplain mapping for the 1-percent annual chance (100-year) and 0.2-percent annual chance (500-year) flood events were leveraged to understand the fluvial flood extent. Town parcels located within FEMA designated floodplains were identified as carrying elevated flood risk, informing the spatial prioritization of flood-prone areas across the Town. Where FEMA floodplain boundaries overlap with pluvial flood exposure, the combined risk to properties and infrastructure is compounded, underscoring the importance of addressing both flood mechanisms in a comprehensive resilience strategy.

5%

**of Manchester's land area
is located within FEMA
1-percent annual chance
floodplain**

1%

**of additional land area
is located within FEMA
0.2-percent annual chance
floodplain**



Legend

FEMA Flood Zones (Effective)

1% Annual Chance Flood Hazard

0.2% Annual Chance Flood Hazard

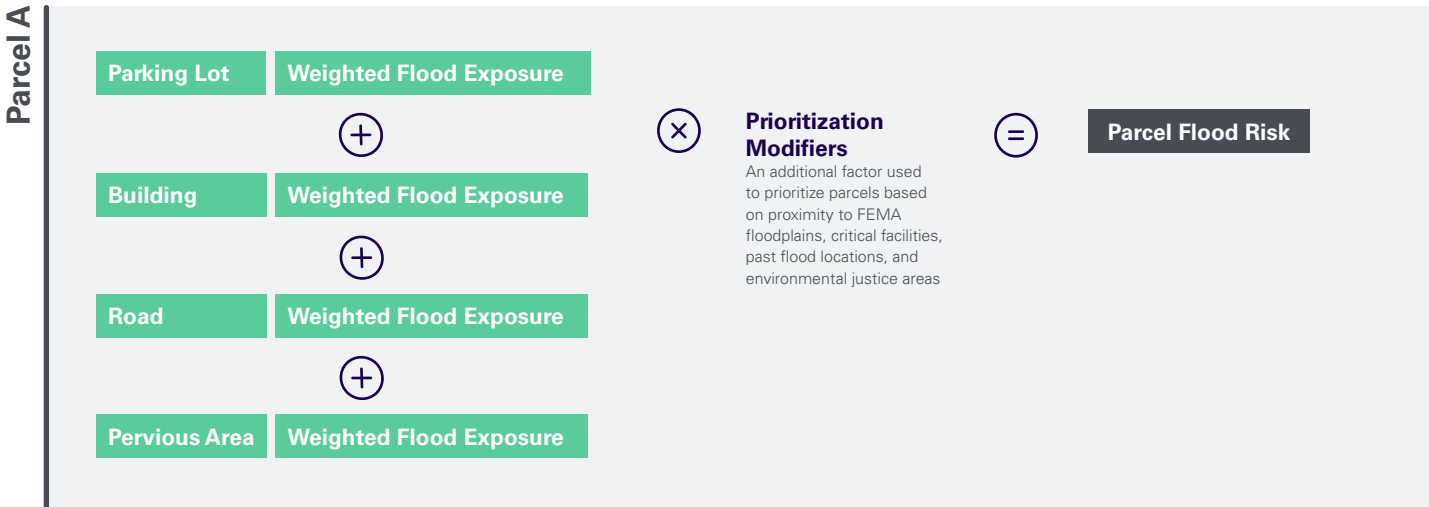
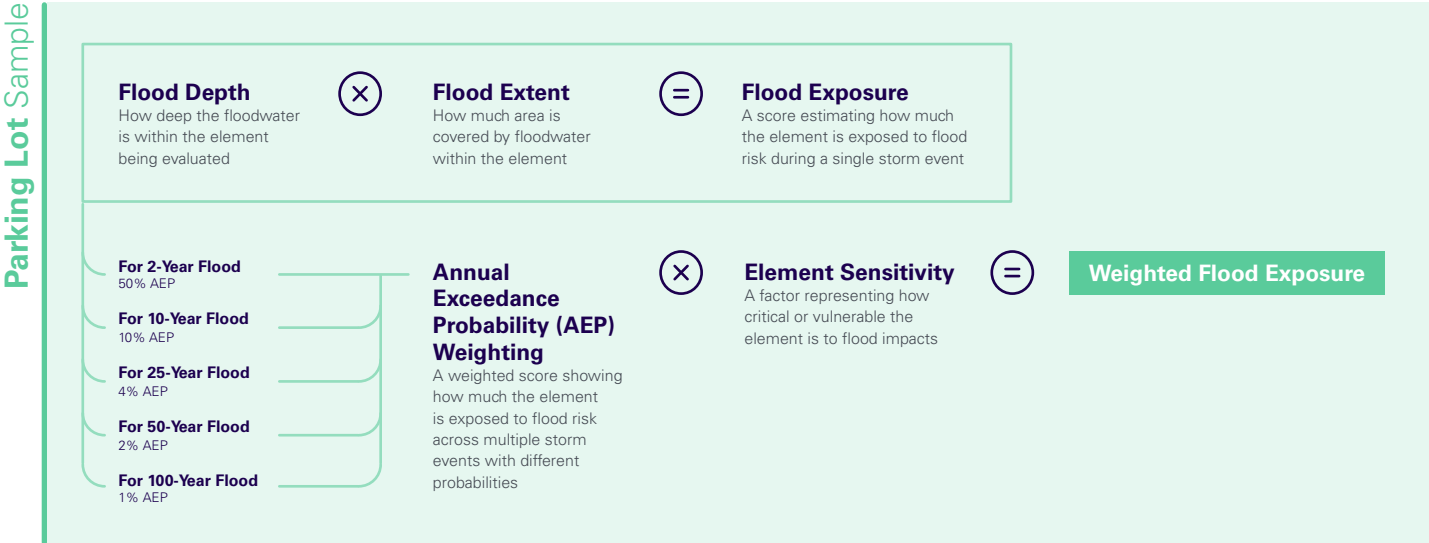
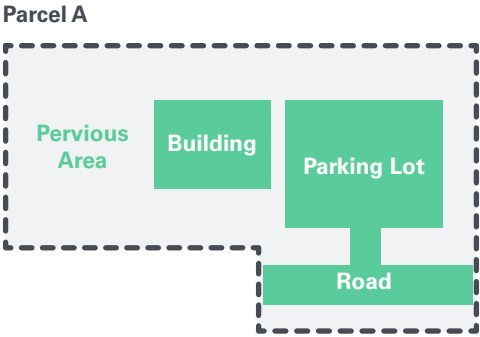
Flood Risk Assessment

Two-level approach

The Flood Risk Assessment for Manchester was conducted using a two-level approach.

At the **element-level analysis**, individual parcel features were analyzed to determine their exposure to flooding across a range of storm events, with flood depths and inundated areas used to estimate the relative risk associated with each feature.

These results were then aggregated at the parcel level to identify the most vulnerable locations across Manchester. This **parcel-level analysis** was further informed by overlaying historic flood locations, floodplain boundaries, critical facilities, and environmental justice considerations - providing a comprehensive and spatially grounded basis for prioritizing mitigation investments across the Town.

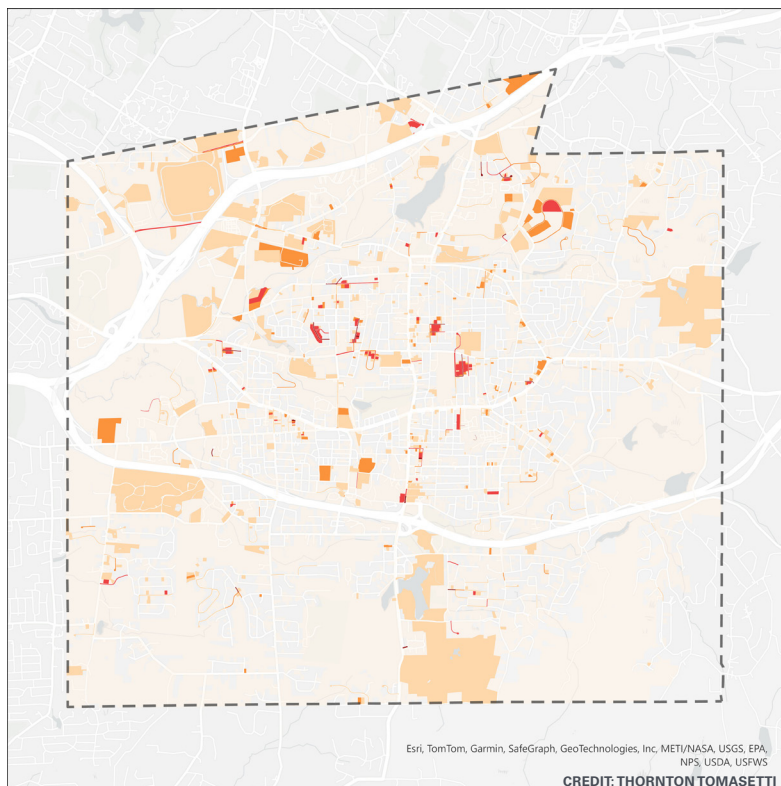


Flood Risk Assessment Results

Current Climate Conditions

Approximately 12% of Manchester's land area is exposed to measurable flood risk. Areas scoring between 3 and 5 - representing the highest levels of flood exposure and vulnerability - account for a combined 0.6% of the Town's land area, reflecting localized but significant stormwater management constraints that require targeted attention. Many of these high-risk areas align well with historically documented flood locations across the Town.

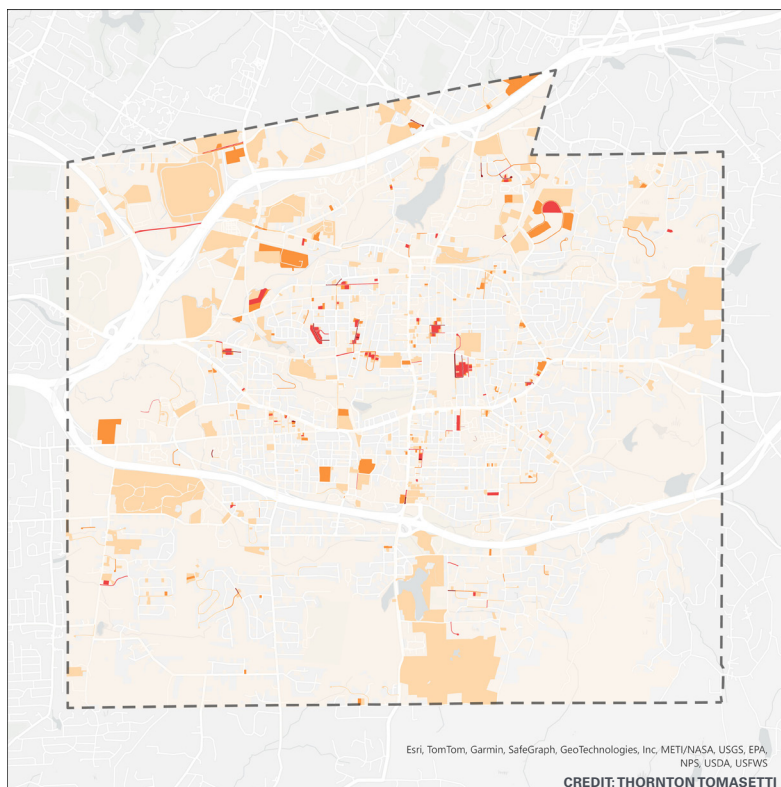
Risk	Acres	%
0 - 1	14,333	88%
1 - 2	1,673	10.2%
2 - 3	199	1.2%
3 - 4	80	0.5%
4 - 5	10	0.1%



Future Climate Conditions

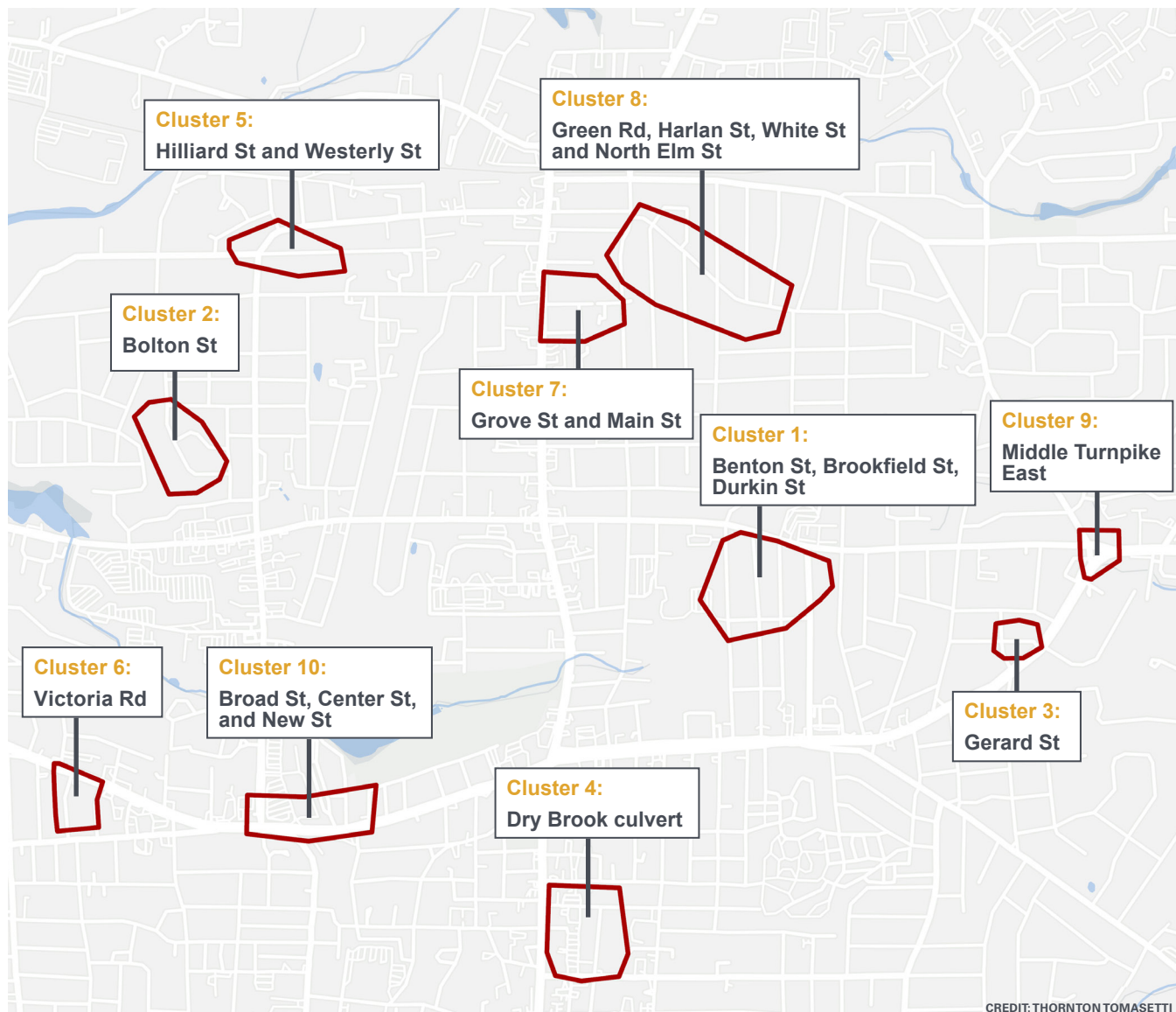
As climate conditions intensify, flood risk across Manchester is projected to increase. The portion of the Town's land area exposed to measurable flood risk increases to approximately 13.6%, while the highest risk category - flood risk score between 4 and 5 - approximately doubles compared to current conditions, underscoring the growing pressure that more frequent and severe precipitation events will place on Manchester's flood-prone communities.

