

Roadsoft Culvert Module

The Dirt on Culvert Data Collection



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Retired
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Commission

Safety Concerns

- Traffic



Safety Concerns

- Footing



Safety Concerns

- Insects and Reptiles



Inventory Items

- Location
- Field Measurements



Inventory Items

- Historic Data
 - Plans
 - Annual Reports
 - Other Sources

Location



Material

- CMP
 - Visual
 - Probe



Material

- Plastic
 - Deformation
 - Joints



Material

- Concrete
 - Joints



Material



Blockage

- Hampers Getting Size
- Makes Getting Condition Rating Difficult
- Effects Overall Culvert Rating

Blockage



Blockage



Condition

- 1-10 is too Complex – Too Many Options
- Used more of a Good, Fair, Poor Rating



Data Collection

- Used a Laptop for Data Collection
- Set up Defaults in Roadsoft LDC to Suit Your Needs
- Backup Regularly Throughout Day
- Downloaded Data Every Day
- Created Filter for Every Day

Example Culvert Issues



Example Culvert Issues



Example Culvert Issues



Thank You

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2018 Culvert Pilot

Project Overview



Center for Technology & Training

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2018 RUCUS
Roadsoft User Conference of the United States

Culvert Pilot Background

- The pilot was funded through House Bill 4320 (S-3) - Supplemental Appropriation Adjustments, which added \$2 million to TAMC's fiscal year 2018 budget from the state restricted Michigan Infrastructure Fund.
- Based on recommendations made in the 21st Century Infrastructure Commission Report.
- TAMC Bridge Committee decided to use the funding for a local agency culvert project
- All work was to be completed by Sept. 30, 2018

Goal of the Pilot

- Estimate the total number of culverts in the state.
- Estimate the overall condition of culverts in the state using similar inspection components and rating.
- Determine the range of physical characteristics (inventory information) of culverts, such as material, size, and depth, that may impact the cost to maintain or replace the asset.
- Benchmark estimates of agency labor (time and materials) necessary to find and collect inventory data for culverts on a dollar per mile or other production rate basis.
- Benchmark estimates of agency labor (time and materials) necessary to find and collect condition data for culverts on a dollar per mile or other production rate basis.

Topics for Today

- Pilot Overview
- Importance – Houghton County Flood
- Culvert Pilot Results
- Tablet Experiences
- Roadsoft Improvements
- Roadsoft Next Steps

Houghton County Flood

- June 17, 2019
- 7-10” of rain in 4.5 hours
- 100+ Houghton County roads affected
- \$100+ million in damages to publically-owned infrastructure
- 10 roads are still impassable

