



Drainage Master Plan Study Results

City of Beavercreek

October 13, 2025





AGENDA

- Introduction
- Background Data
- Field Data Collection
- Condition Assessment Results
- Modeling Results
- Project Prioritization and Costs
- Summary

WOOLPERT IS THE FASTEST-GROWING GLOBAL AEG FIRM



1911

Founded
Dayton, Ohio

3,000+
staff

75+
offices

5
continents

13 companies acquired
in 5 years (6 international)

100,000+
projects completed
across 5 continents and **50** states



Client
Referral
Rate



8 Years



8 Years
(#8 in 2024)



ENDORsing
GISCI Endorsing Employer, GIS
Certification Institute (GISCI)



2025 ENR
Top 500 Design
Firms (#39)

2024 ENR
Top 25 Design Firms,
Sanitary and Storm
Sewers (#17)

2024 ENR
Top 50 Engineering
Firms, Trenchless
Technology (#21)

Esri Gold
partner

Planet
partner

Trimble
partner

Frequent
ERDC partner

HBCU
partner

WOOLPERT WATER MARKET SERVICES



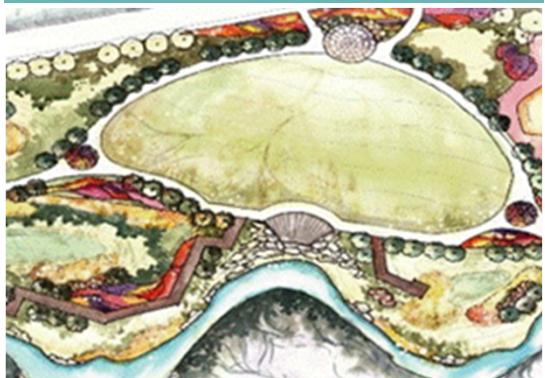
Watershed Planning
River Restoration Design
MS4 Compliance
Watershed Monitoring
Stormwater Master Plans
BMP Design/CA/Testing
Floodplain Modeling



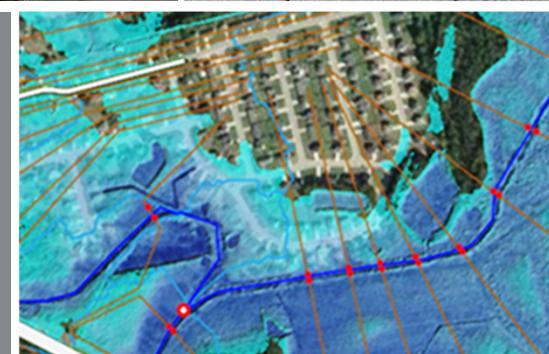
Stormwater Program Management
Stormwater Utility Development
Continuous Surface Water Monitoring



BMP Design/CA/Testing
Green Infrastructure Design
Resiliency Planning



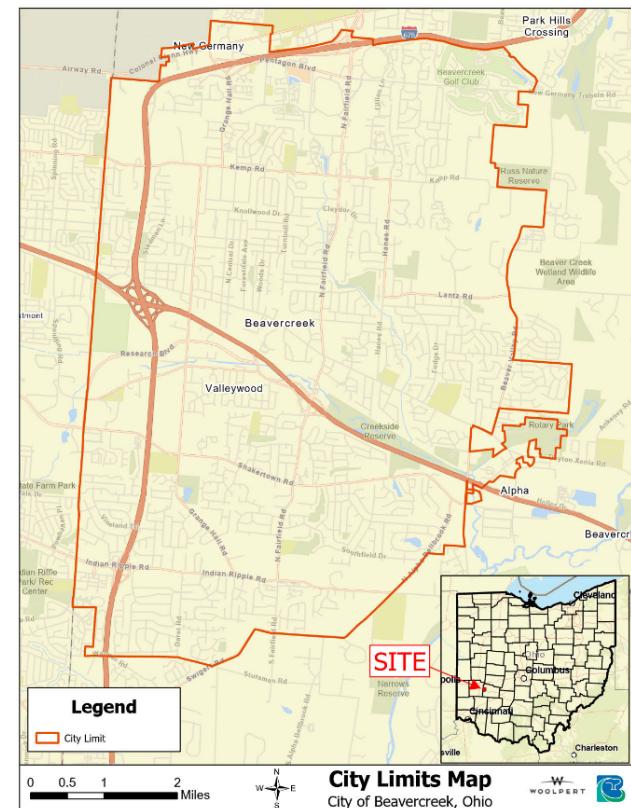
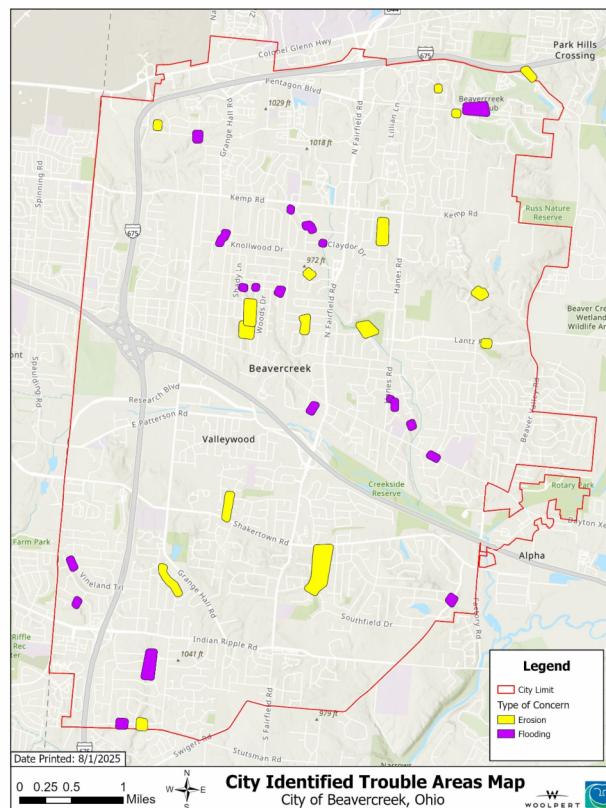
Condition Assessment
Field Inspection
Asset Management
Collection System Design
Storm & Sanitary CIPs
Collection System Evaluation
Water Distribution Design
Construction Management



