Case Study: Route 181 Culvert Replacement Permitting & Culvert Infrastructure Assessment

Municipality/Nonprofit Organization: Town of Palmer
Project Title: RT 181 Culvert Replacement Permitting & Final Design
Grant Award: $ 19,500
Match: $ 6,500

Community Overview:
The Town of Palmer is located in Hampden County and has a unique topographic situation as it is located at the confluence of four (4) rivers and is at the center of the Chicopee River Watershed, the largest watershed in the state. Palmer has an approximately population of 12,232 residents.

Description of Climate Impact:
Address the community's current and potential future vulnerability to climate change impacts. What are the specific threats to the project area/site and reasons for applying to the grant program?

Flooding, including riverine and stormwater flooding, was a top hazard identified at the February 1, 2019 Community Resilience Building (CRB) workshop. The Route 181 culvert, located just north of the intersection of Thorndike Street and MA Route 181 (a major north-south transportation/evacuation route), experiences frequent overtopping by Scott's Brook, a coldwater fisheries resource. By upgrading the culvert to meet MA Stream Crossing Standards, and removing point-source discharges, this project will eliminate the need for road closures and associated travel delays as a result of flooding and/or overall culvert failure by increasing the flood conveyance capacity of the crossing.

Climate change also threatens to impact water quality. The Route 181 culvert is located within a primary recharge area to a public water supply for Three Rivers, MA and is within a Zone II wellhead protection area. The removal of point-source discharges will provide enhancement of water quality in addition to protection from flooding.

The Route 181 culvert conveys Scott's brook, a coldwater fisheries resource, which is highly vulnerable to climate change impacts. By improving stormwater management associated with the crossing, the direct discharge of untreated and warm water runoff from impervious surfaces to the stream will be eliminated, enhancing the streams' ability to support cold-water aquatic wildlife species.

Project Goals:
The specific goals of the project were:

1. To conduct a Culvert Condition Assessment for culverts town-wide, to NAACC standards, for the production of a prioritized culvert maintenance plan
2. Further the construction of the Route 181 culvert. Subtasks included:

a. Develop full design, as based on the preferred alternative in the DER Municipal Culvert Assistance Grant Program FY19 Alternatives Report
b. Permitting the design, including: Section 401, Water Quality Certification permitting; WPA Notice of Intent; ACOE permitting; MA DOT Chapter 85 permitting
c. Develop final designs & construction documents

Approach and Result:
How did the project team implement the project? Describe the methodology or your approach to achieve the project goals. Describe, and quantify (where possible) project results (e.g. square footage of habitat restored or created). Provide web links, if available, to your project deliverables.

The project resulted in the final design of the Route 181 culvert upgrade, which will include a 5-foot tall, 13-foot wide, 60-foot long box culvert embedded 2 feet. The final culvert design complies with the 1.2 bankfull width criteria under the MA Stream Crossing Standards and will have a natural substrate bottom, therefore mimicking the water depth, velocity, channel and substrate conditions found in Scott's brook outside of the influence of the existing, deteriorated, undersized twin culverts. . The channel slope will be 0.5%, and flood conveyance capacity is improved for all events, and there will be no overtopping of the roadway for any event analyzed, which included the 100-year storm. The final design also eliminated point-source discharges by replacing the two existing catch basins with two water quality basins to provide water quality enhancement of stormwater runoff that drains from the low point in the roadway, therefore protecting the primary recharge area for the Three Rivers public water supply and eliminating the discharge of untreated stormwater into a coldwater fisheries stream.

The project also resulted in the final permitting of the Route 181 culvert upgrade. Final deliverables associated with permitting of this project include:

1. Notice of Intent, Route 181 at Thorndike Road: prepared by SLR International Corporation (formerly Malone & Macbroom, Inc.); dated 11/20/2020
2. Site plans, Route 181 Culvert Replacement over Scott's Brook: prepared by SLR International Corporation (formerly Malone & Macbroom, Inc.); dated 11/20/2020
3. Hydraulic Report, Route 181 Culvert Replacement: prepared by SLR International Corporation (formerly Malone & Macbroom, Inc.); dated 4/9/2020
4. Geotechnical Engineering Report, Proposed Route 181 Culvert Replacement: prepared by SLR International Corporation (formerly Malone & Macbroom, Inc.); dated 1/8/2019
5. Order of Conditions with Findings of Fact, Special Conditions, and Approved Plans & Documents for DEP # 256-0351: prepared by Palmer Conservation Commission; dated 1/26/2021

Lessons Learned:

A lesson learned as a result of this project is the importance of volunteers. Due to the COVID-19 pandemic, we were unable to conduct all of the planned culvert condition assessments with local volunteers, which was a large portion of the match component of the grant. This resulted in the need to revise the grant contract to eliminate that task from the project, and to request a cash match from Town Council in the amount of $6,500. In the event that Town Council did not approve the appropriation of the cash match, the town would have defaulted on the grant contract and would not be able to request reimbursement for design and permitting of the project.

Partners and Other Support:

Project partners included the Chicopee 4 Rivers Watershed Council and the Department of Ecological Restoration (DER) who provided volunteers to conduct culvert assessments to become certified lead observers through the North Atlantic Aquatic Connectivity Collaborative (NAACC). The Palmer DPW was another project partner.

Project Photos:

Photos of the inlet and outlet of the Route 181 culvert.