Culvert Assessment Program

From reactive closures to proactive culvert planning

Clinton County Road Commission
County Engineers Workshop 2026

Presenters:
Douglas Steffen (CCRC)
Jacob Perkins (CCRC)
Marc Trotter, P.E. (LRE)

LRE
ENGINEERS & SURVEYORS

Proactive Culvert Management Through GIS

Context

- Large culverts represent a growing risk due to age, cost, and the lack of required inspection programs. Recent unexpected closures demonstrated the need for better visibility and planning.

What we did

- Inventoried **400 large culverts (5'–20' diameter)**
- Applied **standardized condition ratings**
- Centralized data in a **GIS-based system**
- Produced **township-ready reports**

What we learned

- **~86%** in good or fair condition
- **~14%** require near-term monitoring or replacement
- Early visibility allows budgeting **years in advance**, rather than reacting to failures

Why it matters

- Expedites emergency responses
- Enables **3-5 year budget planning**
- Shifts culvert management from reactive response to proactive planning

What we can do next

- Integrate & expand county-wide GIS data and access for planning, coordination, and transparency

Bottom line

- **Proactive inventory + GIS = fewer closures, clearer priorities, better use of funds.**

THE NEED FOR BETTER CULVERT VISIBILITY BECAME UNAVOIDABLE

Unexpected culvert failures exposed a gap in planning

- Three large CMP culverts closed in 2023
- No warning to townships; no time to budget
- Questions raised:
  - What else is approaching failure?
  - How can we avoid reactive closures?

Owner
County: Clinton(19)

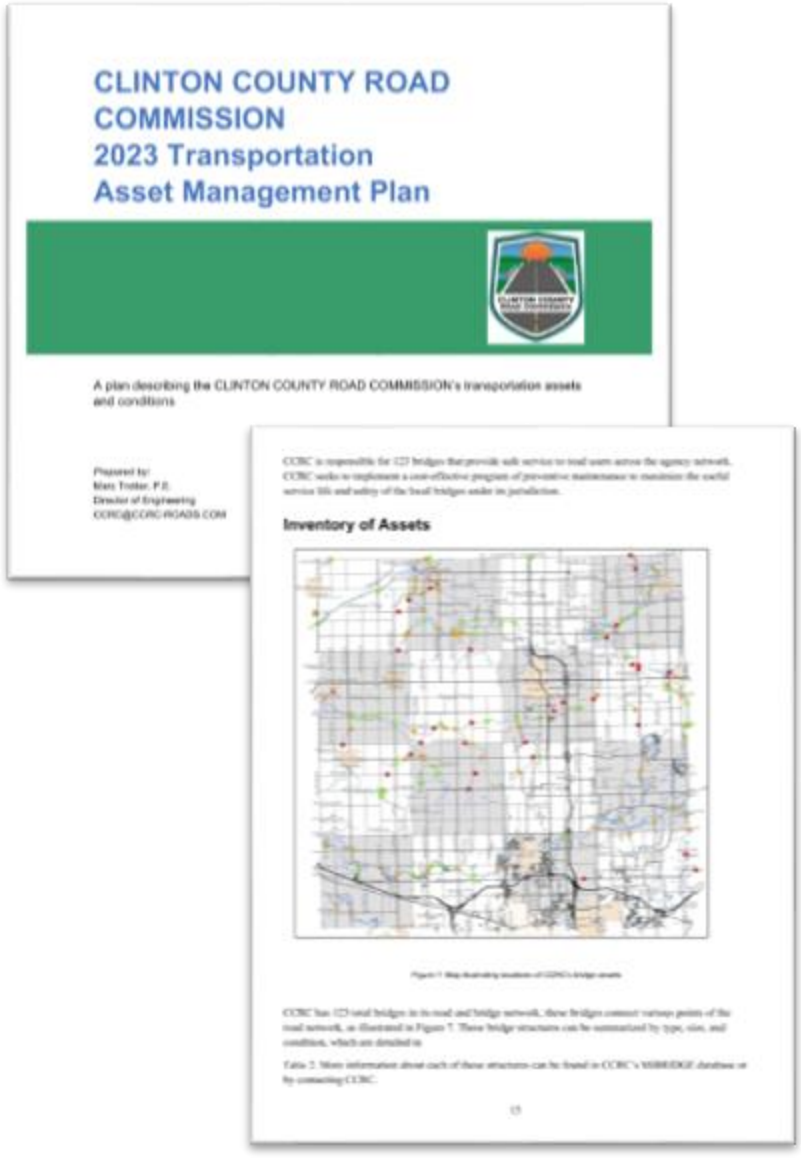
TSC	**Operational Status**
Lansing(17)	K Closed to all traffic(K)
Last NBI Inspection	**Scour Evaluation**
10/13/2022 / J5BJ	5 Stable w/in footing

Large culverts carry high cost and limited warning

- Policy & Program Gaps
  - No mandatory inspections for 5'–20' culverts
  - No required AMP
- Funding Reality
  - No dedicated state/federal funding stream
- Cost & Impact
  - **$350K-$600K** avg replacement (15’-20’)
  - One culvert can consume a township's annual road budget
  - Requires **3-5 year budget** planning

Traditional asset plans offer limited insight for large culverts

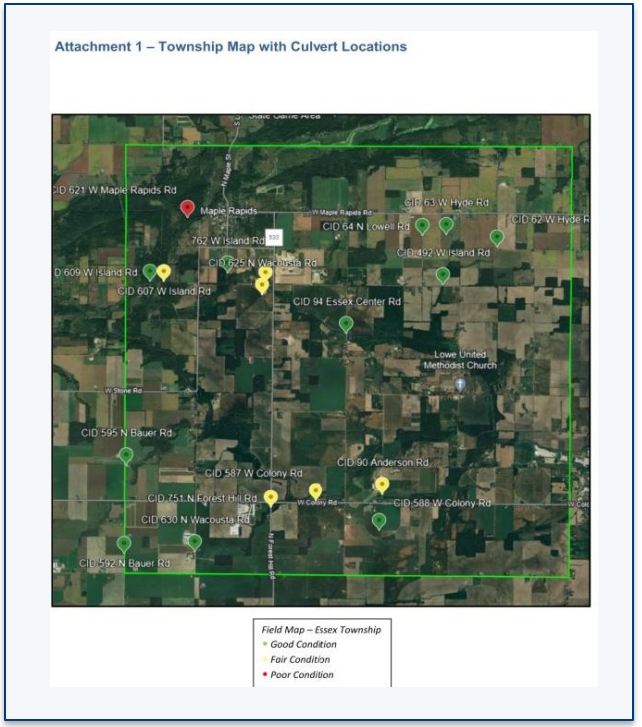
- What works
  - Roads and bridges are mandated assets
  - TAMC plans meet reporting requirements
- What's missing
  - Large culvert inspections are voluntary
  - AMP's are static, long form documents
  - Limited use for operational decision making
- Large culverts remain largely invisible until problems occur

