





Cuyahoga River - South

-  Regional Stormwater System in NEORSR Service Area
-  Regional Stormwater System not in NEORSR Service Area
-  Service Area
-  Community



**Northeast Ohio
Regional Sewer District**

Coordinate System : Ohio State Plane North
 Datum: NAD 1983 , NAVD 1988
 Projection: Lambert Conformal Conic
 Sources: NEORSR GIS

Map Created: October 2017 1:72,379 

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Watershed Advisory Committee

Cuyahoga River South

October 2018

NORTHEAST OHIO REGIONAL SEWER DISTRICT



REGIONAL
STORMWATER
MANAGEMENT
PROGRAM

Agenda

- Sewer District Updates
 - Community Cost-Share
 - Local Sewer System Evaluation Studies
- Stormwater Master Plan
- Stormwater Inspection and Maintenance
 - Urgent Response Process
 - Problems to Projects
 - Community Meetings on Crossings and Culverts
- Stormwater Construction Plan
 - 2018 Project Updates
 - 2019 Annual SW Construction Plan Review
 - Construction Project Oversight

Community Cost-Share

- CCS Funds Balance (8/31/2018) \$ 22,039,931
- 67 approved projects \$ 9,150,615
- 17 approved allocation agreements \$ 7,539,502
- CCS Funds available to Member Comm. \$ 5,349,814

30 of 55 Member Communities currently participating

Community Cost-Share Project Ideas

Examples of the Community Cost-Share Program

✦ Edit ✕



- 1
- 2
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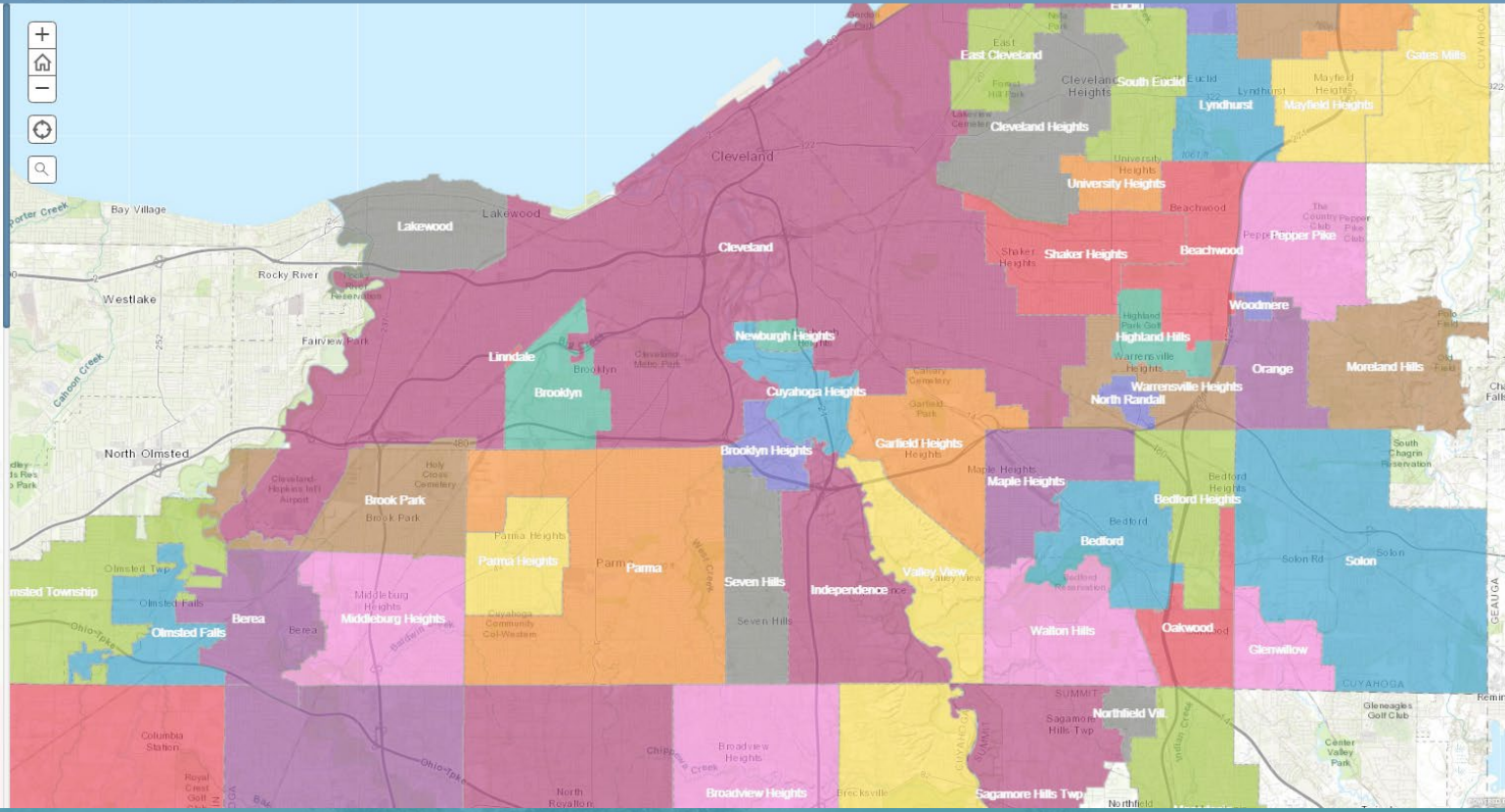
The Community Cost-Share Program provides funding to Member Communities for Community-specific stormwater management projects. To implement the Community Cost-Share Program, the Northeast Ohio Regional District (District) has formed a financial account termed "Community Cost-Share Account" for the aggregation and dissemination of funds derived from Stormwater Fee collected in each Member Community.

