

TOWN OF MONTAGUE CULVERT ASSESSMENT

September 2021



Franklin Regional Council of Governments

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Town of Montague Culvert Assessment

August 2021

Project Summary

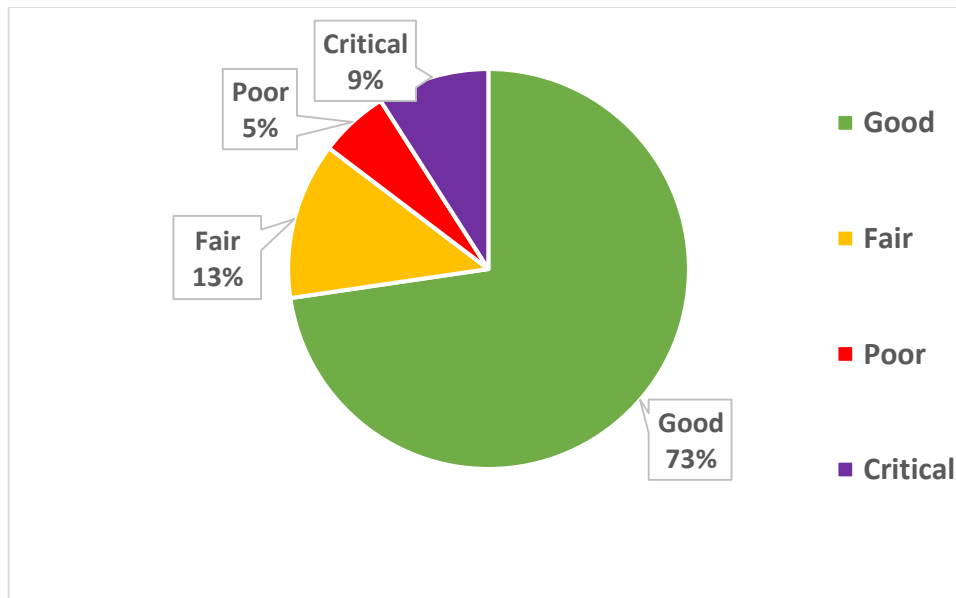
In the spring and summer of 2021, the Franklin Regional Council of Governments (FRCOG) conducted an inventory and assessment of the Town of Montague's culverts and drainage structures. This work included: 1) locating every culvert and marking each inlet and outlet with GPS; 2) evaluating the physical state of each inlet, outlet, and the interior of the culvert, if visible; and 3) providing an overall Condition grade of each culvert's inlet and outlet. This project is intended to be a rapid assessment for Montague's Highway Department and Selectboard so that they can have an understanding of the location and general condition of the town's culverts in order to prioritize maintenance and capital improvement planning.

This assessment took place from April to August 2021. During the month of July, Franklin County received an extremely high amount of rainfall – a total of 12.87 inches of rain, which is 8 inches above the typical July average. As a result of this rain, high water levels may have prevented interior inspections of the culverts that were inventoried during that time.

FRCOG identified a total of 1,672 culvert and drainage structures on Montague's roadways. This total includes both the inlet and outlet of traditional culvert pipes that pass under a roadway from one side to the other, as well as the inlets of drop inlets or catch basins that connect to one long pipe that travels under the roadway.

Of these drainage structures, 73% were assessed as being in Good condition, while another 9% were identified as being in Critical condition needing immediate attention for either replacement or maintenance. The remaining 19% of culverts were in either Fair or Poor condition. Figure 1 below shows the condition breakdown of the condition of the Town's culverts.

Figure 1: Condition of Montague's Culverts as of August 2021



Culvert Assessment Methodology

The FRCOG staff assessed all culverts and drainage structures on the town-maintained roads within Montague. The assessments were conducted using the standardized guidance from the Culvert Condition Assessment Manual (2017) developed by the North Atlantic Aquatic Connectivity Collaborative (NAACC). FRCOG staff evaluated various aspects of the culvert, took pictures documenting the conditions at the time of the assessment, and noted any particularly unique situations.

The assessments looked at current conditions and FRCOG did not calculate the future projected flow of water through the structures to determine potential risk of failure under various rain events. However, because of the record rainfall this summer, the FRCOG was able to observe many structures that were either at or over capacity and this was noted during the assessments. In addition, because drop inlets are typically covered by a concrete cover or metal grate, assessing the interior of these structures is difficult without pulling the covers off or using tools such as CCTV. FRCOG staff examined the interior of these structures as best as possible.