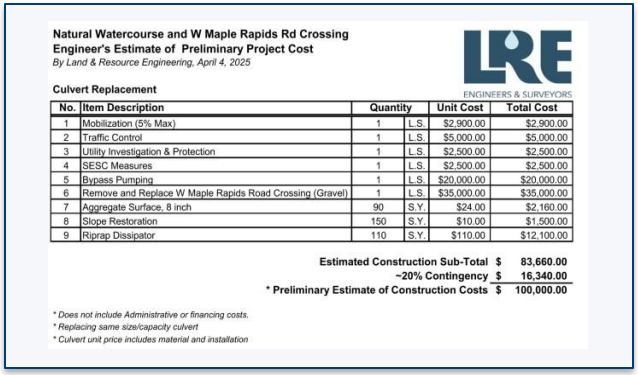


A GIS-DRIVEN APPROACH WAS DEVELOPED TO SUPPORT BETTER DECISIONS

The program was built to inventory, rate, and prioritize large culverts

- Inventory all culverts 5'–20' diameter
- Assign standardized condition ratings
- Prioritize replacements and repairs
- Develop planning-level cost estimates
- Produce concise township-level reports





Natural Watercourse and W Maple Rapids Rd Crossing
Engineer's Estimate of Preliminary Project Cost
By Land & Resource Engineering, April 4, 2025

LRE ENGINEERS & SURVEYORS

Culvert Replacement

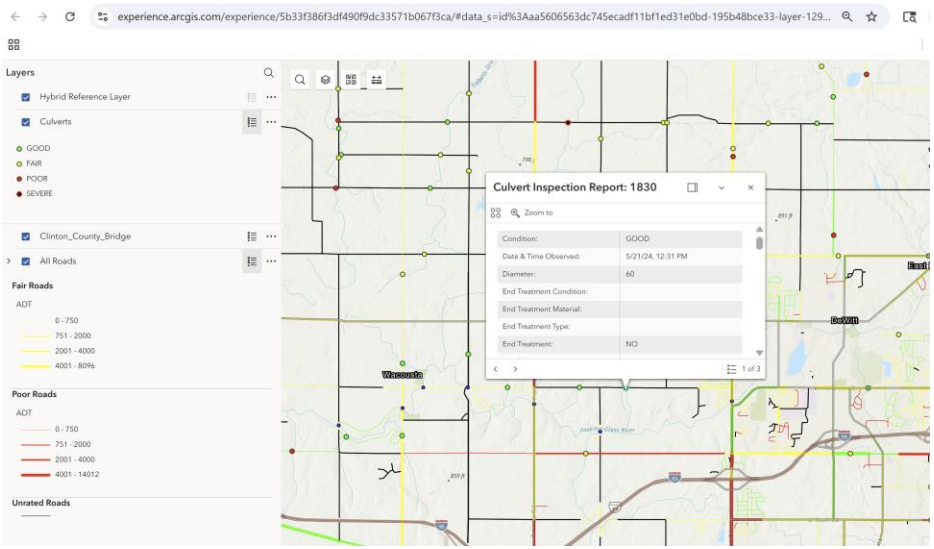
No.	Item Description	Quantity		Unit Cost	Total Cost
1	Mobilization (5% Max)	1	L.S.	$2,900.00	$2,900.00
2	Traffic Control	1	L.S.	$5,000.00	$5,000.00
3	Utility Investigation & Protection	1	L.S.	$2,500.00	$2,500.00
4	SESC Measures	1	L.S.	$2,500.00	$2,500.00
5	Bypass Pumping	1	L.S.	$20,000.00	$20,000.00
6	Remove and Replace W Maple Rapids Road Crossing (Gravel)	1	L.S.	$35,000.00	$35,000.00
7	Aggregate Surface, 8 inch	90	S.Y.	$24.00	$2,160.00
8	Slope Restoration	150	S.Y.	$10.00	$1,500.00
9	Riprap Dissipator	110	S.Y.	$110.00	$12,100.00

Estimated Construction Sub-Total	$ 83,660.00
~20% Contingency	$ 16,340.00
* Preliminary Estimate of Construction Costs	$ 100,000.00

** Does not include Administrative or financing costs.*
** Replacing same size/capacity culvert*
** Culvert unit price includes material and installation*