Houghton County Flood



Houghton County Flood



Houghton County Flood



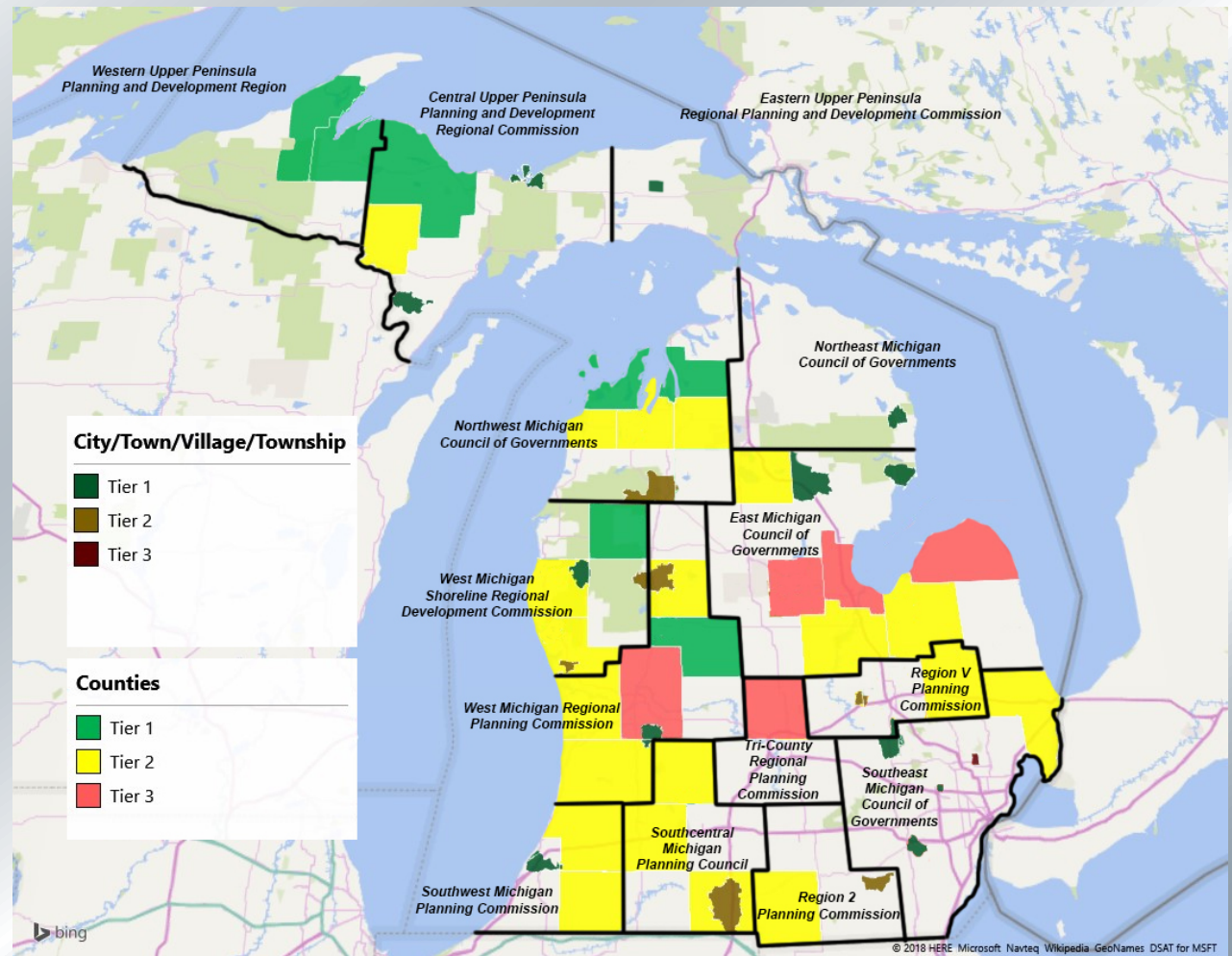
Houghton County Flood



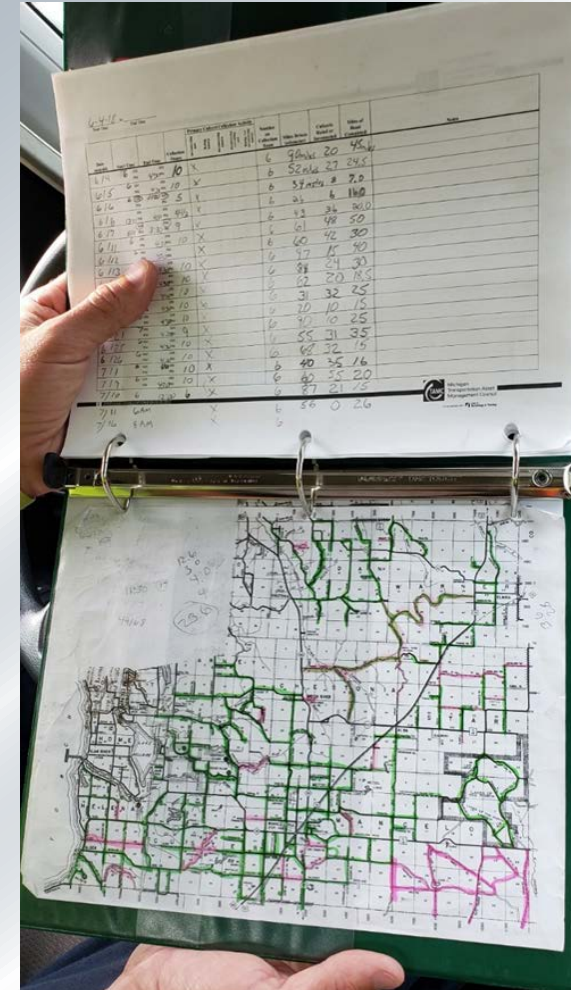
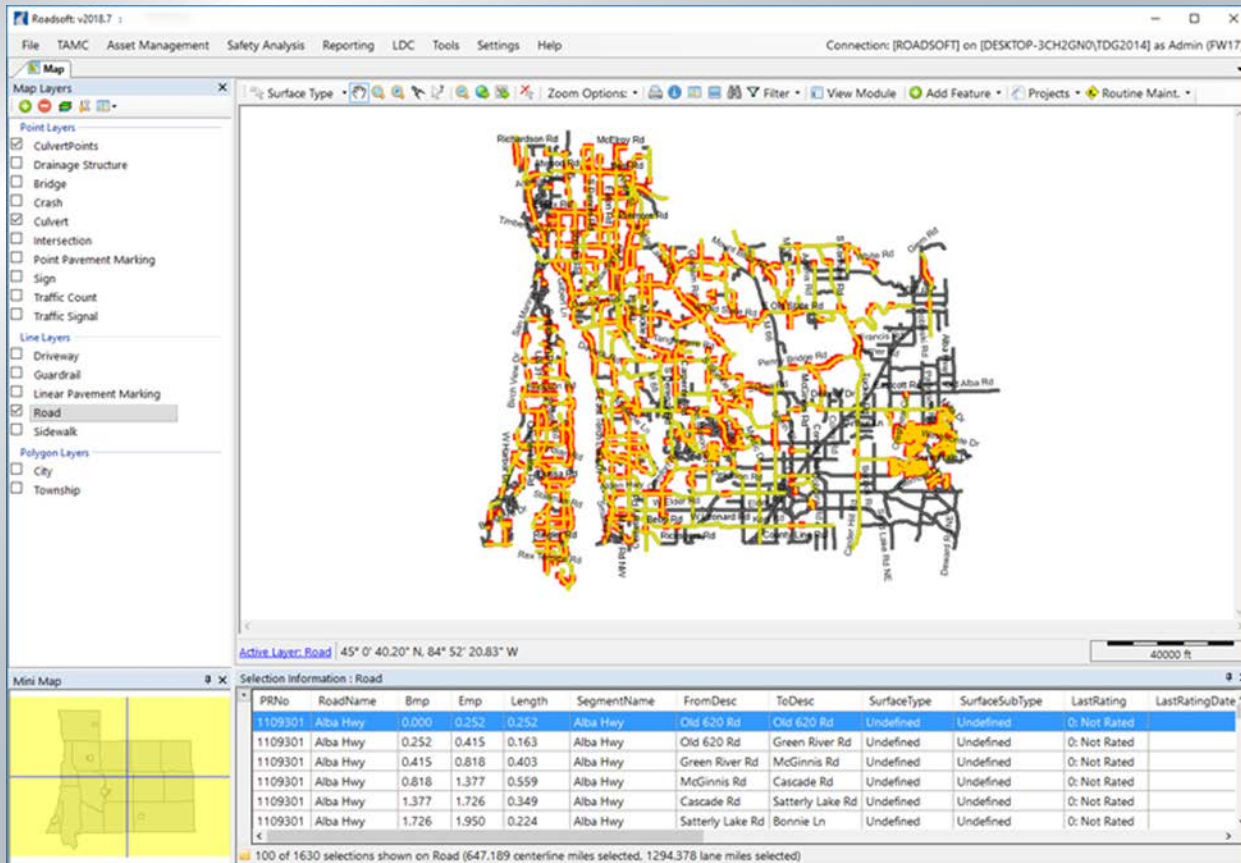
Culvert Pilot

