Culvert Inspection Program and Replacement Projects Case Studies

Washtenaw County Road Commission Presenters
Aaron Berkholz, PE
James Hui
What are culverts?

• A channel that allows water to flow under the road

• Per MDOT, Culvert size is typically under 20’ span
Type of Culverts

- They come in many shapes and materials
  - Shapes: Circular, Box, Pipe Arch, Arch
  - Materials: Plastic, Metal, Aluminum, Concrete
Managing Culverts - Why is it important?

- Prevent culvert/road failures
- Advance Budgeting
- Inform the local officials and residents
- Coordinate with major construction
Over 12 regional media outlets covered the Braun Road failure.
Unconventional Fixes

Old US 12 Road Culvert
Hitchingham Road Culvert

- Culvert ID: C2017006
- Size: 17’ Span x 24’ Length
- Type: Jack Arch over Concrete Abutments
- Condition: Closed
Hitchingham Road Culvert
Hitchingham Road Culvert
How many culverts are in your county?

A. Less than 1000
B. Between 1000-2000
C. Over 2000
D. More than I can count on one hand
Set up a poll with Pete. Include multiple choice.
Washtenaw County Culvert Data

- Total of 2410 documented culverts
In the beginning there was paper...... and it was good.

BOOK No. 1
House & Culvert Survey 1954

Twps #
1. Salem
2. Northfield
3. Webster
4. Dexter
5. Lyndon

Culvert Book - 1954
History of Asset Management – 1950’s

Culvert Book - 1954
History of Asset Management – 1950’s

Culvert Book - 1954
History of Asset Management – 1990’s

Culvert Book - 1996
<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DATE</th>
<th>INSPECTED</th>
<th>EXPLANATION OF CONDITIONS</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>West End: 18&quot; CIP -&gt; 1/2 Full of Dirt. East End: 24&quot; CIP -&gt; 1/2 Full of Dirt. 24&quot; Drain -&gt; Culvert Still Appears to Work.</td>
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<td>1. DECK</td>
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<td>2. GUTTER</td>
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<td>3. CURB</td>
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<td>4. SIDEWALK</td>
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<td>5. PAVEMENT</td>
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<td>6. ALIGNMENT</td>
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<td>8. A VENUE</td>
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<td>9. DRAIN</td>
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<td>10. GUTTER</td>
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<td>11. DECK</td>
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<td>12. GUTTER</td>
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</tbody>
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**Recommendations:**

- Clean debris in pipe under sidewalk.
- Channel should be cleaned out. Mucular water is forming near pipe in generally good condition. New general is recommended.
- Roadway in poor condition - Roadway drainage is poor.
Culvert Inspection

- Professional Inspection: Great Lakes Engineering
- 4 year inspection cycle for all culverts
- 2 year inspection cycle for critical culverts
Management Software

- Roadsoft – GIS Mapping Tool
  - Created by Center for Technology & Training
From Paper to Server

- Conversion of paper documentation
- New data (Existing and Replacement)
  - Interns
  - District Foremen
  - Proposed culvert replacement
Has your agency determined how many culverts to replace this upcoming year?

A. Yes
B. No
C. Working on them now
D. We usually decide when problem arises
Work with Pete on a poll

Hui, James, 2/4/2021
All culverts in Washtenaw
Augusta Township, Washtenaw
Roadsoft

Bridge Safety Inspection Report

Facility: Hitchingham Rd  
Federal Structure ID:  
Inspector Name: Ryan Lefere  
Agency/Consultant: OLEG  
Inspection Date: 11/17/2017

Feature: Stony Creek  
Location: Augusta Twp, Sect 17  
Latitude:  
Longitude:  
Struc Num: C2017005  
InspFreq: 24  
Insp Key:  
Legend:
- 9: New  
- 7-8: Good  
- 5-6: Fair  
- 3-4: Poor  
- 2 or less: Critical

Deck

1. Surface
   STA-56A
   - Graded gravel over concrete. Outside 3' of deck surface closed. Barrels utilized to close shoulders. Missing barrels along both railings.

2. Expansion Jts
   N

3. Other Jts
   N

4. Railings
   1
   - Railing attached to fascia channels. Both fascia channels have failed, therefore railings have no support.

5. Sidewalks or Curbs
   N

Culvert Report
Replacement Priorities

- Budget for design and construction
- Township agreements
- Guardrails
- Primary Road vs Local Road
- Haul/Truck Route
Planning for Replacement

Time/Cost Factors
- EGLE Permits
- Drain Commission Permits
- ROW Needs
- Utility Conflicts
Cost Efficiency Methods

- Ordering multiple culverts
- Packaging multiple culverts for bid
- Packaging culverts with nearby projects
To be Successful, It Takes a Village
THANK YOU!
Halbert Road Culvert Replacement

2021 COUNTY ENGINEERS WORKSHOP
TODAY’S Presentation

+ SAMUEL LEATCH, P.E.
  WIGHTMAN & ASSOCIATES, INC.
  PROJECT MANAGER
PROJECT LOCATION

+ HALBERT ROAD OVER WAUBASCON CREEK
+ BEDFORD CHARTER TOWNSHIP
+ CALHOUN COUNTY

+ ±5 MILES NORTHWEST OF BATTLE CREEK
PROJECT LOCATION

- HALBERT ROAD OVER WAUBASCON CREEK
- BEDFORD CHARTER TOWNSHIP
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ORIGINAL CROSSING