The system was designed for long-term use by county staff

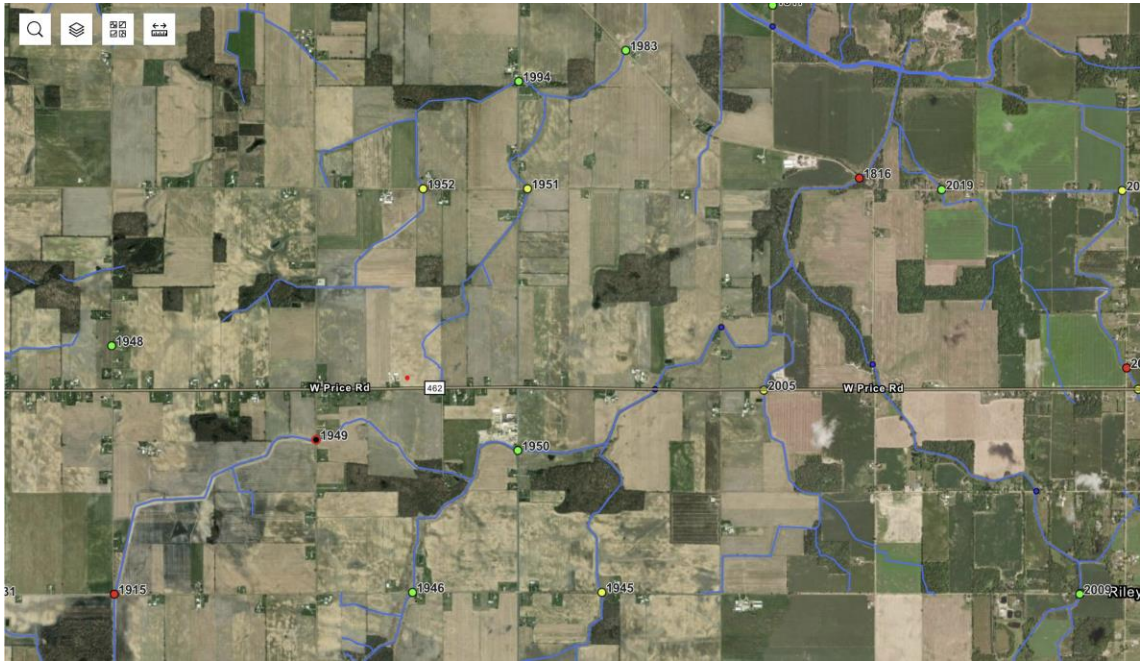
- Consultant assistance for startup
- Field crews, supervisors, engineers engaged
- Mobile-based data collection for updates
- Built so CCRC can maintain data in-house



FIELD DATA FLOWS DIRECTLY INTO A CENTRALIZED GIS SYSTEM

GIS mapping revealed gaps and verified culvert locations

- Import data from Roadsoft to ArcGIS
- Aerial maps help ID missing culverts
- Why did we choose to use GIS, not Roadsoft?

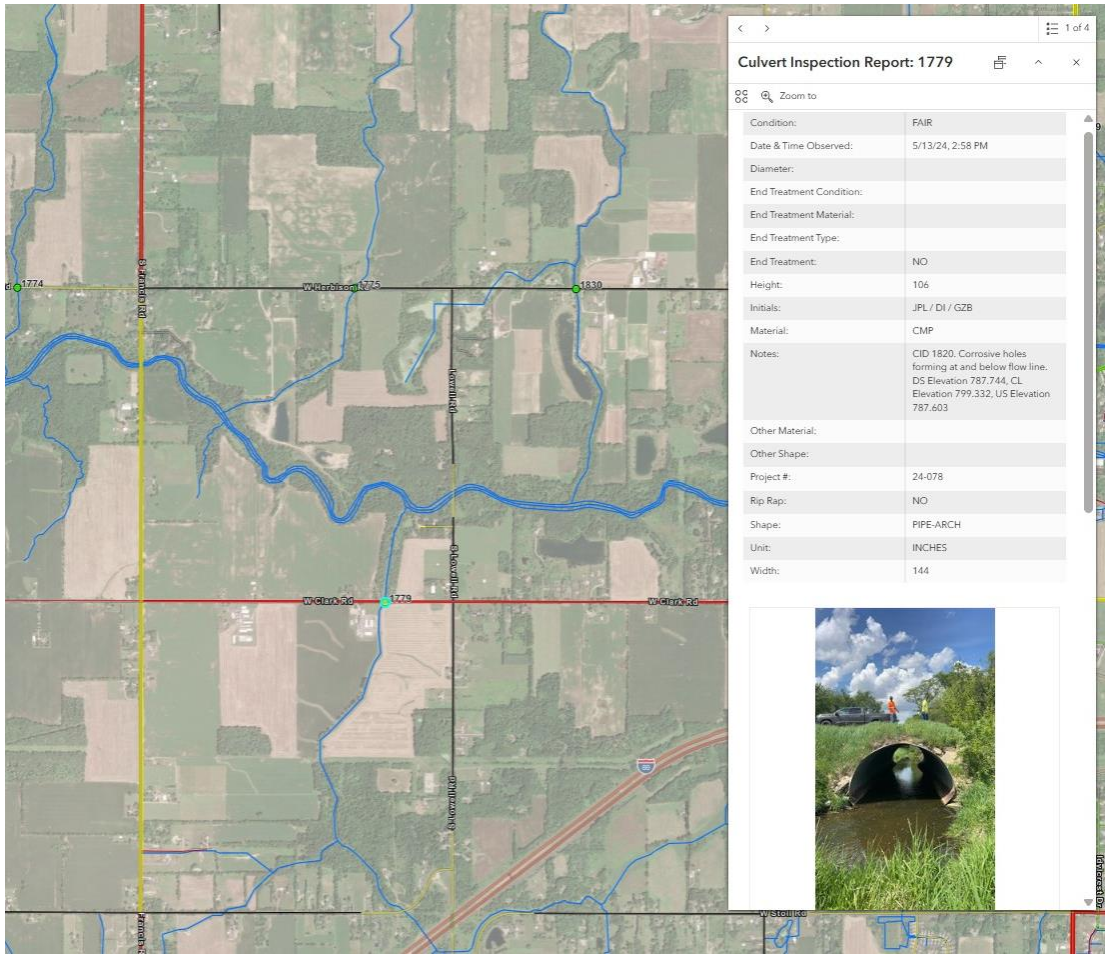


ArcGIS compliments Roadsoft

	ArcGIS	RoadSoft
Strength:	Visualization	Asset Management
Audience:	General users	Engineer
Support:	Licensed based - Fee	Provided - CTT
Ease of Access:	Broad	Limited
Speed of Query:	Fast	Moderate
Sharing:	Agency & Public	Agency

Mobile data collection keeps culvert information current

- Mobile app for field entry
  - Survey123
- Photo capture and attachments
- Central GIS database
- Easy future updates by CCRC



Standardized field ratings ensure consistent condition data

- Interns collected base data
- TAMC Non-NBI Culvert Inspection Guide
- LRE verification of conditions
- Survey data obtained as needed

