Nine-Element Nonpoint Source Implementation Strategic Plan (NPS-IS plan)

Cuyahoga River: YELLOW CREEK (04110002-04-02)
Version 1.0
December 03, 2020

APPROVED January 26, 2021

Acknowledgements

The Summit Soil and Water Conservation District would like to thank the many agency, nonprofit, and community partners whose guidance, information, and participation in the planning and development of this plan was fundamental. We hope this plan will be used to guide the work and facilitate projects and coordinate efforts to address nonpoint source impairments in the Yellow Creek HUC-12 watershed.

Chapter 1: Introduction

1.1 Report Background

The Yellow Creek Action Plan was written by NEFCO in 2004 and since then the land use and watershed conditions have changed. Through development of the 9-Element Plan, the Summit Soil and Water Conservation District (Summit SWCD) has worked closely with local stakeholders to increase the understanding of the current watershed state. Understanding the entire watershed will allow key players to implement sound management techniques that will not only address concerns within their political boundary, but also in other areas of the watershed.

Strategic, implementation-based watershed planning encourages locally led initiatives to address nonpoint source pollution.

Currently, the Yellow Creek HUC-12 has numerous existing initiatives and programs lead by several government and citizen agencies operating under similar intentions. This NPS-IS plan was created to encourage collaboration between decision makers and citizens by addressing water quality concerns identified by government officials, state/federal agencies, non-government organizations, and citizen stakeholders.

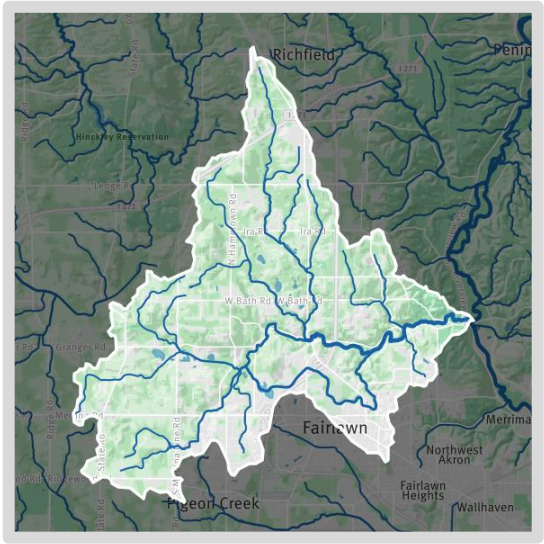


Figure 1: The Yellow Creek HUC-12

In addition, nonpoint source projects that are eligible for State and Federal funding must align with *Ohio's Nonpoint Source Management Plan Update* and include "Nine Essential Elements" as defined in *U.S. EPA's Handbook for Developing Watershed Plans to Restore and Protect Our Waterways*. The NPS-IS Plan will incorporate these elements and requirements, making projects "grant ready" while allowing for a singular document to bring implementation efforts together. This plan will also reassure funders that projects submitted are addressing the worst problems in the watershed and have the components to ensure the greatest long-term benefit possible.

1.2 Watershed Profile & History

The Yellow Creek watershed (04110002-04-02), spanning approximately 31 square miles, is a sub-basin of the Lower Cuyahoga River Watershed. This watershed is 1 of 26 named tributaries of the Cuyahoga River and is considered one of the most high-quality tributaries entering the Cuyahoga. Located northwest of Akron and south of Cleveland, the Yellow Creek Watershed spans the counties of Summit and Medina and is located within nine municipalities. Found primarily within the political boundary of Bath Township, Yellow Creek mainstem flows from West to East, entering the Lower Cuyahoga in Cuyahoga Falls.

Table 1: Municipalities within the Yellow Creek HUC-12

Municipality	Area (acres)	Coverage (%)
Bath Township	11800	60
Copley Township	960	4
Richfield Township	540	3
Village of Richfield	1420	7
Cuyahoga Falls	230	1
City of Akron	210	1
Fairlawn	810	4
Granger Township	2510	12.5
Sharon Township	1500	7.5

Note: Areas and percentages are approximate.

The Yellow Creek mainstem is approximately 10.3 miles in length. The North Fork of Yellow Creek empties into the Yellow Creek mainstem at RM 4.64. The North Fork is 6.4 miles in length and has a drainage area of 9.8 square miles. Both the Yellow Creek Mainstem and the North Fork are designated Warmwater Habitat and Primary Contact Recreational use per the Ohio Water Quality Standards (OAC Chapter 3745-1).

Founded in 1818, Bath Township consisted mainly of agricultural and rural land. Urbanization of the township began towards the mid-twentieth century as the cities of Akron and Fairlawn began annexing parts of the township. Much of Bath Township remains rural-residential, with large acreage home lots a development standard.

Hale Farm and Village, located within the Cuyahoga Valley National Park, is an historic farm which connects residents to the agricultural roots of the area. The townships of Granger and Sharon, Medina County, both remain agricultural with areas of urbanization concentrated along State Route 18. Urbanized areas of Copley Township, Fairlawn, and City of Akron are found along the southern boundary of the watershed.

1.3 Public Participation and Involvement

The Summit SWCD has worked closely with the Friends of Yellow Creek (a local non-profit watershed group), participating watershed communities, and the Summit County Engineers office while developing the Yellow Creek Watershed NPSIS. Residents have been surveyed by the Friends of Yellow Creek and Summit SWCD for input and identification of problem areas.

The Summit SWCD Watershed Coordinator has conducted several stakeholder meetings to identify areas of concern and potential projects with input from community representatives and residents. These stakeholder meetings included representatives from participating MS4 communities, Summit County Engineers Office (SCE), Northeast Ohio Four County Regional Planning and Development Organization (NEFCO), Friends of Yellow Creek, Yellow Creek Foundation, West Creek Conservancy, Summit County Public Health, Summit County Emergency Management Agency, and Ohio Environmental Protection Agency (OEPA). As part of stakeholder engagement, participants completed a survey to better understand how decision makers view watershed health. Erosion and sedimentation, increase in impervious area, and flooding were perceived as the top problems or issues prevalent in the watershed. The top need or goal of the watershed was identified as reducing streambank degradation; increasing flood control and floodplain habitat was identified as the next top needs and goals. In a recent survey conducted by Friends of Yellow Creek, residents identified stream erosion as the dominant concern. The results from these surveys will be used to guide future efforts and watershed decisions.

The Summit SWCD will continue to conduct stakeholder meetings to determine new challenges and opportunities. Public Involvement and Public Education through volunteer stream monitoring and educational workshops.

It is understood that additional critical areas or projects generated from future meetings will prompt an update to the NPS-IS and necessitate a new review by the Ohio EPA and U.S. EPA.

It’s also important to note that in 2017 Summit County Council created, through legislation, the Surface Water Management District, which functions as a utility program by charging residents a small monthly fee. The SWMD revenue can be used for studies, design, and a portion of construction for drainage improvement projects to improve water quality, reduce erosion and mitigate flooding. The ditch petition process will also be utilized to facilitate acquisition of land and easements, and to generate revenue for a portion of construction and for the important perpetual maintenance of the new facilities.

Participation in the SWMD is entirely voluntary and is open to all Summit County townships, cities, and villages. All money collected from property owners in a political subdivision will be used for projects that benefit that subdivision. The Summit County Engineer’s office (SCE) manages the SWMD and maintains a completely separate budget for it.

Bath Township joined the SWMD in 2018 and has worked cooperatively with the SWMD to ascertain project needs. The Bath Township Board of Trustees are advised by the Bath Surface Water Advisory Committee, an ad hoc group of 7 Bath citizens that provides review and recommendations on the needs and direction of the program.

Bath Township constitutes 60% of the Yellow Creek watershed, and the Yellow Creek watershed comprises approximately 77% of Bath Township, so the annual revenue of approximate $350,000 from SWMD – Bath will be primarily available for projects in the Yellow Creek watershed. This is an important factor in consideration of funding for not only construction, but also ongoing maintenance of the facilities.

Chapter 2: HUC-12 Watershed Characterization and Assessment Summary

2.1 Summary of HUC-12 Watershed Characterization

2.1.1 Physical and Natural Features

Soils

The headwaters of Yellow Creek feature low to moderate slopes, while severe slope areas surround the eastern most segments of Yellow Creek. Figure 2 shows water infiltration rates during wet, saturated conditions. A low infiltration rate over much of the watershed translates to a high runoff potential. In areas of dense urbanization, high runoff potential is further increased as low infiltration is amplified by impervious cover.