25% of the total annual Stormwater Fee collected in each Member Community is allocated to the Community Cost-Share Account for each Member Community. The Community Cost-Share Account is under the control of the District, with disbursement of funds to Member Communities through a grant application and reimbursement process. To access Community Cost-Share Program funds, Member Communities must maintain compliance with Title V: Stormwater Management Code. A Community Cost-Share Program Project must clearly promote or implement the goals and objectives of the District set forth in Title V and must be intended to address current or minimize new, stormwater flooding, erosion, and water quality problems.

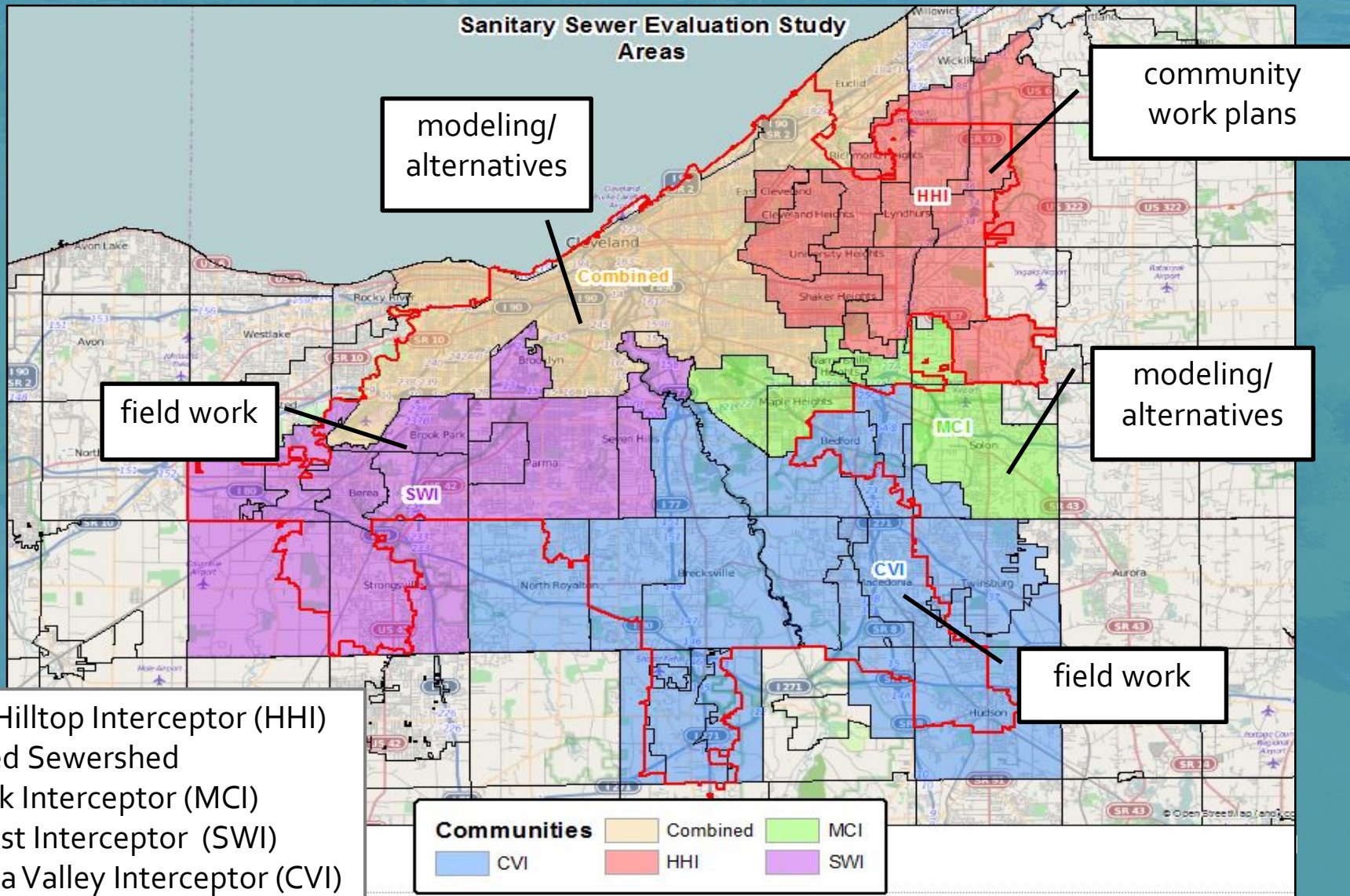
More Information

WTL Communities

- Beachwood
- Bedford
- Bedford Heights
- Berea
- Bratenahl
- Brecksville
- Broadview Heights
- Brook Park
- Brooklyn
- Brooklyn Heights
- Cleveland
- Cleveland Heights




Local Sewer System Evaluation Studies



Johnston
TH AMERICA

Questions

This equipment was funded by the
 Northeast Ohio
Regional Sewer District
Regional Stormwater Management Program