SWPPP Reviews
Watershed Modeling
H&H Modeling

BACKGROUND DATA

- First study completed since 1983 Stormwater Management Study
- 26.5 square miles
- City GIS data
 - 5.5 miles of Public streams
 - 16.5 miles of Private streams
 - Trouble areas
 - Storm network



FIELD DATA COLLECTION

Field Data Collection Manual



City of Beavercreek, Ohio
February 2025

4. FIELD DATABASE DICTIONARY

4.1 NODES

Stream Inspection SubType	
Stream Inspection	
ObjectID	unique id automatically assigned by data collection software
INSPECTIONDATE	enter date of inspection
OBSERVATION	select from Start, End, Start of Defect, End of Defect or Defect
TYPEOFTANALYSIS	select from: Sediment Accumulation, Erosion, Bank Failure, Debris Blockage, Utility Crossings, or Evidence of Illicit
BEDMATERIAL	select from Dirt, Grass, Riprap, Asphalt, Geotextile, Vegetation, or Concrete
BANKMATERIAL	select from Dirt, Grass, Riprap, Asphalt, Geotextile, Vegetation, or Concrete
LOCATIONOFDEFECT	select from Above, Center, Upstream Left, Upstream Right, Entire Width of Stream, or Other
SEDACCUMULATION	select from 0%, 25%, 50%, 75%, or completely blocked
PRESENCEOFREROSION	1-All banks are condition 1 unless otherwise noted 2-Some evidence of erosion 3-Some evidence of failure 4-Existing bank failure impacting public or private property 5-Existing bank failure impacting roads, utilities, or other infrastructure
THREATINFRASTRUCTURE	From None, Headwall, Pipe, Road, House, Business, Bridge Abutment, Outfall, Utility, Sidewalk, Ancillary Structure, Fences, or Other
TYPEOFBLOCKAGE	select from sediment, trees, trash and debris, rocks, beaver dam, or man-made structures
PERCENTSTREAMBLOCK	select from 0%, 25%, 50%, 75%, or completely blocked
Accessibility for Assessment	1-Ditch is fully accessible for assessment 3-Ditch segment is inaccessible

Structural Condition Score	1-No visible signs of erosion 2-Some bank erosion 3-Bank failure has occurred or is imminent
Maintenance Condition Score	1-Ditch does not need maintenance 2-Ditch requires routine maintenance 3-Ditch needs immediate maintenance to restore functionality
STNDRDCOMMENTS	select from Abandoned, Private System, Overgrown, Concrete slab - no manhole (id), Buried, Submerged, Tide backflowing into inlet, Too Heavy to Open, Not Found, Inaccessible, Bolted or Otherwise Sealed Shut, Traffic Control Needed, Under Construction, Filled with Sediment or Debris, No MH Lid, Dog, Fence, Denied Access by Owner, Immovable object on structure, No MH
COMMENTS	enter additional comments
DATASOURCE	select from GPS - Mapping Grade, GPS - Survey Grade, Traditional Survey, As-Built, Plans/Drawing, Other
PHOTO	take photo of inspection
Culvert Inspection Sub Type	
Culvert Inspection	
ObjectID	unique id automatically assigned by data collection software (marked on each structure using paint or paint pens)
INSPECTIONDATE	select current date (will be populated with date, select "Ok")
ENDTYPE	select from 90° Pipe Cut, Bell, Socket, Beveled, Flared, Headwall, Endwall, Other
ENDMATERIAL	select from RCP, CMP, BCMP, Brick, Clay, Concrete, DIP, SLHOP, HOP, Metal, PVC, Rubble Masonry, Stone, Wood, Other
PIPESHAPE	select from Circular, Rectangular, Elliptical, Arched, Other
ENDDIAMETER	select from 6, 8, 10, 12, 15, 18, 21, 24, 27, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96, 102, 108, 114, 120, 126, 132, 138, 144
ENDWIDTH	enter pipe width in inches (for non-circular)
ENDHEIGHT	enter pipe height in inches (for non-circular)
FLOWDIR	select from Upstream or Downstream End of Culvert
SURROUNDINGMAT	select from Asphalt, Concrete, Grass, Gravel, Dirt, Leaves, Pine Straw, Rip Rap, Brick, Water, Sand, Other
INVERTOFFSET	enter depth in feet from bottom of pipe to survey point.
Accessibility for Assessment	1-Culvert is fully accessible for assessment 3-Culvert segment is inaccessible for assessment
Structural Condition Score	1-Culvert shows no visible signs of deterioration, like new condition 2-Culvert shows some signs of deterioration 3-Failure of culvert has already occurred or is imminent
Maintenance Condition Score	1-Indicates that the culvert end does not need maintenance 2-Indicates that the culvert end exhibits issues and routine maintenance may be needed. 3-Culvert end needs immediate maintenance to restore functionality of the system
OVERALLCONDITION	1-Good Condition Overall 2-Moderate Condition (Over 25% blockage to 60%, minor erosion) 3-Severe Condition (60% blockage or above, sinkholes, undermining, headwall failure, etc...)
PERCENTCULBLOCK	select from 0%, 25%, 50%, 75%, or completely blocked
DATASOURCE	select from GPS - Mapping Grade, GPS - Survey Grade, Traditional Survey, As-Built, Plans/Drawing, Other
COMMENTS	input comments if needed
STNDRDCOMMENTS	select from Abandoned, Private System, Overgrown, Concrete slab - no manhole (id), Buried, Submerged, Tide backflowing into inlet, Too Heavy to Open, Not Found, Inaccessible, Bolted or Otherwise Sealed Shut, Traffic Control Needed, Under Construction, Filled with Sediment or Debris, No MH Lid, Dog, Fence, Denied Access by Owner, Immovable object on structure, No MH
PHOTO	take photo of culvert pipe end