- THREE 36-INCH CMP CULVERTS
- TWO 12-INCH CMP CULVERTS
- ±62 FEET IN LENGTH
- ORIGINAL CULVERTS WERE ALIGNED DOWNSTREAM, HOWEVER, WERE ±30-DEGREES MISALIGNED UPSTREAM
- ROADWAY HAD A SLIGHT BEND AT THE LOCATION OF THE CROSSING
ORIGINAL ALIGNMENT

±30°
ONE OF THE CULVERTS HAD FAILED
BACKFILL WAS CONTINUOUSLY FALLING INTO THE CULVERT CAUSING PAVEMENT FAILURE
REQUIRED ROUTINE HMA PATCHING
EROSION UPSTREAM OF CULVERTS
ALTERNATIVE ANALYSIS

+ ALTERNATIVE 1 – DO NOTHING
  • MAINTAIN EXISTING CROSSING
  • NOT ACCEPTABLE DUE TO SAFETY CONCERNS

+ ALTERNATIVE 2 – CLEAR SPAN BRIDGE
  • ±60 FOOT SPAN FROM BANK TO BANK
  • FREEBOARD CLEARANCE CONCERNS DUE TO THE LOW PROFILE OF THE ROADWAY
  • INCREASED WETLAND IMPACTS
  • ESTIMATED CONSTRUCTION COST: $750,000
ALTERNATIVE ANALYSIS

+ ALTERNATIVE 3 – TRADITIONAL CULVERT
  • STRAIGHT CULVERT
  • WOULD NOT SOLVE ALIGNMENT ISSUES
  • EROSION/SCOUR CONCERNS DUE TO THE MISALIGNMENT OF THE CULVERT

+ ALTERNATIVE 4 – CURVED CULVERT
  • UNIQUE SOLUTION THAT COULD SOLVE ALIGNMENT ISSUES
  • MITIGATE EROSION/SCOUR CONCERNS
  • COST EFFECTIVE
PROPOSED DESIGN

+ 20-FOOT BY 5-FOOT CURVED CONCRETE BOX CULVERT
+ 23 TOTAL CONCRETE BOX SECTIONS
+ 15 SKEWED SECTIONS (5-DEGREE SKEW)
+ 8 STANDARD STRAIGHT SECTIONS
+ ALIGNED THE CULVERT WITH BOTH THE UPSTREAM AND DOWNSTREAM SECTIONS OF THE CREEK
+ 1-FOOT OF NATIVE MATERIAL WITHIN CULVERT TO PROVIDE A NATURAL STREAM BOTTOM
+ INSTALL RIPRAP AT INLET/OUTLET TO MITIGATE EROSION CONCERNS
+ CUSTOM GUARDRAIL DESIGN TO ENSURE GUARDRAIL POSTS DID NOT INTERFERE WITH THE CULVERT JOINTS
+ RE-ALIGN ROADWAY TO REMOVE THE SLIGHT BEND
PROPOSED ALIGNMENT
DURING CONSTRUCTION
SIDE-BY-SIDE
PROJECT SUMMARY

+ PROJECT SUCCESSES
  - MINIMIZED WETLAND IMPACTS
  - PROVIDE PROPER ALIGNMENT
  - REDUCED SCOUR POTENTIAL
  - IMPROVED ROADWAY SAFETY

+ PROJECT STATS
  - CONSTRUCTION START: JULY 15, 2019
  - FINAL COMPLETION: AUGUST 30, 2019
  - 2 DAYS TO INSTALL THE STRUCTURE
  - AWARDED BID: $308,555
AWARDS

+ MICHIGAN CONCRETE ASSOCIATION’S 2020 MICHIGAN AWARDS OF EXCELLENCE
  • CATEGORY: STRUCTURAL – TRANSPORTATION
  • OVER 50 PROJECTS SUBMITTED
PUBLICATIONS

Crossroads

AROUND THE BEND: CALHOUN COUNTY’S S-SHAPED CULVERT EARNHS HONORS

IN THIS ISSUE:
- Case County using software to separate roads
- MDE’s virtual town hall meeting on road issues

PIPELINE

2020 MACDC INNOVATION & EXCELLENCE AWARDS
MICHIGAN’S DRAIN BUFFER STRIP PROGRAM PROJECT
NEW DRAIN AND WATER RESOURCES MAINTENANCE SECTION

CrosSection

SUMMER 2020
PARTNERSHIPS

- **OWNER** - CALHOUN COUNTY ROAD DEPARTMENT
- **PERMITTING AGENCY** - MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES & ENERGY
- **SUPPLIER** - NORTHERN CONCRETE PIPE
- **PRIME CONTRACTOR** - BALKEMA EXCAVATING
- **ENGINEER** – WIGHTMAN & ASSOCIATES, INC.
WIGHTMAN SERVICES PROVIDED

- ENGINEERING
- SURVEYING
- CONSTRUCTION STAKING
- DRONE AERIAL IMAGERY
QUESTIONS?

- SAMUEL LEATCH, P.E.
  WIGHMAN & ASSOCIATES, INC.
  PROJECT MANAGER
  (269) 487-9106
  SLEATCH@GOWIGHTMAN.COM