

- **Channel blockage** from soil and/or debris affecting the flow of water through the culvert is evaluated and reported as the amount of blockage in the culvert and whether there is presence of pooling water.
- **Scour** is erosion of the embankment or trenching of the inlet/outlet due to water flow or debris. Inspectors will look for scour holes and their severity, condition of the embankment erosion as it affects any cutoff walls or headwalls, and any undermining of the footings at the inlet/outlet.

Roadsoft LDC allows inspectors to input individual ratings for each of these culvert components, and Roadsoft LDC will automatically select the lowest of these six ratings as the overall culvert condition rating. Inspectors can, however, overwrite this lowest rating selection with the rating of another culvert condition if it is believed to be more representative of the overall culvert condition.

Rating evaluation charts were developed to assist inspectors with assigning ratings in the field. A chart was developed for each culvert type considered in the pilot; corrugated metal pipe (CMP), concrete, plastic, masonry, slab and abutment, and timber culverts. These charts are provided in Appendix G along with supporting documentation.

5. DEVELOPMENT OF PILOT TRAINING AND RESOURCES

Statewide training programs for local agencies and consultants were developed to help ensure inventory and condition evaluation data were collected, reported, and submitted consistently. Three training webinars were developed; one for inventory collection and data storage, another for condition evaluation, and a third to demonstrate how to submit the collected culvert data. The first two training sessions, which were held prior to the culvert pilot commitment deadline, were each offered twice for increased participation in an effort to give potential participating agencies the information they needed to decide whether to participate in the pilot project. Recordings of all three training webinars were made available for viewing shortly after the conclusion of each of the training sessions.

5.1. Culvert Pilot Training

5.1.1. *Culvert Data Collection Using Roadsoft*

This training module was developed to provide an overview of the pilot and focus on three of its primary aspects: equipment, data collection, and data validation. The webinar included details on recommended equipment for culvert data collection, completing data collection with Roadsoft using visual walk-throughs of the software to explain the processes needed to collect each piece of information, and covered the overall process of data management and reporting methods for the completion of the pilot.

This training module was presented as a webinar on April 25, 2018 and again on May 1, 2018. Attendance totaled 78 and positive feedback was received. The presentation slides from this webinar are located in Appendix I. The recording of the April 25, 2018 webinar is available at <http://mtu.adobeconnect.com/pgqdi7ilhma/>

5.1.2. TAMC Michigan Local Agency Culvert Pilot Condition Evaluation Training

This training module gave an overview of the required inventory data categories and provided a standardized method for collecting each piece of information. Recommended data collection equipment was also presented. Culvert characteristics and related vocabulary were addressed to clarify what each measurement or condition evaluation was analyzing. Rating tables were provided to assist in the field with condition evaluation. Example culvert photos were presented and participants were asked to rate them appropriately. These culvert photos included examples on every material type considered in the pilot, along with a variety of culvert conditions. Once participants attempted to rate each picture, the correct condition evaluation was shown and discussed with reference to the culvert rating table. This process was crucial for participants to understand how to use the culvert rating tables in the field to produce consistent, standardized condition ratings. The training also explained how the individual component ratings would be combined into a single overall culvert rating.

This training module was presented as a webinar on April 26, 2018 and again on May 2, 2018. Attendance totaled 83 and positive feedback was received. The presentation slides from this webinar are available in Appendix J. The recording of the April 26, 2018 webinar is available at <http://mtu.adobeconnect.com/pnbo6uxmkt07/>

5.1.3. Michigan Local Agency Culvert Data Submittal Training

This training module provided an overview of the culvert pilot data submittal process using Roadsoft. The training also covered data submission for agencies not using Roadsoft. A refresher was presented on building networks in Roadsoft for tracking the centerline-miles traveled in the data collection efforts. Submitting the daily logs and any other data related to the project to the CTT was presented at the end of the training.