Condition:	End Treatment:	Rip Rap:	CL El.	DS. El.	US El.	Notes:	Date	x	y
Good	no	no	774.87	766.17	767.44	Light rust throughout, 3 tile connections.	12/24/2024	-84.71913	42.878699
Poor	no	yes				Crushing exceeding 10" in areas, joint gaps 2-4".	12/24/2024	-84.72001	42.886337
Good	no	no	755.32	742.59	742.59	CID 1498. Few feet of embedment along E wall, US end mitered. US 742.59; CL 755.32; DS 742.59	12/24/2024	-84.70849	42.90046
Fair	no	yes	755.06	743.46	743.46	Considerable deformation under road, holes forming.	12/24/2024	-84.70297	42.900425
Fair	no	no	737.42	729.1	728.31	2 areas with sharp deformations, rust below flow line, water flowing under culvert, DS higher than	12/24/2024	-84.71593	42.929345
Fair	no	no				Double culvert. Joint separation in barrel with water. Looks filled with foam. E is 66", W is 70". See roadsoft elevations.	12/24/2024	-84.68118	42.943502
						Dual culvert. Rusty with			

THE ASSESSMENT PRODUCED CLEAR, ACTIONABLE RESULTS

400 culverts assessed and clear priorities identified

- 400 culverts assessed across 16 townships

- Condition:
  - 64 Good
  - 179 Fair
  - 55 Poor
  - 2 Severe

- ~14% require near-term action

Township-ready reports support immediate planning decisions

- Culverts to monitor vs. replace
- Planning-level costs
- Photos and condition summaries
- Usable by townships independently

LRE
ENGINEERS & SURVEYORS
2121 3 Mile Rd. NW
Walker, MI 49544
Ph: 616-301-7888
www.LREMI.com

MEMO

Date: May 30, 2025

To: Marc Trotter – Clinton County Road Commission (CCRC)

From: Kyle Patrick P.E. – Land & Resource Engineering (LRE)

Re: Clinton County Culvert Assessments – Bengal Township

Executive Summary

This report presents the results of a culvert assessment conducted
County. The Clinton County Road Commission (CCRC) engaged
in 2024 to evaluate all culverts within the township that are greater
than 19 feet in span. The objective was to assess the structural an
culverts and to provide data-driven recommendations for maintena

Twelve culverts were assessed using field inspections and GPS d
rated based on the Michigan Transportation Asset Management C
Culvert Structure Inspection Guide. The assessment revealed:

- Good Condition: 17 culverts
- Fair Condition: 11 culverts
- Poor Condition: 4 culverts
- Severe Condition: 0 culverts

This report provides an overview of the assessment methodology,
improvements for culverts in poor condition.

1. Introduction

In 2024, LRE was retained by the CCRC to conduct a compre
structures within Bengal Township. The study focuses on culverts

- Greater than 48 inches in diameter
- Less than 19 feet in span

The intent of this assessment is to support asset managemen
requiring maintenance or replacement, and by providing conditi
standards.

Page 2

2. Methodology

2.1 Data Collection

LRE performed the initial field assessment of the Township's cu
assessment with GPS survey data in November 2024. LRE use
to produce a list of culverts for assessment that met the sizing
that had missing sizing data. This database was used to generat
each culvert as well as the culvert identification (CID) numbers
conducted include the following data:

- GPS Coordinate
- Material Type
- Shape
- Invert & Centerline Elevations

2.2 Evaluation Parameters

The condition rating includes four classifications: good, fair, poor,
with the Michigan Transportation Asset Management Council
Structure Inspection Guide.

- **Good Condition** - like-new condition with little to no deter
  functionally adequate.
- **Fair Condition** - some deterioration but still structurally s
- **Poor Condition** - significant deterioration and/or function
  action or maintenance.
- **Severe Condition** - severe deterioration, structurally uns
  imminent failure and possible threat to human safety.

3. Assessment Results

Using CCRC's Roadsoft data, 32 culverts were identified for fiel
found to be within the size range specified in the in the culvert
rated and cataloged per the criteria listed above. The 32 culverts
rating:

- Good Condition – 17
- Fair Condition - 11
- Poor Condition - 4
- Severe Condition – 0

LRE | 2121 3 Mile Rd. | Walker, Michigan 49544 |

Page 3

According to the TAMC Non-NBI Culvert Structure Inspection Guide, the following measures are recommended per culvert rating:

- Good Condition – No improvement necessary, inspect a minimum of 72 month intervals
- Fair Condition – No improvements necessary, inspect a minimum of 48 month intervals
- Poor Condition – Improvements needed, inspect minimum of 24 month intervals
- Severe Condition – Improvements/replacement needed, inspect minimum of 12 month intervals

4. High Priority Culvert Improvement Recommendations

(837) Muskrat Creek and W. Dexter Trail Crossing

Muskrat Creek runs from South to North before crossing W Dexter Trail via a double pipe-arch culvert each with a height of 120 inches and width of 196 inches. The west barrel is in fair condition; however the east barrel is in severe condition with significant heaving throughout the flow line. The invert of the culvert is no longer performing properly as a pipe arch. This heaving affects the hydraulic performance of the structure. Due to this, the downstream portion of the culvert is 0.2 feet higher than the upstream. The Bank riprap has shifted to interfere with the flow of the drain.

Recommendation

- Culvert was replaced by CCRC after the assessment

Cost analysis:

- Not performed with this study

(728) Dallas and Bengal Drain and W. Walker Road Crossing

The Dallas and Bengal Drain flows from south to north before crossing W Walker Rd via a culvert with a height of 60 inches and width of 84 inches. This culvert has been classified as poor due to the significant crushing, with deformation of up to a foot from original design showing the culvert is highly damaged. Furthermore, the barrel is misaligned with tipping towards the east. This results in increased flows throughout this portion of the culvert and will lead to an increased rate of deterioration. The culvert has high sedimentation levels throughout, with rust forming below the scour line. The exact condition of the invert of the culvert is unknown but due to corrosion on sidewalls, heavy corrosion is likely.