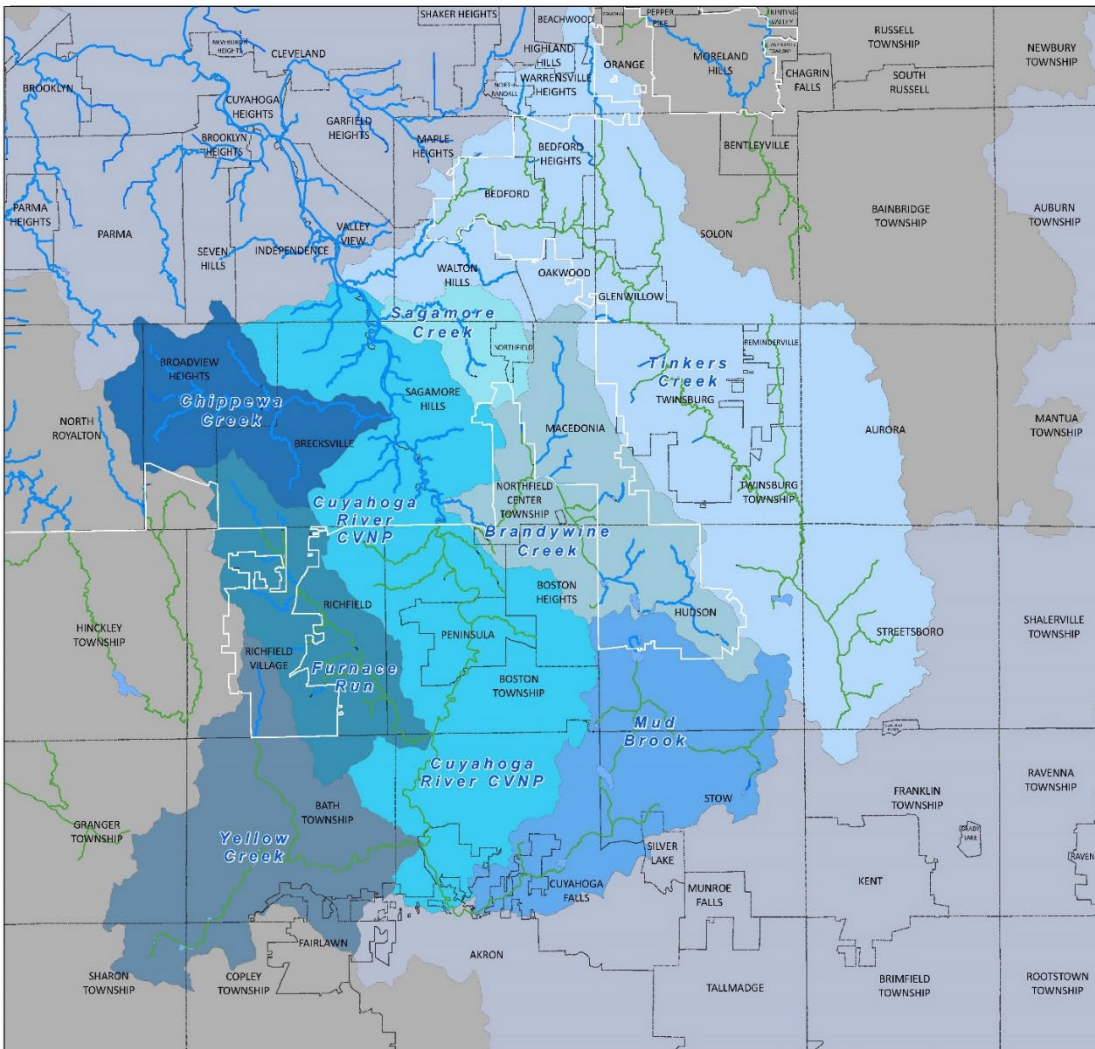
STAINLESS STEEL
BODY

south euclid 18





Johnston

South Euclid Community Cost Share – Equipment Purchase

Stormwater Master Plan



Cuyahoga River - South

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-  