Risk	Acres	%
0 - 1	14,074	86.4%
1 - 2	1,921	11.7%
2 - 3	209	1.3%
3 - 4	69	0.5%
4 - 5	22	0.1%



Priority Flood Risk Clusters

Building on the flood risk assessment findings and community input, Ten Priority Flood Risk Clusters were identified in coordination with the Town. Each Priority Cluster represents a geographic convergence of high flood risk scoring and documented flood history - areas where the need for intervention is greatest and the potential for impact is highest. Addressing these clusters through coordinated, targeted investment represents the most effective path toward reducing flood risk and building long-term resilience across Manchester's communities and infrastructure systems.



Flood Resiliency Recommendations





Effective flood mitigation requires a toolkit of strategies tailored to the specific conditions, vulnerabilities, and priorities of the community it serves. Drawing on data-driven analysis and community engagement, these recommendations form the foundation of Manchester’s commitment to protecting its residents, properties, and vital assets from the growing threat of flooding.

Flood Resiliency Toolkit

The Flood Resiliency Toolkit includes a range of nature-based, gray infrastructure, and operations and maintenance strategies designed to reduce flood risk and improve stormwater management across Manchester. These approaches vary in scale and application but share the common goal of reducing runoff, improving stormwater system performance and subsequently reducing flood risk. Depending on site conditions and the specific flood challenges present, toolkit strategies can be applied individually or in combination to address unique vulnerabilities.

For each Priority Cluster, concept-level mitigation solutions were developed, providing the Town with a practical framework to prioritize flood resilience investments.



**Stormwater
Conveyance
Upgrades**

Improvements to pipes, catch basins, and culverts to help convey stormwater more efficiently and reduce surface flooding.



**Green
Infrastructure**

Nature-based solutions such as rain gardens, permeable pavement, and tree plantings that help infiltrate, slow down, and filter runoff.



**Underground
Storage**

Underground tanks, chambers, or oversized pipes that temporarily store runoff during heavy rain and release it slowly to reduce flooding.



**Nature-Based
Storage**

Nature-based solutions that use natural or restored features, such as wetlands, ponds, and low-lying open space, to hold and manage runoff during storm events.



**Operations &
Maintenance**

Routine actions such as cleaning catch basins, clearing debris, inspecting drainage infrastructure, and maintaining systems so they continue to work effectively over time.

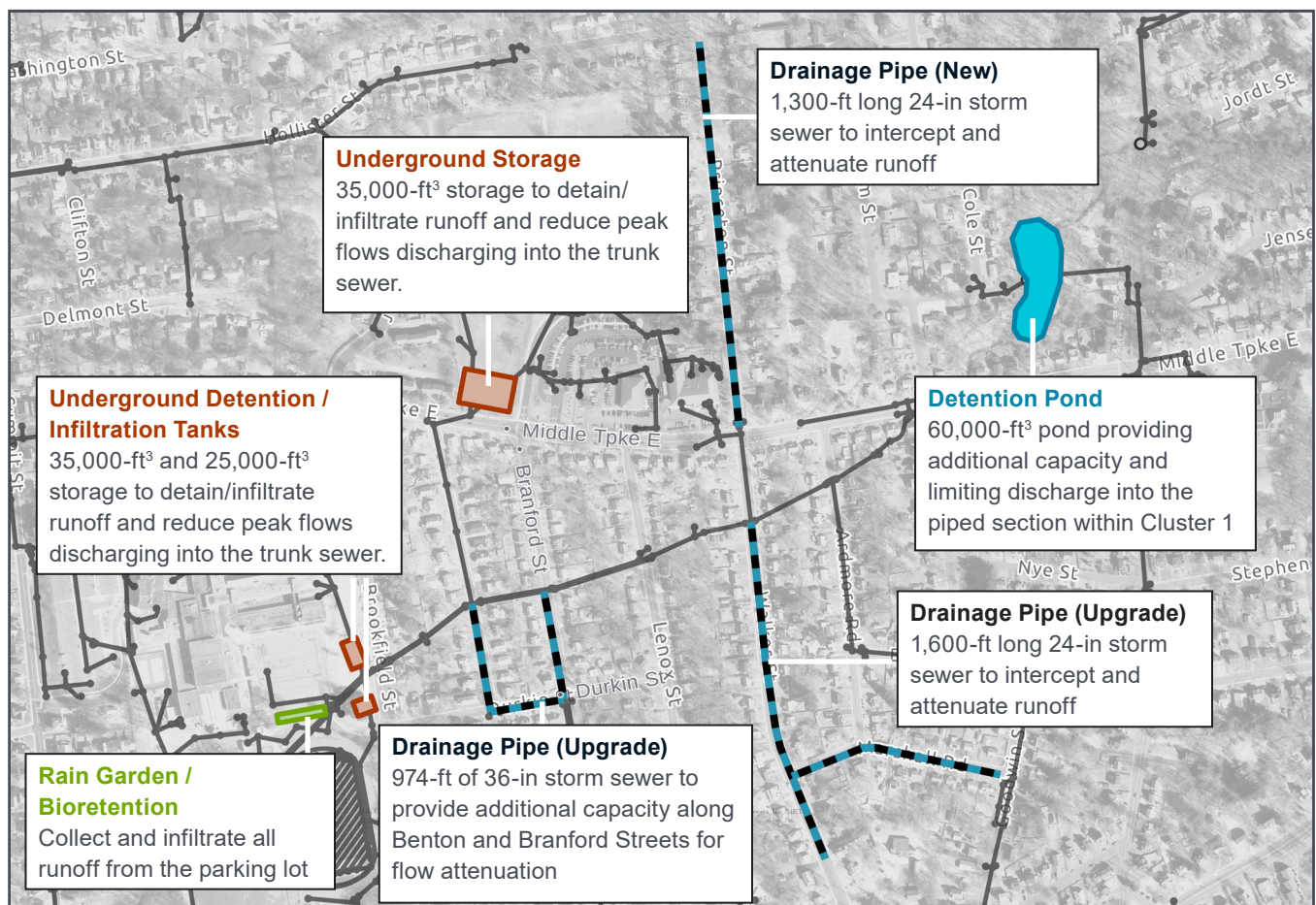
Cluster 1: Benton St, Brookfield St and Durkin St

At Cluster 1, multiple detention measures, including underground and nature-based storages, are proposed to detain and attenuate stormwater flows entering the trunk sewer line serving this area.

Several roads currently lack drainage infrastructure, causing runoff to flow overland into low-lying areas where it overwhelms existing downstream systems and accumulates. To address this condition, a new drainage system is proposed along Princeton Street, Walker Street, and Marshall Road to intercept and convey runoff before it reaches and ponds within the low-lying areas of Cluster 1.

In addition, the existing drainage pipes along Branford Street and Benton Street are proposed to be upsized and fitted with a controlled outlet to attenuate flows discharged to the trunk line serving Cluster 1.

	Low	High
Benefit	● ● ● ● ●	● ● ● ● ●
Cost	● ● ● ● ●	● ● ● ● ●
Design complexity	● ● ● ● ●	● ● ● ● ●
Permitting requirements	● ● ● ● ●	● ● ● ● ●
Stakeholder complexity	● ● ● ● ●	● ● ● ● ●



-  **Stormwater Conveyance Upgrades**
-  **Green Infrastructure**
-  **Underground Storage**
-  **Nature-based Storage**
-  **Operations & Maintenance**

Existing

-  Drainage Pipe, Removed
-  Drainage Pipe
-  Outlet
-  Underground Storage

Proposed

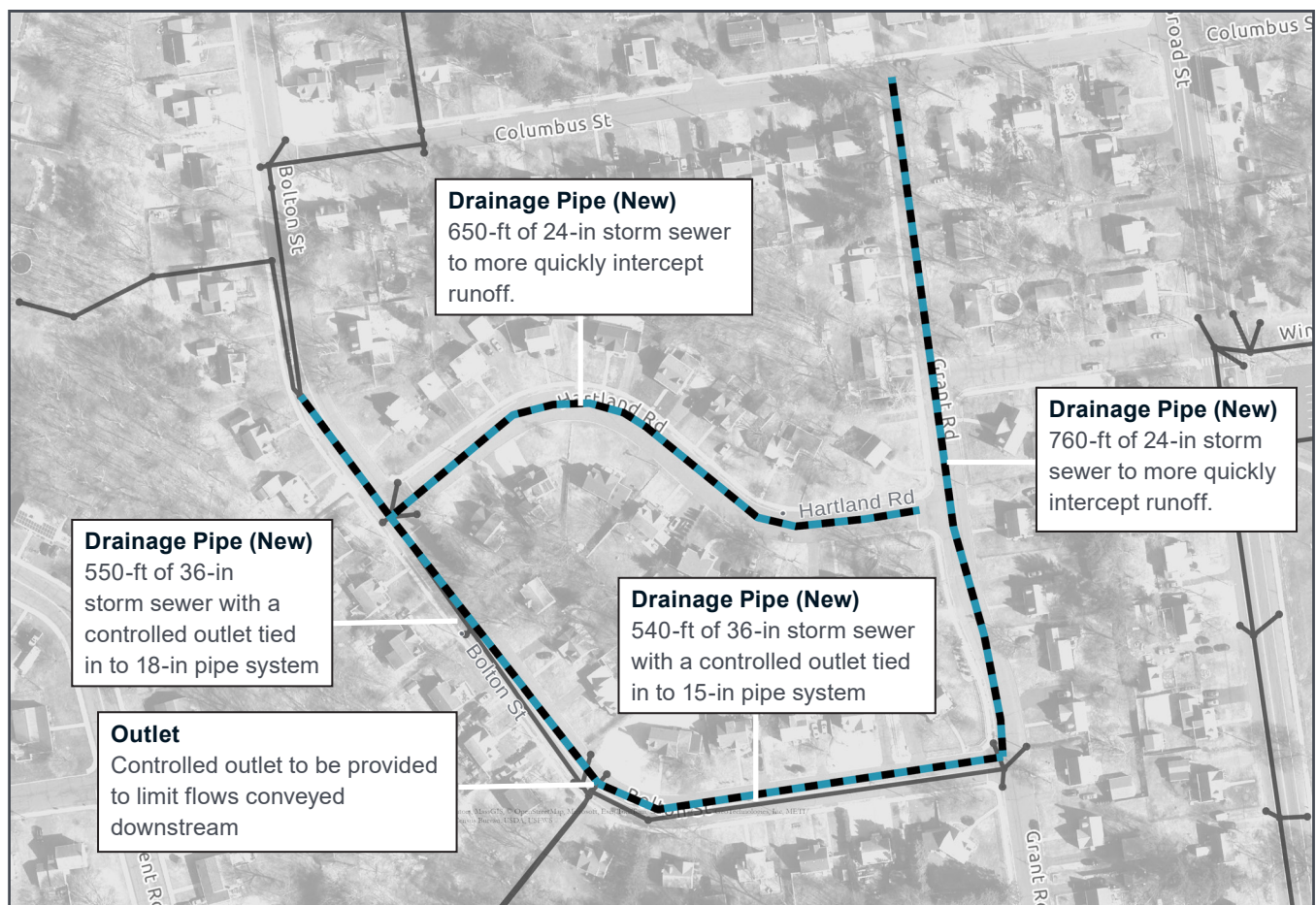
-  Drainage Pipe
-  Outlet
-  Underground Storage
-  Permeable Pavement
-  Nature-Based Storage
-  Green Infrastructure

Cluster 2: Bolton St

At Cluster 2, several roads in the area currently lack drainage infrastructure, resulting in overland runoff that overwhelms existing downstream systems and accumulates in the low-lying areas along Bolton Street. To address this, a new drainage system is proposed along Bolton Street, Hartland Road, and Grant Road to intercept, convey and store runoff before it reaches these low-lying areas.

Additionally, a new stormwater chamber with a controlled outlet is proposed along Bolton Street, connecting the existing and proposed drainage network to regulate and attenuate flows discharged from the new 36-inch pipes to the existing 15- and 18-inch pipes downstream.