- Culverts 24" and larger
- Open channels
- Trouble areas
- ESRI ArcGIS Online
- Inventory and condition assessment
 - Attribute data
 - Structural
 - Maintenance
 - Infrastructure threats



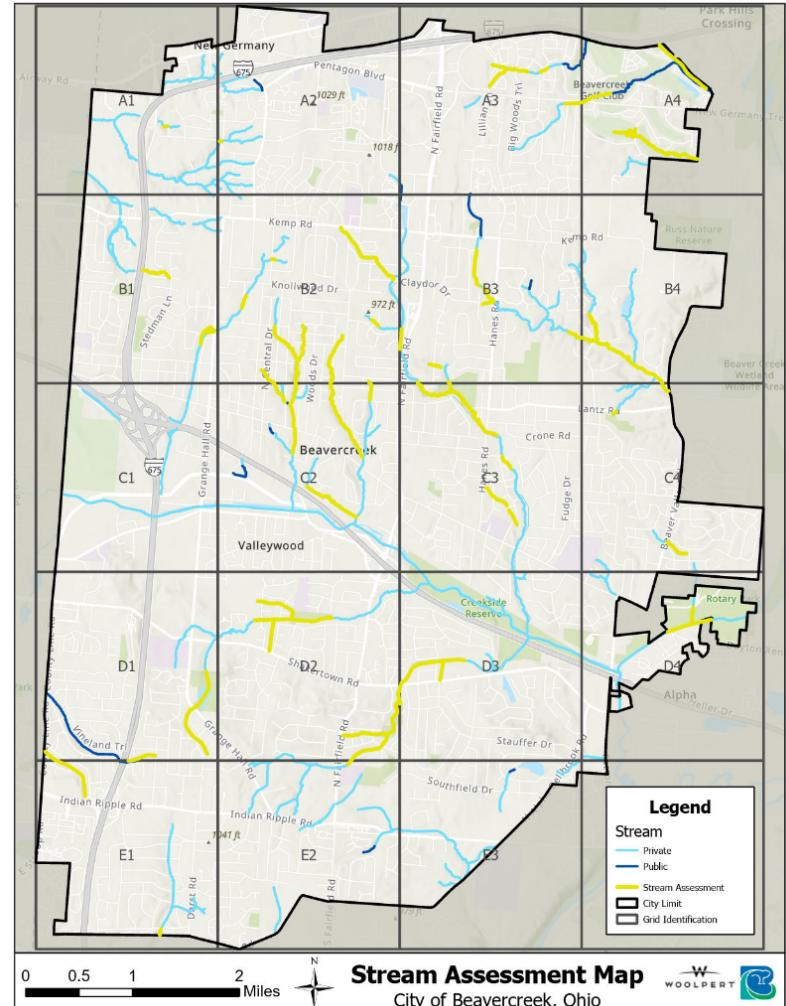
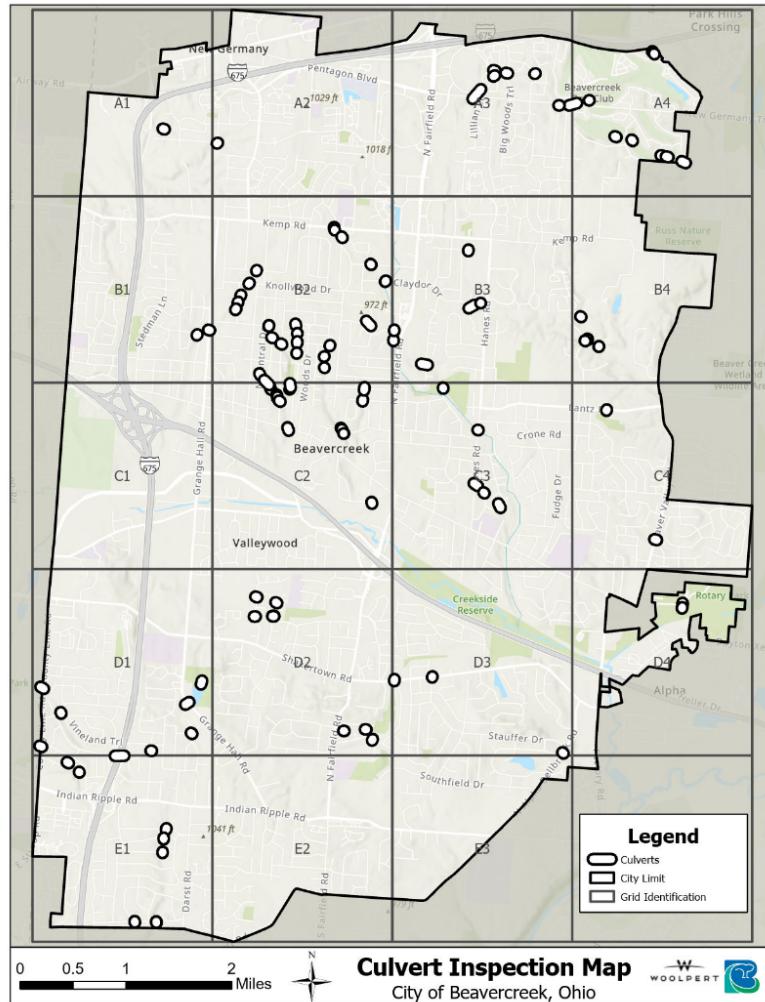
FIELD DATA COLLECTION ASSESSMENT CRITERIA

Culvert Assessment Scores			
Score	Accessibility for Assessment Score	Structural Condition Score	Maintenance Condition Score
1	Structure is fully accessible and visible	No visible signs of deterioration	Culvert end does not need maintenance
2		Some signs of deterioration	Culvert end exhibits issues and routine maintenance may be needed
3	Structure is not accessible or is not fully visible, follow up assessment is required	Failure has already occurred or is imminent	Culvert end needs immediate maintenance to restore functionality of the system