Participating Agencies

- 49 Local Agencies
- Approximately 13 weeks to Collect Data



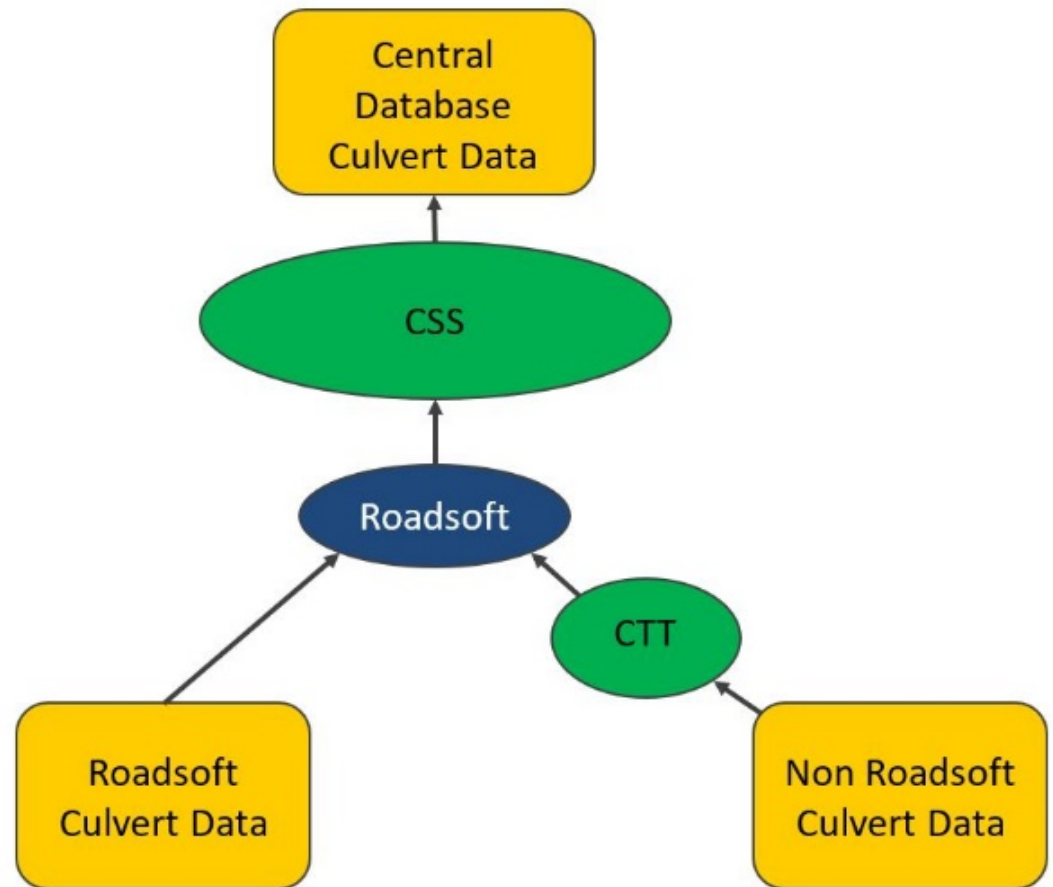
Culvert Pilot Data Collection



Culvert Pilot

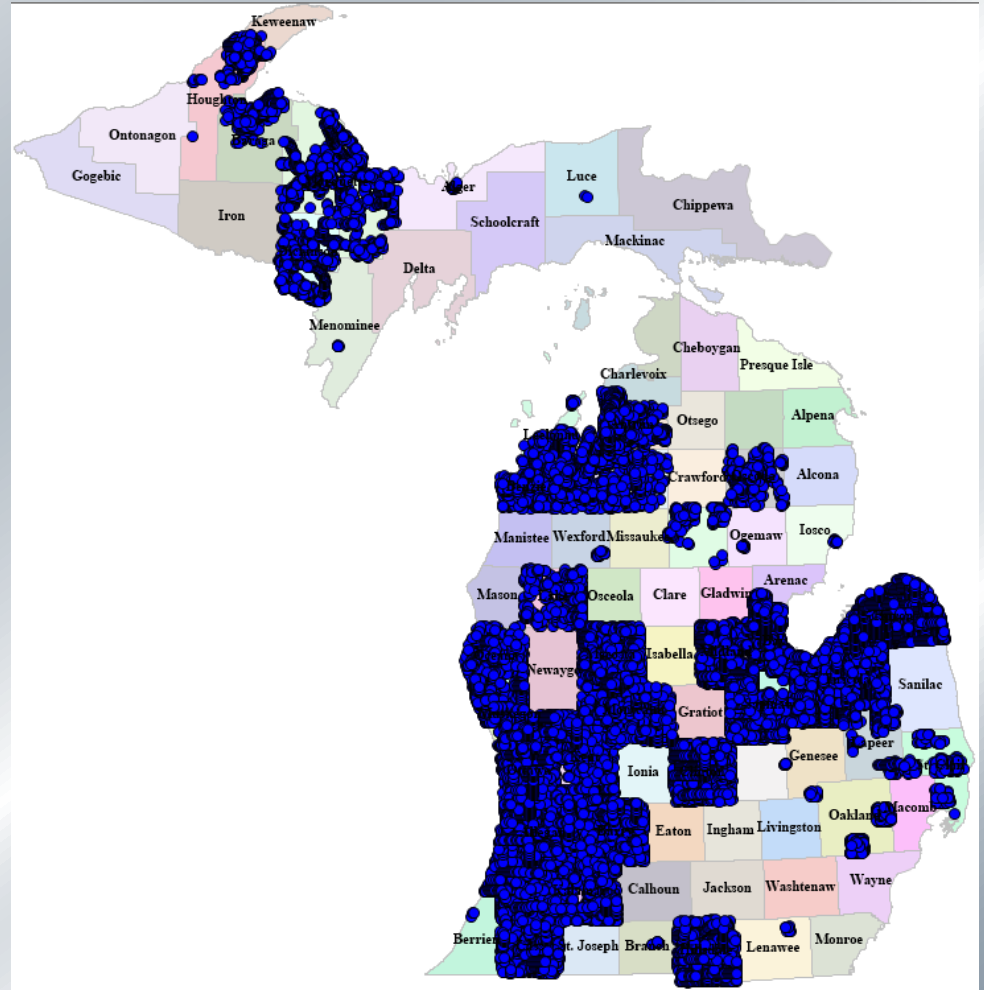
Participating Agencies

- 44 Agencies Used Roadsoft to Collect and Submit Data
- Non-Roadsoft Agencies Submitted Data to CTT for Conversion and Submittal to CSS