Recommendation

- Full-Replacement

Cost analysis:

- $80,000 (see attached)

LRE | 2121 3 Mile Rd. | Walker, Michigan 49544 | Phone: 616.301.7888 | www.LREMI.com

EFFECTIVE REPLACEMENT STRATEGIES

Inventory data directly supported real-world decisions

Implementation strategies

- Drain Office coordination
- Alternate material bids

STATE OF MICHIGAN
COUNTY OF CLINTON

AGREEMENT REGARDING IMPROVEMENTS TO THE KLOECKNER & FULLER CREEK AT GRANGE ROAD

WHEREAS, The Kloeckner & Fuller Creek is a legally established county drain under the jurisdiction of the Clinton County Drain Commissioner (the "Drain Commissioner") and traverses Section 32 and 33 in Dallas Township; and

WHEREAS, Grange Road crosses over the Kloeckner & Fuller Creek by an existing culvert; and

WHEREAS, Grange Road is currently closed to traffic due to a washout of the existing culvert crossing during a rain event on April 3, 2025; and

WHEREAS, pursuant to Section 196(8) of the Drain Code of 1956, Act 40, Public Acts of Michigan, 1956, as amended (the "Drain Code") the Drain Commissioner may expend funds to alleviate an emergency condition that exists that endangers the public health or property within the drainage district; and

WHEREAS, the Clinton County Road Commission (the "Road Commission") is the owner of the Grange Road culvert crossing and the Drain Commissioner is undertaking a project to restore the flow of the drain and reopen the roadway to traffic; and

WHEREAS, the Road Commission, has contracted with TL Contracting Inc and Land and Resource Engineers, Inc. to prepare plans, supply and install all necessary materials to replace the culvert crossing and reopen the roadway

WHEREAS, the Road Commission has requested the assistance of the Drain Commissioner in coordinating the replacement of the Grange Road culvert over the Kloeckner & Fuller Creek (the "Project"); and

WHEREAS, Section 431 of the Drain Code permits the Drain Commissioner to enter into an agreement with public corporations, including the Road Commission, for the Project.

NOW, THEREFORE, IT IS HEREBY AGREED THAT:

1. The Drain Commissioner, on behalf of the Kloeckner & Fuller Creek Drainage District, will assist in the administration of the Project, and because the cross sectional area of the crossing is not being decreased, a permit from the Michigan Department of Environment, Great Lakes, and Energy is not expected to be required and all of the Drain Commissioner's applicable exemptions may be utilized.

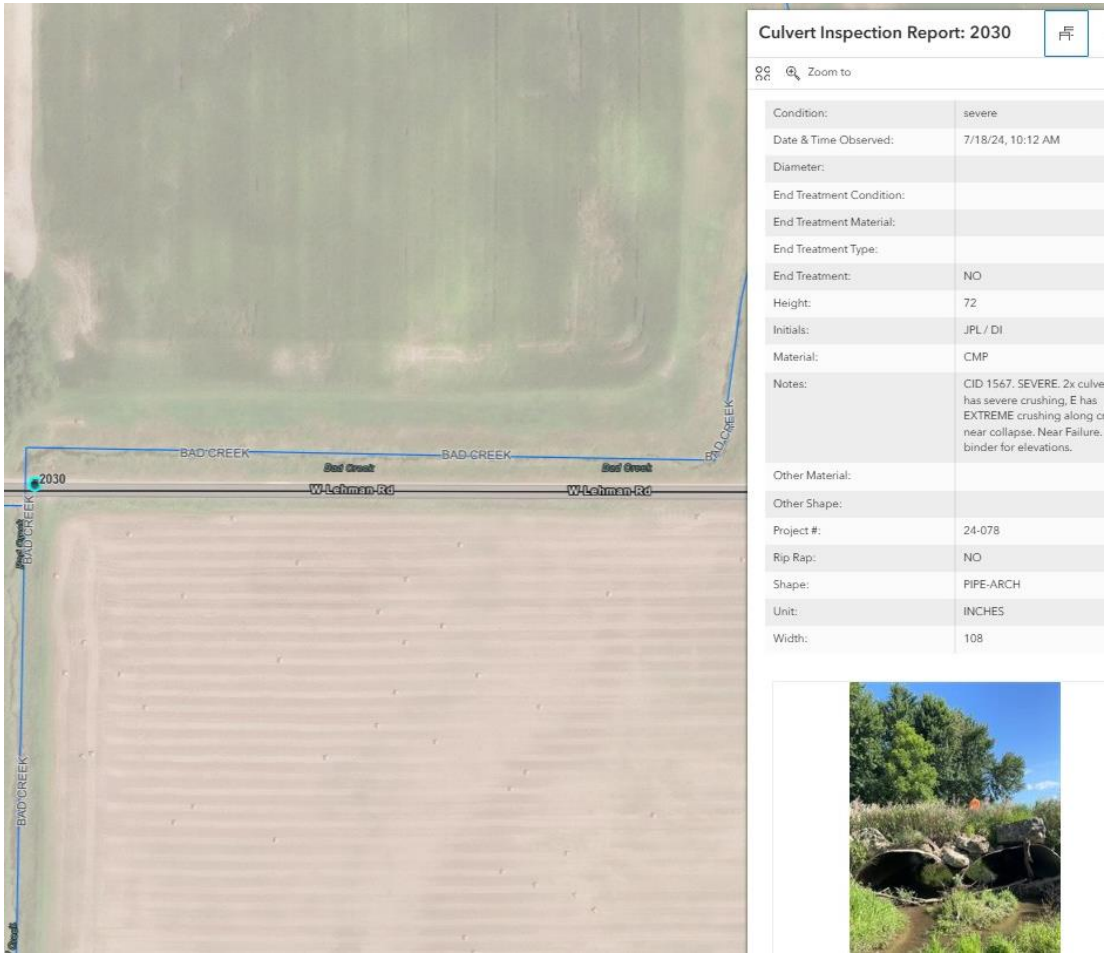
2. The Road Commission will cover all project expenses, including design and construction engineering, contracted construction services, labor and materials. The Road

Implementation strategies

- In-house crews
- As-needed contractors & consultants

Inventory data prevented unnecessary closure on Lehman Road

- Historical photos confirmed stability
- Reduced load; road remained open
- Decision support using inventory



Townships used prepared reports to guide decisions

- Report was ready, available for township use in decision-making

(1567) Bad Creek and W. Lehman Road Crossing

The Bad Creek flows from south to north before crossing W. Lehman Road via a double culvert with heights of 72 inches and widths of 108 inches. Both culverts are in poor condition due to the severe joint separation and deflection upwards of 2 feet. The east barrel is experiencing crushing from the top and buckling along the invert. This failure is causing large amounts of infiltration and base material exposed, resulting in a culvert rating of severe. The west barrel also has severe crushing with high stress on joints and a small amount of separation in the middle. There is little corrosion, some localized pitting and general rust. Both culverts are near failure and should be replaced.

