TOWN OF BILLERICA, MA
STORMWATER ASSET MANAGEMENT PLAN

April 2024

Funded in part by the 2022 Asset Management Grant Program by the Massachusetts Department of Environmental Protection, and its State Revolving Fund partner the Massachusetts Clean Water Trust (CWSRF-7198).

MASSACHUSETTS CLEAN WATER TRUST

MassDEP

Tighe&Bond

OBJECTIVES

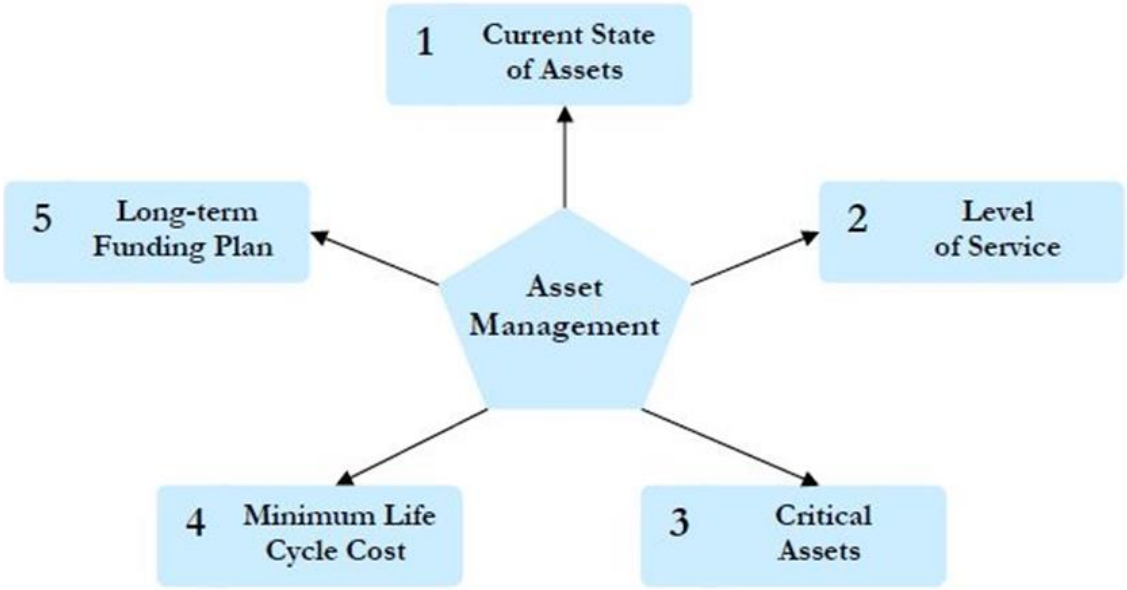
Provide an overview of the work completed under the Stormwater Asset Management Plan (AMP)

Present the risk-based prioritization of Billerica's culverts

Review recommendations for implementation of the AMP

OVERVIEW OF ASSET MANAGEMENT PRINCIPLES

- Change from reactive to proactive approach to drainage system maintenance, repair, and replacement
- Prevents adverse consequences of failure such as flooding and road closures
- Distributes costs over the service life of the infrastructure
- Learn more about asset management here