This training module was presented as a webinar on July 24, 2018. Attendance totaled 65. The presentation slides from this webinar are available in Appendix K. The recording is available at <http://mtu.adobeconnect.com/p0gdmzzygp35>

5.2. Other Resources

5.2.1. Frequently Asked Questions

The CTT created a “living” Frequently Asked Questions (FAQ) document based on questions asked during the webinars, via email, and over the phone. The document was updated periodically as the pilot project proceeded. The document covered questions ranging from important dates, to funding specifics, to overall project guidance. The FAQ document is included in Appendix H.

5.2.2. Daily Data Collection Logs

In addition to the FAQ, the CTT also created a daily data collection sheet template for agencies to record and track activities related to the culvert pilot. The collection sheet is a typical daily log asking for date; start and end times; specifics about the activity being performed; the number of people on the collection team; the miles driven; the number of culverts rated and/or inventoried; and any notes. These logs allowed the CTT to estimate the amount of effort needed per culvert, culverts per hour, etc. The CTT also created a list of equipment recommendations.

5.2.3. TAMC Culvert Pilot Web Page

The CTT created a *TAMC Culvert Pilot* web page to house commonly used working files including a *Windows Tablet Setup Guide*, various driver files for the Windows tablet, and links to the various webinar recordings. The CTT *TAMC Culvert Pilot* web page can be found at: <http://ctt.mtu.edu/tamc-culvert-pilot>

The FAQ and other culvert pilot related files, along with copies of the presentations given during the two training webinars, are hosted on the Support page of the Michigan Transportation Asset Management Council’s website at : <https://www.michigan.gov/tamc/0,7308,7-356-82159---,00.html>

5.3. Participating Local Agencies & Reimbursement Policy

Given the fixed budget, an unknown number of culverts that agencies would be collecting data on, and an unknown number of agencies that were going to commit to participate in the pilot, the TAMC bridge committee discussed several funding options and scenarios to equitably distribute the funding amongst the participating agencies. The TAMC bridge committee decided that all agencies that responded to the survey were eligible to participate in the pilot project. Based on the survey results, agencies were divided into tiers based on their existing level of culvert inventory as discussed in Section 3.2. Agencies were then organized into “rounds” based on their tier and geographical proximity to other responding agencies. The first round included

all Tier 3 agencies, and all other agencies that fell within the overall RPO/MPO boundary of the response hotspots. The second round included all other agencies that responded to the survey.

It was determined that all participating agencies were to receive a fixed mobilization reimbursement for training, purchasing of equipment to be used on the pilot, and for other pilot-related activities. Counties received up to \$10,000, and cities/villages received up to \$5,000.

The TAMC bridge committee determined the number of Public Act 51 certified centerline-miles for all agencies that responded to the survey was the upper bound quantity and the only known variable (as opposed to a per-culvert reimbursement) and could therefore be budgeted. It was also believed that much of the culvert inventory effort would be related to the number of centerline-miles traveled while collecting culvert data. Based on that, they determined that the first round agencies were to receive \$30/per-centerline-mile where they drove to collect culvert data, not to exceed the agency's Public Act 51 certified total centerline-miles. The TAMC bridge committee couldn't determine the amount of per-centerline-mile funding, if any, for the second round agencies until after the April 30, 2018 commitment deadline. Fifty-two agencies initially agreed to be part of the pilot project. This included twenty-five first round agencies and twenty-seven second round agencies. Once the number of participating agencies was known, the TAMC bridge committee determined that the second round agencies would also receive \$30/per-centerline-mile where they drove to collect culvert data, not to exceed the agency's Public Act 51 certified total centerline-miles. Details regarding the first round and second round reimbursements can be found in Section 5.4 and Section 5.5, respectively.

Several agencies approached the committee after the April 30, 2018 commitment deadline indicating their willingness to participate. Those agencies were allowed to participate as volunteers with no reimbursement for expenses. None of the agencies that indicated that they were willing to participate as volunteers submitted data, however. Also, three of the agencies that initially indicated that they were willing to participate decided to withdraw from the pilot after funding was allocated. Participating agencies are shown in Figure 5-1, as well as in Table 5-1.