Stream Assessment Scores			
Score	Maintenance Condition Score	Structural Condition Score	Percent Stream Blockage
1	Channel or stream does not need maintenance	No visible signs of erosion	0%
2	Channel or stream requires routine maintenance	Some bank erosion	25% 50% 75%
3	Bank failure has occurred or is imminent	Channel or stream requires immediate maintenance to restore functionality	Completely Blocked



FIELD DATA COLLECTION INSPECTION LIMITS



FIELD DATA COLLECTION GIS DATA

Beavercreek Stream Assessment

Legend

- StreamInspection
- CulvertInspection
- Beavercreek City limits
- Trouble Area
- Stream Segment to Assess
- Ponds

4/8/2025, 11:17 AM

OBJECTID: 219

InspectorID: 4/8/2025, 11:17 AM

EndType: 90° Pipe Cut

EndMaterial: CMP

PipeShape: Circular

EndDiameter: 72

EndWidth:

EndHeight:

FlowDir: Downstream End of Culvert

SurroundingMat: Rip Rap

InvertOffset: 6.100000

AccessibilityForAssessment:

StructuralConditionScore: 1. Culvert fully accessible for assessment

MaintenanceConditionScore: 1. No visible signs of deterioration, like new condition

OverallCondition: 2. Moderate Condition (Over 25% blockage to 60% minor erosion)

PercentCulvBlock: 25%

DataSource: GPS Mapping Grade

Comments: Standard Comments

GlobalID: {95DF1EE4-7885-4C04-9526-6E0CF3F129FD}

created_user: Travis.Combell@woolport.com

created_date: 4/8/2025, 11:17 AM

last_edited_user: Victoria.Jenkins@woolport.com

last_edited_date: 4/9/2025, 10:18 AM

Pop-up

Conduits_final - B4_02

OBJECTID_1: 55

NameID: B4_02

USNode: Node 36

DSNode: Node 31

Length: 32.183512

Shape_1: Circular

Rise: 6

Span: 6

Manning_in: 0.024

USElevatio: 859.31

DSElevatio: 858

Slope: 0.040704

StruScore: 2

MaintScore: 2

EndMaterial: CMP

PerCulvBlock: 25%

Shape_Length: 32.183263

Grid: B4

PR_Struc: 2

PR_Main: 2

PR_Trouble: 1

PR_Mat: 3

PR_Model: 1

PR_Size: 1.5

PR_Average: 1.75

Final_Svc: Replace CMP with 72"

Measure: NaN

End: NaN

Maximum: NaN

Measure Values: NaN's

Parts: 1

All Measures Unknown: True

ATT424_US_04.jpg

9,333,198.18W 4,828.843N m

9,354,273.05W 4,828.843N m



CONDITION ASSESSMENT RESULTS

CULVERT CONDITION ASSESSMENT SUMMARY

- 120 culverts ~ 1.75 miles
- Structural Ratings
 - Good {1} – 48
 - Fair {2} – 59
 - Poor {3} – 13 (11%)
- Maintenance Ratings
 - Good {1} – 43
 - Fair {2} – 46
 - Poor {3} – 31 (26%)
- Material Consideration
 - Corrugated Metal Pipe – 33 (28%)

SUMMARY OF RATINGS

Grid	Segments (120 Total)	Length (ft)	Structural			Maintenance		
			3	2	1	3	2	1
A1	1	80	-	-	80	-	-	80
A2	1	44	-	44	-	-	44	-
A3	6	811	37	-	774	37	-	774
A4	10	924	-	523	401	112	388	424
B1	2	117	-	47	71	71	-	47
B2	27	1,765	501	783	481	722	603	440
B3	7	698	-	276	423	-	77	621
B4	11	320	-	76	244	44	62	214
C1	0	-	-	-	-	-	-	-
C2	14	980	185	538	257	208	537	235
C3	6	691	54	410	227	54	596	41
C4	2	153	101	-	52	101	-	52
D1	9	896	-	431	466	120	311	466
D2	9	598	54	262	283	270	256	72
D3	3	179	-	103	77	60	-	119
D4	2	105	-	105	-	-	105	-
E1	10	884	56	554	274	145	640	99
E2	0	-	-	-	-	-	-	-
E3	0	-	-	-	-	-	-	-
E4	0	-	-	-	-	-	-	-
Total (ft)		9,247	988	4,151	4,108	1,943	3,620	3,684
Total (mi)		1.75	0.19	0.79	0.78	0.37	0.69	0.70