	Low	High
Benefit	● ● ● ●	
Cost	● ● ● ●	
Design complexity	● ●	
Permitting requirements	● ●	
Stakeholder complexity	● ●	



-  **Stormwater Conveyance Upgrades**
-  Green Infrastructure
-  **Underground Storage**
-  Nature-based Storage
-  **Operations & Maintenance**

Existing

-  Drainage Pipe, Removed
-  Drainage Pipe
-  Outlet
-  Underground Storage

Proposed

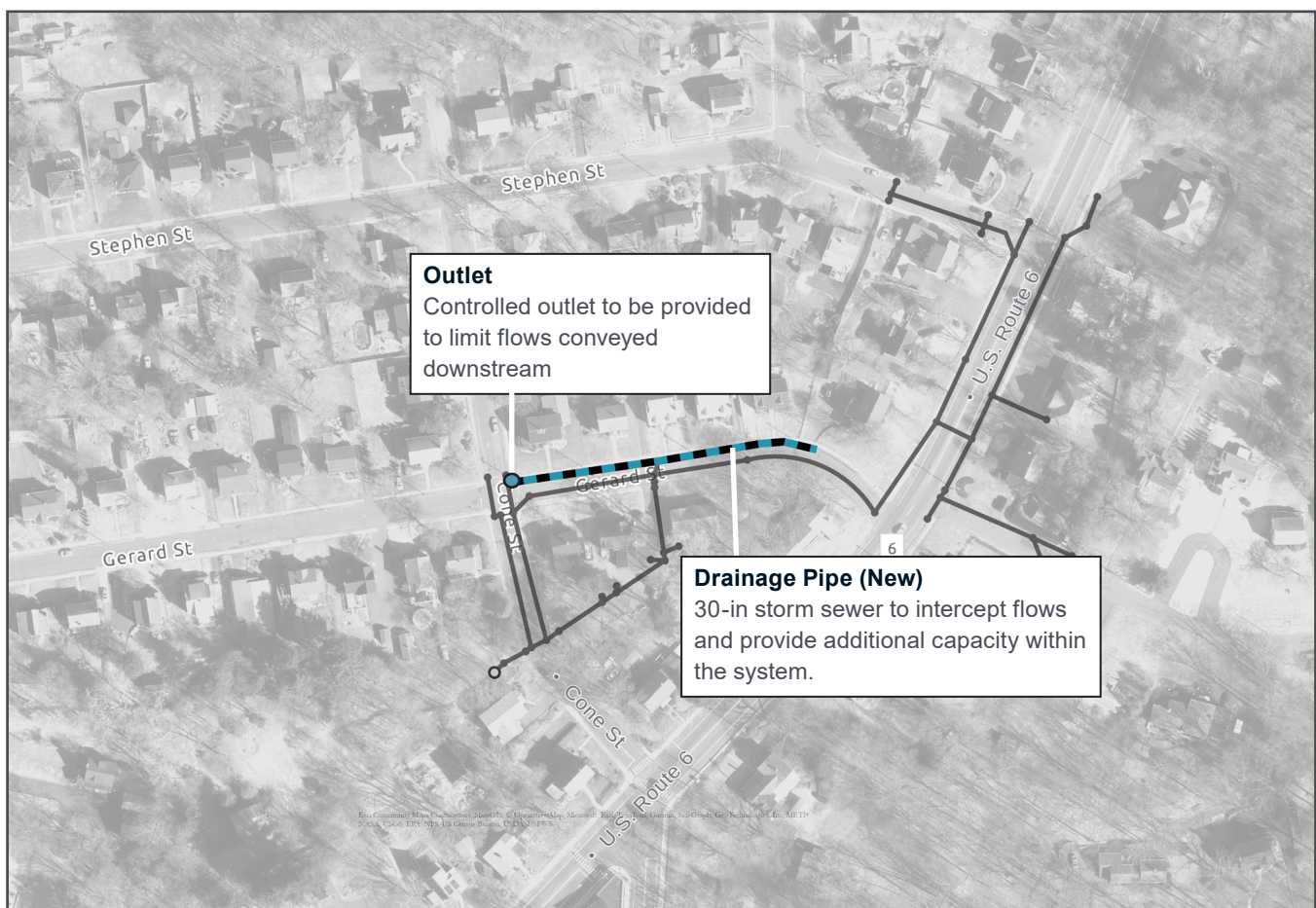
-  Drainage Pipe
-  Outlet
-  Underground Storage
-  Permeable Pavement
-  Nature-Based Storage
-  Green Infrastructure

Cluster 3: Gerard St

At Cluster 3, several roads in the area currently lack adequate drainage infrastructure, resulting in overland runoff that overwhelms existing downstream systems and accumulates in the low-lying areas along Gerard Street and within the backyards of private properties. To address this, a new storm sewer is proposed along Gerard Street to intercept and convey runoff before it starts accumulating.

Additionally, the proposed pipe along Gerard Street is designed as an online storage, providing additional capacity within the system to detain and attenuate stormwater flows before they are discharged to the downstream network.

	Low	High
Benefit	● ●	
Cost	● ●	
Design complexity	●	
Permitting requirements	●	
Stakeholder complexity	●	



Stormwater Conveyance Upgrades

 Green Infrastructure

 Underground Storage

 Nature-based Storage

 Operations & Maintenance

Existing

 Drainage Pipe, Removed

 Drainage Pipe

 Outlet

 Underground Storage

Proposed

 Drainage Pipe

 Outlet

 Underground Storage

 Permeable Pavement

 Nature-Based Storage

 Green Infrastructure

At Cluster 4, a 60,000-cubic-foot underground storage is proposed within the Town's parking lot, upstream of the Dry Brook culvert, to detain and reduce peak flows discharged into the culvert. Additionally, the existing Dry Brook culvert is proposed to be upgraded to better manage upstream stormwater flows. The proposed solution includes replacing the current structure with a new 5-foot by 10-foot box culvert, fitted with a controlled outlet at the downstream end to limit and attenuate flows conveyed further downstream.



Operations & Maintenance

- Drainage Pipe, Removed
- Drainage Pipe
- Outlet
- Underground Storage

- Drainage Pipe
- Outlet
- Underground Storage
- Permeable Pavement
- Nature-Based Storage
- Green Infrastructure

Cluster 5: Hilliard St and Westerly St

At Cluster 5, several roads in the area currently lack adequate drainage infrastructure, resulting in overland runoff that overwhelms existing downstream systems and accumulates in the low-lying areas at the intersection of Hilliard Street and Westerly Street and within the backyards of private properties. To address this, a new storm sewer is proposed along Westerly Street and Bilyue Road to intercept and convey runoff before it reaches and accumulates in these low-lying areas. Additionally, the existing Hilliard Street pipe network is proposed to be disconnected at Griffin Road, and diverted to a new pipe network along Bilyue Road.

A rain garden is also proposed within the Town's parcel to receive and manage bypass flows from Westerly Street, promoting stormwater infiltration and reducing overall runoff volume entering the downstream system.

	Low	High
Benefit	● ● ● ●	
Cost	● ● ● ● ●	
Design complexity	● ● ●	
Permitting requirements	● ● ● ●	
Stakeholder complexity	● ●	



- Stormwater Conveyance Upgrades**
- Green Infrastructure**
- Underground Storage**
- Nature-based Storage**
- Operations & Maintenance**

Existing

- Drainage Pipe, Removed
- Drainage Pipe
- Outlet
- Underground Storage

Proposed

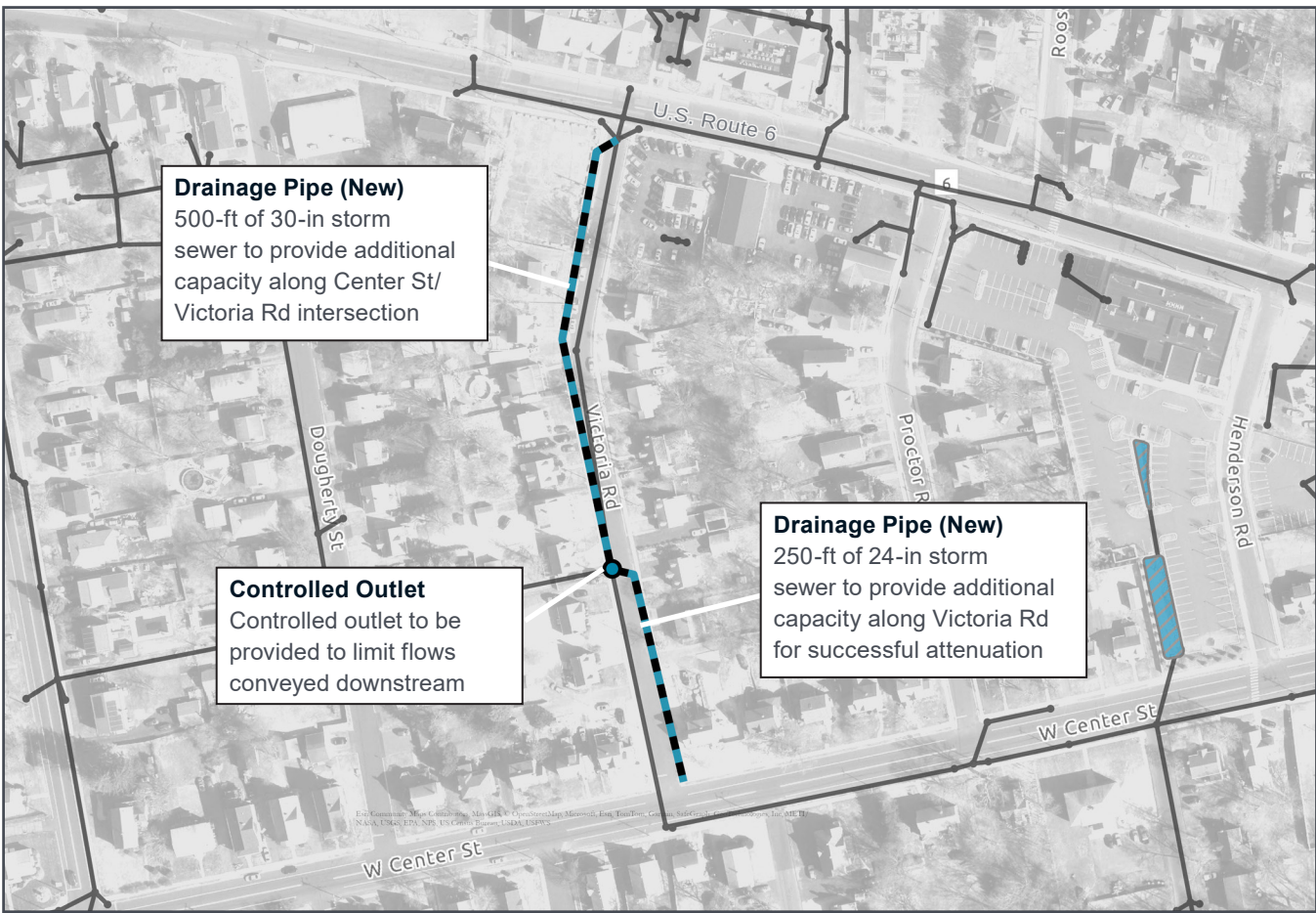
- Drainage Pipe
- Outlet
- Underground Storage
- Permeable Pavement
- Nature-Based Storage
- Green Infrastructure

Cluster 6: Victoria Rd

At Cluster 6, several roads in the area currently lack adequate drainage infrastructure, resulting in overland runoff that overwhelms existing downstream systems and accumulates in the low-lying areas at the Victoria Road and Center Street intersection. Residential properties along Proctor Road are also likely to experience flooding in their backyards due to the natural topography, which directs runoff away from the road and toward the rear of private properties.

To address this, online storage is proposed along Victoria Street to provide additional capacity. A controlled outlet is also proposed to regulate and attenuate flows discharged from the new 30-inch pipe into the existing 24-inch pipe.

	Low	High
Benefit	● ●	
Cost	● ●	
Design complexity	● ●	
Permitting requirements	● ●	
Stakeholder complexity	●	



- Stormwater Conveyance Upgrades
- Green Infrastructure
- Underground Storage
- Nature-based Storage
- Operations & Maintenance

Existing

- Drainage Pipe, Removed
- Drainage Pipe
- Outlet
- Underground Storage

Proposed

- Drainage Pipe
- Outlet
- Underground Storage
- Permeable Pavement
- Nature-Based Storage
- Green Infrastructure

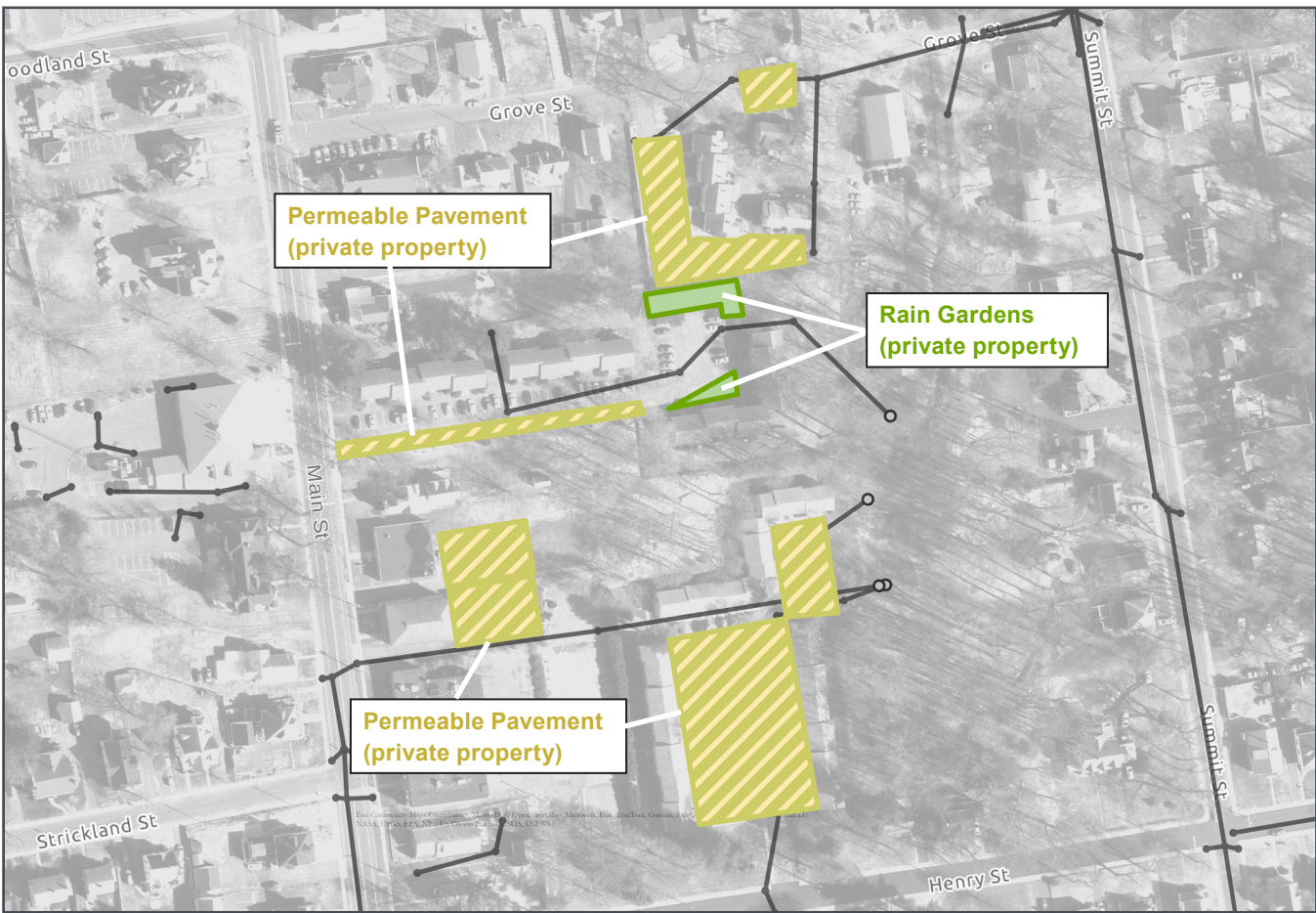
Cluster 7: Grove St and Main St

At Cluster 7, the majority of the area is comprised of private property, limiting the Town’s ability to implement drainage improvements.