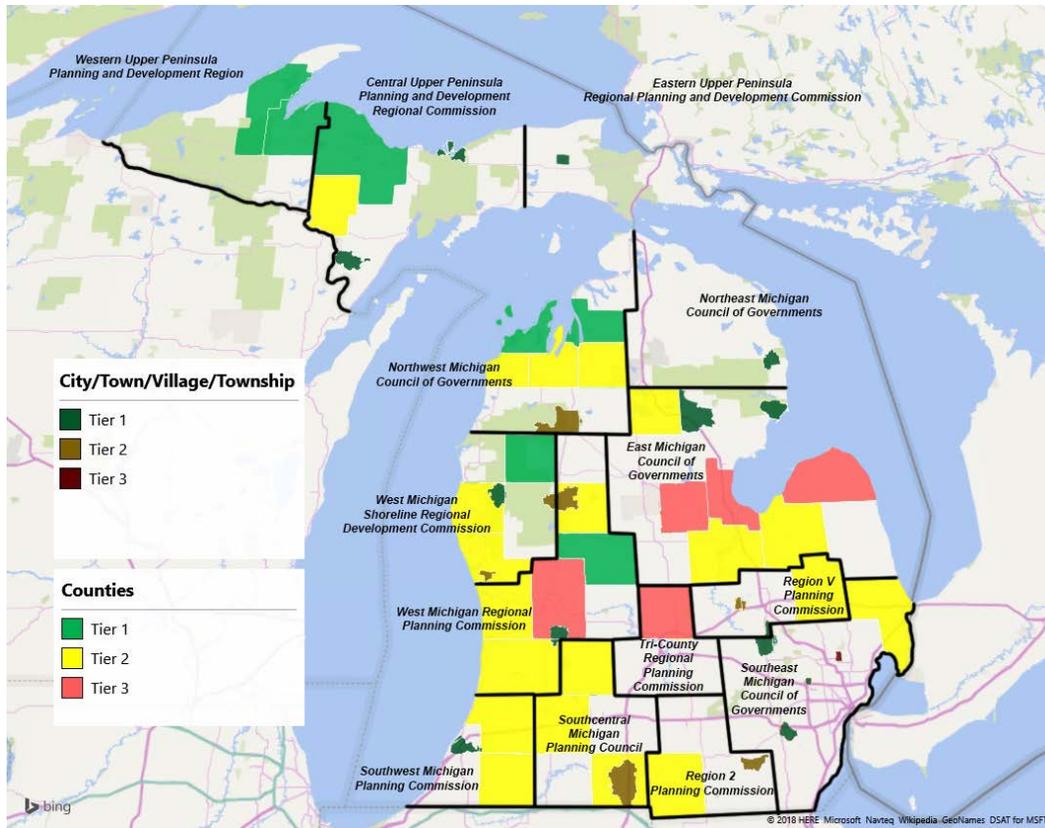


Figure 5-1: Culvert pilot participating road agencies

Table 5-1: Culvert pilot project participating road agencies

Tier	Round	RPO	Agency Type	Agency
2	1	WMRPC	County	Allegan County Road Commission
1	1	Networks Northwest	County	Antrim County Road Commission
1	2	WUPPDR	County	Baraga County Road Commission
2	2	SCMPC	County	Barry County Road Commission
3	1	EMCOG	County	Bay County Road Commission
2	1	Networks Northwest	County	Benzie County Road Commission
2	2	SCMPC	County	Cass County Road Commission
1	2	SWMPC	City	City of Benton Harbor
2	1	WMRPC	City	City of Big Rapids
2	1	Networks Northwest	City	City of Cadillac
2	2	SCMPC	City	City of Coldwater
1	1	EMCOG	City	City of East Tawas
1	2	SEMCOG	City	City of Farmington Hills
1	2	GLS-Region V	City	City of Fenton