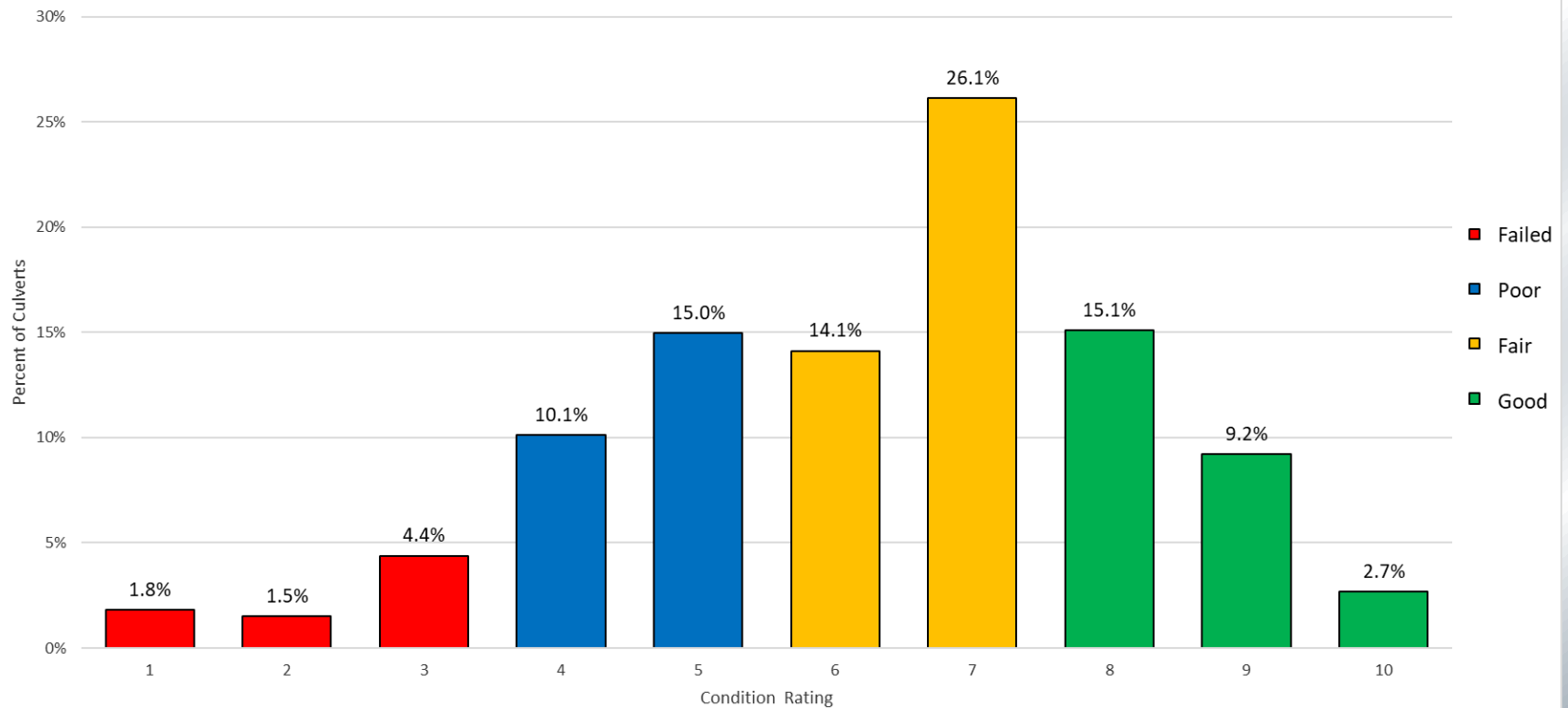
Culvert Pilot Data

- 49,644
Culverts
inventoried
- 196,000
Local-Agency
Owned
Culverts



Culvert Data Collected

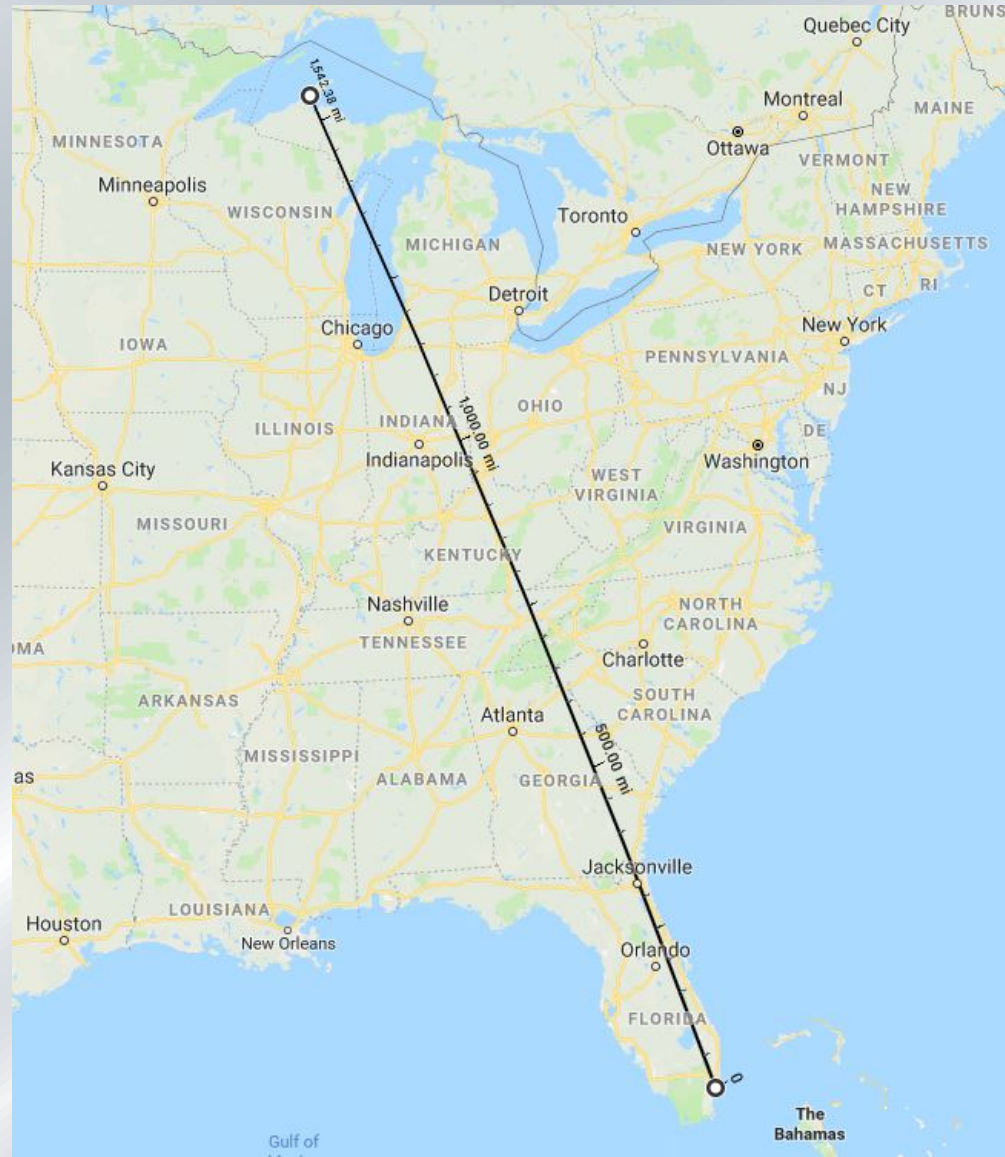
Overall Reported Culvert Condition Rating



49,664 culverts inventoried, 34,354 recorded condition ratings

Pilot Findings

- Local agencies own between 7.3 to 9.2 million feet (1,389 to 1,756 miles) of culvert.



Pilot Findings

- Estimated total replacement value of locally-owned culverts in Michigan exceeds approximately \$1.48 billion.

Pilot Culvert Total	Culvert Span (in)	Pilot Size Distribution	Estimated Number of Culverts In State	Cost / Each Culvert Project	Cost For All Project
5911	12	16.6%	32,443	\$ 2,416	\$ 78,392,329
7132	15	20.0%	39,144	\$ 3,064	\$ 119,948,327
8344	18	23.4%	45,796	\$ 3,755	\$ 171,961,955
4721	24	13.2%	25,911	\$ 5,264	\$ 136,408,675
1430	30	4.0%	7,849	\$ 6,945	\$ 54,507,322
2368	36	6.6%	12,997	\$ 8,796	\$ 114,322,341
2212	48	6.2%	12,141	\$ 13,012	\$ 157,967,973
304	54	0.9%	1,669	\$ 15,376	\$ 25,654,305
1018	60	2.9%	5,587	\$ 17,911	\$ 100,071,693
215	66	0.6%	1,180	\$ 20,616	\$ 24,327,973
810	72	2.3%	4,446	\$ 23,493	\$ 104,443,420
517	84	1.4%	2,838	\$ 29,759	\$ 84,444,101
347	96	1.0%	1,905	\$ 36,709	\$ 69,913,291
188	120	0.5%	1,032	\$ 52,660	\$ 54,336,566
194	240	0.5%	1,065	\$ 173,431	\$ 184,663,661
		100.0%	196,000		\$ 1,481,363,931

Pilot Findings

- Culvert material: 69% corrugated steel pipe, 21% concrete, and 5% plastic
- Culvert shape: 88.9% circular, 90% were 48 inches or less in span
- Depth of cover: 85% have 6 feet or less of cover
- Road surface: 66% asphalt pavement, 28% gravel
- Estimated cost of \$10.5 - \$11.5 million to collect data and evaluation all local agency culverts in the state

The background features a stylized globe with a white grid of latitude and longitude lines. A large, thick, white 'S' shape is superimposed over the globe, starting from the top left, curving around the center, and ending at the bottom right. The text 'TABLET EXPERIENCES' is written in a bold, blue, sans-serif font across the middle of the image, partially overlapping the 'S' shape and the globe.