Regional Stormwater System not in NEORS D Service Area
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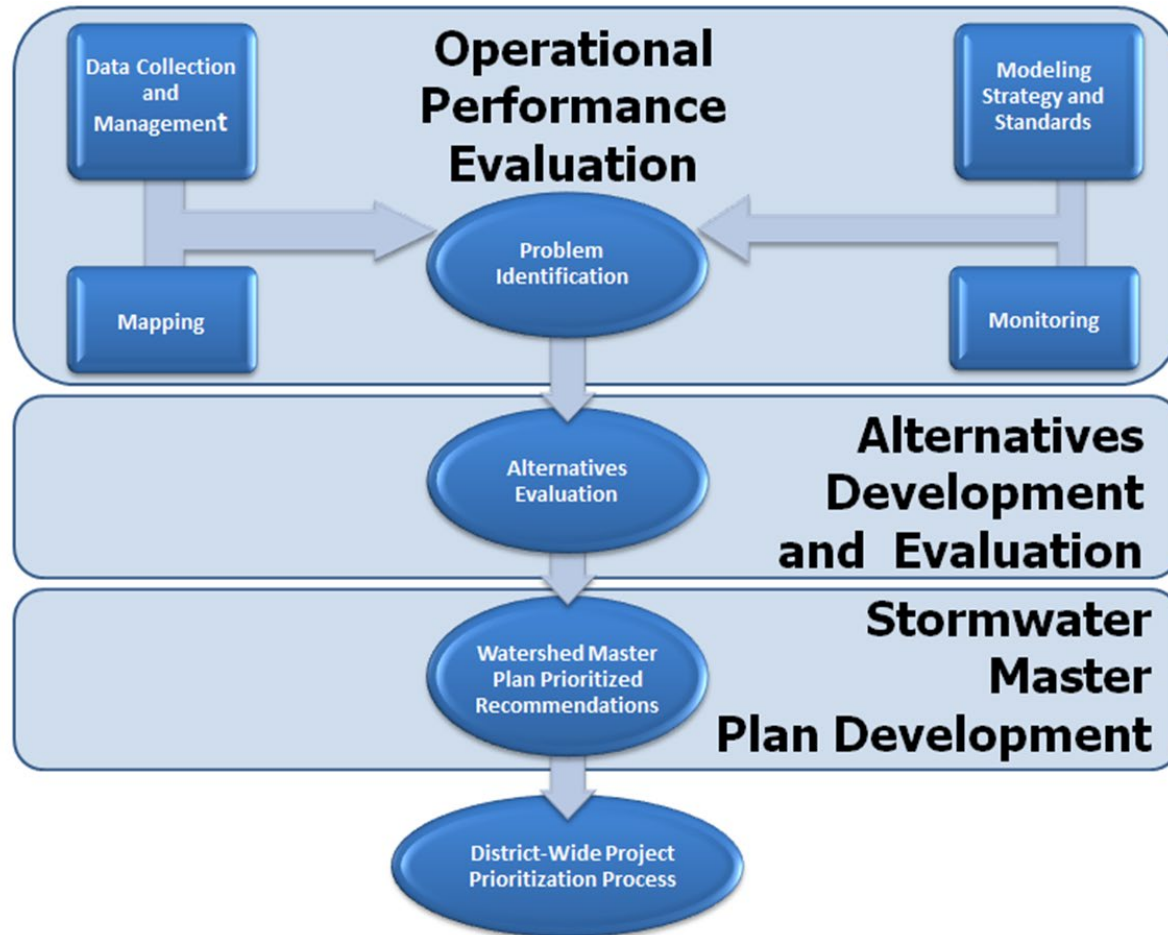
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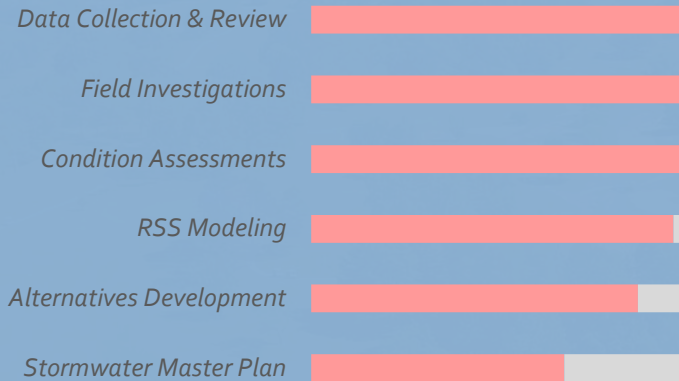