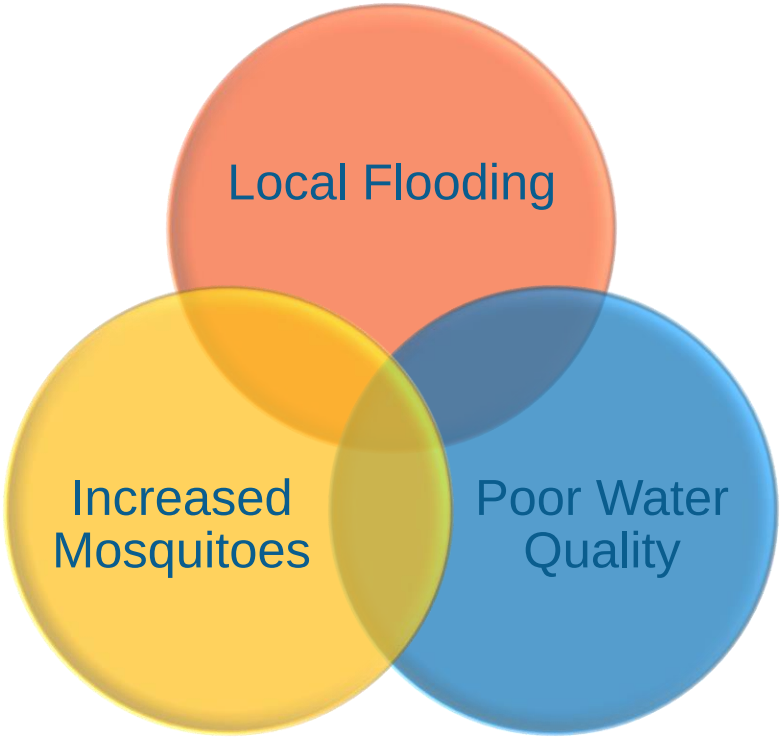


Source: EPA, "Asset Management: A Best Practices Guide," April 2008.
URL: https://nepis.epa.gov/Exe/ZyPdf.cgi?Dockey=P1000LP0.txt

ASSET MANAGEMENT FOR BILLERICA

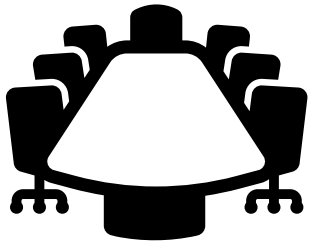
- **Billerica's Goals:**
  - Develop inventory of Town culverts to inform capital improvement planning
  - Continue to proactively meet EPA stormwater requirements
  - Establish appropriate level of service considering Town goals for water quality and drainage/flooding
  - Move to a more proactive program of drainage system operation and maintenance and capital improvements
  - Develop risk-based capital improvement program
  - Perform a funding alternatives assessment

What could happen if we don't maintain drainage systems?



PROJECT TIMELINE

Spring 2022
- Notice to Proceed from MassDEP



2022

Planning Components
- Level of service
- Prioritization of field work areas
- Data collection methods

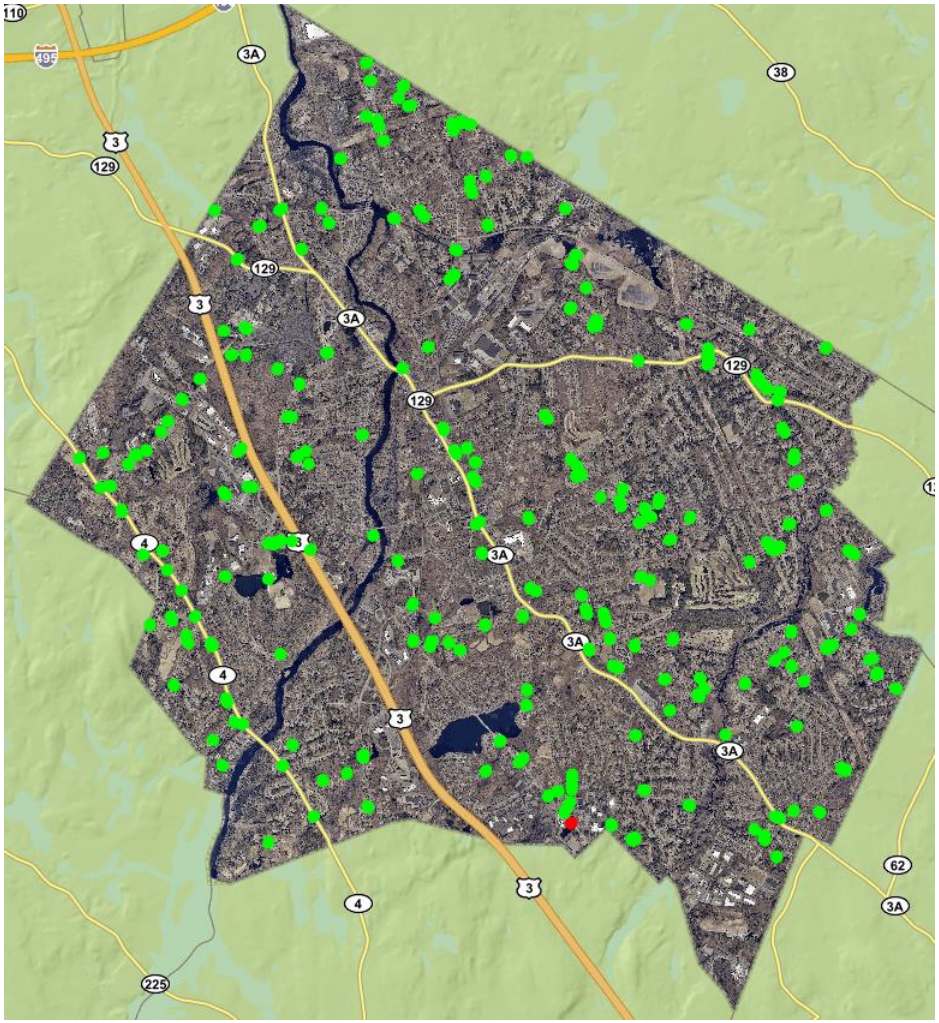
2023

Condition Assessments
- Stormwater Best Management Practices (BMPs)
- Catchment Investigations
- Outfalls
- Culverts