The final product of these assessments is a database showing each culvert's inlet and outlet given a unique identifier along with the accompanying details about their conditions and a photograph. In addition to the database, the FRCOG created both a hardcopy map and an interactive online map for the Town to use. The hardcopy map shows each culvert with its ID number and is color-coded by its Condition. The hardcopy maps have been designed so that they can be used in the field by Highway Department staff as they conduct maintenance. The digital data collected is also compatible with the Town of Montague's GIS mapping system.

The online version of the map is interactive and users can click on each culvert to see its picture, condition, and view all of the data that is included in the database. The online map can be found here:

<https://frcog.maps.arcgis.com/apps/instant/attachmentviewer/index.html?appid=5820c96f19004b258a58ea1dbd7b78dc>.

The appendix at the end of the report provides definitions for each of the fields within the Culvert Database.

Assessment Results

As noted above, 1,672 culverts and drainage structures were assessed on town-maintained roads. Below is a quick summary of the results from the culvert inventory. This information provides an idea of the general state of the stormwater drainage infrastructure in town for both maintenance and budgeting purposes.

- Seventy-seven percent (1,298) of the structures assessed are drop inlets or catch basins, of which:
 - 60 are in Critical condition and need immediate maintenance or repair; and
 - 46 are in Poor condition and will require maintenance or repair soon.
 - Most of these structures just need to be cleaned out in order to improve their assessment rating.
- There are a total of 194 structures associated with stream crossings, of which:
 - 22 are in Critical condition and;
 - 17 are in Poor condition.
 - The majority of these structures had either of the two following issues:
 - They may require repair to their headwalls and wingwalls to ensure that they remain functional; or
 - The metal pipes have rusted out for large portions and need to be replaced.
 - Replacement of these culverts will require that they be brought up to current stream crossings standards, which can greatly increase their size (and cost), but will ensure that they be more resilient to future storm events.
- There are a total of 194 structures that are 24 inches in diameter or larger.

Top Problem Culverts Identified

The following culverts or roadways have been identified as those that have major issues and/or need immediate attention.

- Taylor Hill Road (Culvert 1951o) – this stream crossing is an open bottom structure with a 9 foot span. The headwall is concrete with metal beams and the wingwalls are composed of fieldstone. The beams are rusting with material loss. There is erosion at the footings of the wingwalls on both the inlet and outlet side. The outlet wingwall is falling down with many stones lost with water passing under the footing (see picture to the right).



- Taylor Hill Road (Culvert 1966) – this is a drop inlet with a 16 inch metal pipe. The outlet is 100% blocked and the inlet’s structure walls are falling apart with many bricks falling down. The bottom tier of concrete blocks on one wall are missing.

- Meadow Road – the very southern portion of the road is directly adjacent to the Connecticut River and when the river water levels are very high, such as in July, the culverts on this road have difficulty draining into the river. This results in sedimentation of both the inlets and outlets on this stretch. They should be monitored on a more regular basis due to high rate of sedimentation. The following issues were also found on Meadow Road:

- Culvert 1925o is a concrete box culvert with an 8 foot span. The outlet concrete box has separated from the adjoining box, allowing a 1 foot gap in the joint through which water was flowing. FRCOG staff viewed this site twice – the first time, the Connecticut River had backed up and completely covered the outlet preventing water from exiting.
- Culvert 1929 is an 18 metal pipe whose inlet is 50% full of silt. The outlet has a wingwall of caged riprap that has pulled away from the hill and fallen over.
- The inlet of Culvert 1933i was full of silt with water backing up. FRCOG staff was able to clean some of the silt away from the inlet so that the water could drain.

- Turners Falls Road (1790i) – this culvert is next to the electric transmission lines on Turners Falls Road on a stream crossing. It is a 48 inch round, concrete pipe. It appeared to be completely blocked resulting in a large amount of standing water on the side of the road. Due to the volume of traffic on Turners Falls Road, this inlet should be routinely checked for maintenance to prevent roadway flooding.

- School Street and Station Street (1871i) – this culvert is a drop inlet that drains the wetland on the west side of School Street. It is a 36 inch concrete pipe with a brick and concrete structure. It has missing and loose bricks and the concrete walls around the pipe are crumbling.