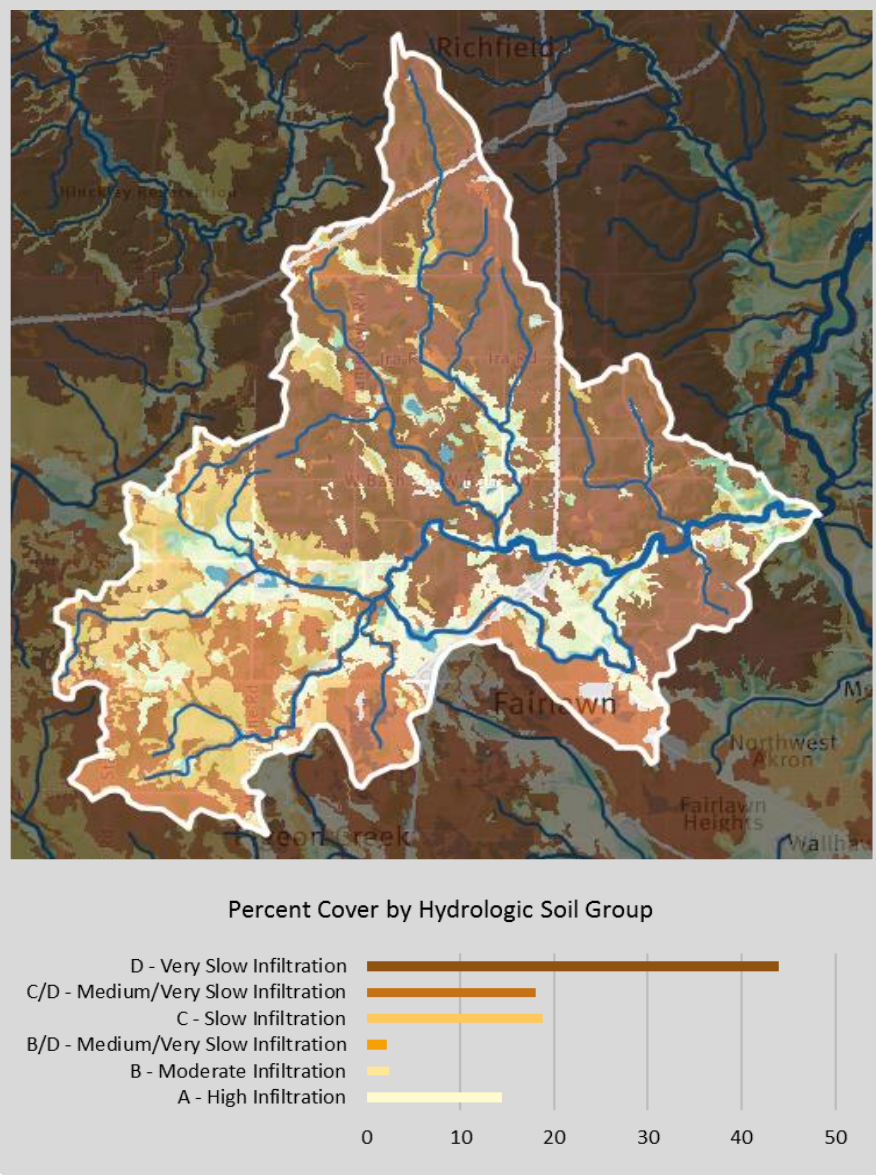
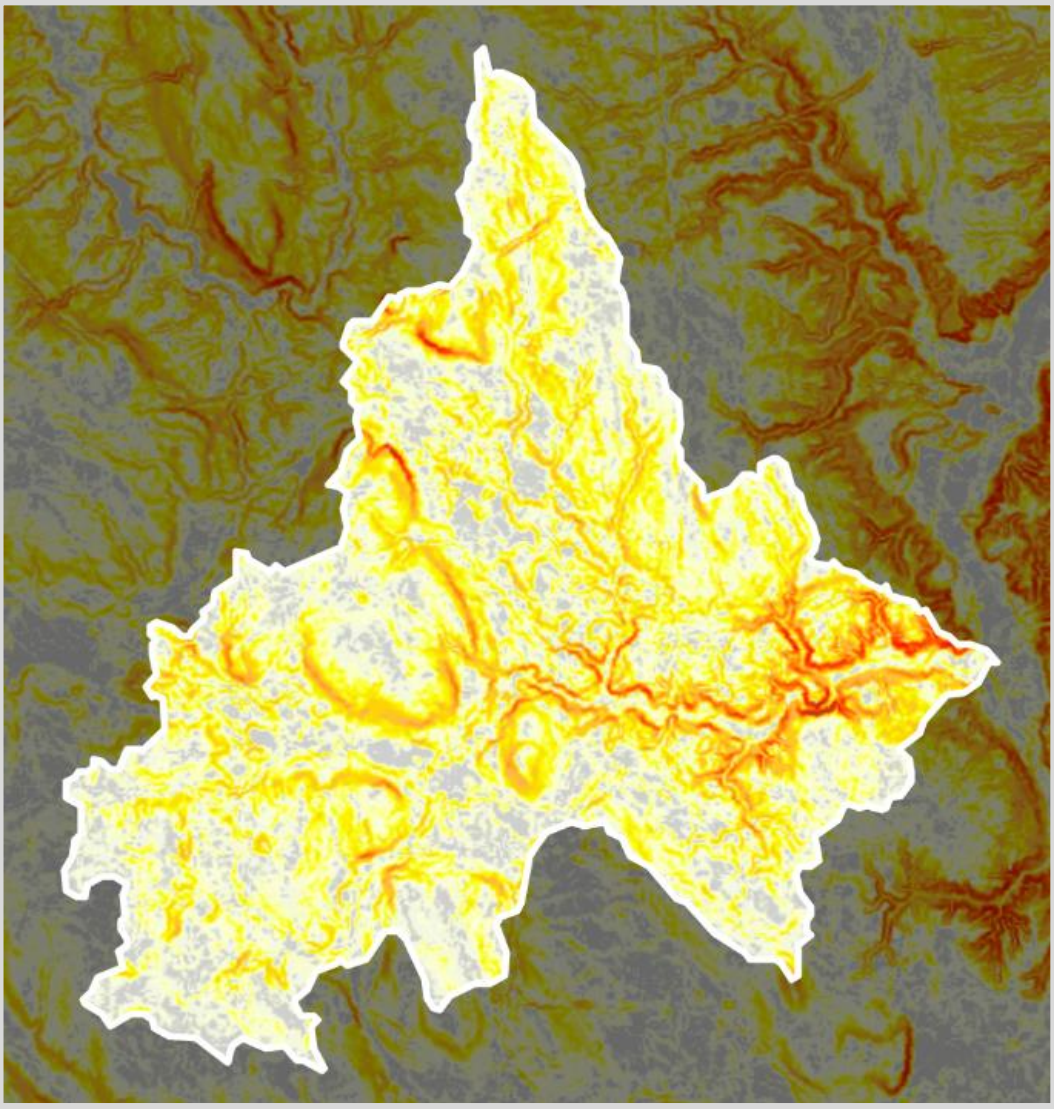


Figure 2: Hydrologic Soil Groups in the Yellow Creek HUC-12

Slope

Accelerated bank erosion is of significant concern through much of the watershed due to the instability of the soils and severity of slopes, with the most severe slope areas exceeding 70%. Urban landscape and stormwater runoff have altered the natural flow and velocity of runoff, increasing streambank instability and erosion while intensifying siltation issues.



	Elevation (m)	Slope (%)
Average	325.2	5.0
Minimum	222.3	0.0
Maximum	396.2	72.7

Figure 3: Percent Slope in the Yellow Creek HUC-12

Stream Gradient

Stream gradient is the vertical drop of a waterway over a specified distance. Naturally, headwater streams have a steeper gradient than main stem rivers. The headwaters carry their sediment load quickly downstream where eventually the sediment is deposited when the river reaches base level or when the sediment load becomes too large for the stream to move. When looking at the Yellow Creek watershed, both the headwaters and main stem exhibit high stream gradients. The Yellow Creek mainstem is approximately 10.3 miles in length and has an average gradient of 44.3 feet/mile. The North Fork of Yellow Creek is 6.4 miles in length and has an average gradient of 54.2 feet/mile. This may seem unusual, though the Yellow Creek mainstem and its headwaters together are considered the headwaters of the Cuyahoga, which explains why both the headwaters and mainstem of Yellow Creek have a relatively high gradient.

A fair amount of erosion and deposition is to be expected in the watershed. However, urbanization exacerbates this natural erosion process and can be detrimental to adjacent lawn owners. In a recent survey conducted by Friends of Yellow Creek, residents identified stream erosion as the dominant concern. A geomorphic assessment of over 41 miles of streams documented extensive areas of stream erosion; in some cases, failing banks up to 70 feet tall.

Mass wasting along ~70-ft tall bank.
Image provided by Sustainable Steams LLC.

~40-foot tall, near vertical bank with mass wasting and tree loss.
Image provided by Sustainable Steams LLC.

2.1.2 Land Use and Protection

Land Use

Low to high density developed and impervious area is the predominant land use, covering almost 40% of the watershed. The remaining area of the watershed is primarily mature deciduous and evergreen forest. Approximately 15% of the watershed is cultivated crop and pastureland.

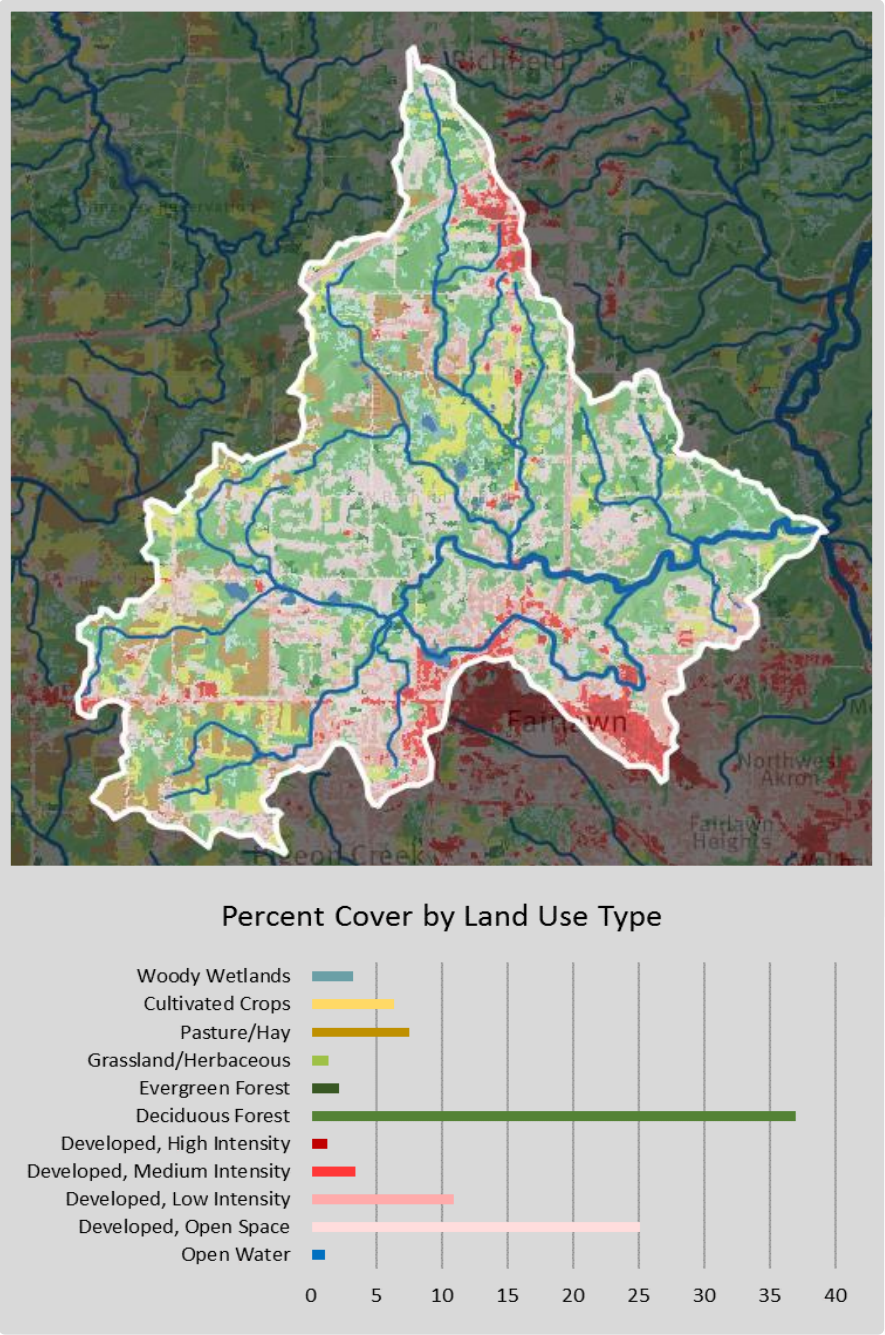


Figure 4: Land use types in the Yellow Creek HUC-12

Land Protection

In 2002, Summit County adopted a Riparian Setback ordinance, which serves to protect and preserve the water quality of streams within the county. This ordinance also protects residents from property loss and flooding damage by limiting the use and development within the setback area. Summit SWCD was instrumental in the drafting and passage of this ordinance. Throughout the county, miles of stream corridor habitat have been preserved. Cities and Villages have also adopted riparian ordinances, using the county ordinance as a guide. Approximately 75% of the watershed has a riparian setback ordinance. Using an average 50-foot riparian width area, approximately 3 miles of riparian corridor are found in agricultural and 46 miles in non-agricultural areas. Residential development is the predominant land use surrounding the headwater streams, making homeowner education an essential piece to successful watershed management.

Table 2: Protected and Preserved Land within the Yellow Creek HUC-12

Protected Lands			
Site Name	Location	Acres	Features
Bath Nature Preserve	Bath Township	400+	Wetland, riparian, woodland, old field habitat
O'Neils Woods Park	Bath Township, SCMP	250	Severe slopes, woodland
Hale Farm and Village	Bath Township, CVNP	90	Heritage gardens
Crowne Point Ecology Learning Center	Bath Township	115	Organic agriculture, environmental education
Camp Christopher	Bath Township	160	Four lakes, woodland, wetland, floodplain, grassy fields, cave

2.2 Summary of HUC-12 Biological Trends

The Ohio Environmental Protection Agency (OEPA) collects data from streams, rivers, and lakes as part of their statewide biological and water quality monitoring program. The data collected during these field surveys is incorporated into regulatory actions and reports, such as the EPA's 303(d) program. This program establishes a list of impaired or threatened waters within the state. The OEPA also identifies the pollutant causing the impairments and potential sources of the pollutants as part of their Total Maximum Daily Load (TMDL) report.