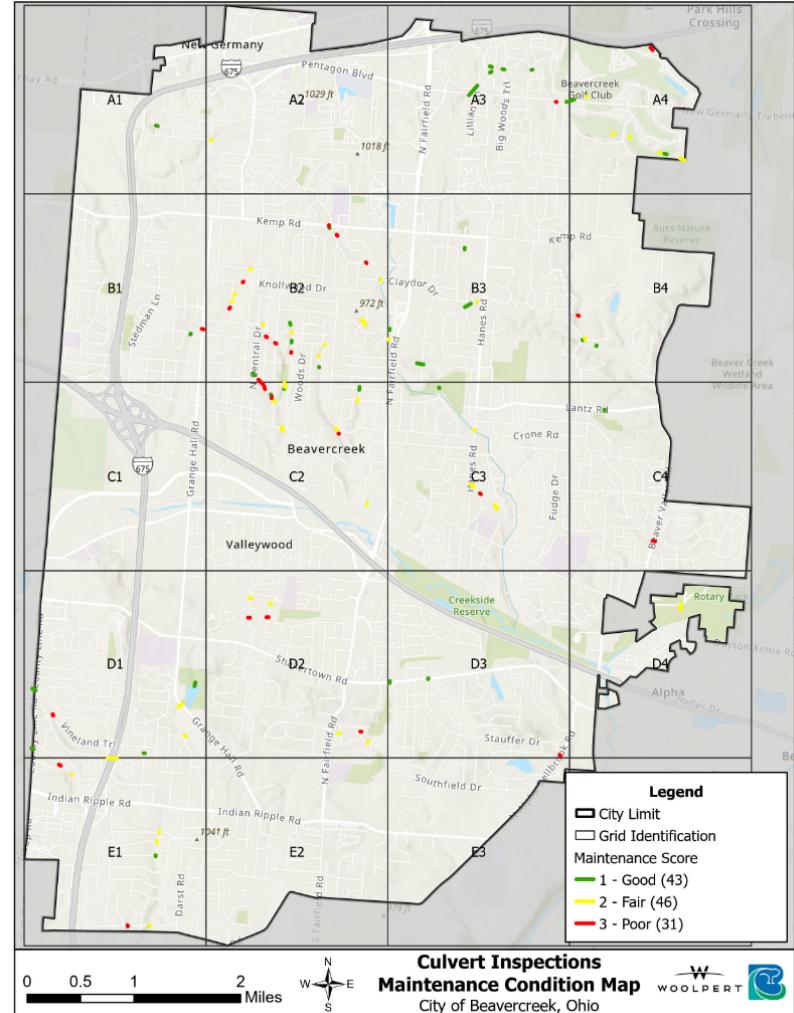
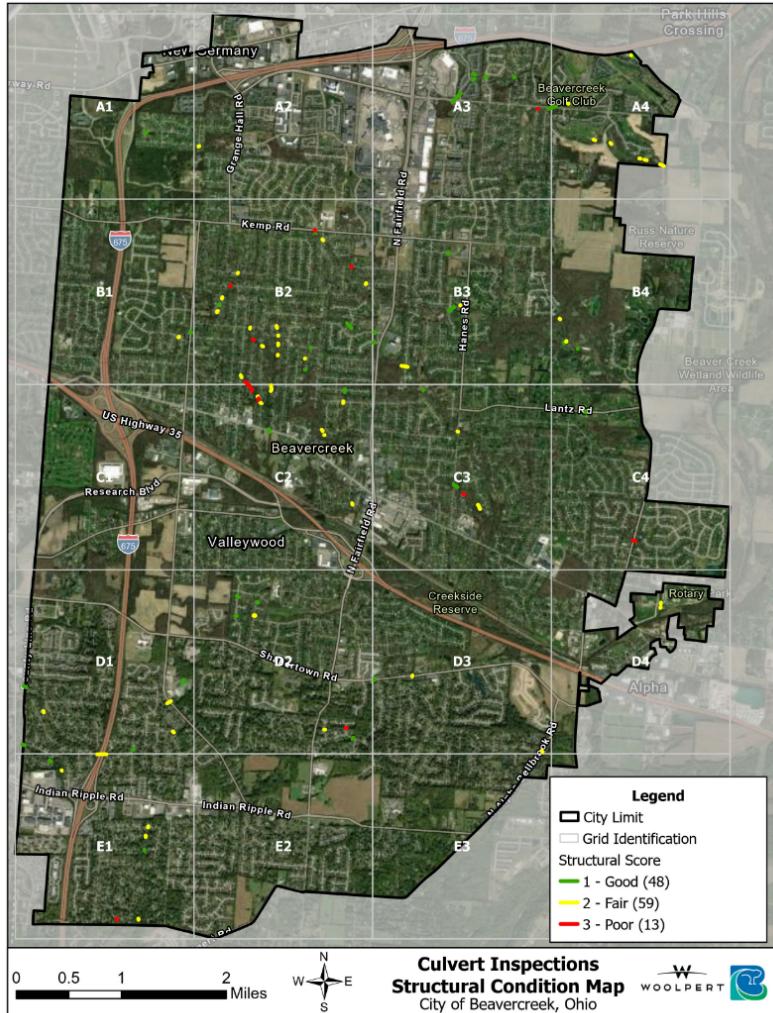
SUMMARY OF MATERIALS

Type	Quantity	Length (ft)	Length (mi)
CMP	33	2,425	0.46
RCP	74	6,013	1.14
SLHDPE	13	809	0.15
Total	120	9,247	1.75