Tier	Round	RPO	Agency Type	Agency
1	2	CUPPAD	City	City of Munising
2	2	WMSRDC	City	City of Muskegon Heights
3	1	SEMCOG	City	City of Rochester Hills
2	2	Region 2 PC	City	City of Tecumseh
1	1	EMCOG	City	City of West Branch
3	1	TCRPC	County	Clinton County Road Commission
2	2	CUPPAD	County	Dickinson County Road Commission
2	1	Networks Northwest	County	Grand Traverse County Road Commission
2	2	Region 2 PC	County	Hillsdale County Road Commission
1	2	WUPPDR	County	Houghton County Road Commission
3	1	EMCOG	County	Huron County Road Commission
2	1	Networks Northwest	County	Kalkaska County Road Commission
3	1	WMRPC	County	Kent County Road Commission
1	2	WMSRDC	County	Lake County Road Commission
2	2	GLS-Region V	County	Lapeer County Road Commission
1	1	Networks Northwest	County	Leelanau County Road Commission
1	2	CUPPAD	County	Marquette County Road Commission
2	1	WMRPC	County	Mecosta County Road Commission
3	1	EMCOG	County	Midland County Road Commission
1	1	WMRPC	County	Montcalm County Road Commission
2	2	WMSRDC	County	Muskegon County Road Commission
2	2	WMSRDC	County	Oceana County Road Commission
2	2	NEMCOG	County	Oscoda County Road Commission
2	1	WMRPC	County	Ottawa County Road Commission
2	2	SCMPC	County	Road Commission of Kalamazoo County
2	1	EMCOG	County	Roscommon County Road Commission
2	1	EMCOG	County	Saginaw County Road Commission
2	2	SEMCOG	County	St Clair County Road Commission
2	1	EMCOG	County	Tuscola County Road Commission
2	2	SWMPC	County	Van Buren County Road Commission
1	1	WMRPC	City	Village of Caledonia
1	2	CUPPAD	City	Village of Daggett
2	2	GLS-Region V	City	Village of Lennon
1	2	EUPPRDC	City	Village of Newberry
1	2	WMSRDC	City	Village of Walkerville