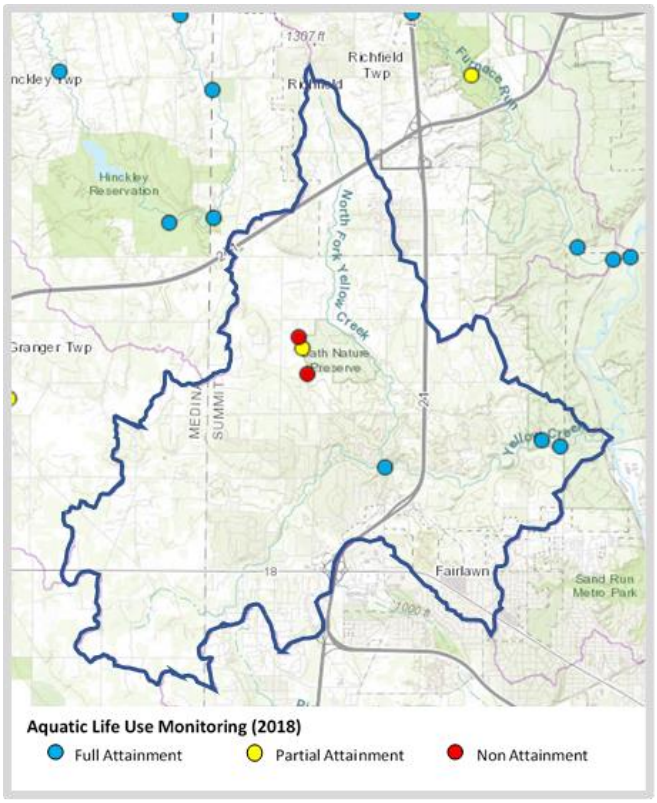


Figure 5: OEPA attainment status, Yellow Creek HUC-12

As part of the 2003 Lower Cuyahoga TMDL report, portions of the Yellow Creek Watershed were sampled. Overall, the 2000 Survey data show Yellow Creek to be in FULL attainment status and continues to meet Warmwater Habitat (WWH) criteria since initial sampling was conducted in 1988.

<u>Fish Communities</u>

Yellow Creek continues to support a high diversity of fish communities. Fish present in 1996 sampling data included the Redside Dace, a species highly sensitive to habitat and water quality variations. Although the IBI score decreased to 38 in 1996 from 42 in 1991, the decrease was likely due to sampling variability, not a decrease in habitat or water quality as more sensitive species and darters were collected in 1996. Yellow Creek, one of the high-quality tributaries entering the Cuyahoga, has the potential to function as biological repopulation epicenter for the distribution of fish downstream.

Macroinvertebrates

Natural substrate sampling at the mouth of Yellow Creek continues to reflect very good water quality conditions. Total taxa richness (54), EPT taxa richness (10) and the QCTV score of 38.4 were consistent with other high-quality streams in the northeast section of the state (Table 7). Previous samples from the mouth in 1988 and RM 1.7 in 1991 have revealed consistently stable conditions and very good stream quality.

Table 3: Ohio EPA Biomonitoring Data 1988-2000

Yellow Creek Watershed									
Stream Name: Yellow Creek, River Code: 19-021									
Year Sampled	River Mile	Drainage (sqmi)	QHEI	MIwb	IBI	ICI	Qual. EPT	Latitude	Longitude
2000	0.10	30	84.0	-	40, 40	46	12	41.1606	81.5753
1998	0.10	30	-	-	-	-	12	41.1606	81.5753
1996	0.10	30	-	-	-	-	10	41.1606	81.5753
1984	0.10	30	-	-	36	-		41.1606	81.5753
1996	1.5	29.4	71	-	38	-		41.1619	81.5983
1991	1.7	27.5	78.5	-	40	-	11	41.1600	81.6000
1988	1.7	27.5	-	-	38	-	-	41.1600	81.6000
2000	2.8	26.6	-	-	-	50	9	41.1550	81.6108
2000	3.0	24.4	83.5	-	38, 42	-	-	41.1539	81.6142
1991	4.1	22.9	66.5	-	36	-	11	41.1572	81.6306
1988	4.1	22.9	-	-	40	-	-	41.1572	81.6306
2000	5.3	12.9	62	-	36	44	4	41.1606	81.6489
Stream Name: North Fork Yellow Creek, River Code: 19-022									
Year Sampled	River Mile	Drainage (sqmi)	QHEI	MIwb	IBI	ICI	Qual. EPT	Latitude	Longitude
2000	0.10	9.8	73.0	-	50	-	5	41.1592	81.6383
1995	0.30	9.7	-	-	48	-	-	41.1617	81.6383
1991	0.30	9.7	71.5	-	42	-	10	41.1617	81.6383

2.3 Summary of HUC-12 Pollution Causes and Associated Sources

Development pressures within the Yellow Creek watershed pose significant threat for continued WWH attainment status. The Lower Cuyahoga TMDL identifies siltation, low dissolved oxygen, habitat modification, and flow alteration as causes of biological impairment. Sources of these causes include municipal discharges, urban runoff/impervious area, stream channelization, and riparian alteration. Urbanization has altered stream hydrology, eroded stream banks, and impacted riparian vegetation and corridor preservation. If left unchecked, these sources could lead to water quality deterioration and loss of WWH attainment status.

As noted in the TMDL report, preserving the Yellow Creek Watershed is also crucial to the preservation and attainment goals of the Lower Cuyahoga Watershed. The Yellow Creek watershed serves an important role as a place of refuge for fish populations, serving as the epicenter for repopulation of the Cuyahoga main stem.

Table 4: Summary of NPS Pollution Causes and Associated Sources for Yellow Creek HUC-12

Cause	Source
Siltation	• Urban runoff • Agriculture • Hydromodification
Low Dissolved Oxygen	• Urban runoff • MS4 discharge • Riparian alteration
Habitat Modification	• Urban runoff • Hydromodification • Dam/impoundment • Riparian alteration • Wetland destruction
Flow Alteration	• Urban runoff • Dam/impoundment • Hydromodification • Wetland destruction

2.4 Additional Information for Determining Critical Areas and Developing Implementation Strategies

2.4.1 Ohio EPA Data

- Ohio EPA Integrated Report
- Total Maximum Daily Loads for the Lower Cuyahoga River Basin (2003)
- Cuyahoga River TSD (1999) (1991)

2.4.2 Friends of Yellow Creek Data

- Volunteer Water Quality Monitoring
- Residential Survey

2.4.3 Summit County Engineers Data

- Yellow Creek Watershed Technical Memorandum (Sustainable Streams, 2019)

2.4.4 Cuyahoga Valley National Park

- QHEI Sampling (2010)

2.4.5 National Land Cover Data (2011)

2.4.6 USGS StreamStats

Chapter 3: Critical Area Conditions & Restoration Strategies

3.1 Overview of Critical Areas

Critical Areas for restoration in the Yellow Creek Watershed are located throughout the watershed. This watershed is impacted by urban development; insufficient stormwater management, riparian alteration, wetland destruction, floodplain disconnection, and channel modification. There are several legacy sampling locations along the main stem and North Fork, all of which are in Full Attainment of Ohio Water Quality Standards for Warm Water Habitat. Although biological and chemical data are meeting WWH standards, implementation of stormwater control measures practices and habitat restoration throughout the watershed will promote continued attainment. Efforts in the Yellow Creek watershed will also contribute to the overall improvement of the Cuyahoga River and Lake Erie.

The following critical areas have been identified for the Yellow Creek HUC-12.

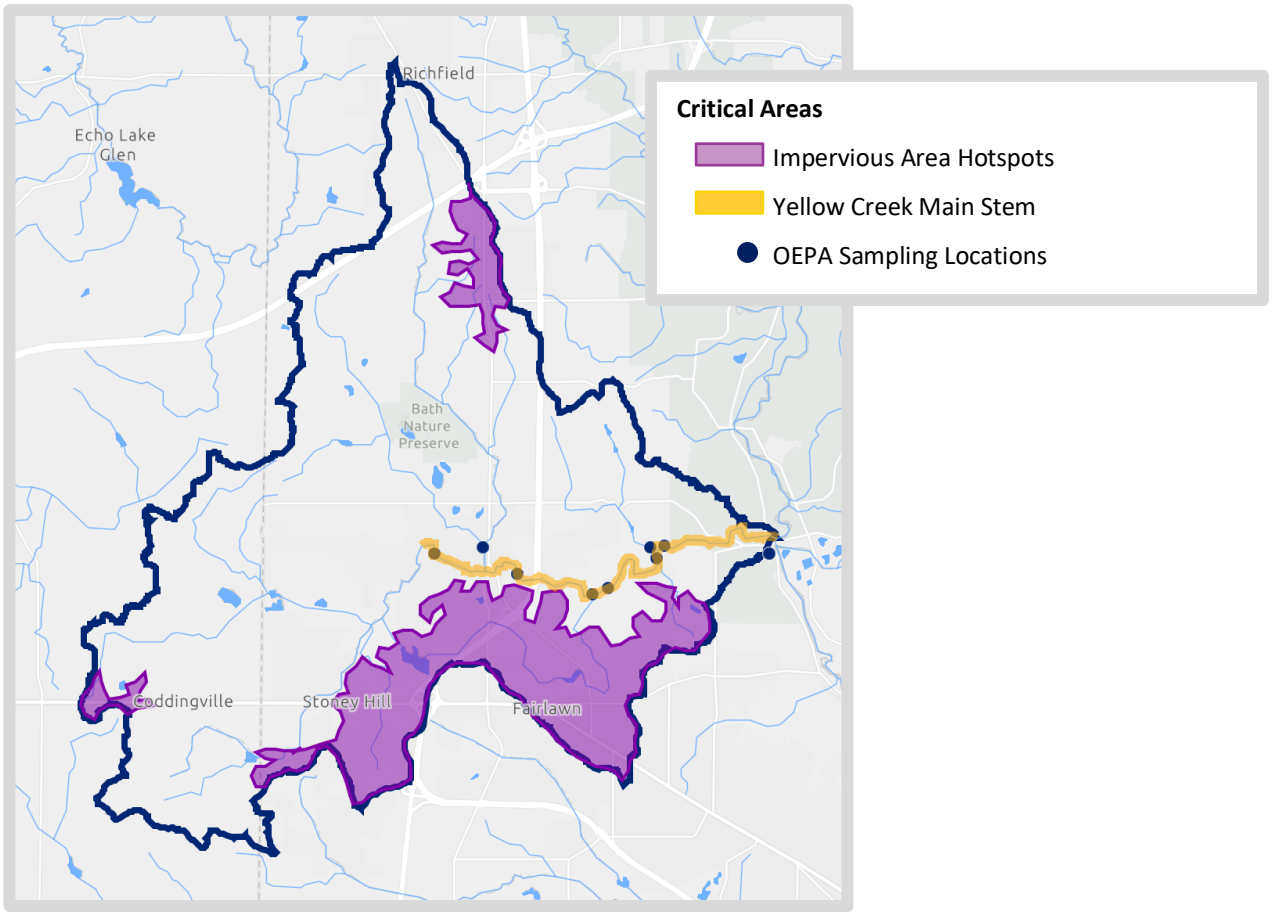


Figure 6: Critical Areas, Yellow Creek HUC-12

Note: Additional critical areas are under development and will be included in subsequent versions, which will be submitted to OEPA and USEPA for approval.

3.2 CRITICAL AREA 1: Impervious Area Hotspots (IAH)

3.2.1 Detailed Characterization

The Impervious area hotspot critical area addresses portions of the watershed that have dense urbanization and large amounts of impervious surface cover. Parking lots, commercial buildings, and roadways dominate the landscape.

This critical area covers approximately 3600 acres, or 18%, of the watershed. The watershed's impervious cover is concentrated along the commercial corridor of Medina Road (Route 18), with much of the impervious cover within the City of Fairlawn and the Village of Richfield.