However, the abundance of available parking space presents an opportunity to introduce green infrastructure measures, such as permeable pavement and rain gardens, to improve stormwater infiltration and reduce overall runoff volume discharged to the underground drainage system and subsequently to the creek.

Routine operations and maintenance practices will need to be established to ensure that the new green infrastructure measures operate effectively and continue to provide the intended stormwater management benefits over time.

	Low	High
Benefit	● ●	
Cost	● ● ● ●	
Design complexity	● ●	
Permitting requirements	● ●	
Stakeholder complexity	● ● ●	



- Stormwater Conveyance Upgrades
- Green Infrastructure**
- Underground Storage
- Nature-based Storage
- Operations & Maintenance**

Existing

- Drainage Pipe, Removed
- Drainage Pipe
- Outlet
- Underground Storage

Proposed

- Drainage Pipe
- Outlet
- Underground Storage
- Permeable Pavement
- Nature-Based Storage
- Green Infrastructure

Cluster 8: Green Rd, Harlan St, White St and North Elm St

At Cluster 8, the existing drainage culverts were identified to have sufficient capacity to convey stormwater runoff, provided that these culverts are properly maintained. If not maintained adequately, debris may accumulate at the culvert inlets, resulting in blockages that overwhelm the existing system and cause flooding in the surrounding areas.

A routine maintenance and cleaning schedule is proposed to be developed and adhered to by the Town, ensuring that the existing culverts continue to operate effectively during storm events and provide the intended stormwater conveyance capacity over time.

	Low	High
Benefit	● ● ●	
Cost	●	
Design complexity		
Permitting requirements		
Stakeholder complexity	●	



-  Stormwater Conveyance Upgrades
-  Green Infrastructure
-  Underground Storage
-  Nature-based Storage
-  Operations & Maintenance

Existing

-  Drainage Pipe, Removed
-  Drainage Pipe
-  Outlet
-  Underground Storage

Proposed

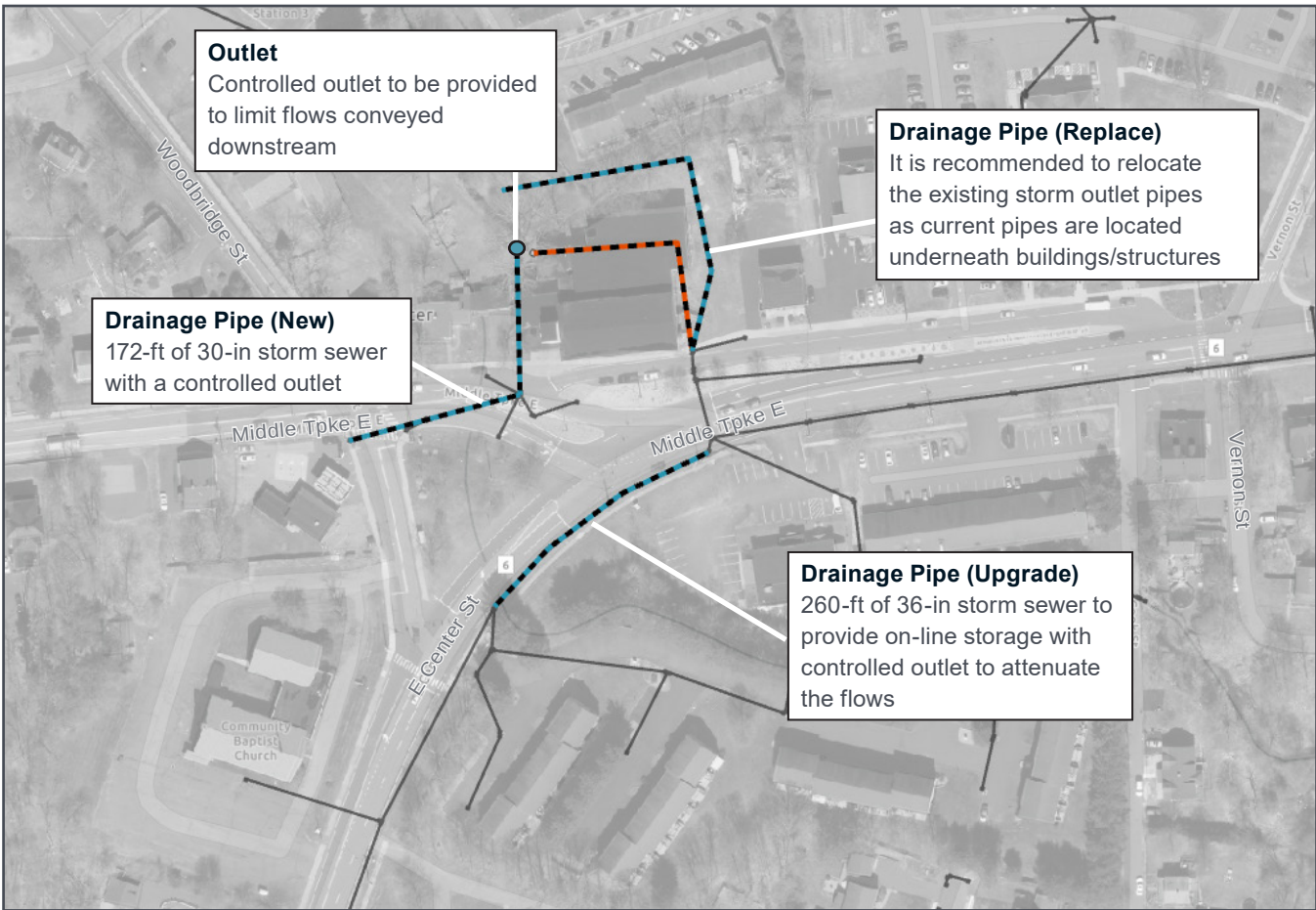
-  Drainage Pipe
-  Outlet
-  Underground Storage
-  Permeable Pavement
-  Nature-Based Storage
-  Green Infrastructure

Cluster 9: Middle Turnpike East

At Cluster 9, several roads in the area currently lack adequate drainage infrastructure, resulting in overland runoff that overwhelms existing downstream systems and accumulates in the low-lying areas at the Middle Turnpike East and Woodbridge Street intersection.

The proposed solution includes increasing online storage through the installation of new drainage pipes to detain and attenuate flows before they are discharged to the downstream network. Additionally, the existing drainage pipe and outlet currently located beneath a private property at 519 Middle Turnpike East are proposed to be relocated around the existing structures to improve accessibility and facilitate routine maintenance.

	Low	High
Benefit	● ● ●	
Cost	● ● ●	
Design complexity	● ● ●	
Permitting requirements	● ● ●	
Stakeholder complexity	● ● ●	



- Stormwater Conveyance Upgrades**
- Green Infrastructure**
- Underground Storage**
- Nature-based Storage**
- Operations & Maintenance**

- Existing**
- Drainage Pipe, Removed
 - Drainage Pipe
 - Outlet
 - Underground Storage

- Proposed**
- Drainage Pipe
 - Outlet
 - Underground Storage
 - Permeable Pavement
 - Nature-Based Storage
 - Green Infrastructure

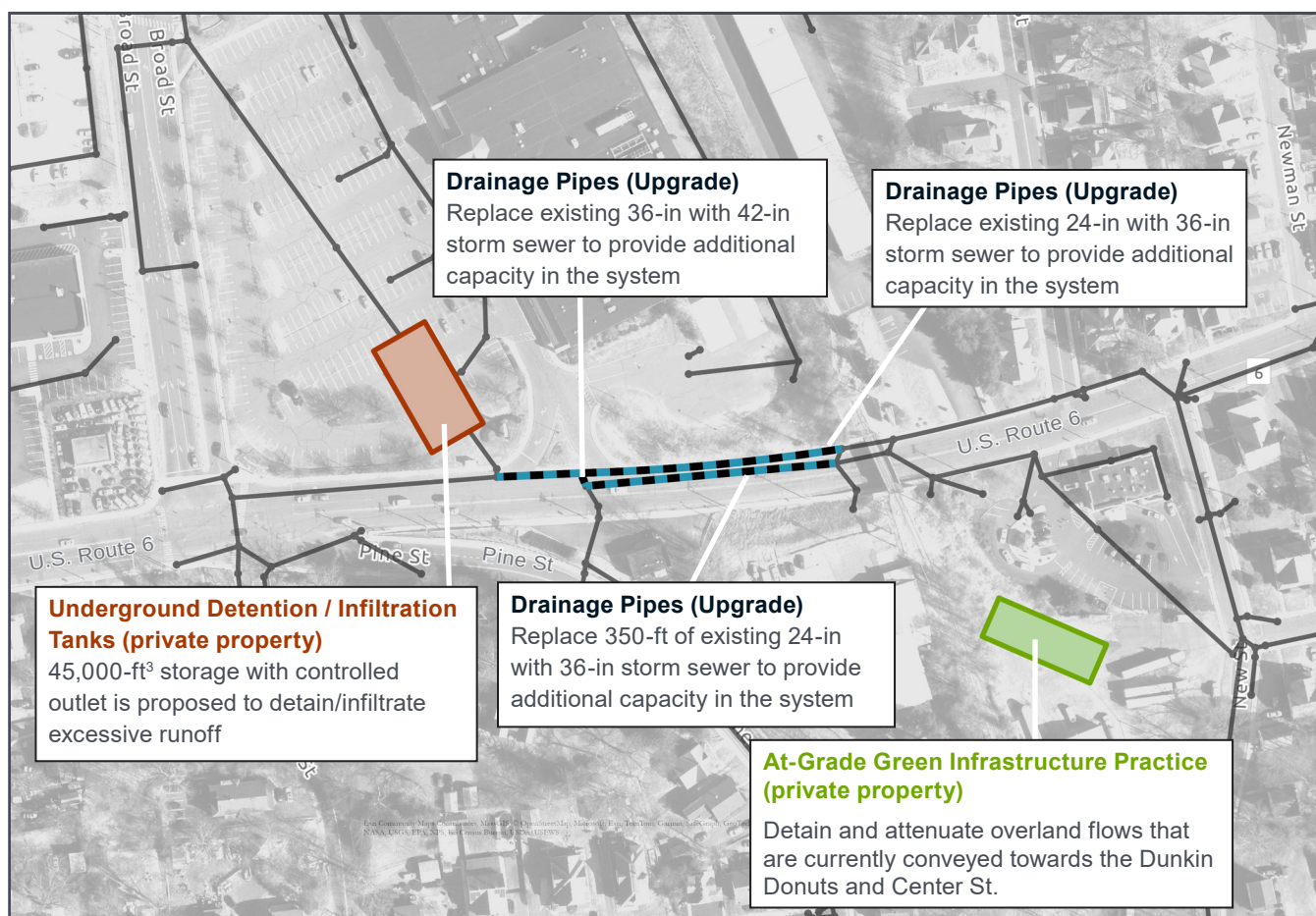
Cluster 10: Broad St, Center St and New St

At Cluster 10, the existing drainage system along Center Street is identified to have insufficient capacity, resulting in overland runoff that overwhelms existing downstream systems and causes flooding in the surrounding areas. To address this, additional online storage is proposed by upsizing the existing drainage pipes along Center Street to detain and attenuate stormwater flows before they are discharged to the downstream network.

Additionally, underground storage with a controlled outlet is proposed within the private parking lot downstream to further detain/infiltrate and subsequently reduce peak flows discharged into the system.

At-grade green infrastructure practice, such as a rain garden, is also proposed to reduce overall runoff volume entering the system.

	Low	High
Benefit	● ● ●	
Cost	● ● ●	
Design complexity	● ● ●	
Permitting requirements	● ●	
Stakeholder complexity	● ● ●	



-  **Stormwater Conveyance Upgrades**
-  **Green Infrastructure**
-  **Underground Storage**
-  **Nature-based Storage**
-  **Operations & Maintenance**

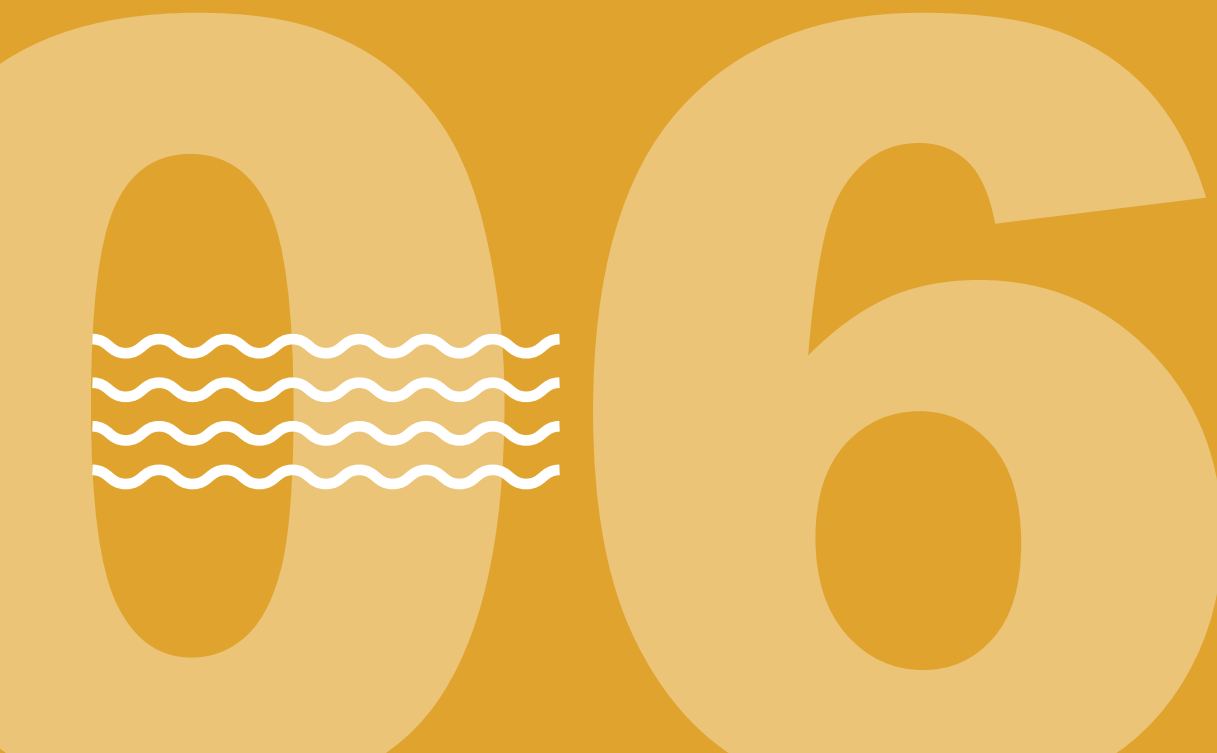
Existing

-  Drainage Pipe, Removed
-  Drainage Pipe
-  Outlet
-  Underground Storage

Proposed

-  Drainage Pipe
-  Outlet
-  Underground Storage
-  Permeable Pavement
-  Nature-Based Storage
-  Green Infrastructure

Implementation Roadmap



The Town of Manchester is committed to building long-term resilience in the face of current and future flood risk. This Plan establishes a clear framework for protecting Manchester's communities and infrastructure, and it marks the beginning of a sustained effort to implement targeted mitigation strategies and reduce flood risk across the Town.