CONDITION ASSESSMENT RESULTS

CULVERT CONDITION ASSESSMENT SUMMARY



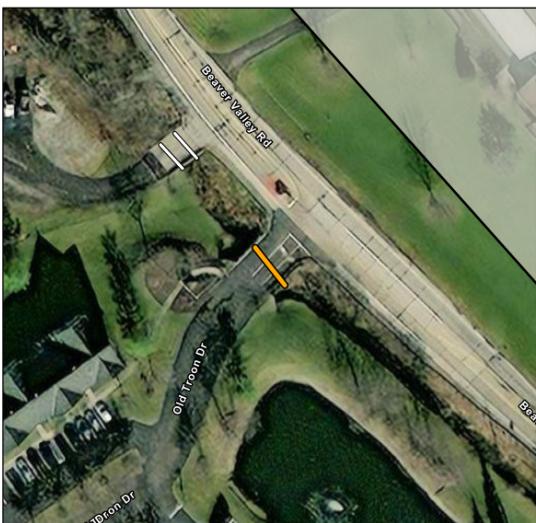
CONDITION ASSESSMENT RESULTS

CULVERT CONDITION ASSESSMENT SUMMARY

Culvert Cutsheets

Beavercreek Drainage Master Plan

CITY OF BEAVERCREEK, OH



Identification

Culvert ID: A4_03

Structure Attributes

Culvert Shape: Arch

Culvert Material: RCP

Culvert Rise (ft): 6

Culvert Span (ft): 28

Culvert Length (ft): 44



A1	A2	A3	A4
B1	B2	B3	B4
C1	C2	C3	C4
D1	D2	D3	D4
E1	E2	E3	E4

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Photos



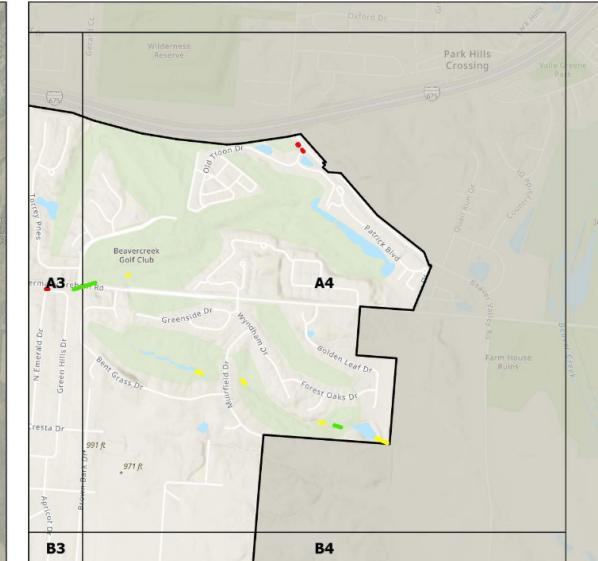
BEAVERCREEK DRAINAGE MASTER PLAN

CITY OF BEAVERCREEK, OH

Structural Condition

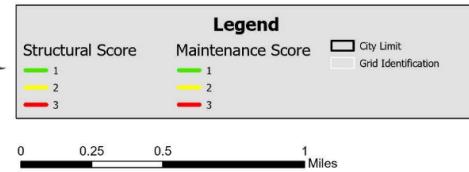


Maintenance Condition



Culvert Inspection Map

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8/5/2025



9/4/2025



CONDITION ASSESSMENT RESULTS

STREAM CONDITION ASSESSMENT SUMMARY

- 15.12 miles inspected
- Streams assigned to 200 LF or less segments
- Structural Ratings
 - Good {1} – 141
 - Fair {2} – 253
 - Poor {3} – 44 (10%)
- Maintenance Ratings
 - Good {1} – 145
 - Fair {2} – 230
 - Poor {3} – 63 (14%)
- Threats
 - 54 (12%) segments had a threat within 25'

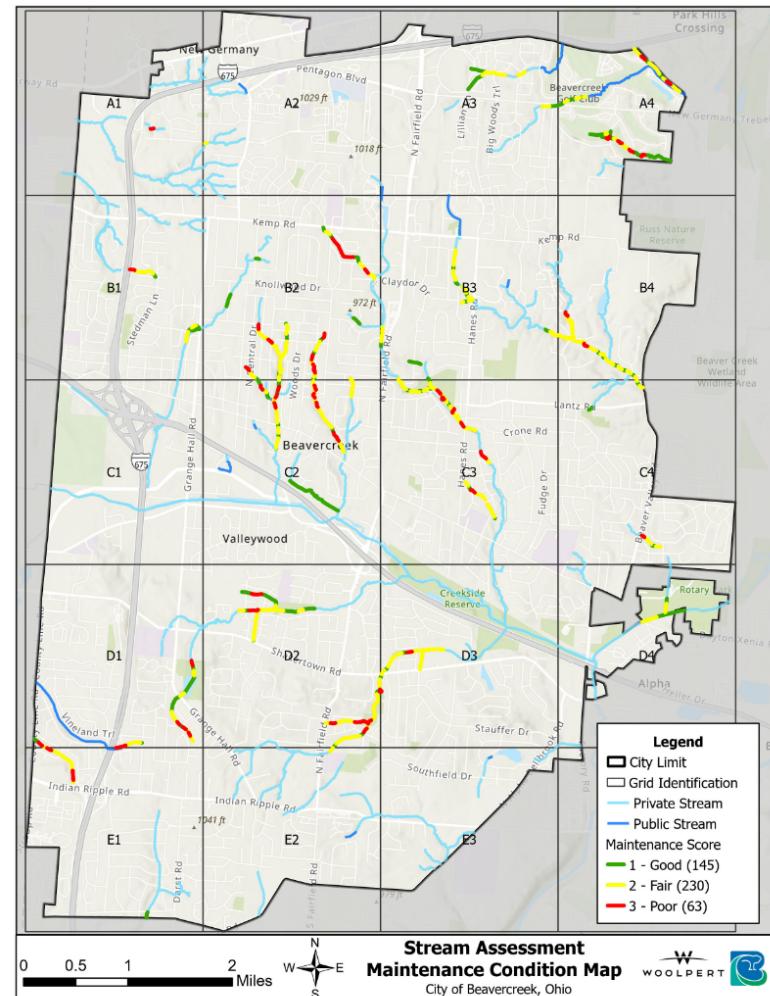
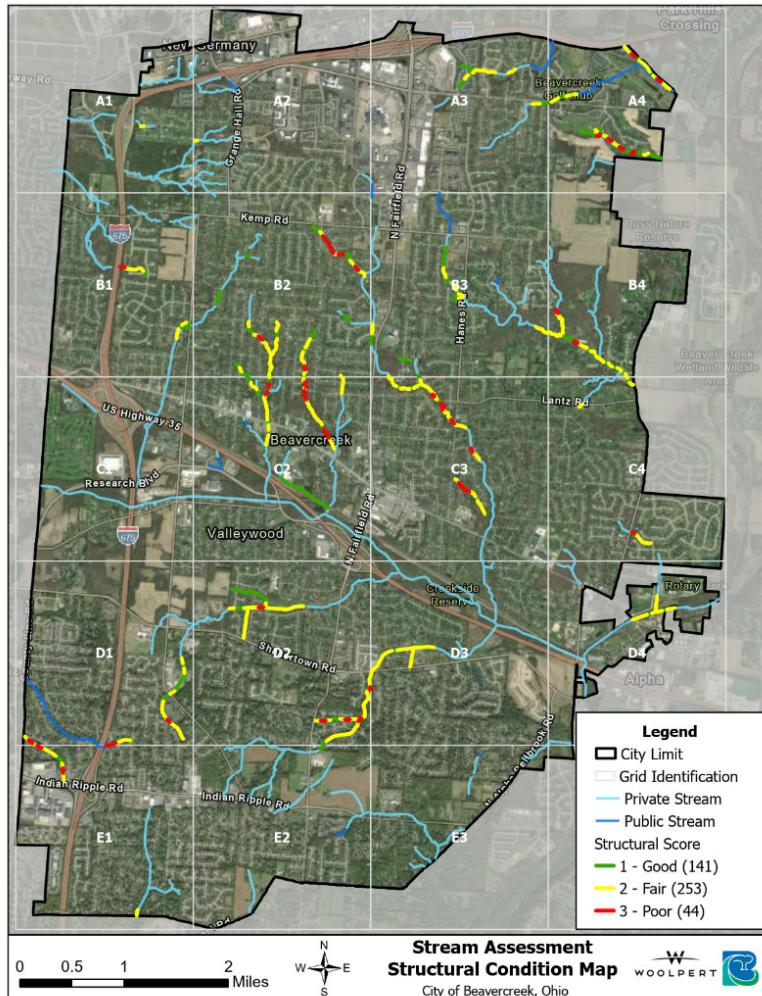
SUMMARY OF RATINGS