These areas were developed at a time where stormwater management requirements were minimal or nonexistent. Such a large area of dense urbanization threatens the watershed by increasing the velocity, quality, temperature, and pollutant load of stormwater runoff that is being discharged.

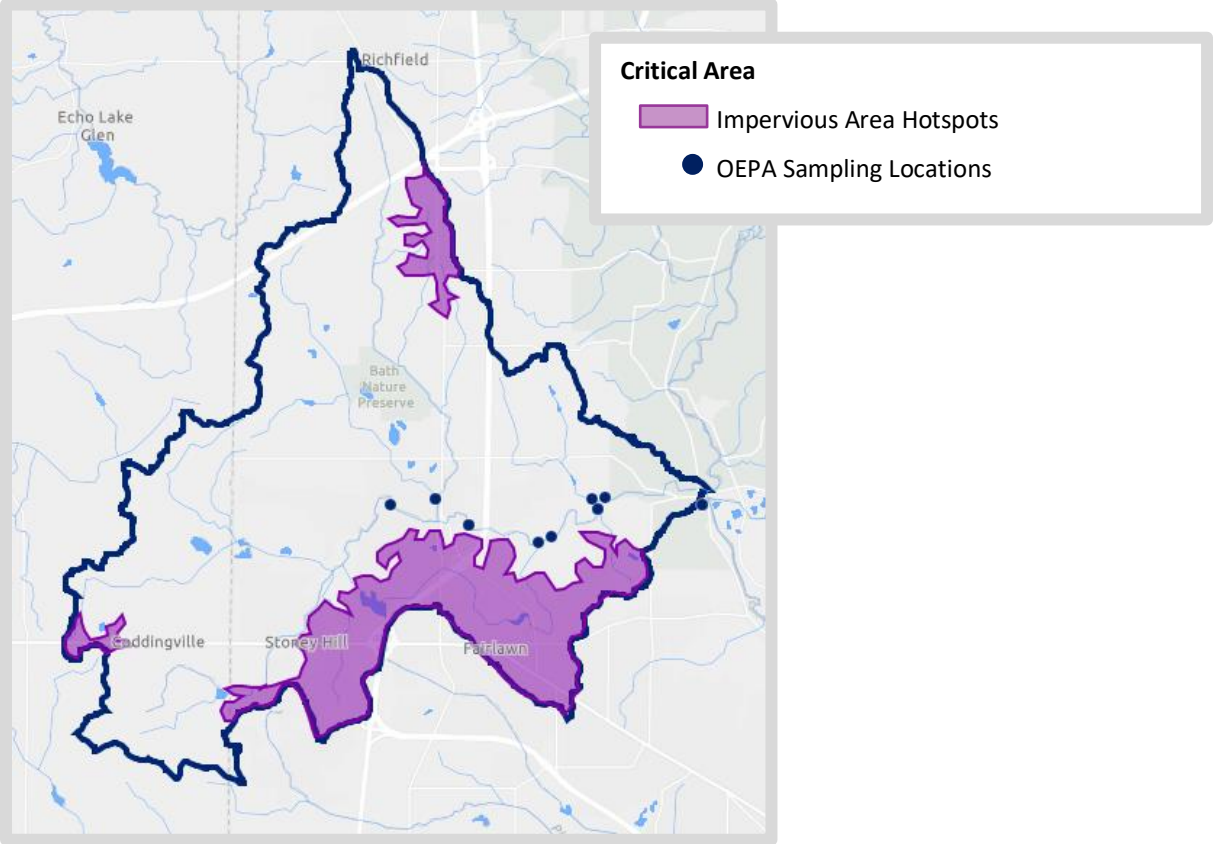


Figure 7: Critical Area 1, Yellow Creek HUC-12

3.2.2 Detailed Biological Conditions

Sampling by Ohio EPA during 1988-2000 have consistently shown the Yellow Creek Watershed is in attainment for WWH.

Table 5: Ohio EPA Biomonitoring Data (most current data for each River Mile)

Yellow Creek Watershed Stream Name: Yellow Creek, River Code: 19-021										
Year Sampled	River Mile	Drainage (sqmi)	QHEI	MIwb	IBI	ICI	Qual. EPT	Latitude	Longitude	Station Code
2000	0.10	30	84.0	-	40, 40	46	12	41.1606	81.5753	-
1996	1.5	29.4	71	-	38	-		41.1619	81.5983	-
1991	1.7	27.5	78.5	-	40	-	11	41.1600	81.6000	F01A45
2000	2.8	26.6	-	-	-	50	9	41.1550	81.6108	-
2000	3.0	24.4	83.5	-	38, 42	-	-	41.1539	81.6142	F01G28
1991	4.1	22.9	66.5	-	36	-	11	41.1572	81.6306	F01P16
2000	5.3	12.9	62	-	36	44	4	41.1606	81.6489	F01G46
Stream Name: North Fork Yellow Creek, River Code: 19-022										
Year Sampled	River Mile	Drainage (sqmi)	QHEI	MIwb	IBI	ICI	Qual. EPT	Latitude	Longitude	Station Code
2000	0.10	9.8	73.0	-	50	-	5	41.1592	81.6383	F01P21
1995	0.30	9.7	-	-	48	-	-	41.1617	81.6383	F01P22
1991	0.30	9.7	71.5	-	42	-	10	41.1617	81.6383	F01P22

3.2.3 Detailed Causes and Associated Sources

Cause	**Source**
Siltation	• Urban runoff • Hydromodification
Low Dissolved Oxygen	• Urban runoff • Riparian alteration
Flow Alteration	• Urban runoff • Hydromodification

3.2.4 Outline Goals and Objectives for the Critical Area 1

Critical Area 1 – Impervious Surface Hotspots - GOALS
Goal 1: Achieve QHEI score of 70 at RM 0.10 (Station Code F01P21). ☺ ACHIEVED: Current QHEI score is 73.

Critical Area 1 – Impervious Surface Hotspots - OBJECTIVES
Objective 1: Reduce the rate and quantity of stormwater runoff by treating 20% (730 acres) of impervious area identified in the critical area through the addition of stormwater management practices and retrofitting existing stormwater basin.
Objective 2: Establish Post Construction Stormwater Control Measure inspection program.
Objective 3: Implement natural bank stabilization techniques on 1,000 linear feet of eroding stream bank.

3.3 CRITICAL AREA 2: YELLOW CREEK MAIN STEM

3.3.1 Detailed Characterization

The Yellow Creek Main Stem critical area focuses on implementing strategies to reduce urban sediment loading while repairing altered stream and habitat. Some of the watersheds worst erosion and flooding occur in this critical area. By stabilizing banks, reducing stream velocity, restoring riparian habitat, and reconnecting floodplain, confident continued attainment and contribute to the overall improvement of the Cuyahoga River and Lake Erie.

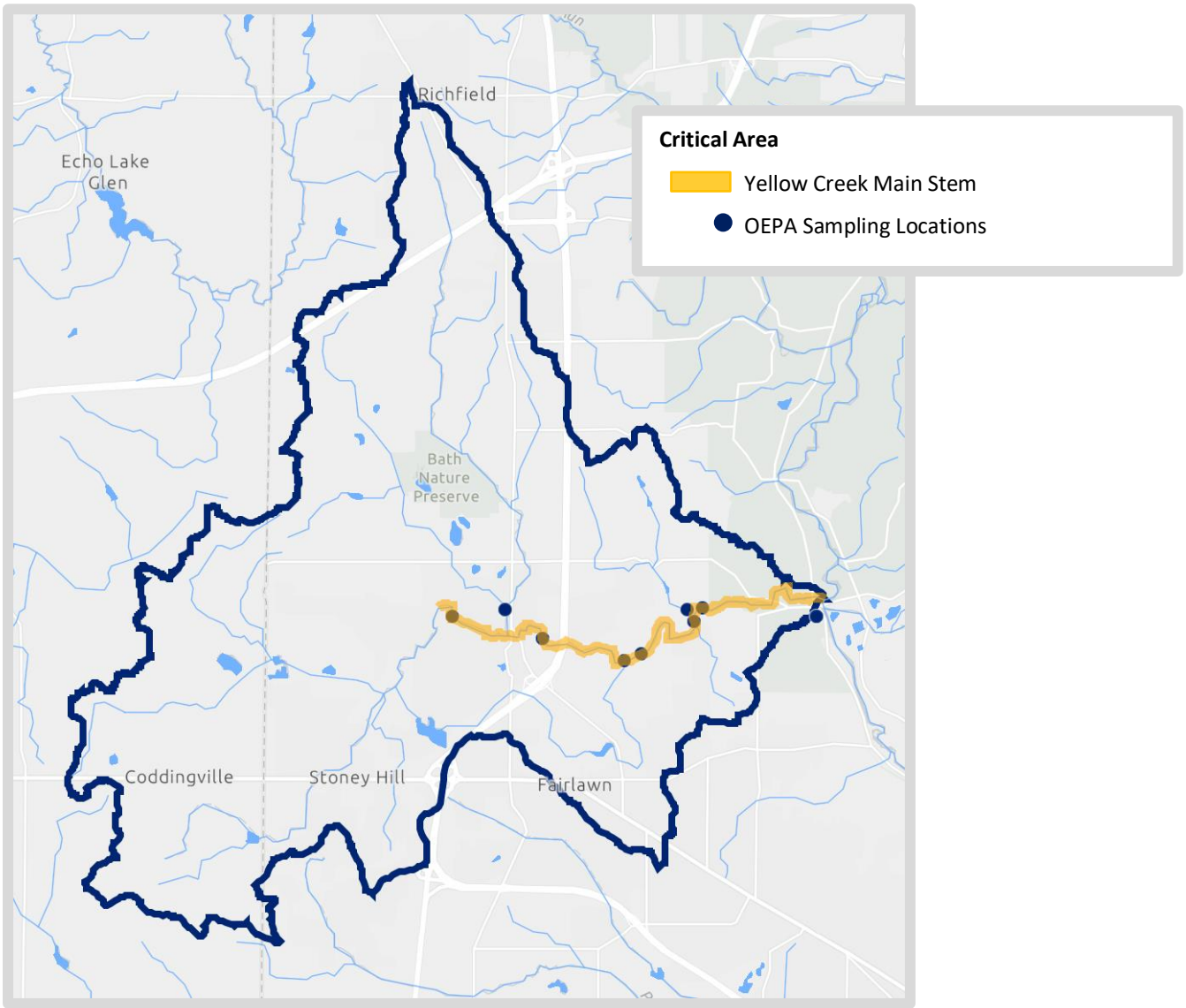


Figure 8: Critical Area 2, Yellow Creek HUC-12

3.3.2 Detailed Biological Conditions

Sampling by Ohio EPA during 1988-2000 have consistently shown the Yellow Creek Watershed is in attainment for WWH.