April 2024
- Final Report to MassDEP

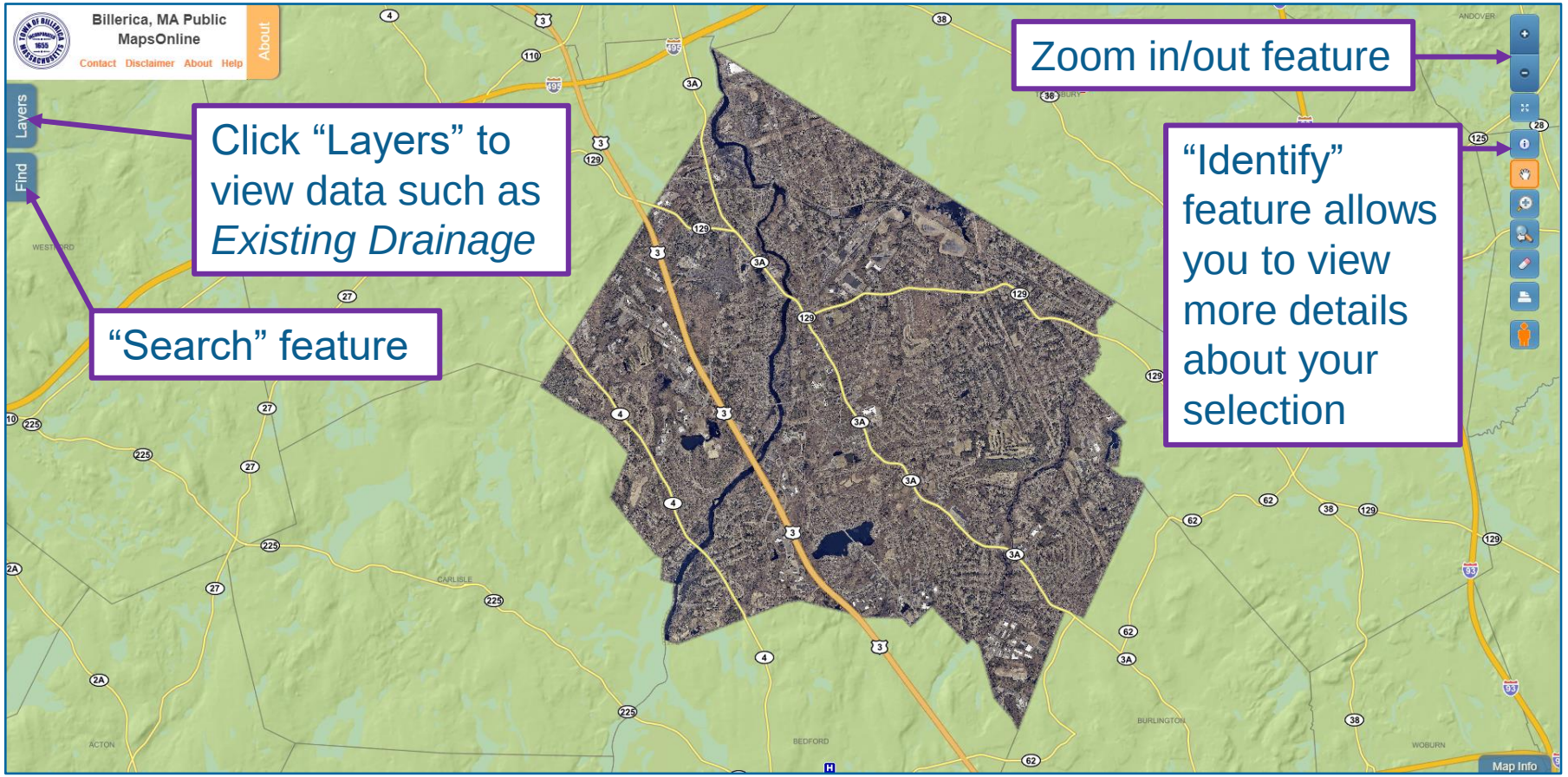
GIS & DATA MANAGEMENT IMPROVEMENTS

- **AMP provided an opportunity to make further investments in the Town's stormwater Geographic Information Systems (GIS) mapping**
  - GIS Coordinator maintains a comprehensive drainage system geodatabase
  - AMP included mapping improvements
  - Inspection forms were developed in PeopleGIS for electronic data collection