TABLET EXPERIENCES

Tablet Considerations

- Internal GPS
- Ruggedized & Weather Resistant
- Horsepower to Run Roadsoft LDC
- Built-in Camera
- Found Three That Met Criteria (may have been others):
 - MobileDemand xTablet T1600
 - Trimble T10
 - Getac F110

Tablet Use in the Field



Tablet Use in the Field



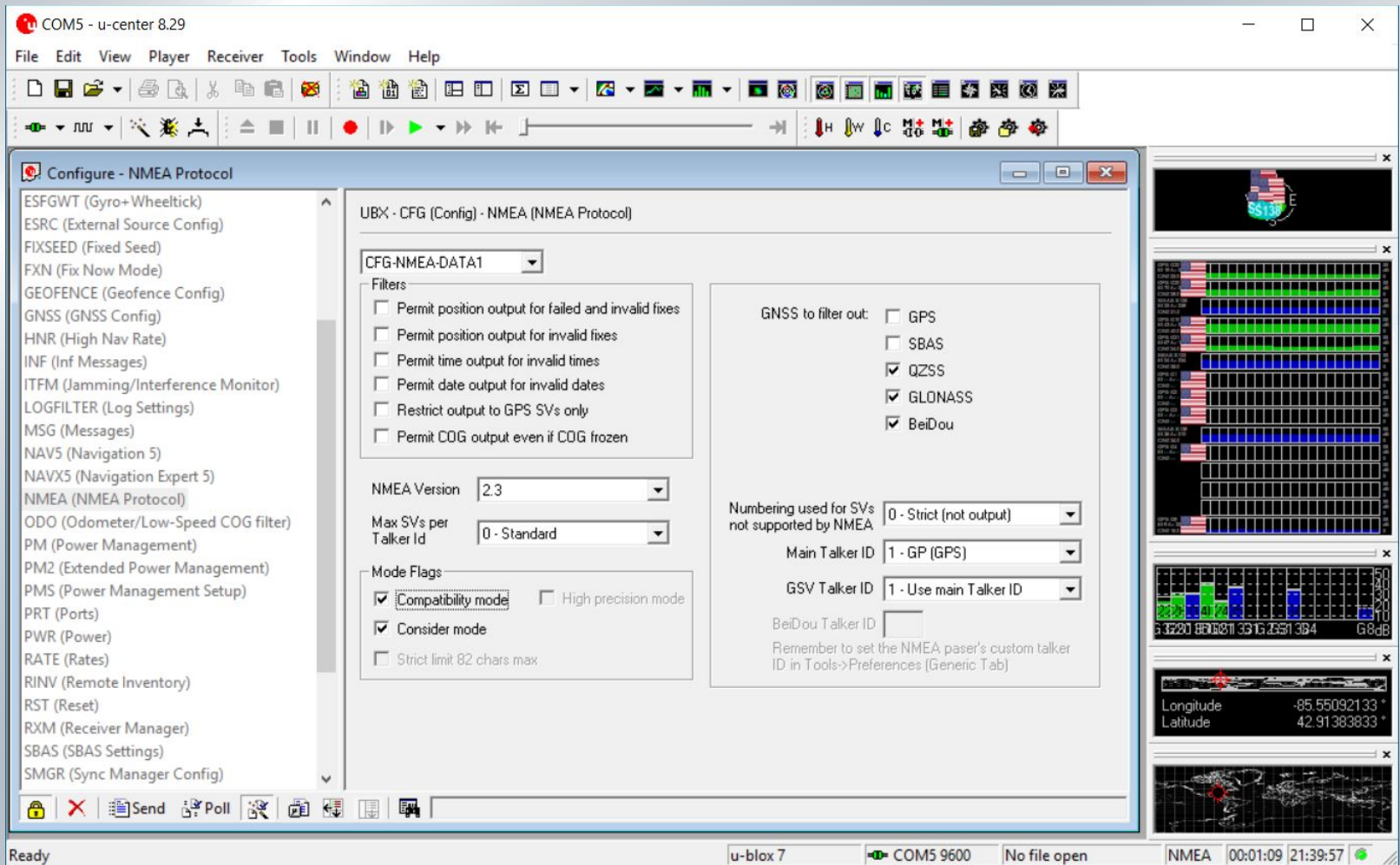
Tablet Use in the Field



Tablet “Gotchas”

- GPS Setup
- GPS Driver Issues
 - Windows Updates Don’t Help
- Tablet Interface
 - Similar But Different to Windows Desktop
 - Screen “Real Estate” Issues

Tablet “Gotchas”