Recommendation:

- Full-Replacement

Cost analysis:

- $275,000 (see attached)

Grange Road responded faster because inventory data already existed

- Emergency washout; replaced in 60 days
- Inventory enabled immediate design basis

The road was reopened in 60 days using existing inventory data

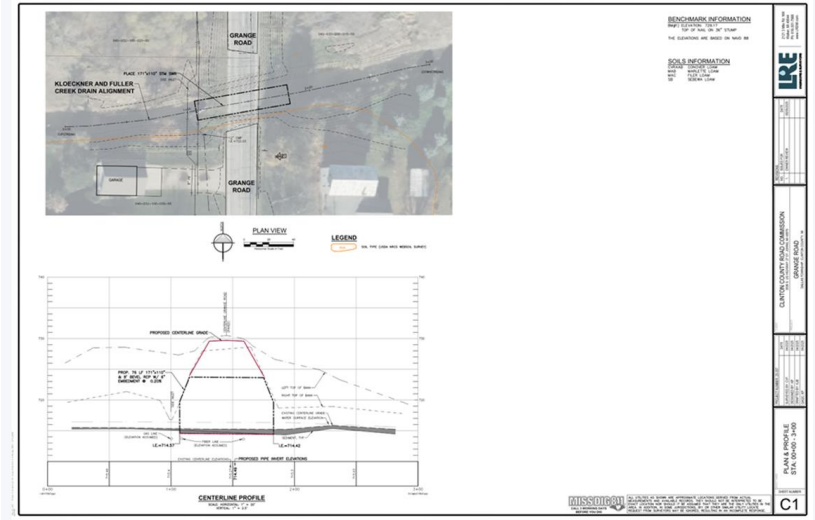
4/3/25 – Culvert washed out during rainstorm