GIS & DATA MANAGEMENT IMPROVEMENTS

- Click here to learn more about Billerica's GIS capabilities
- View the Town's public mapping here



CONDITION ASSESSMENTS – BMPS

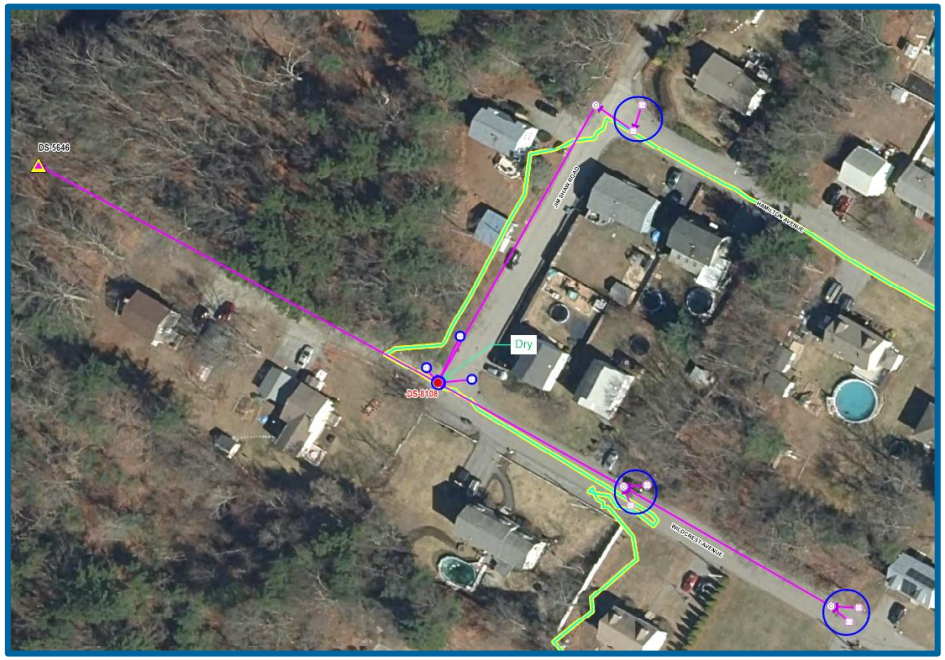
- **What is a stormwater best management practice (BMP)? Click here to learn more!**
- **Assessments of Town-owned BMPs were completed during AMP time period (2022, 2023)**
  - Noted BMP type
  - Condition of BMP components
  - Maintenance concerns (trash, overgrown vegetation, excess sediment)
- **Takeaways**
  - Make targeted repairs
  - Conduct general routine maintenance

CONDITION ASSESSMENTS – OUTFALLS

- ***Outfall*:** stormwater discharge structure
- **Dry weather inspections of Town-owned outfalls have been completed over the past five years**
  - Noted outfall type
  - Pipe condition
  - Maintenance concerns (overgrown vegetation, excess sediment)
- **Takeaways**
  - Conduct general routine maintenance and repairs
  - Continue to inspect newly mapped Town-owned outfalls

CONDITION ASSESSMENTS – CATCHMENT INVESTIGATIONS

Catchment Area: land area draining to a single outfall, determined by topography, impervious cover, and location and connectivity of drainage structures



Structures were checked for potential pollutants or sewer connections:

While there is more work to be done under the Catchment Investigations program, there were no initial indications of illegal discharges to the drainage system in the investigation areas.