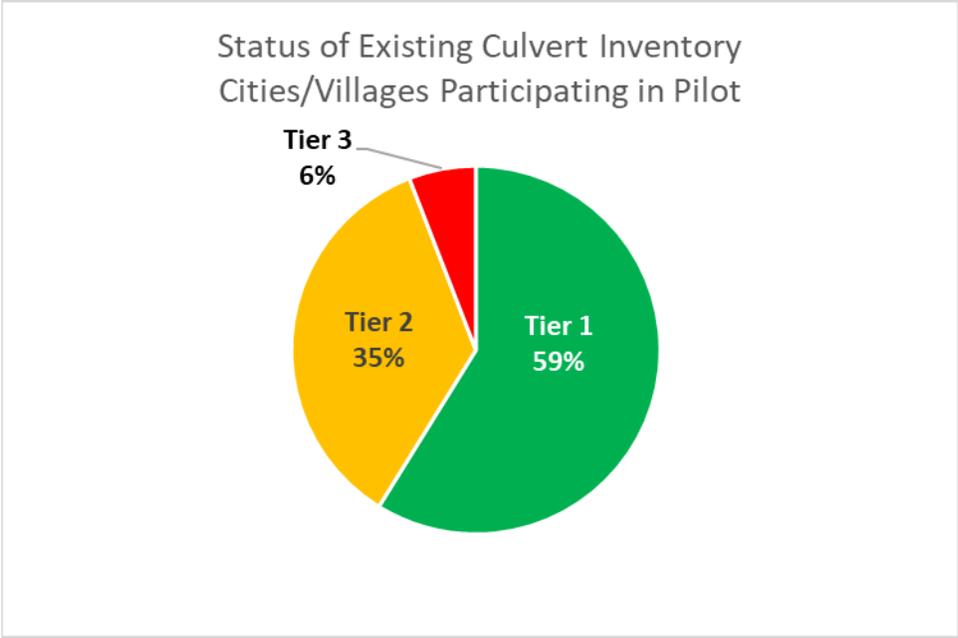


Figure 5-2: Participating agencies by tier - cities/villages

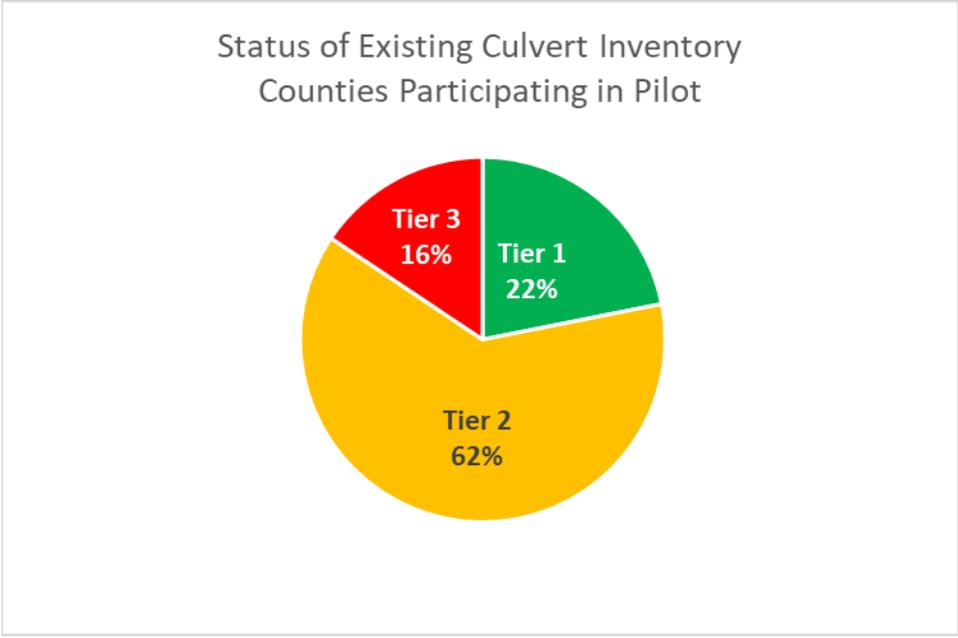


Figure 5-3: Participating agencies by tier – counties

5.4. First Round Local Agencies

The TAMC initially selected twenty-five local agencies to be involved in the pilot based on their willingness to participate and their ability to provide data that would contribute to the statewide determination of the pilot goals. The selection of agencies to participate was at the

sole discretion of the TAMC. First round agencies committed to participate were guaranteed financial support for their pilot activity using the following guidelines:

- 1) Each first round agency was given a fixed mobilization budget that was based on the relative expense to commit to the pilot. The mobilization budget was intended to compensate agencies for the time necessary to train staff, participate in meetings, and purchase necessary collection equipment. The lump sum amount for each first round agency was awarded as follows:
 - a. County road agencies were awarded \$10,000.
 - b. Cities and villages were awarded \$5,000 so long as they certify mileage of public roadways.
 - c. Townships that expressed interest in participation of this pilot were not eligible to receive an award; resources will be allocated to the respective County road agencies.
- 2) First round agencies committed to participate were awarded a per-centerline-mile payment for every centerline mile of road where all data elements are collected for all roadway culverts present in that section. Road mileage that did not contain a culvert is still eligible for reimbursement as long as the agency had field checked and verified that no culverts are present. Existing culvert data could be used for this pilot, but it was to have been field collected in 2013 or later, must reflect the current asset, and be complete.
- 3) The per-centerline-mile payment for county road agencies will be \$30 per-centerline-mile of road where all roadway culverts are submitted
- 4) The per-centerline-mile payment for cities and villages will be \$30 per-centerline-mile of road where all roadway culverts are submitted
- 5) The total centerline miles of reimbursement cannot exceed an agency's Public Act 51 certified total centerline miles
- 6) All data will be collected and stored electronically using an approved method (such as Roadsoft) compatible with a state-wide database.
- 7) All data must have been submitted to the TAMC by July 30, 2018 to qualify for reimbursement.