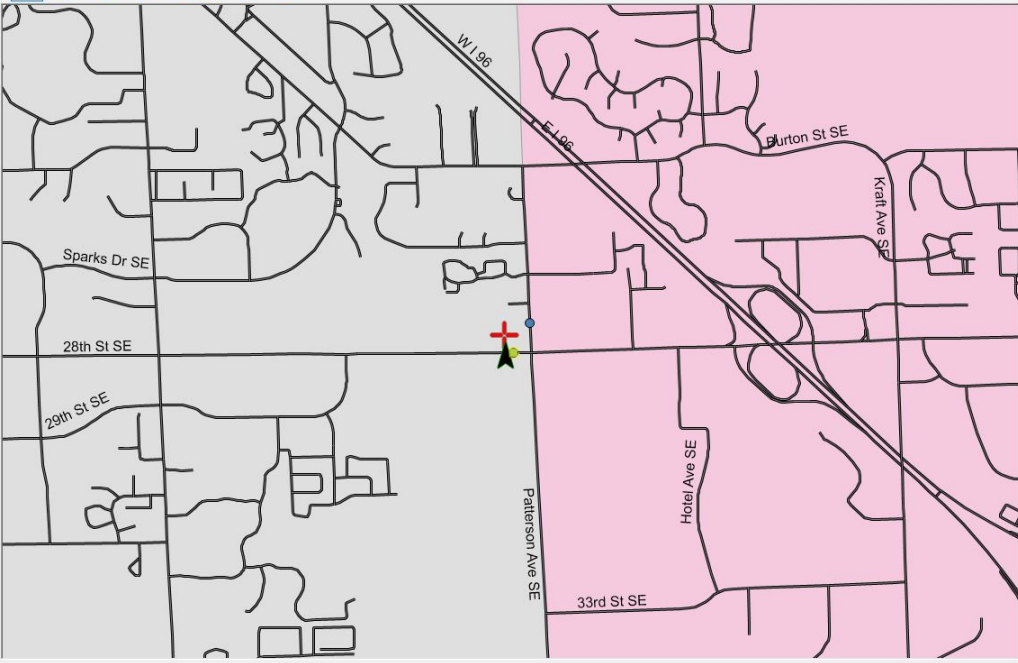


Tablet “Gotchas”

Roadsoft Laptop Data Collector v2018.7 [RStoLDC_Kent(County)_2018_09_25_09_03]

File GPS Tools Settings Help

Map Map Layers Shortcut Keys



Active Layer: Culvert 42° 54' 40.55" N, 85° 34' 0.30" W Kent (County), FW: v17 500 m