Flood Resiliency Process

This Plan represents a starting point for an ongoing process of flood risk reduction and climate adaptation in Manchester. Resilience is not achieved through a single plan or investment cycle - it requires continual learning, monitoring, and adjustment as conditions evolve and new information becomes available. The Town should regularly reassess flood vulnerabilities as storm patterns shift, infrastructure ages, and land use changes over time. Lessons learned from implemented projects should be used to refine strategies, measure progress, and identify new opportunities for investment.

Community and stakeholder engagement will remain essential to this process. The strategies and priorities identified in this Plan should continue to reflect the concerns and goals of Manchester residents, property owners, and community institutions. As the Plan is implemented, the Town is encouraged to integrate its recommendations into future updates to the Manchester NEXT Plan of Conservation and Development and other municipal planning efforts, ensuring that flood resiliency remains a central and sustained priority across all areas of Town decision-making.

Potential Funding Sources

Implementation of the flood mitigation strategies recommended in this Plan will require coordination across multiple funding sources.

At the federal level, the Town can pursue funding through FEMA's Flood Mitigation Assistance (FMA), Hazard Mitigation Grant Program (HMGP) and Building Resilient Infrastructure and Communities (BRIC) programs to advance stormwater and flood mitigation projects.

At the state level, the Connecticut Department of Energy and Environmental Protection (CT DEEP) and the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) administer programs specifically designed to support municipal flood resilience planning and implementation.

The Town should also explore philanthropic funding, conservation partnerships, and public-private arrangements to supplement public investment - particularly for green infrastructure and nature-based solutions where non-governmental partners may have aligned interests and independent funding capacity.



CREDIT: MANCHESTER NEXT PLAN OF CONSERVATION AND DEVELOPMENT

Data Sources



1. **Page 12:** Town of Manchester, Manchester NEXT Plan of Conservation and Development, 2023.
2. **Page 13:** Connecticut High-Resolution Land Cover Data, Connecticut Environmental Conditions Online (CTECO), 2016
3. **Page 14:** USDA Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO), CT DEEP GIS, 2023.
4. **Page 15:** Capitol Region Council of Governments (CRCOG), Hazard Mitigation Plan, 2024.
5. **Page 16:** Connecticut Subregional Drainage Basin, CT Geodata Portal, 2023.
6. **Page 17:** Town of Manchester Drainage Infrastructure, Manchester GIS, 2025.
7. **Page 24:** National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information (NCEI), Climate Data Online / local climatological data for Hartford Brainard Airport, 2008–2025. Accessed at <https://www.ncei.noaa.gov/access/search/data-search/local-climatological-data-v2>
8. **Page 24:** Town of Manchester, Public Improvement Standards, Section 3.06.04, October 2020.
9. **Page 24:** National Oceanic and Atmospheric Administration (NOAA), Atlas 14.
10. **Page 24:** Northeast Regional Climate Center (NRCC) Extreme Precipitation Dataset for New York and New England.
11. **Page 24:** Intergovernmental Panel on Climate Change (IPCC), Interactive Atlas.
12. **Page 25:** SCALGO Live. Accessed at <https://scalgo.com>
13. **Page 26:** Federal Emergency Management Agency (FEMA), Effective Flood Hazard Layers / Effective Flood Insurance Rate Map (FIRM) floodplains, effective date September 26, 2008.

Appendix 01

Permitting Requirements Assessment

Concept Solution Cluster 1

**Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 1**

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
FEDERAL								
1	Section 404 Individual Permit ^{1,2}	U.S. Army Corps of Engineers (USACE) New England Regulatory District	Required to authorize the impacts to wetland vegetation and dredging of wetlands (or waters of the U.S.) for the installation of a detention pond within wetlands associated with the daylighted portion of Bigelow Brook.	Wetland Delineation required to identify the jurisdictional boundaries of waters of the U.S. Compensation (i.e., mitigation) will be required for loss of forested wetlands functions and values.	2 months	12-18 months	\$25,000	N/A
STATE								
2	401 Individual Water Quality Certificate	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resources Division (LWRD)	Required to obtain State authorization of impacts to wetlands.	Review conducted by the Manchester Planning and Zoning Commission, with 401 Water Quality review/concurrence provided by CT DEEP.	4 weeks	6-12 months	\$9,500	N/A
3	Flood Management Certification (General Certification)	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resources Division (LWRD)	Under Connecticut General Statutes Sections 25-68b through 25-68h, CT DEEP requires certification for state-funded actions to ensure compliance with flood safety regulations, including for projects affecting 100-year floodplains.	Exemption should apply as the project involves retrofitting structures for flood protection. Public hearing may be required.	3 weeks	3-4 months	\$10,000	N/A
4	National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater from Construction Activities (DEEP-WPED-GP-015) Permit No.: CTR100000	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED) Review delegated to Municipality for locally approvable projects (Small Construction Locally Approvable Projects that will disturb an area equal to or greater than one (1) and less than five (5) acres).	Authorizes the discharge of stormwater from construction activities (any activity and discharges associated with construction at a site or the site's preparation for construction including, but not limited to, clearing, grubbing, pile driving, soil disturbance, soil compaction by construction equipment, staging and stockpiling, storage, cleaning and washout, grading, excavation, and dewatering) with a total disturbance of one (1) or more acres of land area.	Assumes all dewatering discharges to support construction are uncontaminated. Requires the preparation of a Stormwater Pollution Control Plan (SWPCP) (See below).	2 weeks (Limited to CT DEEP Forms. Application to be prepared for Municipal Approval. See below.)	60 days after Notice of Coverage issued by the Town of Manchester	\$3,500	\$625
5	Water Diversion Permit for Non-Consumptive Uses	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resource Division (LWRD)	Required for activities that withdraw or redirect more than 50,000 gallons per day (gpd) of surface or groundwater. Required to relocate, retain, detain, bypass, channelize, pipe, culvert, ditch, drain, redirect, fill, excavate, dredge, dam, impound, dike, or enlarge or diminish waters of the state.	Supporting documents include, but are not limited to, engineering and environmental reports, plans and specifications describing the proposed activity and its impact on the environment, long-range water conservation and drought emergency contingency plans, and documentation of what alternatives were considered for the project.	N/A	N/A	\$15,000	\$2,500-\$6,250 based on size of watershed
6	Dam Safety Individual Permit	Connecticut Department of Energy and Environmental Protection (CT DEEP), Dam Safety Program	Required if the construction of the detention basin within the daylighted portion of Bigelow Brook involves a new substantial embankment or "dam" structure to hold back stream flows	New dam construction is not covered under General Permits. Requires stormwater management and aquifer protection plans. Public hearing may be required.	4 weeks	6-18 months (Varies based on project complexity)	\$50,000	\$1,000 max. (Fee calculated as 1% of construction costs with \$100 minimum)

**Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 1**

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
MUNICIPALITY								
7	Inland Wetlands and Watercourses Permit	Manchester Planning and Zoning Commission	Required for regulated impacts to the existing wetlands and waters along Bigelow Brook to support the construction of the detention pond.	The activity does not meet the requirements of lesser General Permit or Nationwide Permits.	2 months	4-6 months	\$10,000	\$260
8	National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater from Construction Activities (DEEP-WPED-GP-015) Permit No.: CTR100000	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED) Review delegated to Municipality for locally approvable projects (Small Construction Locally Approvable Projects that will disturb an area equal to or greater than one (1) and less than five (5) acres).	Authorizes the discharge of stormwater from construction activities (any activity and discharges associated with construction at a site or the site's preparation for construction including, but not limited to, clearing, grubbing, pile driving, soil disturbance, soil compaction by construction equipment, staging and stockpiling, storage, cleaning and washout, grading, excavation, and dewatering) with a total disturbance of one (1) or more acres of land area.	CT DEEP submission is limited to the Notice of Coverage Form Assumes all dewatering discharges to support construction are uncontaminated. Requires the preparation of a Stormwater Pollution Control Plan (SWPCP). The SWPCP can be reviewed by a Qualified Soil Erosion and Sediment Control Professional or a Qualified Professional Engineer licensed in the state of Connecticut for locally approvable projects.	2 months	4-6 months	12,000	\$312.50
9	Soil Erosion and Sediment Control Certification/Approval	Manchester Planning and Zoning Commission	Required for projects that will result in ½-acre or greater of earth disturbance.	Certification from the SCD is submitted to CT DEEP upon issuance to support the filing for a Construction Stormwater General Permit Request for Authorization.	1 month	2-3 months	\$7,500	\$5,665
ADDITIONAL STUDIES/REPORTING								
10	Wetland Field Delineation	N/A	Required to confirm the jurisdictional boundaries of waters of the U.S. to support wetland permitting.	To be completed prior to commencing preparation of wetland permit applications. Conducted in accordance with the USACE 1987 Corps of Engineers Wetland Delineation Manual and Northcentral and Northeast Regional Supplement. Wetland delineators must maintain CT Soil Scientist qualifications.	1 to 2 days to complete	N/A	\$6,000	N/A
11	Wetland Delineation Report	N/A	Required to document the findings of the wetland field delineation to support wetland permitting at Federal, State, and local levels.	To be completed prior to commencing preparation of wetland permit applications. Includes a description of the wetland field delineation methodology and results, including mapping and USACE Wetland Determination Data Forms.	1 month	N/A	\$7,500	N/A
12	Wetland Mitigation / Compensation	U.S. Army Corps of Engineers (USACE) New England Regulatory District	Required to support wetland permit applications.	Reviewed with the USACE Individual Permit and Manchester Inland Wetlands and Watercourses Permit	1 month	N/A	\$12,000	N/A
13	Stormwater Pollution Control Plan (SWPCP)	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED)	Required to support review of stormwater management and erosion and sediment control during construction.		2 months	N/A	\$7,500	N/A

Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 1

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
14	Flood Contingency Plan	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resources Division (LWRD)	Required to support the Flood Management Certificate from CT DEEP.		1 month	N/A	\$10,000	N/A

Notes:

1. Based on current internal USACE guidance for determining waters of the U.S., the on-Site wetland meet the definition of “adjacent wetlands”. The USACE has a draft internal memorandum which may preclude jurisdiction over wetlands connected to traditionally navigable waters and relatively permanent waters via culvert (i.e., the culverted portion of Bigelow Brook). As such, wetlands for this cluster may not be under Federal jurisdiction once the revised internal memorandum directing USACE reviewers is formally issued.
2. The majority of the State General Permits under the USACE New England Regulatory District are being revoked, and starting March 15, 2026 Nationwide Permits (NWP) will be effective in the New England District region. The proposed solutions do not involve impacts/activities that can be covered under NWP.

Assumptions:

1. Project Limit of Disturbance encompasses an area of approximately 2 acres. As such, General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities from CT DEEP is not required for the Project.
2. Groundwater from excavations and trenching are not suspected to contain pollutants of concern to the surface or ground water therefore not requiring coverage under the CT DEEP General Permit for the Discharge of Dewatering and Remediation Wastewaters (Permit No.: CTDRGP000) issued March 1, 2026.



Concept Solution Cluster 2

Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 2

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
FEDERAL								
1	Nationwide Permit No. 7 for Outfalls and Intake Structures ^{1,2}	U.S. Army Corps of Engineers (USACE) New England Regulatory District	Required to authorize filling associated with the installation of the new storm chamber at the existing outfall.	Wetland Delineation required to identify the jurisdictional boundaries of waters of the U.S.	2 months	6-12 months	\$9,500	N/A
STATE								
2	401 Water Quality Certificate	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resources Division (LWRD)	Required to obtain State authorization of impacts to wetlands.	Review conducted by the Manchester Planning and Zoning Commission, with 401 Water Quality review/concurrence provided by CT DEEP.	4 weeks	6-12 months	\$7,500	N/A
MUNICIPALITY								
3	Inland Wetlands and Watercourses Permit	Manchester Planning and Zoning Commission	Required for regulated impacts to the existing wetlands and waters associated with the installation of the new storm chamber at the existing outfall.		2 months	4-6 months	\$10,000	\$260
ADDITIONAL STUDIES/REPORTING								
4	Wetland Field Delineation	N/A	Required to confirm the jurisdictional boundaries of waters of the U.S. to support wetland permitting.	To be completed prior to commencing preparation of wetland permit applications. Conducted in accordance with the USACE 1987 Corps of Engineers Wetland Delineation Manual and Northcentral and Northeast Regional Supplement. Wetland delineators must maintain CT Soil Scientist qualifications.	1 to 2 days to complete	N/A	\$6,000	N/A
5	Wetland Delineation Report	N/A	Required to document the findings of the wetland field delineation to support wetland permitting at Federal, State, and local levels.	To be completed prior to commencing preparation of wetland permit applications. Includes a description of the wetland field delineation methodology and results, including mapping and USACE Wetland Determination Data Forms.	1 month	N/A	\$7,500	N/A

Notes:

- Based on current internal USACE guidance for determining waters of the U.S., the on-Site wetland meet the definition of “adjacent wetlands”. The USACE has a draft internal memorandum which may preclude jurisdiction over wetlands connected to traditionally navigable waters and relatively permanent waters via culvert (i.e., the culverted portion of Bigelow Brook). As such, wetlands for this cluster may not be under Federal jurisdiction once the revised internal memorandum directing USACE reviewers is formally issued.
- The majority of the State General Permits under the USACE New England Regulatory District are being revoked, and starting March 15, 2026 Nationwide Permits (NWP) will be effective in the New England District region.