CONDITION ASSESSMENTS – CULVERTS

- **223 Town culverts identified and assessed**

- **Used NAACC protocol to evaluate condition and aquatic passability**
  - An accepted standard for evaluating risk of failure and other environmental considerations
  - Noted culvert size and material
  - Structural condition of culvert, headwall, roadway
  - Maintenance concerns

North Atlantic Aquatic Connectivity Collaborative

CONDITION ASSESSMENTS – CULVERTS

25 culverts were found to be submerged at the inlet and/or outlet of the culvert

Indicates there may be a hydraulic restriction within the stream reach and/or beaver dam impacts

CONDITION ASSESSMENTS – CULVERTS

- **Billerica experienced historic flooding events in late summer and fall of 2023**
  - These extreme flooding events overwhelmed portions of Billerica's drainage system throughout Town, including culverts
  - Flooding occurred after initial culvert condition assessments were completed, and condition of some culverts may have worsened/changed

Severity of flooding on Shane Lane during a storm on August 8, 2023

CONDITION ASSESSMENTS – CULVERTS

Takeaways

10 culverts changed material between inlet and outlet, which poses additional challenges to its structural integrity.

Corrugated metal pipes (CMP) are deteriorating. CMP made up 34% of the town's assessed culverts.

22 culverts had a tree present near the upstream and/or downstream headwall/wingwall. These may cause damage to the structure and should be removed as applicable.

Poor or critical roadway embankment conditions were noted at 58 upstream locations and 47 downstream conditions.

RISK-BASED PRIORITIZATION OF CULVERTS

Historically:

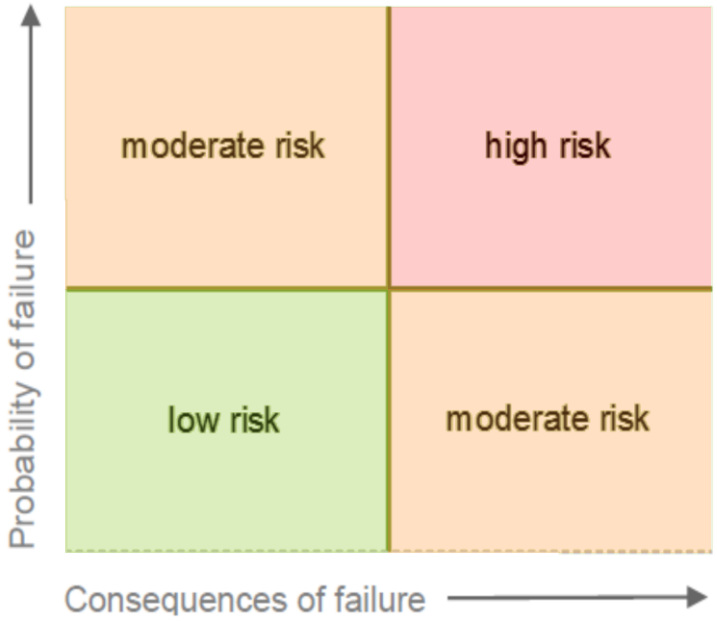
- Priority given to immediate problems as they arise.
- This approach may underestimate the urgency of other stormwater system upgrades, such as, aging stormwater pipes that may not be functioning due to needed preventative maintenance.

Asset management helps target stormwater assets that should be prioritized for repair or replacement BEFORE they run into failure and become an emergency.

RISK-BASED PRIORITIZATION OF CULVERTS

Every town has more infrastructure needs than they can afford to address. This method of prioritization is a way to identify the most cost-effective projects.