Table 6: Ohio EPA Biomonitoring Data (most current data for each River Mile)

Yellow Creek Watershed Stream Name: Yellow Creek, River Code: 19-021										
Year Sampled	River Mile	Drainage (sqmi)	QHEI	MIwb	IBI	ICI	Qual. EPT	Latitude	Longitude	Station Code
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1996	1.5	29.4	71	-	38	-		41.1619	81.5983	-
1991	1.7	27.5	78.5	-	40	-	11	41.1600	81.6000	F01A45
2000	2.8	26.6	-	-	-	50	9	41.1550	81.6108	-
2000	3.0	24.4	83.5	-	38, 42	-	-	41.1539	81.6142	F01G28
1991	4.1	22.9	66.5	-	36	-	11	41.1572	81.6306	F01P16
2000	5.3	12.9	62	-	36	44	4	41.1606	81.6489	F01G46
Stream Name: North Fork Yellow Creek, River Code: 19-022										
Year Sampled	River Mile	Drainage (sqmi)	QHEI	MIwb	IBI	ICI	Qual. EPT	Latitude	Longitude	Station Code
2000	0.10	9.8	73.0	-	50	-	5	41.1592	81.6383	F01P21
1995	0.30	9.7	-	-	48	-	-	41.1617	81.6383	F01P22
1991	0.30	9.7	71.5	-	42	-	10	41.1617	81.6383	F01P22

3.3.3 Detailed Causes and Associated Sources

Cause	**Source**
Siltation	• Urban runoff • Hydromodification
Low Dissolved Oxygen	• Urban runoff • MS4 discharge • Riparian alteration
Habitat Modification	• Urban runoff • Hydromodification • Dam/impoundment • Riparian alteration • Wetland destruction
Flow Alteration	• Urban runoff • Dam/impoundment • Hydromodification • Wetland destruction

3.3.4 Outline Goals and Objectives for Critical Area 2

Critical Area 2 – Bath Township Stormwater Improvement - GOALS
Goal 1: Achieve QHEI score of 70 at RM 0.30 (Station Code F01P22). ☺ ACHIEVED: Current QHEI score is 71.5.
Goal 2: Achieve IBI score of 36 at RM 0.30 (Station Code F01P22). ☺ ACHIEVED: Current IBI score is 48.
Goal 3: Achieve QHEI score of 70 at RM 1.5 (River Code 19021). ☺ ACHIEVED: Current QHEI score is 71.
Goal 4: Achieve IBI score of 40 at RM 1.5 (River Code 19021). ☹ NOT ACHIEVED: Current IBI score is 38.
Goal 5: Achieve QHEI score of 70 at RM 4.1 (Station Code F01P16). ☹ NOT ACHIEVED: Current QHEI score is 66.5.
Goal 6: Achieve IBI score of 40 at RM 4.1 (Station Code F01P16). ☹ NOT ACHIEVED: Current IBI score is 36.
Goal 7: Achieve QHEI score of 70 at RM 5.3 (Station Code F01G46). ☹ NOT ACHIEVED: Current QHEI score is 62.
Goal 8: Achieve IBI score of 40 at RM 5.3 (Station Code F01G46). ☹ NOT ACHIEVED: Current IBI score is 36.
Goal 9: Achieve ICI score of 30 at RM 5.3 (Station Code F01G46). ☺ ACHIEVED: Current ICI score is 44.

Critical Area 2 – Bath Township Stormwater Improvement - OBJECTIVES
Objective 1: Restore and protect 1,000 linear feet of riparian setback at residential home parcels.
Objective 2: Provide 200-acre feet of flood storage and floodplain habitat.
Objective 3: Remove 2 barriers to fish passage and restore natural flows from dam impoundments.
Objective 4: Install 20 new Stormwater Control Measures to reduce stream flow velocity.
Objective 5: Restore and protect 500 linear feet of riparian setback at commercial or public land parcels.

Chapter 4: Projects and Implementation Strategy
Section 4.1 Project and Implementation Strategy Overview Table(s)

YELLOW CREEK WATERSHED (04110002-04-02)								
Applicable Critical Area	**Goal**	**Objective**	**Project #**	**Project Title** *(EPA Criteria g)*	**Lead Organization** *(criteria d)*	**Time Frame** *(EPA Criteria f)*	**Estimated Cost** *(EPA Criteria d)*	**Potential/Actual Funding Source** *(EPA Criteria d)*
Urban Sediment and Nutrient Reduction Strategies								
2	5, 6	2, 4	SCE1	Wye Road Flood Mitigation	SWMD/SCE	1-3 years	$774,676	319, BRIC, SWMD
2	7, 8, 9	2, 4	D32	Idle Brook Bankfull Wetland	SWMD/SCE	1-3 years	$1,587,100	319, GLRI, SWMD
2	1, 2	2, 4	D31	I-77 Corridor/FirstEnergy ROW Bankfull Wetlands	SWMD/SCE	3-7 years	$3,058,900	319, GLRI, SWMD, ODOT.
2	1, 2	2, 4	D30	Ghent Hills Detention	SWMD/SCE	3-7 years	$233,800	319, GLRI, SWMD
2	1, 2	2, 4	D26	Camp Christopher Bankfull Wetland	SWMD/SCE	3-7 years	$1,206,300	319, GLRI, SWMD
2	3, 4	2, 4	D22	Bonnebrook Dr Pond Outlet Modification	SWMD/SCE	3-7 years	$213,800	319, GLRI, SWMD
2	1, 2	2, 4	D25	Bath Community Park Bankfull Wetland	SWMD/SCE	7+ years	$607,500	319, GLRI, SWMD,
2	7, 8, 9	2, 4	D41	West Fork Bankfull Wetland	SWMD/SCE	7+ years	$6,283,000	319, GLRI, SWMD
1	1	1	A1	Stormwater regulation for sites > 1 acre	SSWCD	1-3 years	n/a	n/a
1	1	2	A2	Post Construction SCM Inspection Program	SSWCD	1-3 years	n/a	n/a

SCE= Summit County Engineers
SSWCD= Summit Soil and Water Conservation District
SWMD= Stormwater Management District (Summit County)
ODOT= Ohio Department of Transportation
BRIC= Building Resilient Infrastructure and Communities
GLRI= Great Lakes Restoration Initiative
WRRSP= Water Resources Restoration Sponsorship program

YELLOW CREEK WATERSHED (04110002-04-02)								
Applicable Critical Area	**Goal**	**Objective**	**Project #**	**Project Title** *(EPA Criteria g)*	**Lead Organization** *(criteria d)*	**Time Frame** *(EPA Criteria f)*	**Estimated Cost** *(EPA Criteria d)*	**Potential/Actual Funding Source** *(EPA Criteria d)*
Altered Stream and Habitat Restoration Strategies								
1	1	3	SCE2	North Fork Stream/Floodplain Enhancement	SWMD/SCE	1-3 years	$73,500	319, WRRSP, SWMD
2	1, 2	1	D61	North Fork Stream Re-alignment	SWMD/SCE	3-7 years	$660,000	319, WRRSP, SWMD
2	3, 4	1	D63	Revere Run Select Stream Stabilization	SWMD/SCE	7+ years	$1,320,000	319, WRRSP, SWMD
2	1, 2	1	D58	Bath Creek Select Stream Stabilization	SWMD/SCE	7+ years	$1,662,000	319, WRRSP, SWMD
2	3, 4	1	D60	Merrill's Run Stabilization	SWMD/SCE	7+ years	$3,960,000	319, WRRSP, SWMD
1 2	1 3, 4	3 2, 5	D50	Maple Dr., Stream Stabilization	SSWCD	1-3 years	$34,800	319, WRRSP, SWMD
2	1, 2	1	D45	N Cleve Mass. Road, Stream Stabilization	SSWCD	3-7 years	$240,000	319, WRRSP, SWMD
2	5, 6	1	D42	901 Timberline	SSWCD	3-7 years	$590,400	319, WRRSP, SWMD
2	1, 2	1	D48	Fox Chase Trib., Stream Stabilization	SSWCD	7+ years	$860,600	319, WRRSP, SWMD
2	7, 8, 9	1	D46	Crystal Lake Stream Re-alignment	SSWCD	7+ years	$994,800	319, WRRSP, SWMD
Agricultural Nonpoint Source Reduction Strategies								
High Quality Waters Protection Strategies								
Other NPS Causes and Associated Sources of Impairment								

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Section 4.2 Project Summary Sheet(s)

Nine Element Criteria	Information needed	Explanation
n/a	**Title**	Wye Road Flood Mitigation (SCE1)
criteria d	**Project Lead Organization & Partners**	Summit County SWMD / Summit County Engineers
criteria c	**HUC-12 and Critical Area**	HUC 04110002-04-02 (Yellow Creek, Cuyahoga River) Critical Area 2
criteria c	**Location of Project**	Project area near 3687 Sanctuary Dr.
n/a	**Which strategy is addressed by this project?**	Reduce stormwater runoff.
criteria f	**Time Frame**	Short-Term (1-3 year)
criteria g	**Short Description**	The Summit County Engineer's Office retained the engineering firm of ms consultants, inc. to prepare a flood mitigation alternatives report for the drainage course that ends up adjacent to Wye Road. The report analyzed the existing storm system and receiving stream to evaluate conveyance and capacity to alleviate flooding. Analysis was completed using a combination of hydrologic and hydraulic modeling, with the aid of modeling software, including HEC-RAS and PCSWMM. The selected project includes two (2) new upstream detention basins & modifications to expand the capacity of an existing in-line detention basin.
criteria g	**Project Narrative**	Through hydraulic modeling, ms consultants has identified strategic locations where two (2) small basins will provide the greatest hydraulic advantage for the creek. The locations are as followed: • 9,500 cubic-ft detention basin located on 715 Pine Point Dr. and 665 Timber Creek Dr. • 5,500 cubic-ft. detention basin to the south, located on 637 Timber Creek Dr. and 3687 Sanctuary Dr. Implementing basins to detain stormwater and release it at a controlled rate will reduce section velocities throughout the creek, ultimately reducing erosion. Reducing peak flows within the creek also decreases the peak flow rates experienced by the downstream storm system, which lessen the probability of flooding in front of The Bake Shop from the 10-year storm through the 100-year storm. This project also includes modifications to the existing in-line detention basin. Overall, this project illustrates a successful hydraulic conveyance through Wye Creek and eliminates potential flooding at The Bake Shop along Wye Road.
criteria d	**Estimated Total cost**	Engineering Cost: $138,335 Construction Cost: $553,340 Misc. Cost: $83,001 Total Project Cost: $774,676
criteria d	**Possible Funding Source**	319, BRIC, Summit County Stormwater Management District/local funds
criteria a	**Identified Causes and Sources**	Cause: Habitat modification, flow alteration Source: Urban runoff, hydromodification
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	Project will work towards increasing the current QHEI of 66.5 to 70 or better at RM 4.1 (Station Code F01P16). Project will also work towards increasing the current IBI score of 36 to 40 or better at RM 4.1 (Station Code F01P16).

	Part 2: How much of the needed improvement for the whole Critical Area is *estimated* to be accomplished by this project?	(TBD)-acre feet provided (or TBD% of Critical Area 2, Objective 2: Provide 200-acre feet of flood storage and floodplain habitat). 2 new SCMs created (or 10% of Critical Area 2, Objective 4: Install 20 new Stormwater Control Measures to reduce stream flow velocity).
	Part 3: Load Reduced?	<u>Sediment (TSS)</u> <u>Total Phosphorus</u> <u>Total Nitrogen</u> 53 T/yr 500 lbs/yr 1,000 lbs/yr 106,000 lbs/yr
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	SSWCD and/or volunteers will conduct habitat and stream channel monitoring (QHEI). If the project is funded through the Ohio EPA 319 program, staff from the OEPA-DSW Ecological Assessment Unit will perform both pre- and post-project monitoring.
criteria e	**Information and Education**	• Project updates and highlights on SCE website • 1 tours of the project • 1 fact sheet developed