Culvert 1871i at School Street and Station Street:



- Ripley Road and Spaulding Brook Road (2149i) – this stream crossing is a concrete box culvert with concrete wingwalls and headwalls. Both wingwalls have separated from the headwall by several feet and one is leaning and in danger of falling over.

Culvert 2149i on Ripley Road:



- Dry Hill Road – Goddard Brook crosses this road three times using large box culverts that are just under 10 feet in width. The recent record rain events Montague received in July resulted in extremely large volumes of water going through these crossings. All three were overtopped during these events sending water over the roadways. Despite the huge water volumes with large debris that passed through them, these culverts held up well with only some scour under footings and wingwalls. These should be inspected on a regular basis, particularly prior to large storms to ensure that they are not blocked.
 - There is a 24 inch plastic drainage pipe (2194o) on Dry Hill Road which experienced flows during the July rain events that greatly exceeded its capacity resulting in a portion of the road and its substructure to be washed out. It appears that the Town is aware of this situation. If this culvert is to be

replaced, it is recommended that it be sized much larger to handle the runoff coming down both the hill and roadway.

Culvert 2195o at Dry Hill
Road:



Culvert 2194o at Dry Hill
Road with washed out
portion of roadway:



- West Mineral Road's culverts are in either poor or critical condition due to the fact that almost all of them are mostly or completely full of sediment.

APPENDIX

Culvert Assessment Definitions

Culvert Number

This is the number assigned to the culvert. i = inlet, o = outlet. Example, 22i and 22o are the inlet and outlet for culvert #22. The drop inlets in Turners Falls and Millers Falls are listed with just a number.

Date

Date that the FRCOG staff conducted the assessment.

Size

Approximate diameter of the pipe.

Material

What material is the culvert pipe made of? Choices include:

- Plastic
- Metal
- Cast Iron
- Clay
- Concrete
- Other

Appurtenance (APPURTEN)

This describes the structure (if any) surrounding the inlet/outlet of the pipes that give support to the culvert end. Choices include:

- Headwall/Wingwall
- Apron
- Cover
- Metal grate
- Other

Appurtenance Material (APPUR_MAT)

The material that the appurtenance is constructed from. Choices include:

- Concrete
- Field stone
- Asphalt
- Other

Type of Crossing

This describes the type of the culvert. Choices include:

- Round
- Elliptical
- Open Bottom
- Box
- Drop Inlet

Percent Blockage

This describes how well water can enter or exit the pipe. What percentage is the inlet/outlet blocked? Choices include:

- 0%
- 25%
- 50%
- 75%
- 100%

Grade of Culvert

This describes how the inlets and outlets are situated relative to the stream grade. Is the inlet/outlet submerged? Can water flow easily into it? Is there a free fall of water from the outlet that could cause scour? Choices include:

- Submerged (pipe is below surface of ground/water level)
- At Grade (pipe is even with ground)
- Cascade (outlet is raised above the stream bottom such that water flows very steeply downward across rock or other hard material when flowing from the structure)
- Free Fall (outlet of the structure is above the stream bottom such that water drops vertically when flowing out of the structure)
- Free Fall to Cascade (outlet of the structure is raised above the stream bottom such that the water drops vertically onto a steep area of rock or other hard material, and then flows very steeply downward until it reaches the stream)

Free Fall/Submerged (FREEFALL SUB)

The distance of the free fall from the outlet to the stream bed or the distance the pipe is submerged under the ground (measured in inches).

Condition

This is the overall grade assigned to each inlet and outlet based on the following criteria.

GOOD = Culvert is in good condition with no apparent need of service.

FAIR = May have small issues that need to be addressed or has a large free fall (>10") that could lead to scour and erosion problems. If a culvert was blocked by 25% then it was assigned as Fair.

POOR = Has issues that should be addressed soon before they become critical. May have issues that are affecting performance of culvert and/or is 50% blocked. The metal invert of the pipe may be rusted out for less than 1 foot.

CRITICAL = Has issues that are currently impacting performance and could lead to failure. May be blocked 75-100%. Immediate attention may be necessary for either replacement or simply maintenance. The metal invert of the pipe may be rusted out for more than 1 foot.



For questions or updates to the culvert database and/or map, please contact:

- Megan Rhodes, Senior Transportation Planner II at (413)774-3167 x132 or mrhodes@frcog.org
- Ryan Clary, Senior GIS Planner at (413)774-3167 x 124 or rclary@frcog.org.