5.5. Second Round Local Agencies

To maximize the volume of data collected for the TAMC allocated funds, the TAMC also determined that second round local agencies (any local agency that participated in the TAMC culvert survey that was not selected as a first round agency) could also choose to be involved in the pilot. Second round agencies agreeing to participate in the pilot were guaranteed a mobilization budget; however, they were not guaranteed centerline mileage reimbursement for their data collection activity unless there were remaining funds in the \$2 million that had not been allocated for other mandatory expenses. Remaining funding that was not allocated by

August 10, 2018 was to be allocated to the secondary funding pool. Twenty-seven agencies initially agreed to participate in the culvert pilot as second round agencies. This pool was allocated to second round agencies using the following distribution guidelines:

- 1) Each second round agency was given a fixed mobilization budget that was based on the relative expense to commit to the pilot. The mobilization budget was intended to compensate agencies for the time necessary to train staff, participate in meetings, and purchase necessary collection equipment. The lump sum amount for each second round agency was awarded as follows:
 - a. County road agencies were awarded \$10,000
 - b. Cities and villages were awarded \$5,000 so long as they certify mileage of public roadways.
 - c. Townships that expressed interest in participation of this pilot were not eligible to receive an award; resources were allocated to the respective County road agencies.
- 2) Second round agencies committed to participate were awarded a per-centerline-mile payment, if funds were available, for every centerline mile of road where all data elements were collected for all roadway culverts present in that section. Road mileage that did not contain a culvert was still eligible for reimbursement as long as the agency field checked and verified that no culverts were present. Existing culvert data could be used for the pilot, but it should have been field collected in 2013 or later, and must reflect the current asset, and be complete.
- 3) The per-centerline-mile payment for second round agencies was determined to also be \$30 per-centerline-mile.
- 4) The per-centerline-mile rate of reimbursement for second round agencies could not exceed the first round agency rate
- 5) The total centerline miles of reimbursement could not exceed an agency's Public Act 51 certified total centerline miles
- 6) All data was collected and stored electronically using an approved method (such as Roadsoft) compatible with a state-wide database.
- 7) All data must have been submitted to the TAMC by July 30, 2018 to qualify for reimbursement.

5.6. Payment

All reimbursements for first and second round local agencies were processed through existing project authorizations under the Asset Management Unified Work Program with regional and metropolitan planning organizations (RPO/MPO).

Invoices for mobilization payments for first and second round agencies were submitted upon the completion of the required data collection training and the pilot kickoff meeting;

mobilization reimbursement requests were submitted by RPO/MPO on behalf of local agencies using MDOT’s standard invoice format with activity reports.

First and second round agency per-centerline-mile payments were approved if all required data was submitted to the TAMC prior to July 30, 2018. A breakdown of the allotted budget is presented in Table 5-2.

Table 5-2: Breakdown of culvert pilot budget

TAMC Culvert Pilot Cost Breakdown				
	Item	Rate	Quantity	Total
Administration, Overhead, & Contingency				
	Administration			164,857
	Overhead	5%	\$1,646,153	82,308
	Contingency			106,682
	<i>Subtotal</i>			\$353,847
Round 1 Agencies				
	Mobilization (\$10,000/County, \$5,000/City or Village)		215,000	215,000
	Centerline Mile Reimbursement	\$30	23,126	693,792
	<i>Subtotal</i>			\$908,792
Round 2 Agencies				
	Mobilization (\$10,000/County, \$5,000/City or Village)		215,000	215,000
	Centerline Mile Reimbursement	\$30	17,412	522,361
	<i>Subtotal</i>			\$737,361
Total Pilot Budget				\$2,000,000
<ul style="list-style-type: none"> Administration includes development and provision of training, data processing, and development of the final report. 				

6. PILOT DATA COLLECTION

Data collection for this pilot occurred over thirteen weeks; local agencies collected and logged data from April through July 2018. This section describes some of the inspection techniques used by local agencies during data collection. It was the responsibility of each participating agency to determine their own best practices and to prioritize culvert data collection based on the types, locations, road classifications, etc.

6.1.1. Site Visit Information

Staff from the CTT rode along with nine local agencies to observe their culvert data collection processes. Antrim, Baraga, Benzie, Houghton, Kalamazoo, Lake, Oceana, Roscommon, and Van Buren county road agencies all hosted the site visits. The site visits were conducted in late June