Nine Element Criteria	Information needed	Explanation
n/a	**Title**	Idle Brook Bankfull Wetlands (D32)
criteria d	**Project Lead Organization & Partners**	Summit County SWMD / Summit County Engineers
criteria c	**HUC-12 and Critical Area**	HUC 04110002-04-02 (Yellow Creek, Cuyahoga River) Critical Area 2
criteria c	**Location of Project**	Public parcels near 475 N. Hametown Rd (PPN 0401180)
n/a	**Which strategy is being addressed by this project?**	Urban Sediment and Nutrient Reduction Strategies (reduce runoff, treat flows)
criteria f	**Time Frame**	Short-Term (1-3 year)
criteria g	**Short Description**	Detain ~25 ac-ft of stormwater runoff in 4 proposed bankfull wetlands.
criteria g	**Project Narrative**	In order to increase storage and reduce erosive flows, four bankfull wetlands will be designed and constructed on public parcels in the Idle Brook Subwatershed (a total of approximately 25 acre-feet in storage). The installation of wetland vegetation and hydrology will increase habitat and water quality on the site and downstream by reducing erosive flows and therefore decreasing sedimentation further downstream.
criteria d	**Estimated Total cost**	Engineering Cost: $242,100 Construction Cost: $1,345,000 (cost increases to $2,861,000 if material hauled offsite). Total Project Cost: $1,587,100 (total cost increases to $3,103,100 if material hauled offsite).
criteria d	**Possible Funding Source**	319, GLRI, Summit County Stormwater Management District/local funds
criteria a	**Identified Causes and Sources**	Cause: Habitat modification, flow alteration Source: Urban Runoff, hydromodification
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	Project will work towards maintaining the current ICI of 44 at RM 5.3 (Station Code F01G46), which is currently threatened by urban land development. Project will also work towards increasing the current IBI score of 36 to 40 or better, and current QHEI of 62 to 70 or better and at RM 5.3 (Station Code F01G46).
	Part 2: How much of the needed improvement for the whole Critical Area is *estimated* to be accomplished by this project?	Approximately 500 linear feet of stabilization (or 50% of Critical Area 1, Objective 3: Implement natural bank stabilization techniques on 1,000 linear feet of eroding stream bank). 4 new SCMs created (or 20% of Critical Area 2, Objective 4: Install 20 new Stormwater Control Measures to reduce stream flow velocity).
	Part 3: Load Reduced?	<u>Sediment (TSS)</u> <u>Total Phosphorus</u> <u>Total Nitrogen</u> 1,234 T/yr 12,700 lbs/yr 24,000 lbs/yr 2,468,000 lbs/yr

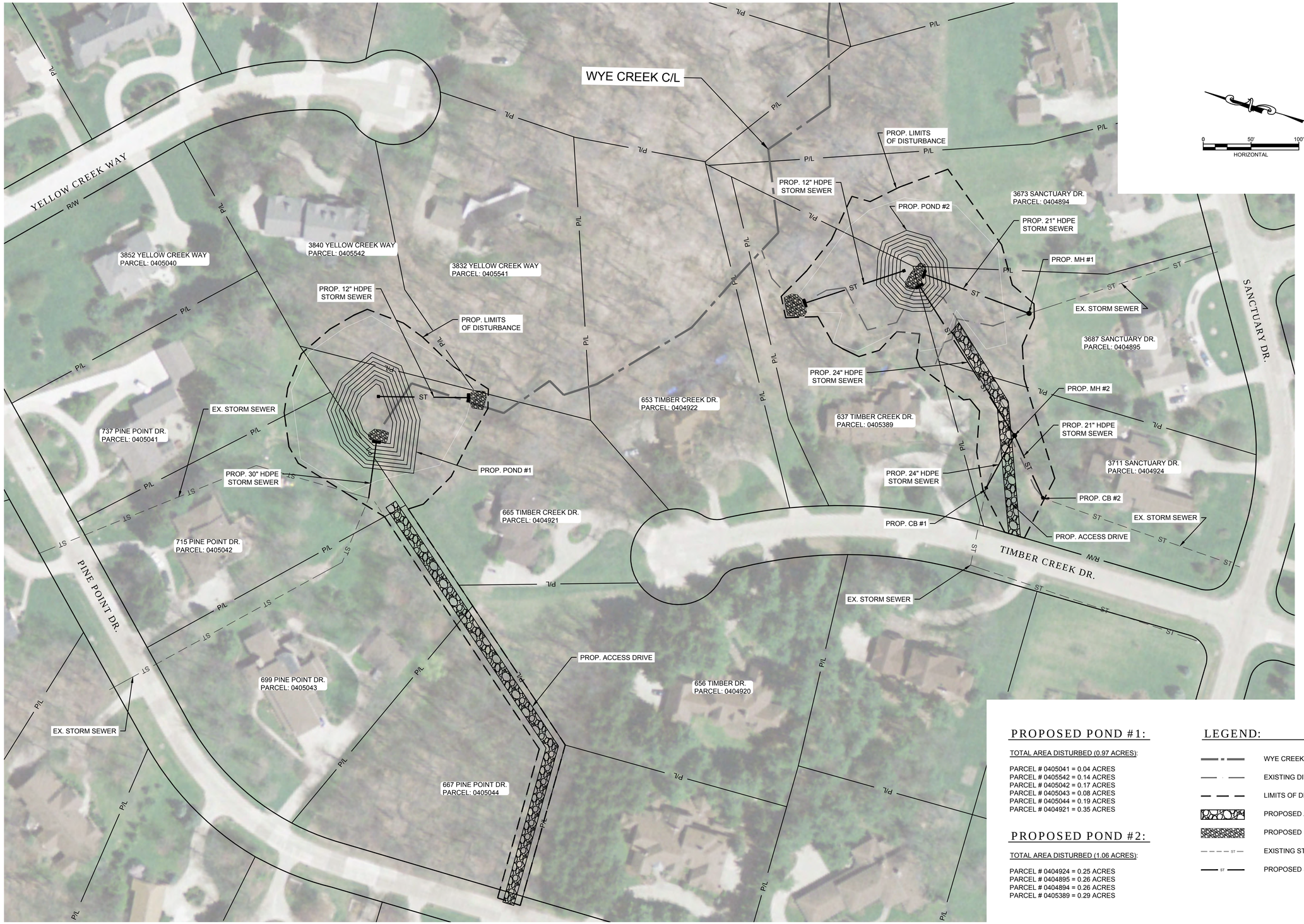
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	SSWCD and/or volunteers will conduct habitat and stream channel monitoring (QHEI). If the project is funded through the Ohio EPA 319 program, staff from the OEPA-DSW Ecological Assessment Unit will perform both pre- and post-project monitoring.
criteria e	**Information and Education**	• Project updates and highlights on SCE website • 1 tours of the project • 1 fact sheet developed

Nine Element Criteria	Information needed	Explanation
n/a	**Title**	North Fork Stream/Floodplain Enhancement (SCE2)
criteria d	**Project Lead Organization & Partners**	Summit County SWMD / Summit County Engineers
criteria c	**HUC-12 and Critical Area**	HUC 04110002-04-02 (Yellow Creek, Cuyahoga River) Critical Area 1
criteria c	**Location of Project**	Public Parcel 5002356; located North of 4361 Maple Drive, Village of Richfield.
n/a	**Which strategy is being addressed by this project?**	Altered Stream and Habitat Restoration Strategies
criteria f	**Time Frame**	Short-Term (1-3 year)
criteria g	**Short Description**	Simple yet effective erosion mitigation project, which utilizes log placement into the bank for stabilization and creation of new flood storage areas.
criteria g	**Project Narrative**	This large public parcel at the headwaters of North Fork has many mature trees and already has some naturally occurring bankfull wetlands and floodplain braids. Rather than using excavators to create conventional bankfull wetlands, this project will be more surgical, largely avoiding mature trees. Valley-wide log jams will be installed to increase hydraulic roughness, channel/floodplain storage, and floodplain connectivity. An existing 24" culvert that currently drains a small bankfull wetland will also be restricted.
criteria d	**Estimated Total cost**	Engineering Cost: $31,500 Construction Cost: $42,000 Total Project Cost: $73,500
criteria d	**Possible Funding Source**	319, GLRI, Summit County Stormwater Management District/local funds, WRRSP
criteria a	**Identified Causes and Sources**	Cause: Siltation, flow alteration Source: Urban runoff, riparian alteration
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	Project will work towards maintaining the current QHEI of 73 at RM 0.10 (Station Code F01P21), which is currently threatened by urban land development.

	Part 2: How much of the needed improvement for the whole Critical Area is *estimated* to be accomplished by this project?	Approximately 1.6 acre-feet provided (or 1% of Critical Area 2, Objective 2: Provide 200-acre feet of flood storage and floodplain habitat).
	Part 3: Load Reduced?	<u>Sediment (TSS)</u> <u>Total Phosphorus</u> <u>Total Nitrogen</u> 250 T/yr 2500 lbs/yr 5,000 lbs/yr 501,000 lbs/yr
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	SSWCD and/or volunteers will conduct habitat and stream channel monitoring (QHEI). If the project is funded through the Ohio EPA 319 program, staff from the OEPA-DSW Ecological Assessment Unit will perform both pre- and post-project monitoring.
criteria e	**Information and Education**	• Project updates and highlights on SCE website • 1 tours of the project • 1 fact sheet developed

Nine Element Criteria	Information needed	Explanation
n/a	**Title**	Maple Dr., Stream Stabilization (D50)
criteria d	**Project Lead Organization & Partners**	Summit SWCD
criteria c	**HUC-12 and Critical Area**	HUC 04110002-04-02 (Yellow Creek, Cuyahoga River) Critical Area 1
criteria c	**Location of Project**	Private Parcel 5000272; located West of 4361 Maple Drive, Village of Richfield.
n/a	**Which strategy is being addressed by this project?**	Altered Stream and Habitat Restoration Strategies
criteria f	**Time Frame**	Short-Term (1-3 year)
criteria g	**Short Description**	Simple yet effective erosion mitigation project, which utilizes log placement into the bank for stabilization.
criteria g	**Project Narrative**	The proposed project includes approximately 630 feet of low-impact stream and floodplain stabilization via hand-placed log structures. These structures provide many benefits to the system, including stabilized streambanks, reduced sediment entering North Fork, and improved habitat conditions. The log structures enhance habitat stability by providing a stable benthic surface for primary production and a trap for leaf litter/detritus. Stable logs also induce depositional zones for sediment and serve as a carbon source for nutrient cycling, both of which can improve water quality. Finally, the added roughness in the channel and the floodplain will induce more frequent and prolonged contact between the vegetated floodplain and the water column, which will enhance both water quality and the hydraulic residence time of storm flows. The structures can be installed with little to no disturbance to the existing riparian vegetation onsite.
criteria d	**Estimated Total cost**	Engineering Cost: $5,800 Construction Cost: $29,000 Total Project Cost: $34,800
criteria d	**Possible Funding Source**	319, GLRI, Summit County Stormwater Management District/local funds, WRRSP
criteria a	**Identified Causes and Sources**	Cause: Siltation, flow alteration Source: Urban runoff, riparian alteration
criteria b & h	**Part 1: How much improvement is needed to remove the NPS impairment for the whole Critical Area?**	Project will work towards maintaining the current QHEI of 73 at RM 0.10 (Station Code F01P21), which is currently threatened by urban land development.