Assumptions:

- Project Limit of Disturbance encompasses an area of approximately 0.4 acres. As such, General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities from CT DEEP is not required for the Project.
- Dewatering is anticipated to be minimal due to project phasing and limited depth of trenching. As such, no dewatering approvals are required.
- Impacts/loss of waters of the U.S. will be less than 1/10-acre, and therefore mitigation/compensation will not be required.



Concept Solution Cluster 3

Cluster 3 Concept Solution:

- New system proposed along Gerard St to intercept the upstream flows and convey towards the culvert.
- Oversized pipe section is proposed to provide online storage.

Based on the limited nature of the proposed improvements and lack of regulated resources within the proposed area of disturbance, no environmental permits or approvals are anticipated to be required to support the Cluster 3 Concept Solution. This assessment is based on the following assumptions:

- Project Limit of Disturbance encompasses an area of approximately 0.12 acres. As such, General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities from Connecticut Department of Energy and Environmental Protection (CT DEEP) is not required for the Project.
- The new reinforced concrete pipe (RCP) installation will not require disturbance within US Route 6/44, therefore, not requiring approval from the Connecticut Department of Transportation.
- Dewatering is anticipated to be minimal due to project phasing and limited depth of trenching. As such, no dewatering approvals are required.

Concept Solution Cluster 4

Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 4

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
FEDERAL								
1	Nationwide Permit No. 3 for Maintenance ^{1,2,3}	U.S. Army Corps of Engineers (USACE) New England Regulatory District	Applies to impacts to Dry Brook to upsize the existing box culvert. Dry Brook may meet the definition of water of the U.S. based on flows to downstream navigable waters. See Note 1.	Authorizes Repair, rehabilitation, or replacement of previously authorized, currently serviceable structures or fills within waters of the U.S. Also authorizes temporary structures, fills, and work necessary to conduct maintenance activity. NWP 3 does not authorize: maintenance dredging for the primary purpose of navigation; beach restoration; or new stream channelization or stream relocation projects. Limits stream channel modification to the minimum necessary for the maintenance activity. No Pre-Construction Notification (i.e., application) submittal required for formal approval granted the conditions of the NWP are met and impacts to waters of the U.S. are less than 1/10-acre.	N/A No Pre-Construction Notification Required	N/A Approval assumed if NWP conditions are met	N/A No Pre-Construction Notification Required	N/A
STATE								
2	401 Water Quality Certificate	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resources Division (LWRD)	Required to obtain State authorization of impacts to wetlands.	Review conducted by the Manchester Planning and Zoning Commission, with 401 Water Quality review/concurrence provided by CT DEEP.	4 weeks	6-12 months	\$7,500	N/A
3	Water Diversion Permit for Non-Consumptive Uses	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resource Division (LWRD)	Required for activities that withdraw or redirect more than 50,000 gallons per day (gpd) of surface or groundwater. Required to relocate, retain, detain, bypass, channelize, pipe, culvert, ditch, drain, redirect, fill, excavate, dredge, dam, impound, dike, or enlarge or diminish waters of the state.	Supporting documents include, but are not limited to, engineering and environmental reports, plans and specifications describing the proposed activity and its impact on the environment, long-range water conservation and drought emergency contingency plans, and documentation of what alternatives were considered for the project.	N/A	N/A	\$15,000	\$2,500-\$6,250 based on size of watershed
MUNICIPALITY								
4	Inland Wetlands and Watercourses Permit	Manchester Planning and Zoning Commission	Required for regulated impacts to the existing wetlands and waters along Bigelow Brook to support the construction of the detention pond.		2 months	6 months	\$10,000	\$260

Notes:

1. Based on current internal USACE guidance for determining waters of the U.S., the on-Site wetland meet the definition of “adjacent wetlands”. The USACE has a draft internal memorandum which may preclude jurisdiction over wetlands connected to traditionally navigable waters and relatively permanent waters via culvert (i.e., the culverted portion of Bigelow Brook). As such, wetlands for this cluster may not be under Federal jurisdiction once the revised internal memorandum directing USACE reviewers is formally issued.
2. Based on the current definition of waters of the U.S., Dry Brook, which is culverted in this area, is considered a water of the U.S. if it maintains relatively permanent flows to downstream navigable waters.
3. The State General Permits under the USACE New England Regulatory District are being revoked and starting March 15, 2026 Nationwide Permits (NWPs) will be effective in the New England District region.



Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 4

Assumptions:

1. Project Limit of Disturbance encompasses an area of approximately 0.37 acres. As such, General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities from CT DEEP is not required for the Project.
2. The proposed box culvert replacement within Dry Brook will not result in a loss of 4,356 square feet (1/10-acre) of waters of the U.S., and therefore the Pre-Construction Notification for the NWP 3 is not required.
3. Groundwater from excavations and trenching are not suspected to contain pollutants of concern to the surface or ground water therefore not requiring coverage under the CT DEEP General Permit for the Discharge of Dewatering and Remediation Wastewaters (Permit No.: CTDRGP000) issued March 1, 2026.

Concept Solution Cluster 5

**Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 5**

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
FEDERAL								
1	Nationwide Permit No. 7 for Outfalls and Intake Structures ^{1,2}	U.S. Army Corps of Engineers (USACE) New England Regulatory District	Required to authorize filling within the unnamed tributary to the Hockanum River and potential wetland fringe to support the construction of the new controlled outlet structure.	Wetland Delineation required to identify the jurisdictional boundaries of waters of the U.S.	2 months	12-18 months	\$9,500	N/A
STATE								
2	401 Individual Water Quality Certificate	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resources Division (LWRD)	Required to obtain State authorization of impacts to wetlands.	Review conducted by the Manchester Planning and Zoning Commission, with 401 Water Quality review/concurrence provided by CT DEEP.	4 weeks	6-12 months	\$7,500	N/A
3	Flood Management Certification (General Certification)	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resources Division (LWRD)	Under Connecticut General Statutes Sections 25-68b through 25-68h, CT DEEP requires certification for state-funded actions to ensure compliance with flood safety regulations, including for projects affecting 100-year floodplains.	Exemption should apply as the project involves retrofitting structures for flood protection. Public hearing may be required.	3 weeks	3-4 months	\$10,000	N/A
4	National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater from Construction Activities (DEEP-WPED-GP-015) Permit No.: CTR100000	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED) Review delegated to Municipality for locally approvable projects (Small Construction Locally Approvable Projects that will disturb an area equal to or greater than one (1) and less than five (5) acres).	Authorizes the discharge of stormwater from construction activities (any activity and discharges associated with construction at a site or the site's preparation for construction including, but not limited to, clearing, grubbing, pile driving, soil disturbance, soil compaction by construction equipment, staging and stockpiling, storage, cleaning and washout, grading, excavation, and dewatering) with a total disturbance of one (1) or more acres of land area.	Assumes all dewatering discharges to support construction are uncontaminated. Requires the preparation of a Stormwater Pollution Control Plan (SWPCP) (See below).	2 weeks (Limited to CT DEEP Forms. Application to be prepared for Municipal Approval. See below.)	60 days after Notice of Coverage issued by the Town of Manchester	\$3,500	\$625
MUNICIPALITY								
5	Inland Wetlands and Watercourses Permit	Manchester Planning and Zoning Commission	Required for regulated impacts to the existing wetlands and waters of the unnamed tributary to the Hockanum River to support the construction of the new controlled outlet structure.	The activity does not meet the requirements of lesser General Permit or Nationwide Permits	2 months	6 months	\$10,000	\$260
6	National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater from Construction Activities (DEEP-WPED-GP-015) Permit No.: CTR100000	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED) Review delegated to Municipality for locally approvable projects (Small Construction Locally Approvable Projects that will disturb an area equal to or greater than one (1) and less than five (5) acres).	Authorizes the discharge of stormwater from construction activities (any activity and discharges associated with construction at a site or the site's preparation for construction including, but not limited to, clearing, grubbing, pile driving, soil disturbance, soil compaction by construction equipment, staging and stockpiling, storage, cleaning and washout, grading, excavation, and dewatering) with a total disturbance of one (1) or more acres of land area	CT DEEP submission is limited to the Notice of Coverage Form Assumes all dewatering discharges to support construction are uncontaminated. Requires the preparation of a Stormwater Pollution Control Plan (SWPCP). The SWPCP can be reviewed by a Qualified Soil Erosion and Sediment Control Professional or a Qualified Professional Engineer licensed in the state of Connecticut for locally approvable projects.	N/A	2 months after local Notice of Coverage issued by the Municipality	N/A	N/A

Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 5

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
7	Soil Erosion and Sediment Control Certification/Approval	Manchester Planning and Zoning Commission	Required for projects that will result in ½-acre or greater of earth disturbance.	Certification from the SCD is submitted to CT DEEP upon issuance to support the filing for a Construction Stormwater General Permit Request for Authorization.	1 month	2-3 months	\$7,500	\$5,665
ADDITIONAL STUDIES/REPORTING								
8	Wetland Field Delineation	N/A	Required to confirm the jurisdictional boundaries of waters of the U.S. to support wetland permitting.	To be completed prior to commencing preparation of wetland permit applications. Conducted in accordance with the USACE 1987 Corps of Engineers Wetland Delineation Manual and Northcentral and Northeast Regional Supplement. Wetland delineators must maintain CT Soil Scientist qualifications.	1-2 days to complete	N/A	\$6,000	N/A
9	Wetland Delineation Report	N/A	Required to document the findings of the wetland field delineation to support wetland permitting at Federal, State, and local levels.	To be completed prior to commencing preparation of wetland permit applications. Includes a description of the wetland field delineation methodology and results, including mapping and USACE Wetland Determination Data Forms.	1 month	N/A	\$7,500	N/A
10	Stormwater Pollution Control Plan (SWPCP)	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED)	Required to support review of stormwater management and erosion and sediment control during construction.		2 months	N/A	\$7,500	N/A
11	Flood Contingency Plan	Connecticut Department of Energy and Environmental Protection (CT DEEP), Land and Water Resources Division (LWRD)	Required to support the Flood Management Certificate from CT DEEP.		2 months	N/A	\$10,000	N/A

- Notes:**
- Based on current internal USACE guidance for determining waters of the U.S., the potential wetland fringe of the unnamed tributary to the Hockanum River meet the definition of “adjacent wetlands”. The USACE has a draft internal memorandum which may preclude jurisdiction over wetlands connected to traditionally navigable waters and relatively permanent waters via culvert (i.e., the culverted portion of Bigelow Brook). As such, wetlands for this cluster may not be under Federal jurisdiction once the revised internal memorandum directing USACE reviewers is formally issued.
 - The State General Permits under the USACE New England Regulatory District are being revoked and starting March 15, 2026 Nationwide Permits (NWP) will be effective in the New England District region. Fills below the Ordinary High Water Mark (OHWM) of the unnamed tributary to the Hockanum River or associated adjacent wetlands (See Note 1) can be covered under the NWP 7.

- Assumptions:**
- Project Limit of Disturbance encompasses an area of approximately 1 acre.
 - Fills within waters of the U.S. will be less than 1/10-acre and therefore mitigation/compensation will not be required.
 - Groundwater from excavations and trenching are not suspected to contain pollutants of concern to the surface or ground water therefore not requiring coverage under the CT DEEP General Permit for the Discharge of Dewatering and Remediation Wastewaters (Permit No.: CTDRGP000) issued March 1, 2026.



Concept Solution Cluster 6

Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 6

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
STATE								
1	Highway Encroachment Permit	Connecticut Department of Transportation (CTDOT), Bureau of Highway Operations and Maintenance	Required to authorize the sewer connection to the existing system within US Route 6/44 and State Route 502.	Requires drainage plans and stormwater calculations to ensure adequate pipe sizing and proper stormwater conveyance. Permit Bond required. State Traffic Commission Certificate and required local building permits must be issued prior to permit issuance. The encroachment permit fee, surety bond amount, certificate of insurance coverage and any specific conditions will be determined by the District Maintenance Director upon review of the proposed work.	3 months	4-6 months	\$10,000	\$1,000
ADDITIONAL STUDIES/REPORTING								
2	Traffic Control Plan	N/A	Required to ensure maintained traffic flows and safety during construction in accordance with CTDOT Form 819, Standards Specifications for Roads, Bridges, Facilities, and Incidental Construction, dated 2024		2 months	N/A	\$7,500	N/A

Assumptions:

- 1. Project Limit of Disturbance encompasses an area of approximately 0.21 acre.
- 2. Groundwater from excavations and trenching are not suspected to contain pollutants of concern to the surface or ground water therefore not requiring coverage under the CT DEEP General Permit for the Discharge of Dewatering and Remediation Wastewaters (Permit No.: CTDRGP000) issued March 1, 2026.



Concept Solution Cluster 7

Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 7

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
STATE								
1	National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater from Construction Activities (DEEP-WPED-GP-015) Permit No.: CTR100000	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED) Review delegated to Municipality for locally approvable projects (Small Construction Locally Approvable Projects that will disturb an area equal to or greater than one (1) and less than five (5) acres).	Authorizes the discharge of stormwater from construction activities (any activity and discharges associated with construction at a site or the site's preparation for construction including, but not limited to, clearing, grubbing, pile driving, soil disturbance, soil compaction by construction equipment, staging and stockpiling, storage, cleaning and washout, grading, excavation, and dewatering) with a total disturbance of one (1) or more acres of land area	Assumes all dewatering discharges to support construction are uncontaminated. Requires the preparation of a Stormwater Pollution Control Plan (SWPCP)	N/A (see below)	60 days after Notice of Coverage issued by the Town of Manchester	\$5,000	\$625
MUNICIPALITY								
2	National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater from Construction Activities (DEEP-WPED-GP-015) Permit No.: CTR100000	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED) Review delegated to Municipality for locally approvable projects (Small Construction Locally Approvable Projects that will disturb an area equal to or greater than one (1) and less than five (5) acres).	Authorizes the discharge of stormwater from construction activities (any activity and discharges associated with construction at a site or the site's preparation for construction including, but not limited to, clearing, grubbing, pile driving, soil disturbance, soil compaction by construction equipment, staging and stockpiling, storage, cleaning and washout, grading, excavation, and dewatering) with a total disturbance of one (1) or more acres of land area	Assumes all dewatering discharges to support construction are uncontaminated. Requires the preparation of a Stormwater Pollution Control Plan (SWPCP). The SWPCP can be reviewed by a Qualified Soil Erosion and Sediment Control Professional or a Qualified Professional Engineer licensed in the state of Connecticut for locally approvable projects.	2 months	2-3 months	N/A	\$312.50
3	Soil Erosion and Sediment Control Certification/Approval	Manchester Planning and Zoning Commission	Required for projects that will result in ½-acre or greater of earth disturbance.	Certification from the SCD is submitted to CT DEEP upon issuance to support the filing for a Construction Stormwater General Permit Request for Authorization.	1 month	2-3 months	\$7,500	\$5,665
ADDITIONAL STUDIES/REPORTING								
4	Stormwater Pollution Control Plan (SWPCP)	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED)	Required to support review of stormwater management and erosion and sediment control during construction.		2 months	N/A	\$7,500	N/A

Assumptions:

1. Project Limit of Disturbance encompasses an area of approximately 1.2 acres. This project is locally approvable, and the review will be conducted by Town of Manchester.