Culvert

MP: 17.660
PR#409008 : 28th St SE

Defaults Adjust Add Save

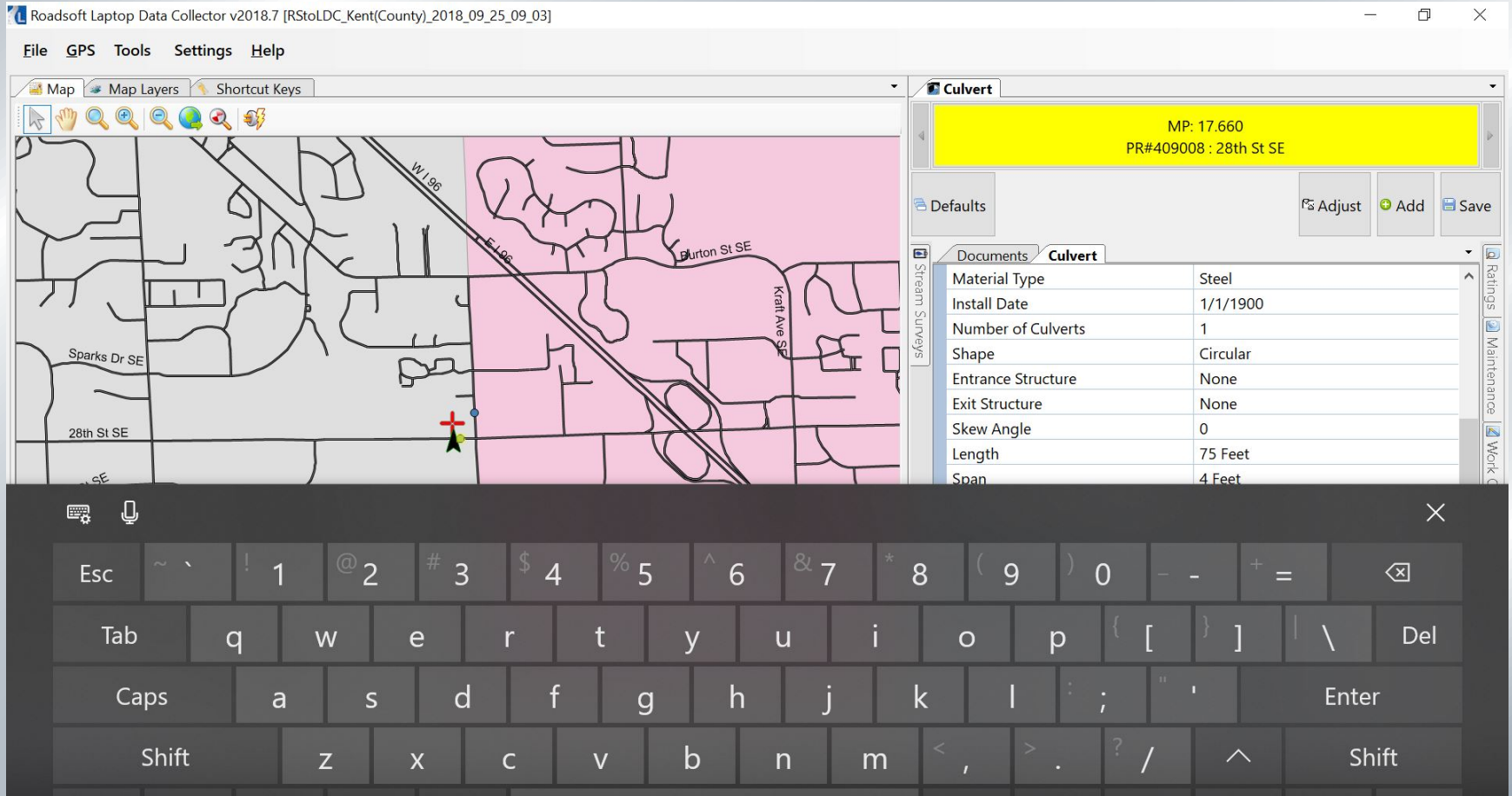
Documents **Culvert**

Material Type	Steel
Install Date	1/1/1900
Number of Culverts	1
Shape	Circular
Entrance Structure	None
Exit Structure	None
Skew Angle	0
Length	75 Feet
Span	4 Feet
Rise	0 Undefined
Depth of Cover	10 Feet
Height/Diameter	4 Feet
Width	0 Undefined
Road Surface Elevation	
Upstream	0 Undefined
DownstreamRoadSurfaceElevation	0 Undefined
Invert Elevation	
Upstream	0 Undefined
DownstreamInvertElevation	0 Undefined
Miscellaneous	

Stream Surveys Ratings Maintenance Work Orders

6:24 AM 9/25/2018

Tablet “Gotchas”



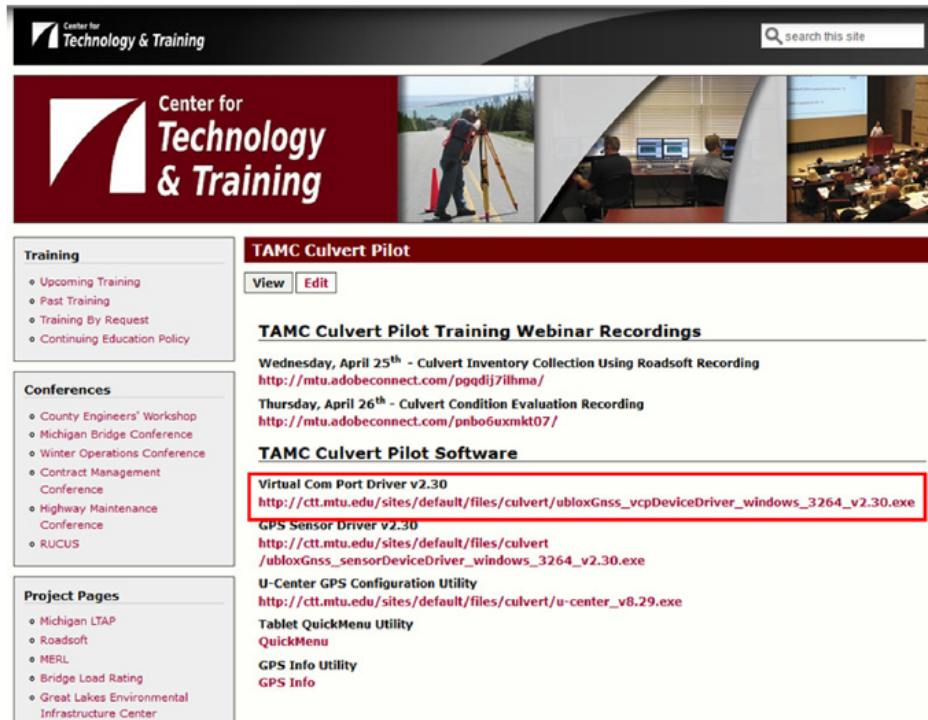
Tablet “Gotchas”

Roadsoft LDC Tablet GPS Setup

The MobileDemand T1600 tablet, as well as the Trimble T10 tablet, have an internal GPS chip manufactured by u-blox. The internal GPS on these tablets needs to be configured so that Roadsoft LDC will communicate with it.

The first thing to do is ensure the correct COM port driver is installed. Automatic Windows 10 updates often update the drivers to the latest version, which can cause problems. The correct driver is located on the CTT website at <http://ctt.mtu.edu/tamc-culvert-pilot>.

Download the Virtual COM Port Driver v2.30 file as highlighted below.



Center for Technology & Training

search this site

Center for Technology & Training

Training

- Upcoming Training
- Past Training
- Training By Request
- Continuing Education Policy

Conferences

- County Engineers' Workshop
- Michigan Bridge Conference
- Winter Operations Conference
- Contract Management Conference
- Highway Maintenance Conference
- RUCUS

Project Pages

- Michigan LTAP
- Roadsoft
- MERL
- Bridge Load Rating
- Great Lakes Environmental Infrastructure Center

TAMC Culvert Pilot

[View](#) [Edit](#)

TAMC Culvert Pilot Training Webinar Recordings

Wednesday, April 25th - Culvert Inventory Collection Using Roadsoft Recording
<http://mtu.adobeconnect.com/pgqdi7ilhna/>

Thursday, April 26th - Culvert Condition Evaluation Recording
<http://mtu.adobeconnect.com/pnbo6uxmkt07/>

TAMC Culvert Pilot Software

Virtual Com Port Driver v2.30
http://ctt.mtu.edu/sites/default/files/culvert/ubloxGnss_vcpDeviceDriver_windows_3264_v2.30.exe

GPS Sensor Driver v2.30
http://ctt.mtu.edu/sites/default/files/culvert/ubloxGnss_sensorDeviceDriver_windows_3264_v2.30.exe

U-Center GPS Configuration Utility
http://ctt.mtu.edu/sites/default/files/culvert/u-center_v8.29.exe

Tablet QuickMenu Utility
QuickMenu

GPS Info Utility
GPS Info

Roadsoft Improvements

- Updates to Culvert Module
- Updates to both LDC and Roadsoft to accommodate new data & provide upload functionality
- Updated LDC interface to accommodate touch screen

Roadsoft Next Steps

- Picture Attachments
- Data Quality Review
- Method for Reporting Collection Area
- Data Sharing

Questions?





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