Grid	Segments (438 Total)	Length (ft)	Structural			Maintenance		
			3	2	1	3	2	1
A1	1	135	-	135	-	135	-	-
A2	1	91	-	91	-	-	91	-
A3	19	3,417	-	1,755	1,662	-	1,555	1,862
A4	44	7,928	1,200	3,299	3,429	1,200	2,945	3,783
B1	13	2,396	200	1,398	798	200	1,398	798
B2	64	11,301	1,600	5,658	4,043	2,798	5,460	3,043
B3	24	4,565	-	2,195	2,370	-	2,880	1,685
B4	27	5,299	400	3,144	1,755	400	3,899	1,000
C1	0	-	-	-	-	-	-	-
C2	56	10,027	1,307	4,880	3,840	1,706	4,481	3,840
C3	40	7,502	1,572	4,825	1,105	1,372	4,825	1,305
C4	8	1,503	149	1,154	200	149	794	560
D1	32	5,443	754	3,216	1,473	1,262	2,047	2,134
D2	63	11,863	1,000	7,991	2,872	2,178	6,613	3,072
D3	21	3,824	-	3,624	200	200	3,024	600
D4	12	2,275	-	1,875	400	-	958	1,317
E1	12	2,088	400	1,288	400	600	1,249	239
E2	1	200	-	-	200	-	200	-
E3	0	-	-	-	-	-	-	-
E4	0	-	-	-	-	-	-	-
Total (ft)		79,857	8,582	46,528	24,747	12,200	42,419	25,238
Total (mi)		15.12	1.63	8.81	4.69	2.31	8.03	4.78



CONDITION ASSESSMENT RESULTS

STREAM CONDITION ASSESSMENT SUMMARY

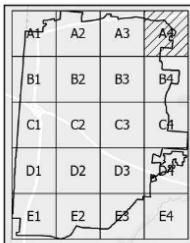


CONDITION ASSESSMENT RESULTS

STREAM CONDITION ASSESSMENT SUMMARY

BEAVERCREEK DRAINAGE MASTER PLAN CITY OF BEAVERCREEK, OH

Structural Condition

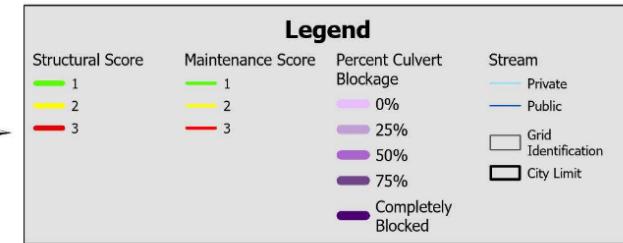
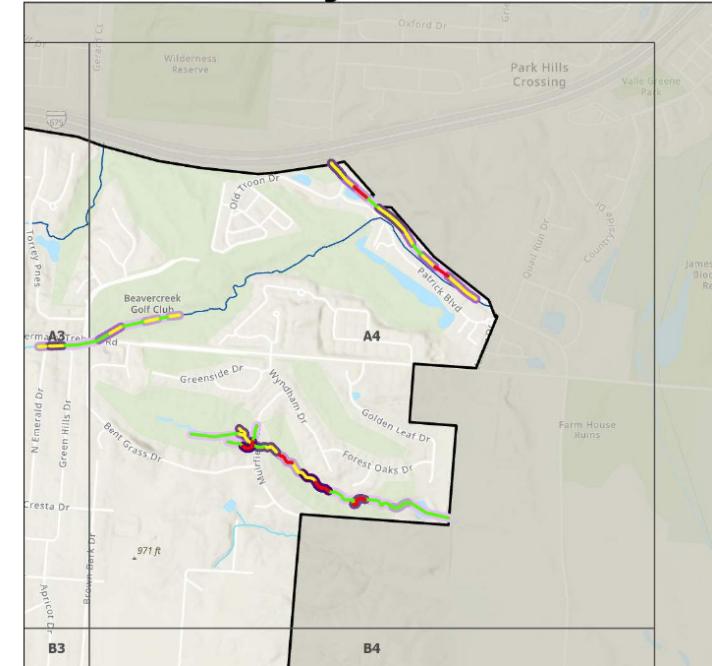


NOTES:

Maintenance Condition and Percent Culvert Blockage

Stream Assessment Map

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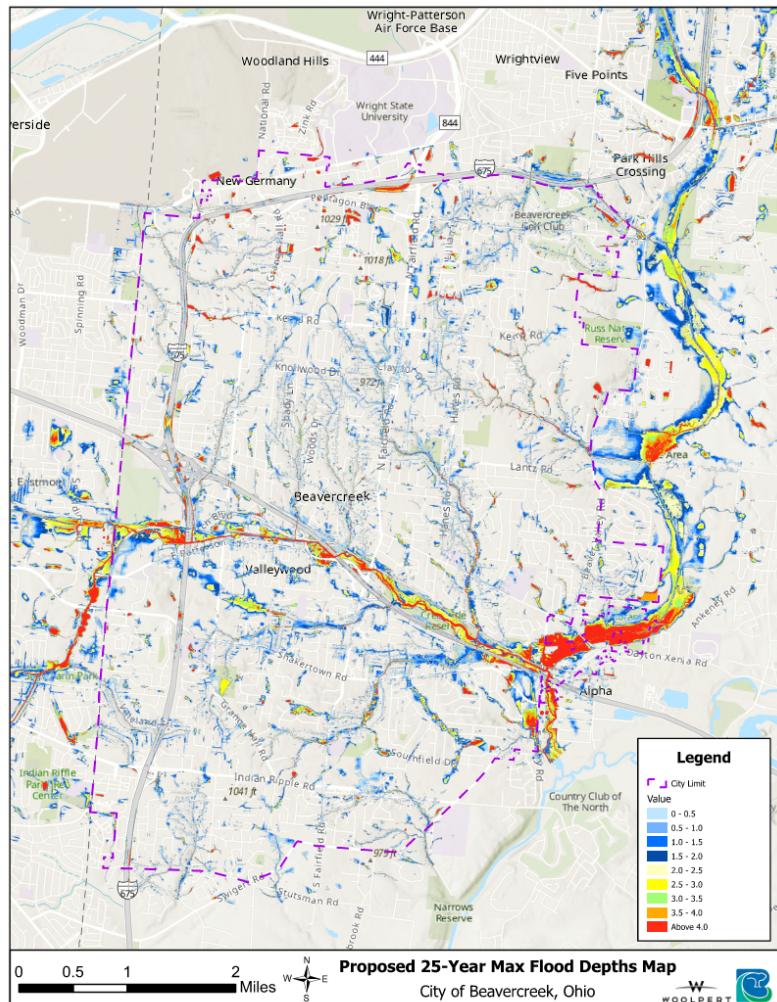
W
WOOLPERT



8/7/2025



MODELING RESULTS



- HEC-RAS 2D
- No future land use considerations
- Storm event recurrence intervals

	Recurrence Interval			
	2-year	10-year	25-year	100-year
Number of surcharged pipes	23	51	67	85
Percentage of surcharged pipes	19%	41%	54%	69%

- Propose increase in pipe size to meet the 25-year design storm event criteria and ODOT standard sizes
- Equivalent pipe sizes for elliptical or box culverts for cover depth



PROJECT PRIORITIZATION AND COSTS

CULVERT IMPROVEMENTS

- 61 culverts identified for replacement due to material, structural deficiency, or hydraulic capacity
- 16 culverts identified for immediate maintenance needs
- Prioritization factors
- Costs from previous study compared to this study
 - City has required detention facilities for new developments
 - City has been developed since last study
- City routine maintenance

	1	1.5	2	3	Total
Structural	48	N/A	59	13	120
Maintenance	43	N/A	46	31	120
Trouble Area (Yes/No)	74	N/A	46	N/A	120
Material (CMP)	87	N/A	N/A	33	120
Model Upsize	73	N/A	N/A	47	120
Size (<4', 4'-8', >8')	45	56	19	N/A	120

Number of segments	Average Engineering Cost	Average Contracting Services Cost	Average Construction Cost	Average Contingency	Average Project Cost	Range of Total Cost	Sum of Project Costs
61	\$23,909	\$4,554	\$113,853	\$28,463	\$170,780	Minimum \$76,629 Maximum \$674,664	\$10,417,558

Number of segments	Average Engineering Cost	Average Contracting Services Cost	Average Maintenance Cost	Average Contingency	Average Project Cost	Range of Total Cost	Sum of Project Costs
All Identified Culverts							
31	\$257	\$128	\$3,209	\$802	\$4,397	Minimum \$1,226 Maximum \$11,950	\$136,296
Culverts not being Identified for Replacement or Upsizing							
16	\$293	\$146	\$3,663	\$915	\$5,017	Minimum \$1,226 Maximum \$11,950	\$80,269



PROJECT PRIORITIZATION AND COSTS

STREAM SEGMENT IMPROVEMENTS

- 44 stream segments identified for stabilization work
- 63 stream segments identified for immediate maintenance needs
- Prioritization factors
- Public vs. private considerations
 - Easement records
 - Maintenance responsibility
 - Legal authority
 - Permitting

	1	2	3	Total
Structural	141	253	44	438
Maintenance	145	230	63	438
Trouble Area (Yes/No)	321	117	N/A	438
Ownership (Private/Public)	130	308	N/A	438
Existing Threat (Within 25')	384	N/A	54	438

Number of segments	Average Engineering Cost	Average Contracting Services Cost	Average Construction Cost	Average Contingency	Average Project Cost	Range of Total Cost	Sum of Project Costs
All Identified Segments							
44	\$12,348	\$2,352	\$58,802	\$14,701	\$88,203	Minimum \$71,267 Maximum \$90,026	\$3,880,945
Public Segments, Only							
25	\$12,251	\$2,334	\$58,340	\$14,585	\$87,510	Minimum \$71,267 Maximum \$90,026	\$2,187,745
Number of segments	Average Engineering Cost	Average Contracting Services Cost	Average Maintenance Cost	Average Contingency	Average Project Cost	Range of Total Cost	Sum of Project Costs
All Identified Segments							
63	\$486	\$243	\$6,079	\$1,520	\$8,328	Minimum \$4,358 Maximum \$9,495	\$524,661
Public Segments, Only							
37	\$477	\$239	\$5,966	\$1,492	\$8,174	Minimum \$4,358 Maximum \$9,495	\$302,425



PROJECT PRIORITIZATION AND COSTS

TOTAL ESTIMATED COSTS

Total Estimated Costs	
Item	Cost
Culvert Replacement (61)	\$ 10,417,558
Culvert Maintenance (31)	\$ 136,296
Stream Stabilization (44)	\$ 3,880,945
Stream Maintenance (63)	\$ 524,661
Total	\$ 14,959,460



Thank you!

Contact Information



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440.865.6093