4/5/25 – Sizing confirmed & requested material quotes

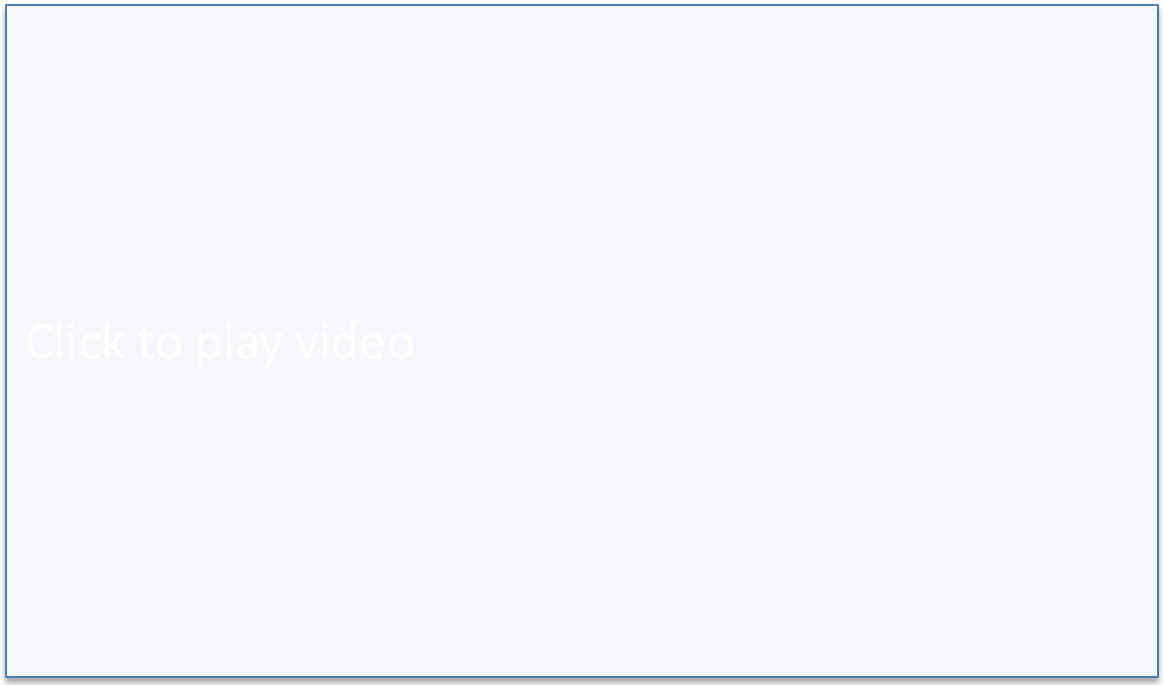
5/12/25 – CMP replacement delivered

6/1/25 – Road open to traffic

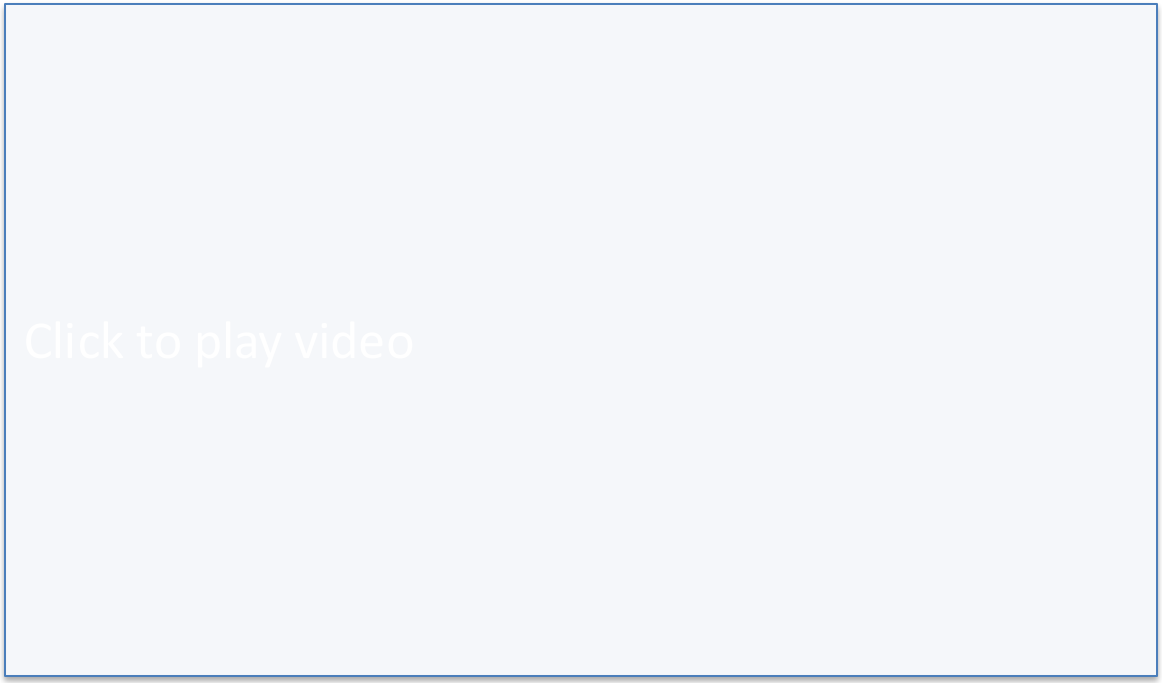
$190k total



CCRC Grange Rd Emergency culvert replacement video



CCRC Dexter Trail over Muskrat Creek replacement video

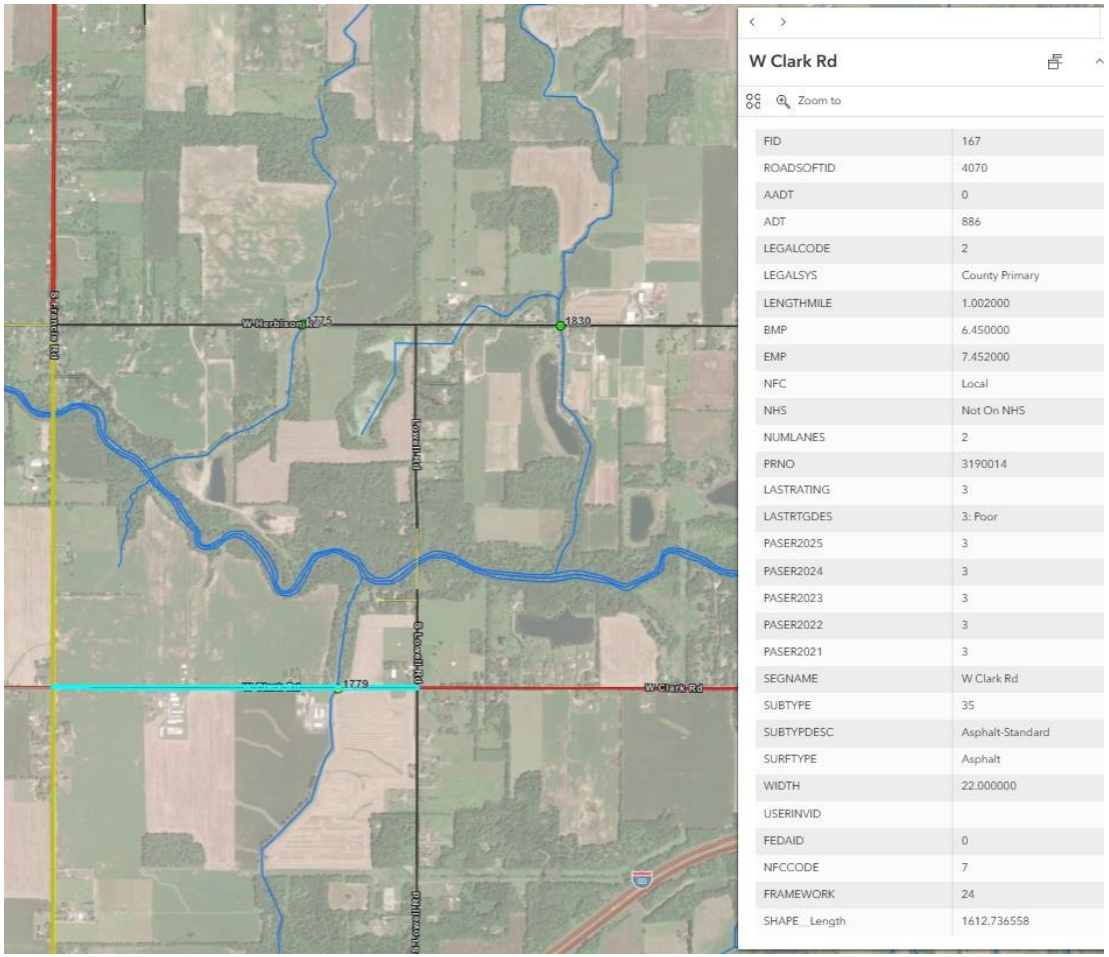


CULVERT DATA NOW SUPPORTS BROADER ASSET MANAGEMENT EFFORTS

Assessment data as a foundation for integrated asset management

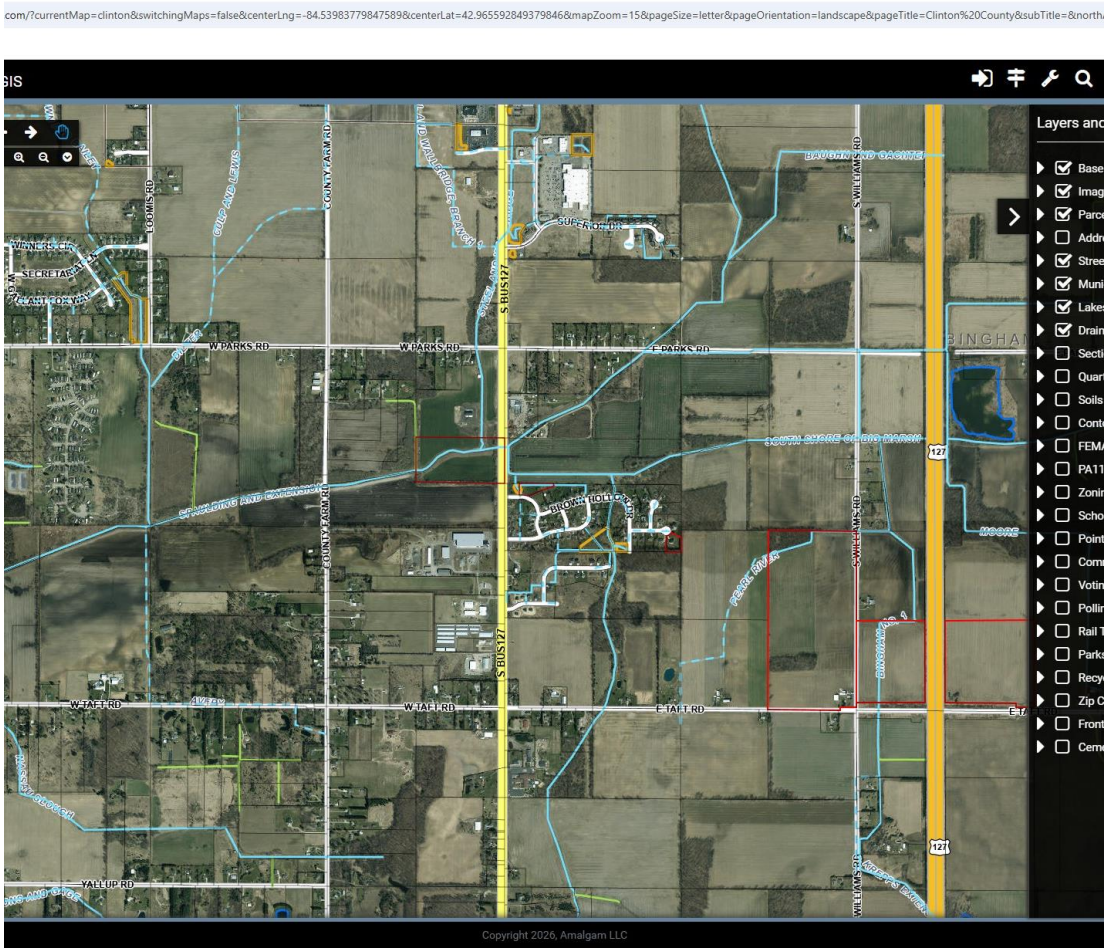
Combining culvert, bridge, and road data improves prioritization

- Import MiBRIDGE data
- Poor culvert + poor road = highest priority
- Efficient capital planning



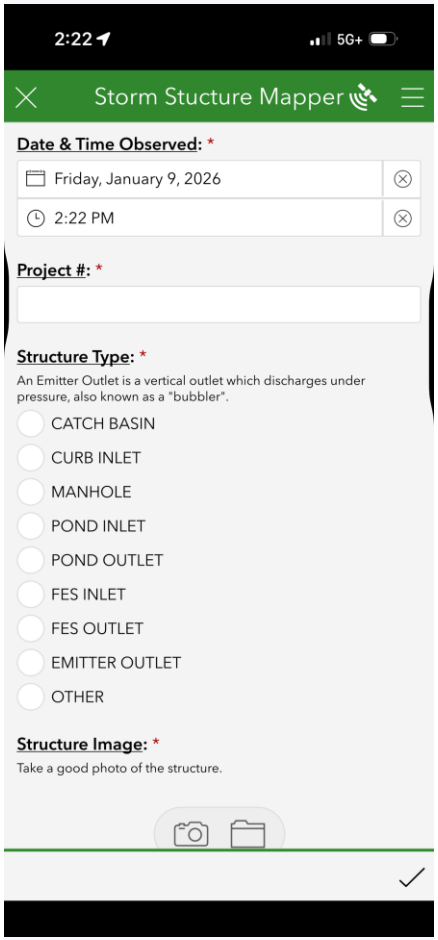
A shared GIS platform improves coordination across the county

