

TOWN OF SUNDERLAND CULVERT ASSESSMENT

Fall 2022



Franklin Regional Council of Governments

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Town of Sunderland Culvert Assessment

October 2022

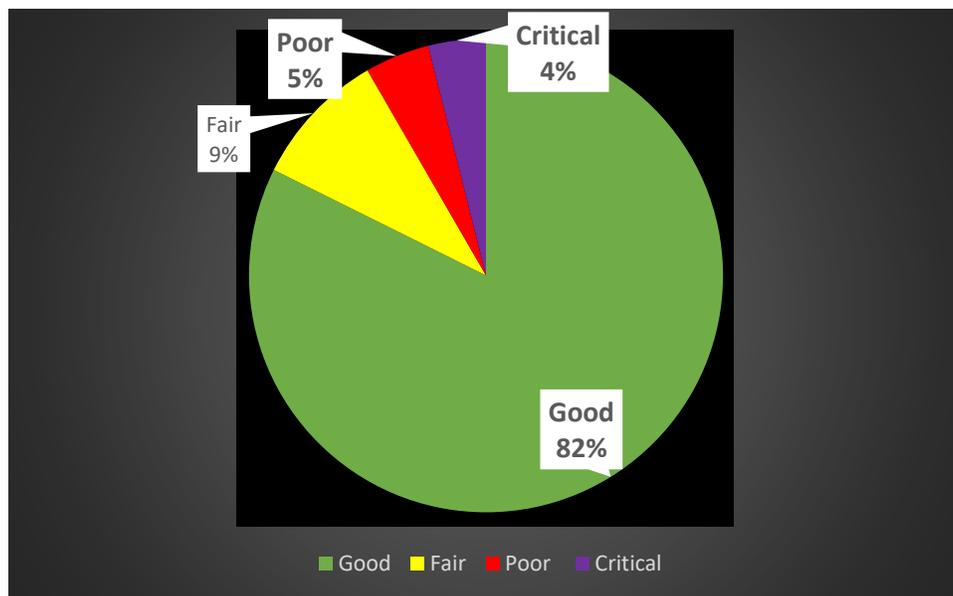
Project Summary

In the Fall of 2022, the Franklin Regional Council of Governments (FRCOG) conducted an inventory and assessment of the Town of Sunderland'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 Sunderland'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.

FRCOG identified a total of 412 culvert and drainage structures on Sunderland's maintained roadways. The state-maintained roads (Route 116) were not included in this assessment. 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, 82% were assessed as being in Good condition, while another 4% were identified as being in Critical condition needing immediate attention for either replacement or maintenance. The remaining 14% 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 Sunderland's Culverts as of October 2022



Culvert Assessment Methodology

The FRCOG staff assessed all culverts and drainage structures on the town-maintained roads within Sunderland. 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.

This assessment took place in October of 2022. During the preceding Summer of 2022, Franklin County experienced very little precipitation as compared to prior years. As of August 2022, all Franklin County towns had been designated as experiencing “Level 3 – Critical Drought.”¹ As a result, many streams that normally carry water through culverts were dry and not experiencing typical flow conditions. This made it challenging for FRCOG staff to accurately determine whether a culvert was a stormwater drainage structure or a stream crossing.

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. Because of the lack of rainfall this Summer/Fall, FRCOG staff was not able to observe the functioning condition of many structures during an average year of rainfall. 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 to identify whether the walls of the structure, pipes, or the covers themselves were damaged. The assessment also included the amount of debris visible and was noted if it impeded the flow of water inside the drop inlet.

The final product of these assessments is a database with each culvert’s inlet and outlet given a unique identifier along with the accompanying details about their location, 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 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=08a121e35b064409a46d6f0c2255ac12>

¹ <https://www.mass.gov/doc/drought-status-map-9-8-22/download>

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

Assessment Results

As noted above, 412 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.

- Sixty-six percent (271) of the structures assessed are drop inlets or catch basins, of which:
 - 1 is in Critical condition and need immediate maintenance or repair; and
 - 7 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 41 structures associated with stream crossings, of which:
 - 1 is in Critical condition and;
 - 7 are in Poor condition.
 - The majority of these structures had either of the following issues:
 - They may require repair to their headwalls and wingwalls to ensure that they remain functional;
 - The inverts of the metal pipes have rusted out for large portions and need to be replaced; or
 - The pipes need to be cleaned out.
 - 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 59 structures that are 24 inches in diameter or larger.

Top Problem Culverts Identified

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

- Garage Road (Culvert 266) – (pictured right) this culvert is 75% blocked on the north side and 50% blocked on the south side. The structure is a 2 foot round plastic pipe at the inlet and is submerged more than 10 inches because of the heavy sediment. The outlet is a 2 foot metal pipe with an apron that is 50% blocked with sediment preventing proper drainage.