Concept Solution Cluster 8 - n/a

Concept Solution Cluster 9

**Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 9**

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
STATE								
1	Highway Encroachment Permit	Connecticut Department of Transportation (CTDOT), Bureau of Highway Operations and Maintenance	Required to authorize grading within the State Route 44 right-of-way	Permit Bond required. State Traffic Commission Certificate and required local building permits must be issued prior to permit issuance. The encroachment permit fee, surety bond amount, certificate of insurance coverage and any specific conditions will be determined by the District Maintenance Director upon review of the proposed work.	3 months	4-6 months	\$10,000	\$1,000
2	National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater from Construction Activities (DEEP-WPED-GP-015) Permit No.: CTR100000	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED) Review delegated to Municipality for locally approvable projects (Small Construction Locally Approvable Projects that will disturb an area equal to or greater than one (1) and less than five (5) acres).	Authorizes the discharge of stormwater from construction activities (any activity and discharges associated with construction at a site or the site's preparation for construction including, but not limited to, clearing, grubbing, pile driving, soil disturbance, soil compaction by construction equipment, staging and stockpiling, storage, cleaning and washout, grading, excavation, and dewatering) with a total disturbance of one (1) or more acres of land area	Assumes all dewatering discharges to support construction are uncontaminated. Requires the preparation of a Stormwater Pollution Control Plan (SWPCP)	N/A (see below)	60 days after Notice of Coverage issued by the Town of Manchester	\$5,000	\$625
MUNICIPALITY								
3	National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater from Construction Activities (DEEP-WPED-GP-015) Permit No.: CTR100000	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED) Review delegated to Municipality for locally approvable projects (Small Construction Locally Approvable Projects that will disturb an area equal to or greater than one (1) and less than five (5) acres).	Authorizes the discharge of stormwater from construction activities (any activity and discharges associated with construction at a site or the site's preparation for construction including, but not limited to, clearing, grubbing, pile driving, soil disturbance, soil compaction by construction equipment, staging and stockpiling, storage, cleaning and washout, grading, excavation, and dewatering) with a total disturbance of one (1) or more acres of land area	Assumes all dewatering discharges to support construction are uncontaminated. Requires the preparation of a Stormwater Pollution Control Plan (SWPCP). The SWPCP can be reviewed by a Qualified Soil Erosion and Sediment Control Professional or a Qualified Professional Engineer licensed in the state of Connecticut for locally approvable projects.	2 months	2-3 months	N/A	N/A
4	Soil Erosion and Sediment Control Certification/Approval	Manchester Planning and Zoning Commission	Required for projects that will result in ½-acre or greater of earth disturbance.	Certification from the SCD is submitted to CT DEEP upon issuance to support the filing for a Construction Stormwater General Permit Request for Authorization.	1 month	2-3 months	\$7,500	\$5,665
ADDITIONAL STUDIES/REPORTING								



Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 9
Middle Turnpike East at Woodbridge

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
6	Wetland Field Delineation	N/A	Required to confirm the jurisdictional boundaries of waters of the U.S. to support wetland permitting.	To be completed prior to commencing preparation of wetland permit applications. Conducted in accordance with the USACE 1987 Corps of Engineers Wetland Delineation Manual and Northcentral and Northeast Regional Supplement. Wetland delineators must maintain CT Soil Scientist qualifications.	2-3 days to complete	N/A	\$8,000	N/A
7	Wetland Delineation Report	N/A	Required to document the findings of the wetland field delineation to support wetland permitting at Federal, State, and local levels.	To be completed prior to commencing preparation of wetland permit applications. Includes a description of the wetland field delineation methodology and results, including mapping and USACE Wetland Determination Data Forms.	1 month	N/A	\$7,500	N/A
8	Stormwater Pollution Control Plan (SWPCP)	Connecticut Department of Energy and Environmental Protection (CT DEEP), Water Permitting and Enforcement Division (WPED)	Required to support review of stormwater management and erosion and sediment control during construction.		2 months	N/A	\$7,500	N/A
9	Traffic Control Plan	N/A	Required to ensure maintained traffic flows and safety during construction in accordance with CTDOT Form 819, Standards Specifications for Roads, Bridges, Facilities, and Incidental Construction, dated 2024		2 months	N/A	\$5,000	N/A

Notes:

1. Assumes no filling within waters of the U.S. Impacts to wetlands (waters of the U.S.) will consist of grading to improve stormwater drainage flows toward Bigelow Brook, which would likely result in a larger wetland footprint.

Assumptions:

1. Project Limit of Disturbance encompasses an area of greater than one but less than five acres. As such, the Project is locally approvable under the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities.
2. Groundwater from excavations and trenching are not suspected to contain pollutants of concern to the surface or ground water therefore not requiring coverage under the CT DEEP General Permit for the Discharge of Dewatering and Remediation Wastewaters (Permit No.: CTDRGP000) issued March 1, 2026.
3. The Project will not result in loss of wetlands or waters of the U.S. and therefore compensation/mitigation is not anticipated to be required.



Concept Solution Cluster 10

Summary of Anticipated Permits/Approvals
Town of Manchester Flood Resiliency Plan
Concept Solution Cluster 10

No.	Permit/Approval	Agency	Applicability	Notes	Application Prep Time	Agency Review Time	Cost to Prepare Application (est.)	Application Fee (est.)
STATE								
1	Highway Encroachment Permit	Connecticut Department of Transportation (CTDOT), Bureau of Highway Operations and Maintenance	Required to authorize the storm sewer within US Route 44.	Requires drainage plans and stormwater calculations to ensure adequate pipe sizing and proper stormwater conveyance. Permit Bond required. State Traffic Commission Certificate and required local building permits must be issued prior to permit issuance. The encroachment permit fee, surety bond amount, certificate of insurance coverage and any specific conditions will be determined by the District Maintenance Director upon review of the proposed work.	3 months	4-6 months	\$10,000	\$1,000
ADDITIONAL STUDIES/REPORTING								
2	Traffic Control Plan	N/A	Required to ensure maintained traffic flows and safety during construction in accordance with CTDOT Form 819, Standards Specifications for Roads, Bridges, Facilities, and Incidental Construction, dated 2024.		2 months to complete	N/A	\$7,500	N/A

Assumptions:

- 1. Project Limit of Disturbance encompasses an area of approximately 0.1 acre.
- 2. Groundwater from excavations and trenching are not suspected to contain pollutants of concern to the surface or ground water therefore not requiring coverage under the CT DEEP General Permit for the Discharge of Dewatering and Remediation Wastewaters (Permit No.: CTDRGP000) issued March 1, 2026.



Appendix 02

Preliminary Cost Estimates



Town of Manchester

Town of Manchester Flood Resiliency Plan
Manchester, Connecticut

Conceptual Design Estimate

3/20/2026



BASIS OF ESTIMATE (B.O.E.)

Project Documents

- 1 Estimate is prepared based on the concept solutions report provided by Thornton Tomasetti dated February 18, 2026

Project Areas & Scope

- A Removal of existing Asphalt pavement
- B Grading and earthwork for new RCP, detention tank, detention pond and rain garden
- C New pavements
- D New Water Detention/ Infiltration tanks and ponds
- E Install new reinforced concrete pipes, manholes, storm chamber and catch basins
- F Provide Rain garden

3 Estimate exclusions

The following items are excluded from estimate:

- A Design fee
- B Overtime cost
- C Environmental Abatements
- D Rock Excavation
- E Testing, Inspection and Quality Control by Owner.
- F Exclude pile and pipe cradles
- G Exclude reinforced cast in place concrete mat under new retention tank

4 Construction Schedule

Construction Start Date	1/1/2027
Construction Mid Point Date	6/1/2027



Town of Manchester
Town of Manchester Flood Resiliency Plan

3/20/2026

BASIS OF ESTIMATE (B.O.E.)

Construction End Date	1/1/2028
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5 Markups

The following Markups are included	
General Conditions	12.0%
General Contractor's Overhead & Profit	21.0%
Design Contingency	30.0%
Bond	2.0%
Escalation to the Midpoint	5.0%
Escalation Rate 4% per year	
Bid Contingency	5%
Construction Contingency	10%



Town of Manchester
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SUMMARY OF TRADES Town of Manchester Flood Resiliency Plan

Description		CLUSTER 1	CLUSTER 2	CLUSTER 3	CLUSTER 4	CLUSTER 5	CLUSTER 6	CLUSTER 7	CLUSTER 9	CLUSTER 10
1	01-00-00 General Requirements	\$ 587,295	\$ 311,963	\$ 73,188	\$ 361,300	\$ 552,603	\$ 94,106	\$ 352,480	\$ 144,318	\$ 198,647
2	31-10-00 Site Clearing	\$ 150,955	\$ 101,737	\$ 16,867	\$ 153,333	\$ 144,517	\$ 26,833	\$ 590,333	\$ 27,367	\$ 197,800
3	31-20-00 Earthwork	\$ 2,458,797	\$ 1,682,116	\$ 447,133	\$ -	\$ 3,112,412	\$ 529,183	\$ -	\$ 431,979	\$ 450,429
4	32-12-00 Pavements	\$ 221,016	\$ 159,240	\$ 26,400	\$ 240,000	\$ 226,200	\$ 42,000	\$ 2,310,000	\$ 37,200	\$ 264,600
5	32-13-00 Concrete walks/ Concrete foundation	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
6	32-00-00 General Site Improvements	\$ 56,000	\$ -	\$ -	\$ -	\$ 80,000	\$ -	\$ 37,000	\$ 9,000	\$ 140,000
7	32-93-00 Planting	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
8	33-33-00 Site Features	\$ 1,090,000	\$ -	\$ -	\$ 2,617,500	\$ -	\$ -	\$ -	\$ -	\$ 450,000
9	33-00-00 Utilities - Plumbing	\$ 917,358	\$ 656,600	\$ 119,504	\$ -	\$ 1,041,896	\$ 186,200	\$ -	\$ 698,155	\$ 152,560
10	33-70-00 Utilities - Electrical	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
11										
12	Subtotal 1	\$ 5,481,421	\$ 2,911,656	\$ 683,092	\$ 3,372,133	\$ 5,157,628	\$ 878,322	\$ 3,289,813	\$ 1,348,019	\$ 1,854,036
13	General Contractor's Office Overhead & Profit 21.0%	\$ 1,151,098	\$ 611,448	\$ 143,449	\$ 708,148	\$ 1,083,102	\$ 184,448	\$ 690,861	\$ 283,084	\$ 389,348
14										
15	Subtotal 2	\$ 6,632,520	\$ 3,523,104	\$ 826,541	\$ 4,080,281	\$ 6,240,730	\$ 1,062,770	\$ 3,980,674	\$ 1,631,103	\$ 2,243,383
16	Design Contingency 30.0%	\$ 1,989,756	\$ 1,056,931	\$ 247,962	\$ 1,224,084	\$ 1,872,219	\$ 318,831	\$ 1,194,202	\$ 489,331	\$ 673,015
17										
18	Subtotal 3	\$ 8,622,276	\$ 4,580,035	\$ 1,074,503	\$ 5,304,366	\$ 8,112,949	\$ 1,381,601	\$ 5,174,876	\$ 2,120,434	\$ 2,916,398
19	Bond 2.0%	\$ 172,446	\$ 91,601	\$ 21,490	\$ 106,087	\$ 162,259	\$ 27,632	\$ 103,498	\$ 42,409	\$ 58,328
20										
21	Subtotal 4	\$ 8,794,721	\$ 4,671,636	\$ 1,095,993	\$ 5,410,453	\$ 8,275,208	\$ 1,409,233	\$ 5,278,374	\$ 2,162,842	\$ 2,974,726
22	Escalation to (Midpoint of Construction) 5.0%	\$ 439,736	\$ 233,582	\$ 54,800	\$ 270,523	\$ 413,760	\$ 70,462	\$ 263,919	\$ 108,142	\$ 148,736
23										
24	Total BID Cost	\$ 9,234,457	\$ 4,905,218	\$ 1,150,793	\$ 5,680,976	\$ 8,688,968	\$ 1,479,695	\$ 5,542,293	\$ 2,270,985	\$ 3,123,463
25	Bid Contingency 5.0%	\$ 461,723	\$ 245,261	\$ 57,540	\$ 284,049	\$ 434,448	\$ 73,985	\$ 277,115	\$ 113,549	\$ 156,173
26										
27	Total BID Cost Bid Contingency	\$ 9,696,180	\$ 5,150,478	\$ 1,208,333	\$ 5,965,024	\$ 9,123,417	\$ 1,553,679	\$ 5,819,407	\$ 2,384,534	\$ 3,279,636
28	Construction Contingency 10.0%	\$ 969,618	\$ 515,048	\$ 120,833	\$ 596,502	\$ 912,342	\$ 155,368	\$ 581,941	\$ 238,453	\$ 327,964
29										
30	Total Cost with Construction Contingency	\$ 10,665,798	\$ 5,665,526	\$ 1,329,166	\$ 6,561,527	\$ 10,035,759	\$ 1,709,047	\$ 6,401,348	\$ 2,622,987	\$ 3,607,599