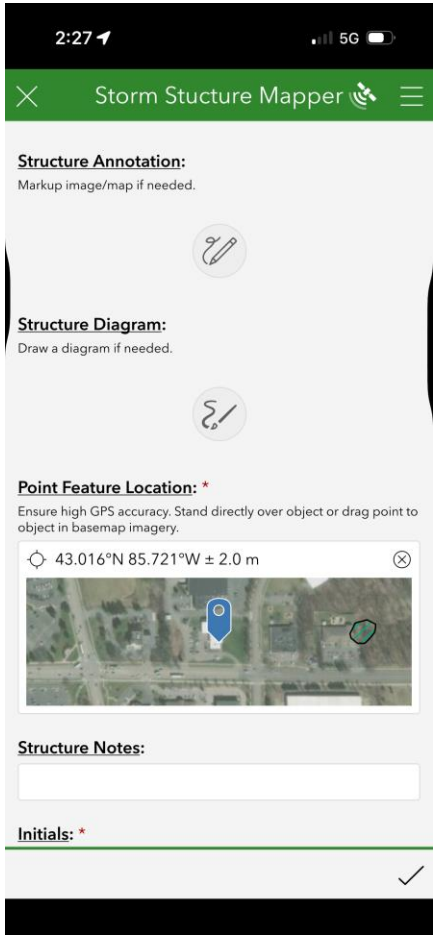
- Immediate access to shared layers via ArcGIS
- ROW, parcels, drains, FEMA, soils



The same GIS framework supports storm structures and MS4 needs

- CB inspection, GPS, photos, documentation
- Supports MS4 permit requirements





Proactive data collection prevents reactive failures

- Proactive data prevents reactive failures
- Link to CCRC ArcGIS Site

Culvert replacement funding strategies

- Consider potential non-governmental organization partners in your area for both inventory and implementation
- Nonprofits may have access to different grant sources or private funding to protect cold water streams, facilitate fish passage, restore watersheds or address water quality and temperature concerns
- May be considered local match

MICHIGAN TROUT UNLIMITED

Conservation Resource Alliance