	Part 2: How much of the needed improvement for the whole Critical Area is *estimated* to be accomplished by this project?	Approximately 25 acre-feet provided (or 12.5% of Critical Area 2, Objective 2: Provide 200-acre feet of flood storage and floodplain habitat).
	Part 3: Load Reduced?	<u>Sediment (TSS)</u> <u>Total Phosphorus</u> <u>Total Nitrogen</u> 17 T/yr 170 lbs/yr 340 lbs/yr 34,000 lbs/yr
criteria i	**How will the effectiveness of this project in addressing the NPS impairment be measured?**	SSWCD and/or volunteers will conduct habitat and stream channel monitoring (QHEI). If the project is funded through the Ohio EPA 319 program, staff from the OEPA-DSW Ecological Assessment Unit will perform both pre- and post-project monitoring.
criteria e	**Information and Education**	• Project updates and highlights on SSWCD website • Highlight at SSWCD Annual Meeting • 1 fact sheet developed



PROPOSED POND #1:

TOTAL AREA DISTURBED (0.97 ACRES):

PARCEL # 0405041 = 0.04 ACRES
PARCEL # 0405542 = 0.14 ACRES
PARCEL # 0405042 = 0.17 ACRES
PARCEL # 0405043 = 0.08 ACRES
PARCEL # 0405044 = 0.19 ACRES
PARCEL # 0404921 = 0.35 ACRES

PROPOSED POND #2:

TOTAL AREA DISTURBED (1.06 ACRES):

PARCEL # 0404924 = 0.25 ACRES
PARCEL # 0404895 = 0.26 ACRES
PARCEL # 0404894 = 0.26 ACRES
PARCEL # 0405389 = 0.29 ACRES

LEGEND:

- WYE CREEK C/L
- EXISTING DITCH LINE
- LIMITS OF DISTURBANCE
- PROPOSED ACCESS DRIVE
- PROPOSED RCP
- EXISTING STORM SEWER
- PROPOSED STORM SEWER

SEAL

NO.	REVISIONS	DATE
-	-	-

ms consultants, inc.
engineers * architects * planners
333 EAST FEDERAL STREET
YOUNGSTOWN, OHIO 44503-1821
(330)-744-5321 Fax (330)-744-5256

SUMMIT COUNTY ENGINEER
SUMMIT COUNTY, OHIO

WYE ROAD FLOOD MITIGATION PROJECT

PROPOSED DETETNION POND LOCATION MAP

Project Number:	61-44049-00
Drawn by:	EMB
Checked by:	CAB
Approved by:	TRT
Scale: (22x34)	1" = 50'
Date:	1/10/20
Dwg. No.:	G-1.0
Sheet:	1 of 3

PROPOSED POND #1:

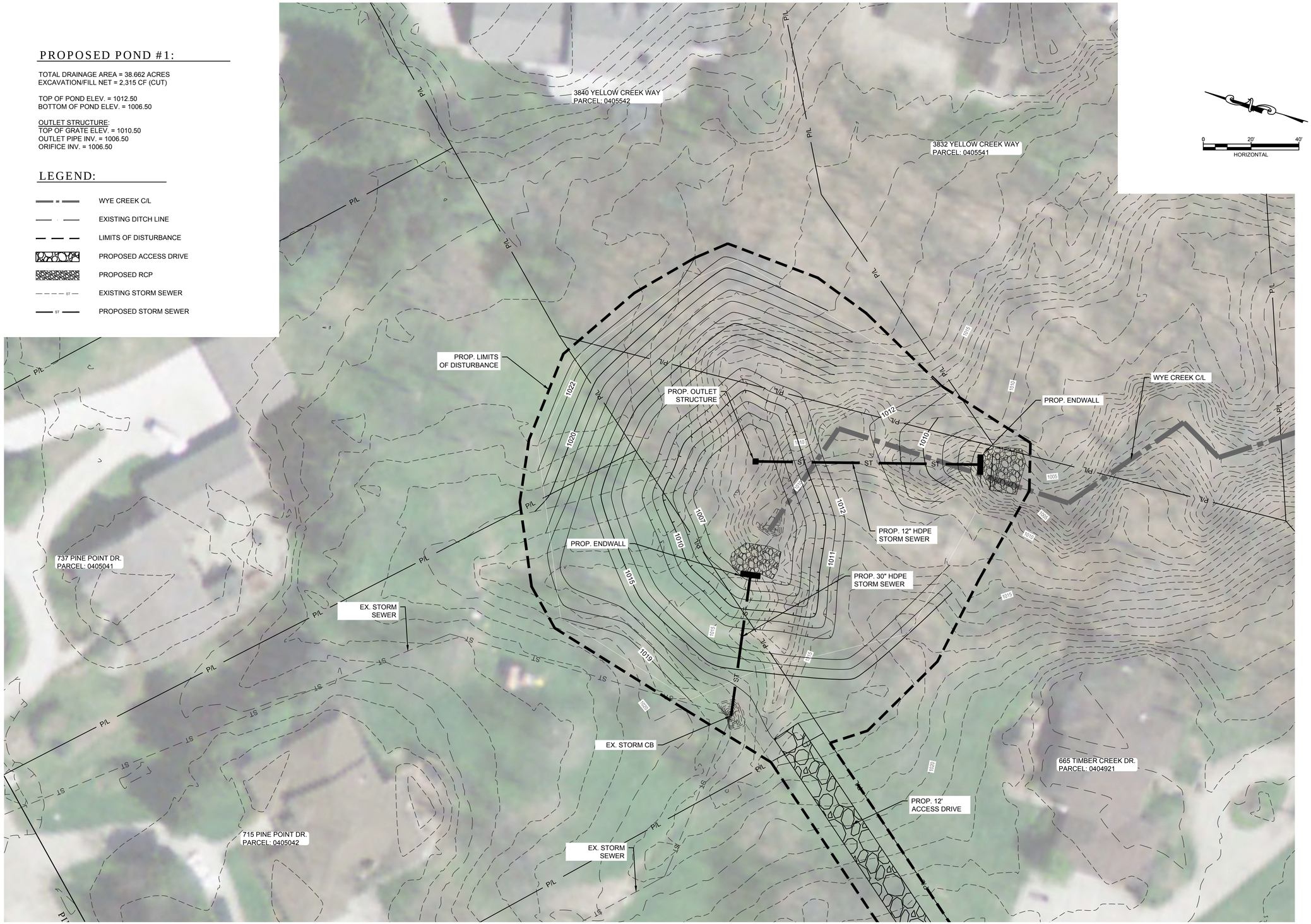
TOTAL DRAINAGE AREA = 38.662 ACRES
EXCAVATION/FILL NET = 2,315 CF (CUT)

TOP OF POND ELEV. = 1012.50
BOTTOM OF POND ELEV. = 1006.50

OUTLET STRUCTURE:
TOP OF GRATE ELEV. = 1010.50
OUTLET PIPE INV. = 1006.50
ORIFICE INV. = 1006.50

LEGEND:

- WYE CREEK C/L
- EXISTING DITCH LINE
- LIMITS OF DISTURBANCE
- PROPOSED ACCESS DRIVE
- PROPOSED RCP
- EXISTING STORM SEWER
- PROPOSED STORM SEWER



0 20' 40'
HORIZONTAL

SEAL

NO.	REVISIONS	DATE
-	-	-

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YOUNGSTOWN, OHIO 44503-1821
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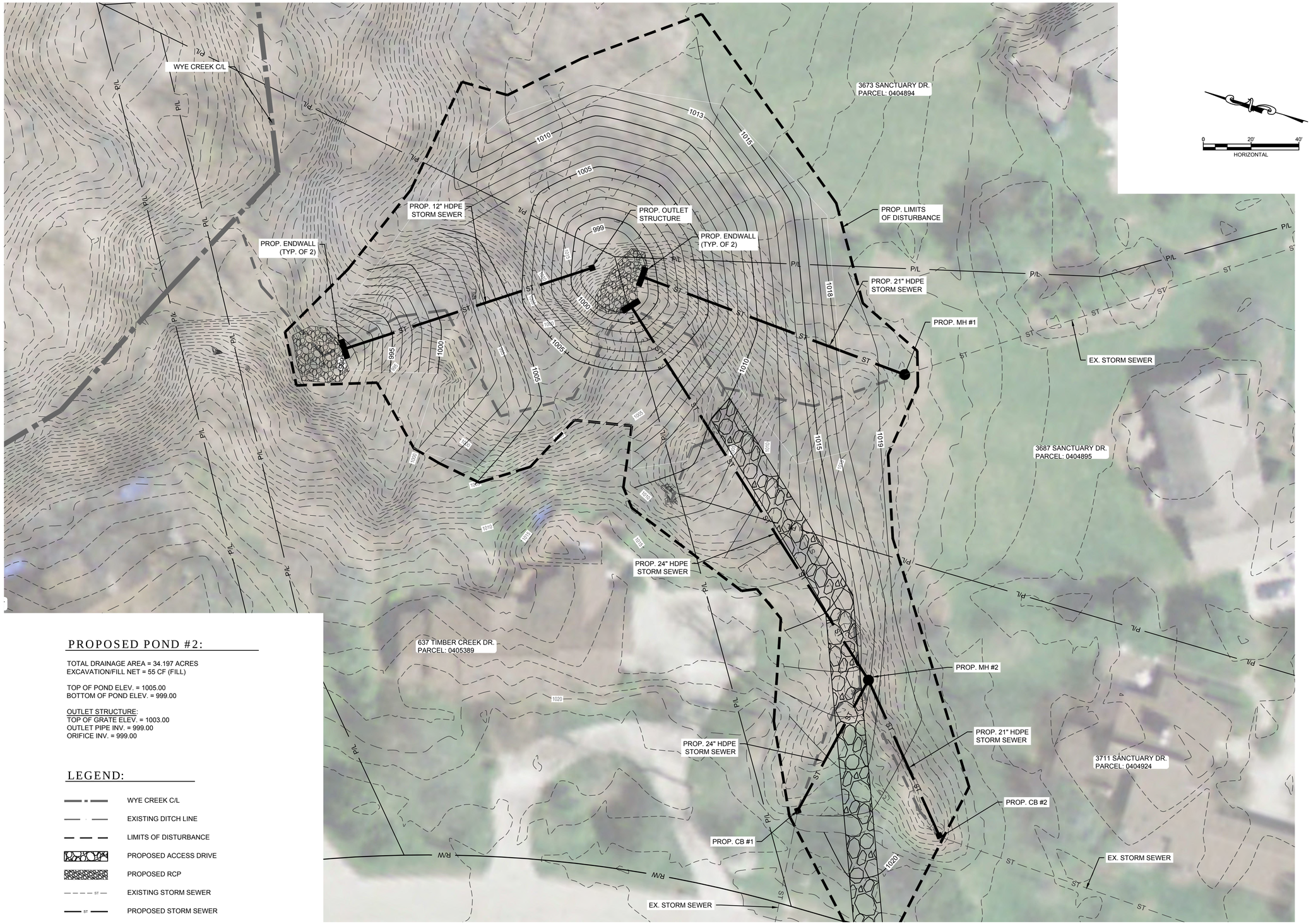
SUMMIT COUNTY ENGINEER
SUMMIT COUNTY, OHIO

WYE ROAD FLOOD MITIGATION PROJECT

PROPOSED DETENTION POND LAYOUT - POND #1

Project Number: 61-44049-00
Drawn by: EMB
Checked by: CAB
Approved by: TRT
Scale: (22x34) 1" = 20'
Date: 1/10/20
Dwg. No.: G-2.0
Sheet: 2 of 3



PROPOSED POND #2:

TOTAL DRAINAGE AREA = 34.197 ACRES
EXCAVATION/FILL NET = 55 CF (FILL)

TOP OF POND ELEV. = 1005.00
BOTTOM OF POND ELEV. = 999.00

OUTLET STRUCTURE:
TOP OF GRATE ELEV. = 1003.00
OUTLET PIPE INV. = 999.00
ORIFICE INV. = 999.00

LEGEND:

- WYE CREEK C/L
- EXISTING DITCH LINE
- LIMITS OF DISTURBANCE
- PROPOSED ACCESS DRIVE
- PROPOSED RCP
- EXISTING STORM SEWER
- PROPOSED STORM SEWER