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		CLUSTER 1		CLUSTER 2		CLUSTER 3		CLUSTER 4		CLUSTER 5		CLUSTER 6		CLUSTER 7		CLUSTER 9		CLUSTER 10	
	Description	Unit Rate	Unit	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
2	01-00-00 General Requirements																		
3																			
4	Site General Conditions	\$ 1.00	LS	587,295	\$ 587,295	311,963	\$ 311,963	73,188	\$ 73,188	361,300	\$ 361,300	552,603	\$ 552,603	94,106	\$ 94,106	352,480	\$ 352,480	144,318	\$ 144,318
5																			
6	Subtotal 01-00-00 General Requirements				\$ 587,295		\$ 311,963		\$ 73,188		\$ 361,300		\$ 552,603		\$ 94,106		\$ 352,480		\$ 144,318
7																			
8	31-10-00 Site Clearing																		
9																			
10	Removal of asphalt paving and subbase (3' W)- include saw cutting	\$ 5.00	SF		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	420	\$ 2,100
11																			
12	Removal of asphalt paving and subbase (4' W)	\$ 5.00	SF	11,600	\$ 58,000	5,640	\$ 28,200		\$ -		\$ -		\$ -	1,000	\$ 5,000		\$ -		\$ -
13																			
14	Removal of asphalt paving and subbase (5' W)	\$ 5.00	SF		\$ -		\$ -	2,200	\$ 11,000		\$ -	16,300	\$ 81,500	2,500	\$ 12,500		\$ -	860	\$ 4,300
15																		3,150	\$ 15,750
16	Removal of asphalt paving and subbase (7' W)	\$ 5.00	SF	6,818	\$ 34,090	7,630	\$ 38,150		\$ -		\$ -		\$ -		\$ -		\$ -	1,820	\$ 9,100
17																		3,150	\$ 15,750
18	Removal of asphalt paving and subbase (7.5' W)	\$ 5.00	SF		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
19																		750	\$ 3,750
20	Removal of asphalt paving and subbase (8.5' W)	\$ 5.00	SF		\$ -		\$ -		\$ -		\$ -	2,550	\$ 12,750		\$ -		\$ -		\$ -
21																			
22	Removal of existing asphalt pavement to install underground infiltration tanks and new RCP pipes	\$ 5.00	SF		\$ -		\$ -		\$ -	20,000	\$ 100,000		\$ -		\$ -		\$ -		\$ -
23																		15,000	\$ 75,000
24	Removal of existing asphalt pavement to install permeable pavement	\$ 5.00	SF		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	77,000	\$ 385,000		\$ -
25																			
26	Remove existing 24" RCP- excluding excavation	\$ 25.00	LF		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
27																		640	\$ 16,000
28	Remove existing 42" RCP- excluding excavation	\$ 50.00	LF		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
29																		100	\$ 5,000
30	Remove existing Median's gravel	\$ 2.00	SF		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	1,800	\$ 3,600
31																			\$ -
32	Clearing and grubbing as required to intall the underground infiltration tanks and detention ponds	\$ 0.25	SF	39,000	\$ 9,750		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
33																			
34	Cart all non contaminated debris off site	\$ 90.00	CY	546	\$ 49,115	393	\$ 35,387	65	\$ 5,867	593	\$ 53,333	559	\$ 50,267	104	\$ 9,333	2,281	\$ 205,333	92	\$ 8,267
35																		739	\$ 66,550
36	Subtotal 31-10-00 Site Clearing				\$ 150,955		\$ 101,737		\$ 16,867		\$ 153,333		\$ 144,517		\$ 26,833		\$ 590,333		\$ 27,367
37																			
38	31-20-00 Earthwork																		
39																			
40	Excavation required to install new 12" RCP sewer to intercept and attenuate runoff- (Depth - 2.5' cover + 1' pipe dia + 0.5' bedding)	\$ 40.00	CY	207	\$ 8,265	133	\$ 5,333	23	\$ 939	0	\$ -	190	\$ 7,595	40	\$ 1,600	0	\$ -	31	\$ 1,220
41																		19	\$ 747
42	Excavation required to install new 18" RCP sewer to intercept and attenuate runoff - (Depth - 2.5' cover + 1.5' pipe dia + 0.5' bedding)	\$ 40.00	CY		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	70	\$ 2,800
43																			\$ -
44	Excavation required to install new 24" RCP sewer to intercept and attenuate runoff - (Depth - 2.5' cover + 2' pipe dia + 0.5' bedding)	\$ 40.00	CY	2,148	\$ 85,926	1,044	\$ 41,778		\$ -		\$ -		\$ -	185	\$ 7,407		\$ -		\$ -
45																			
46	Excavation required to install new 30" RCP sewer to intercept and attenuate runoff (Depth - 5' cover + 2.5' pipe dia + 0.5' bedding)	\$ 40.00	CY		\$ -		\$ -	652	\$ 26,074		\$ -		\$ -	741	\$ 29,630		\$ -	255	\$ 10,193
47																			\$ -
48	Excavation required to install new 36" RCP sewer to intercept and attenuate runoff (Depth - 5' cover + 3' pipe dia + 0.5' bedding)	\$ 40.00	CY	2,146	\$ 85,856	2,402	\$ 96,081	970	\$ 38,785		\$ -	7,184	\$ 287,363		\$ -		\$ -	573	\$ 22,919
49																		1,410	\$ 56,415
50	Excavation required to install new 42" RCP sewer to intercept and attenuate runoff (Depth - 5' cover + 3.5' pipe dia + 0.5' bedding)	\$ 40.00	CY		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
51																		250	\$ 10,000



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		CLUSTER 1		CLUSTER 2		CLUSTER 3		CLUSTER 4		CLUSTER 5		CLUSTER 6		CLUSTER 7		CLUSTER 9		CLUSTER 10	
	Description	Unit Rate	Unit	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
52	Excavation required to install new 54" RCP sewer to intercept and attenuate runoff (Depth - 5' cover + 4.5' pipe dia + 0.5' bedding)	\$ 40.00	CY		\$ -		\$ -		\$ -		\$ -	944	\$ 37,778		\$ -		\$ -		\$ -
53																			
54	Temporary metal trench boxes- 8' high (For Dia 12"- Dia 24" RCP)	\$ 25.00	SF	53,838	\$ 1,345,952	27,360	\$ 684,000	845	\$ 21,120	0	\$ -	6,835	\$ 170,880	5,440	\$ 136,000	0	\$ -	3,338	\$ 83,456
55																		672	\$ 16,800
56	Temporary metal trench boxes- 12' high (For Dia 30"- Dia 54" RCP)	\$ 25.00	SF	23,376	\$ 584,400	26,160	\$ 654,000	10,560	\$ 264,000	0	\$ -	85,440	\$ 2,136,000	12,000	\$ 300,000	0	\$ -	10,368	\$ 259,200
57																		10,800	\$ 270,000
58	Suppport of excavation as required to install the undergorund infiltration tanks	\$ 25.00	SF	3,786	\$ 94,650		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
59																			
60	Provide gravel base under the new reinforced concrete pipe- 6" thk	\$ 80.00	CY	250	\$ 20,038	170	\$ 13,615	30	\$ 2,438	0	\$ -	258	\$ 20,614	50	\$ 3,970	0	\$ -	39	\$ 3,154
61																		36	\$ 2,865
62	Backfill as required after Installing the New Reinforced Concrete pipes- Reuse existing material	\$ 60.00	CY	3,895	\$ 233,710	3,122	\$ 187,309	1,563	\$ 93,777		\$ -	7,536	\$ 452,183	843	\$ 50,576		\$ -	817	\$ 49,037
63																		1,560	\$ 93,602
64	Subtotal 31-20-00 Earthwork				\$ 2,458,797		\$ 1,682,116		\$ 447,133		\$ -		\$ 3,112,412		\$ 529,183		\$ -		\$ 431,979
65																			\$ 450,429
66	32-12-00 Pavements																		
67																			
68	Provide New Asphalt paving (6" compacted aggregate, 3" binder course and 1 1/2" surface course)	\$ 12.00	SF	18,418	\$ 221,016	13,270	\$ 159,240	2,200	\$ 26,400	20,000	\$ 240,000	18,850	\$ 226,200	3,500	\$ 42,000	0	\$ -	3,100	\$ 37,200
69																		22,050	\$ 264,600
70	Install New Permeable Interlocking Pavers including base course	\$ 30.00	SF		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	77,000	\$ 2,310,000		\$ -
71																			\$ -
72	Subtotal 32-12-00 Pavements				\$ 221,016		\$ 159,240		\$ 26,400		\$ 240,000		\$ 226,200		\$ 42,000		\$ 2,310,000		\$ 37,200
73																			\$ 264,600
74	32-13-00 Concrete walks/ Concrete foundation																		
75																			
76																			
77	Subtotal 32-13-00 Concrete walks/ Concrete foundation				\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
78																			\$ -
79	32-00-00 General Site Improvements																		
80																			
81	New Rain Garden Area including Clear and grub surface; Excavation and grading as required; furnish and install geotextile filter fabric; import and place top soil; install ground cover complete.	\$ 20.00	SF	2,800	\$ 56,000		\$ -		\$ -		\$ -	4,000	\$ 80,000		\$ -	1,850	\$ 37,000		\$ -
82																		7,000	\$ 140,000
83	New vegetative cover including the geotextile fabric and top soil	\$ 5.00	SF		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	1,800	\$ 9,000
84																			\$ -
85	Subtotal 32-00-00 General Site Improvements				\$ 56,000		\$ -		\$ -		\$ -		\$ 80,000		\$ -		\$ 37,000		\$ 9,000
86																			\$ 140,000
87	32-93-00 Planting																		
88																			
89																			
90	Subtotal 32-93-00 Planting				\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
91																			
92	33-33-00 Site Features																		
93																			
94	New 5'x10' box culvert to replace existing dry brook culvert providing additional capacity to manage runoff within the drainage area- (Including removal of asphalt, removal of dry brook culvert, excavation, support of excavation, backfill, and asphalt)	\$ 2,500.00	LF		\$ -		\$ -		\$ -	807	\$ 2,017,500		\$ -		\$ -		\$ -		\$ -
95																			\$ -
96	New Detention pond (Including material, earthwork and fabric)	\$ 5.00	SF	20,000	\$ 100,000		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
97																			\$ -
98	Underground Detention/Infiltration Tank System (Including excavation, fabric and stone base)	\$ 10.00	CF	95,000	\$ 950,000		\$ -		\$ -	60,000	\$ 600,000		\$ -		\$ -		\$ -		\$ -
99																		45,000	\$ 450,000
100	New precast concrete storm chamber connecting existing and new trunk sewers- Including excavation, backfill and SOE	\$ 40,000.00	EA	1	\$ 40,000		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -



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		CLUSTER 1		CLUSTER 2		CLUSTER 3		CLUSTER 4		CLUSTER 5		CLUSTER 6		CLUSTER 7		CLUSTER 9		CLUSTER 10	
	Description	Unit Rate	Unit	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
101																			
102	Subtotal 33-33-00 Site Features				\$ 1,090,000		\$ -		\$ -		\$ 2,617,500		\$ -		\$ -		\$ -		\$ 450,000
103																			
104	33-00-00 Utilities - Plumbing																		
105																			
106	New Reinforced Conrete Pipe (RCP), 12" dia, Excluding excavation and backfill	\$ 80.00	LF	465	\$ 37,190	300	\$ 24,000	53	\$ 4,224	\$ -	427	\$ 34,176	90	\$ 7,200	\$ -	69	\$ 5,491	42	\$ 3,360
107																			
108	New Reinforced Conrete Pipe (RCP), 18" dia, Excluding excavation and backfill	\$ 100.00	LF		\$ -		\$ -		\$ -	\$ -		\$ -		\$ -	\$ -	140	\$ 14,000		\$ -
109																			
110	New Reinforced Conrete Pipe (RCP), 24" dia, Excluding excavation and backfill	\$ 140.00	LF	2,900	\$ 406,000	1,410	\$ 197,400		\$ -	\$ -		\$ -	250	\$ 35,000	\$ -		\$ -		\$ -
111																			
112	New Reinforced Conrete Pipe (RCP), 30" dia, Excluding excavation and backfill	\$ 210.00	LF		\$ -		\$ -	440	\$ 92,400	\$ -	3,260	\$ 684,600	500	\$ 105,000	\$ -	172	\$ 36,120		\$ -
113																			
114	New Reinforced Conrete Pipe (RCP), 36" dia, Excluding excavation and backfill	\$ 280.00	LF	974	\$ 272,720	1,090	\$ 305,200		\$ -	\$ -		\$ -		\$ -	\$ -	260	\$ 72,800	350	\$ 98,000
115																			
116	New Reinforced Conrete Pipe (RCP), 42" dia, Excluding excavation and backfill	\$ 330.00	LF		\$ -		\$ -		\$ -	\$ -		\$ -		\$ -	\$ -		\$ -	100	\$ 33,000
117																			
118	New Reinforced Conrete Pipe (RCP), 54" dia, Excluding excavation and backfill	\$ 460.00	LF		\$ -		\$ -		\$ -	\$ -	300	\$ 138,000		\$ -	\$ -		\$ -		\$ -
119																			
120	Storm drainage manholes, frames and covers, precast concrete, 4' diameter manhole, 8" thick top	\$ 9,000.00	EA	15	\$ 139,464	10	\$ 90,000	2	\$ 15,840	\$ -	14	\$ 128,160	3	\$ 27,000	\$ -	2	\$ 20,592	1	\$ 12,600
121																			
122	Provide New Catch Basin as required	\$ 2,000.00	EA	31	\$ 61,984	20	\$ 40,000	4	\$ 7,040	\$ -	28	\$ 56,960	6	\$ 12,000	\$ -	5	\$ 9,152	3	\$ 5,600
123																			
124	Relocate existing storm outlet pipes as these pipes are located underneath a private property- Assuming 24" dia	\$ 1,200.00	LF		\$ -		\$ -		\$ -	\$ -		\$ -		\$ -	\$ -	450	\$ 540,000		\$ -
125																			
126	Subtotal 33-00-00 Utilities - Plumbing				\$ 917,358		\$ 656,600		\$ 119,504	\$ -		\$ 1,041,896		\$ 186,200	\$ -		\$ 698,155		\$ 152,560
127																			
128	33-70-00 Utilities - Electrical																		
129																			
130																			
131	Subtotal 33-70-00 Utilities - Electrical				\$ -		\$ -		\$ -	\$ -		\$ -		\$ -	\$ -		\$ -		\$ -
132																			
The End																			