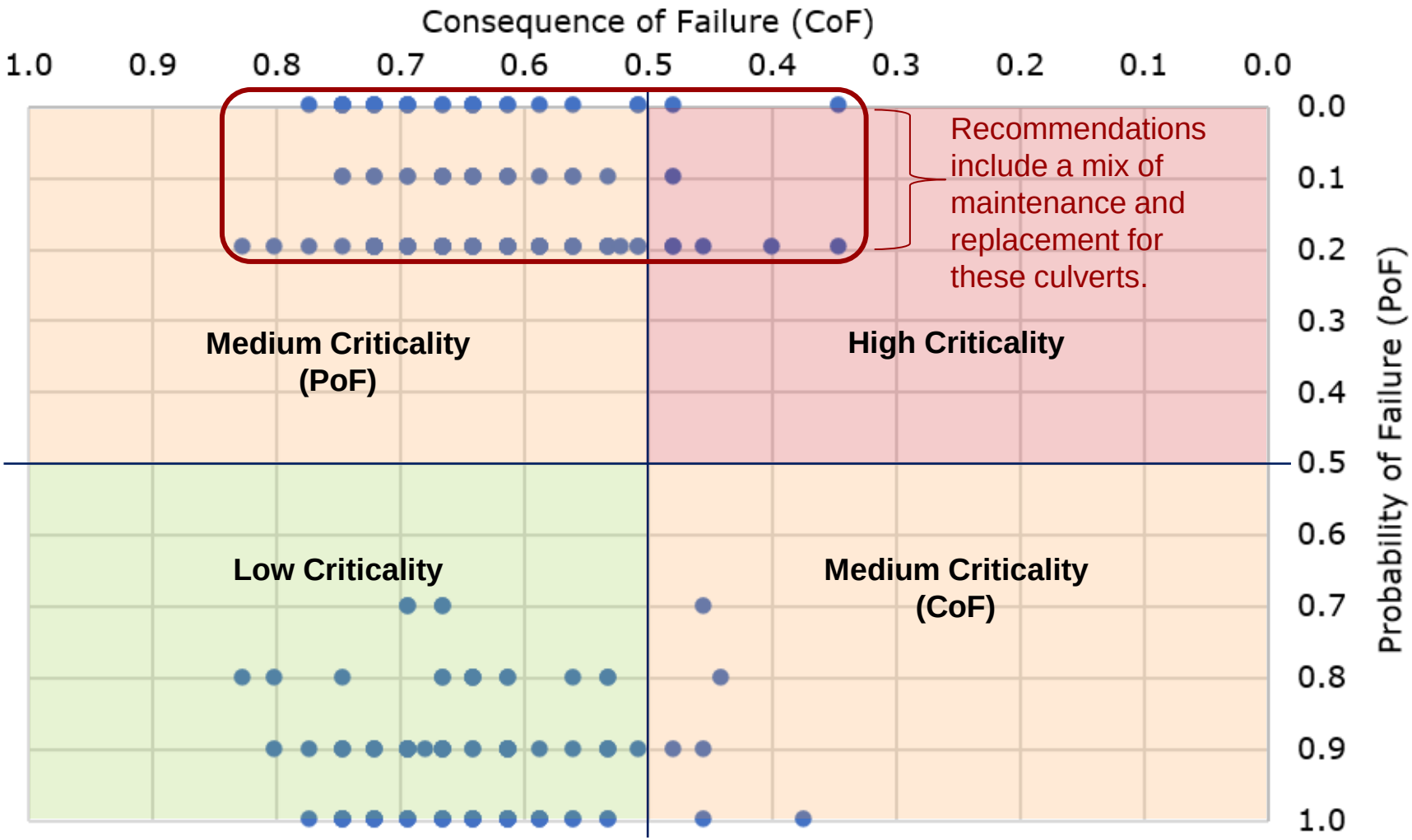
- **Probability of Failure (POF)**
  - Based on data collected during culvert condition assessments
- **Consequence of Failure (COF)**
  - Considers hypothetical failure scenarios and the cost or impact to the community (i.e., number of houses impacted on a dead-end road or length of a detour if the culvert were to fail)
- **Overall Criticality**
  - **High** = immediate attention
  - **Medium** = aggressive maintenance or monitoring
  - **Low** = routine maintenance and monitoring



Criticality allows the Town to manage its overall risk and provides a logical framework for allocation of operation and maintenance dollars and capital expenditures.

OVERALL CRITICALITY FOR CULVERTS

How Billerica's culverts scored:



Of the highest criticality culverts, 10 were prioritized for replacement

AMP RECOMMENDATIONS

- Culvert capital improvement projects
- Targeted maintenance and repairs
- Further investigation
- Programmatic recommendations

FUNDING ALTERNATIVES

- **Grants and loans**
  - MA Chapter 90 Program, MassDOT Small Bridge Program, DER Culvert Replacement Municipal Assistance Program, Municipal Vulnerability Preparedness (MVP) Action Grant Program, and more
- **Compared long-term funding mechanisms: General Fund and Stormwater Enterprise Fund**
  - General Fund: Current funding mechanism for Billerica's stormwater program
  - Stormwater Enterprise Fund: Would establish a user fee to each property based on impervious cover on the property
- **Capital projects should be phased on a schedule that makes sense for Billerica**
  - The AMP and Action Plan are living documents that should be updated regularly

NEXT STEPS

Implement recommendations for targeted maintenance and rehabilitation

Continued evaluation of the stormwater system

Update criticality assessments for new assets evaluated and as maintenance is completed

Continue to make progress on EPA stormwater permit

Update GIS mapping and asset inventory as field work is completed

Obtain funding as needed

FOR MORE INFORMATION ON BILLERICA'S STORMWATER MANAGEMENT PROGRAM, VISIT:

https://www.town.billerica.ma.us/1011/Stormwater-Management