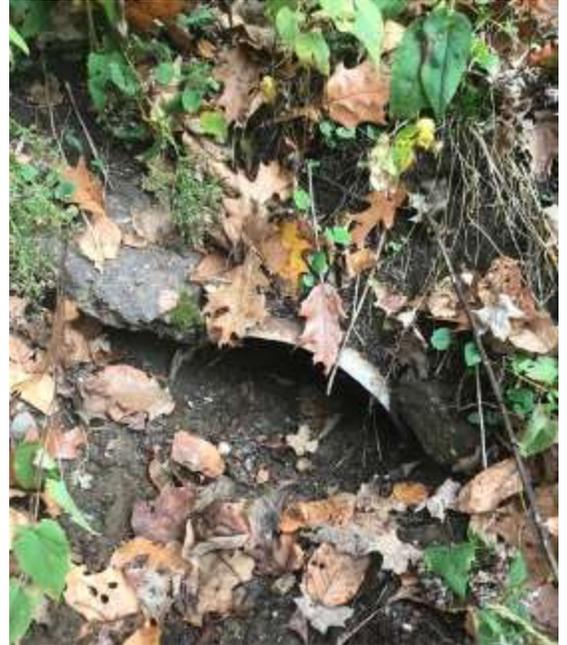
- North Silver Lane (Culvert 272) – this culvert is a 2 foot metal pipe that is 50% blocked at the inlet with more than 24 inches of the invert completely rusted out. This is causing water to not properly drain through to the outlet, which is 25% blocked.

- Grobko Cross Road (Culvert 62 & 63) – #62 is a 16 inch culvert with a failing headwall on the outlet causing the road to be impacted. Culvert #63 is a 4 foot pipe with a failing headwall on the outlet which needs to be repaired. Both of these culverts are in close proximity to Mohawk Brook. (#63 pictured right)



- Old Amherst Road (Culvert 135) – this is a 3 foot round concrete culvert. The outlet’s headwall is comprised of wood beams, concrete and fieldstone and is 75% blocked. The headwall is failing with concrete abutments falling into the stream. This is a unique culvert as it spans the width of Old Amherst Road as well as the parking lot for a service station. Cars are continuously parked in the small parking lot on top of the culvert’s outlet. The inlet on the north side is 50% blocked and shows signs of cracked and missing asphalt at the roadway.

- Cross Mountain Road (Culvert 252) – this is an 18 inch metal round culvert that is approximately 50% blocked at the far western end of the road. The FRCOG identified this culvert as a major issue because it appears to be undersized for the amount of stormwater runoff the structure has to handle due to the steep slope of the surrounding land. Much of the stormwater is flowing down an entrenched roadway directly into the pipe, which has been crushed. The pipe inlet is also submerged approximately 10 inch with no headwall on the inlet or outlet. This is causing general erosion around the culvert. Because it is not sized sufficiently, the runoff causes one of the only gravel roads in the town to consistently wash out. (Pictured right)



- Russell Street (Culvert 162) – this 4 foot round pipe is in poor condition due to poor drainage on the outlet side. The water from Dry Brook has backed up to the top of the pipe and could cause issues for the headwall in the future depending on freeze/thaw conditions. (pictured below)



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.

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).

Stream Crossing

Does the culvert convey a perennial stream (as observed from the field)? Yes or No.

Constricted

If there is a perennial stream passing through the culvert, does it flow freely or does its width become constricted in order to flow through the pipe. Choices include:

- Spans Full Banks (this structure goes across the stream and its banks)
- Spans Active Channel (this structure goes across the actual stream, but does not expand much past the typical water line)
- Moderate (the structure is smaller than the actual stream, forcing the stream to narrow to enter the culvert)
- Severe (this structure is much smaller than the actual stream, forcing the stream to narrow considerably to enter the culvert)

Scour

This measures the amount of scour that is occurring near the outlet of the culvert. There may be a scour pool or the bank under the culvert may be eroded away. The choices include:

- Slight
- Moderate
- Severe

Erosion

This measures the amount of erosion that is happening around the culvert, either on the inlet or outlet side, usually on the banks surrounding the structures. Choices include:

- Stable
- Moderate
- Severe

Sediment

This measures the amount of sediment that may be being deposited in the ditch or stream as water flows through the culvert. Excess sediment at the inlet could mean that the structure may become blocked and that it is most likely undersized. Excess sediment at the outlet means that the structure could become blocked. Choices include:

- Slight
- Moderate
- Severe

Invert Rusted

This examines the length of a metal pipe's invert that may be rusted and either about to fail or is already allowing water to flow under the pipe. It is 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, GIS Program Manager & Planning Coordinator at (413)774-3167 x132 or mrhodes@frcog.org
- Ryan Clary, Senior GIS Planner at (413)774-3167 x 124 or gis@frcog.org.