SEAL

NO.	REVISIONS	DATE
-	-	-

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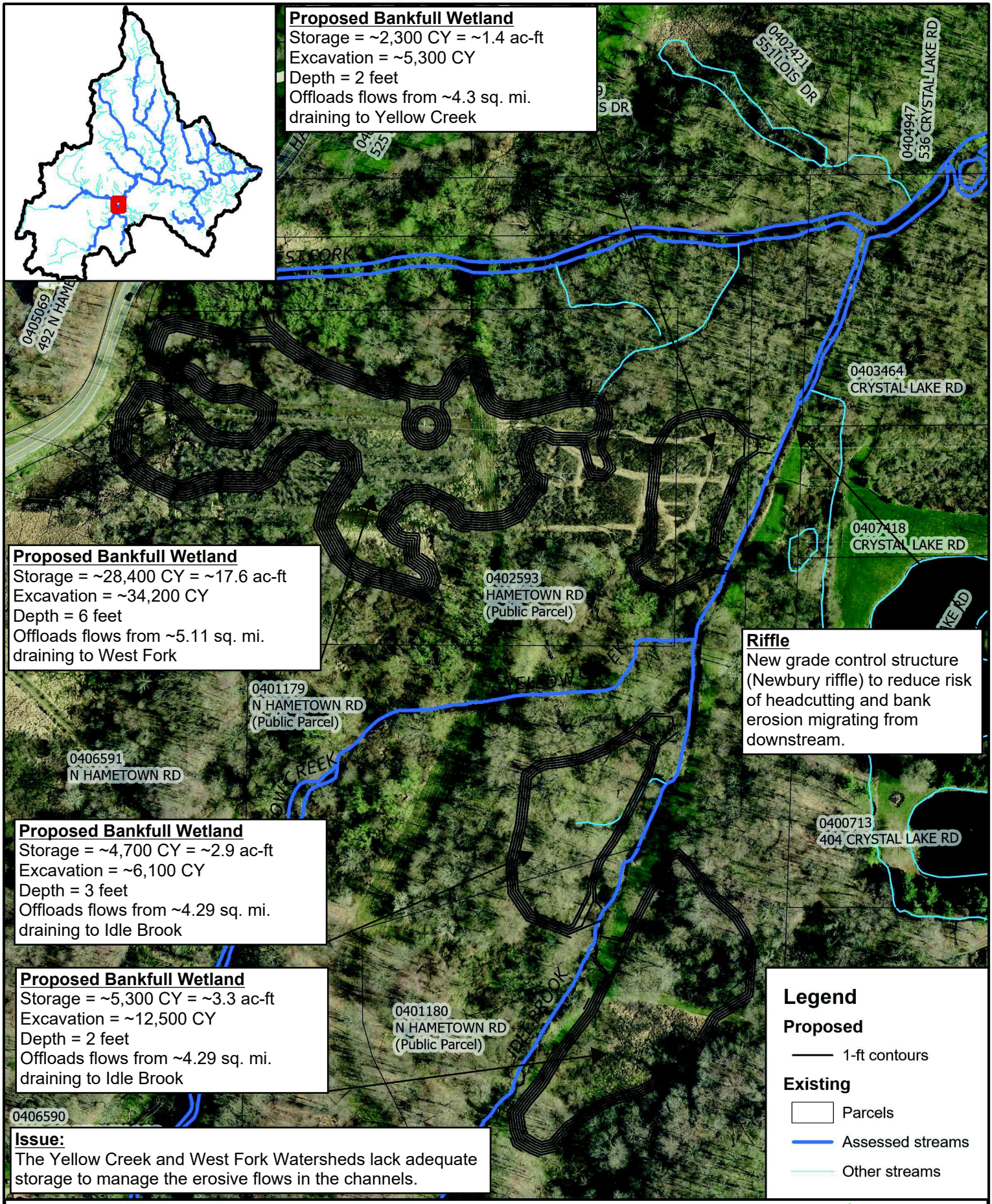
SUMMIT COUNTY ENGINEER
SUMMIT COUNTY, OHIO

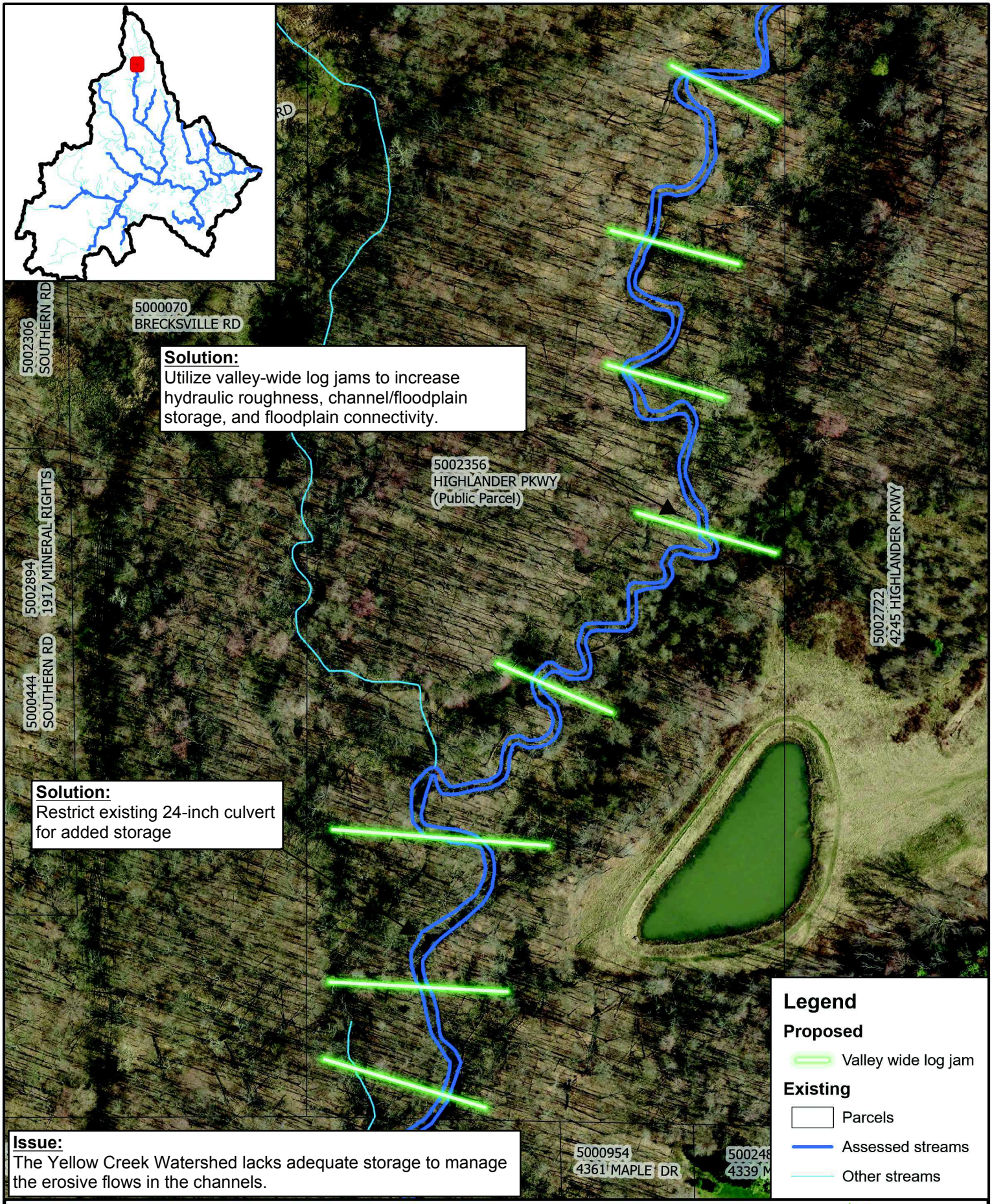
WYE ROAD FLOOD MITIGATION PROJECT

PROPOSED DETENTION POND LAYOUT - POND #2

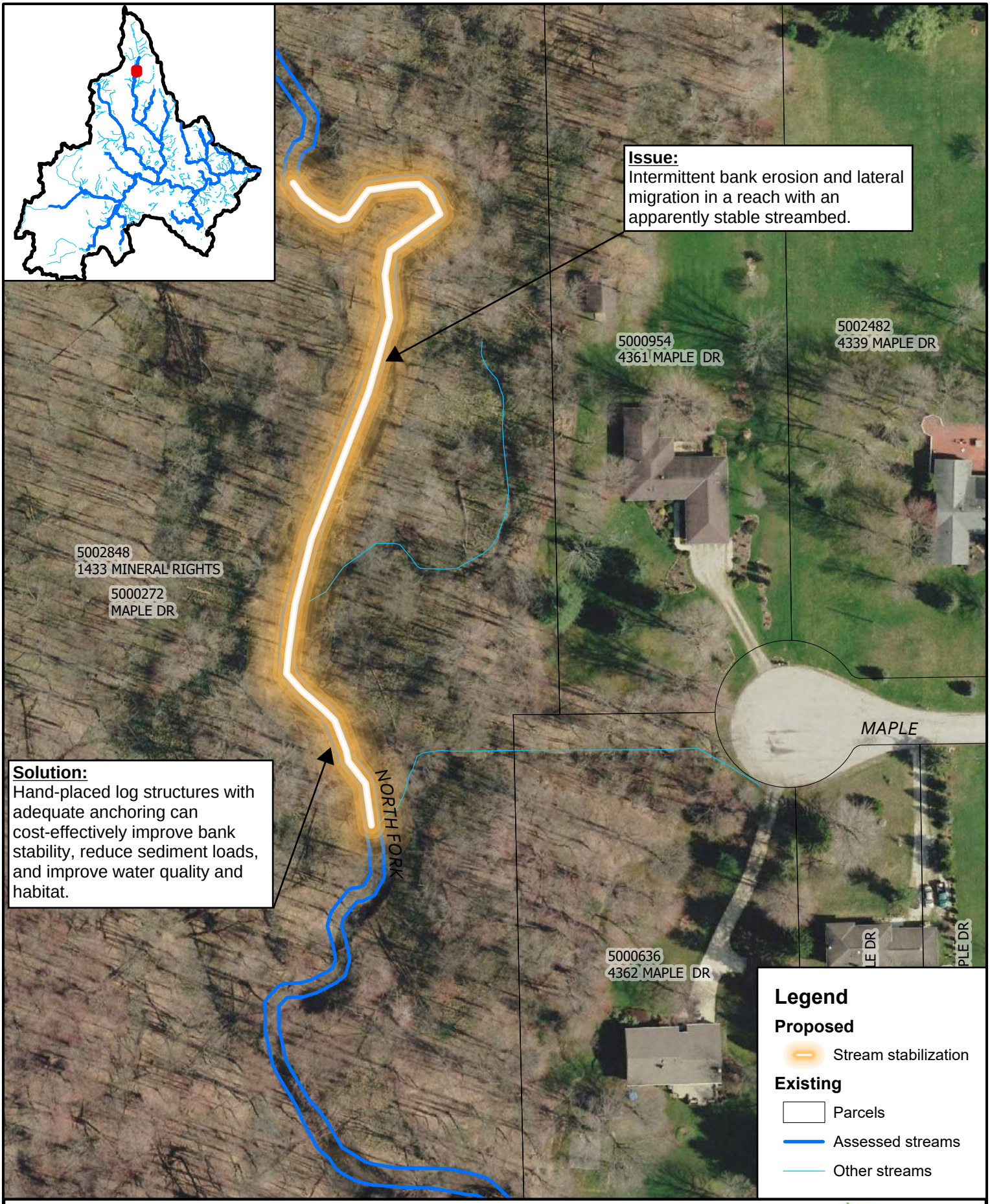
Project Number: 61-44049-00
Drawn by: EMB
Checked by: CAB
Approved by: TRT
Scale: (22x34) 1" = 20'
Date: 1/10/20
Dwg. No.: G-3.0
Sheet: 3 of 3



Last Updated On: Monday, April 6, 2020



Last Updated On: Wednesday, April 8, 2020



STREAM STABILIZATION

MAPLE DR HAND-PLACED LOG STABILIZATION

BATH TOWNSHIP DRAINAGE BASIN IMPROVEMENT

SUMMIT COUNTY SURFACE WATER MANAGEMENT DISTRICT

Sustainable Streams LLC

Last Updated On: Monday, July 8, 2019