Stormwater Master Plan Study Process

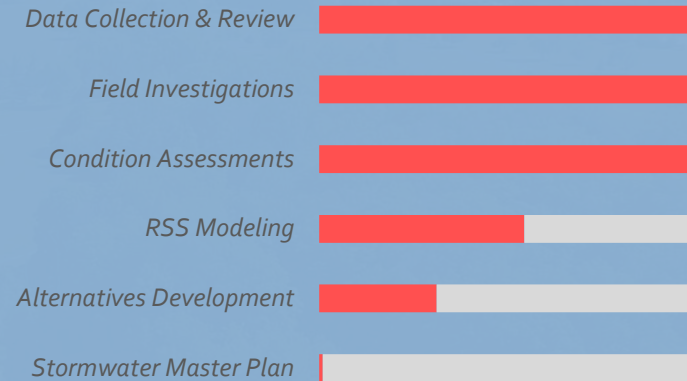


Stormwater Master Planning (status through September)

Cuyahoga River South



Cuyahoga River North



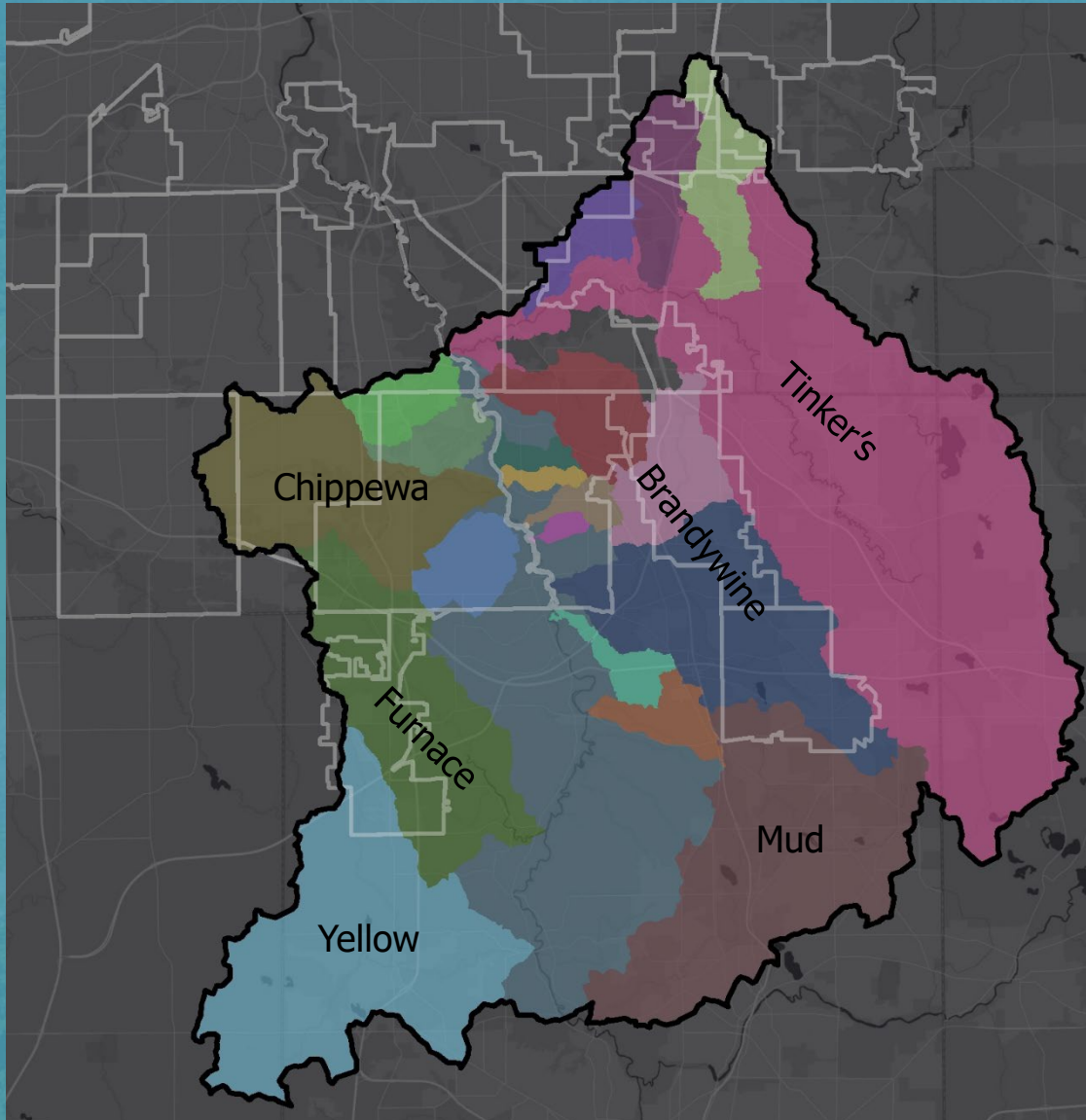
Rocky River



Chagrin/Lake Erie



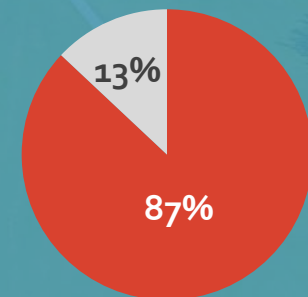
Cuyahoga River South SWMP



Total Study Area:
184,000 acres

- 9 Subwatersheds
- 24 Member Communities

\$5.20 Million



Cuyahoga River South SWMP

Upcoming work

- **Finalize:**
 - SWMP Watershed Reports
 - Community Reports
 - Data Deliverables, including models and inspection/assessment data

Recommended Projects to Date

- ***Tinkers Creek***
15 Projects @ \$50.0M
- ***Chippewa Creek***
14 Projects @ \$55.7M
- ***Brandywine Creek***
19 Projects @ \$66.2M

Stormwater Master Plan

Level of Service Evaluation



Stormwater Master Plan

Level of Service Evaluation

Sam's Club – Brooklyn, Ohio – Big Creek Subwatershed

Problem:

- Stormwater inundation and impacts to Sam's Club, Brookpark Road & surrounding areas including fueling station
- Brookpark Road overtops around a 1-yr. storm
- Sam's Club parking lot begins to flood between the 2- and 5- yr storms
- Water enters the Sam's Club Building around the 10-yr storm

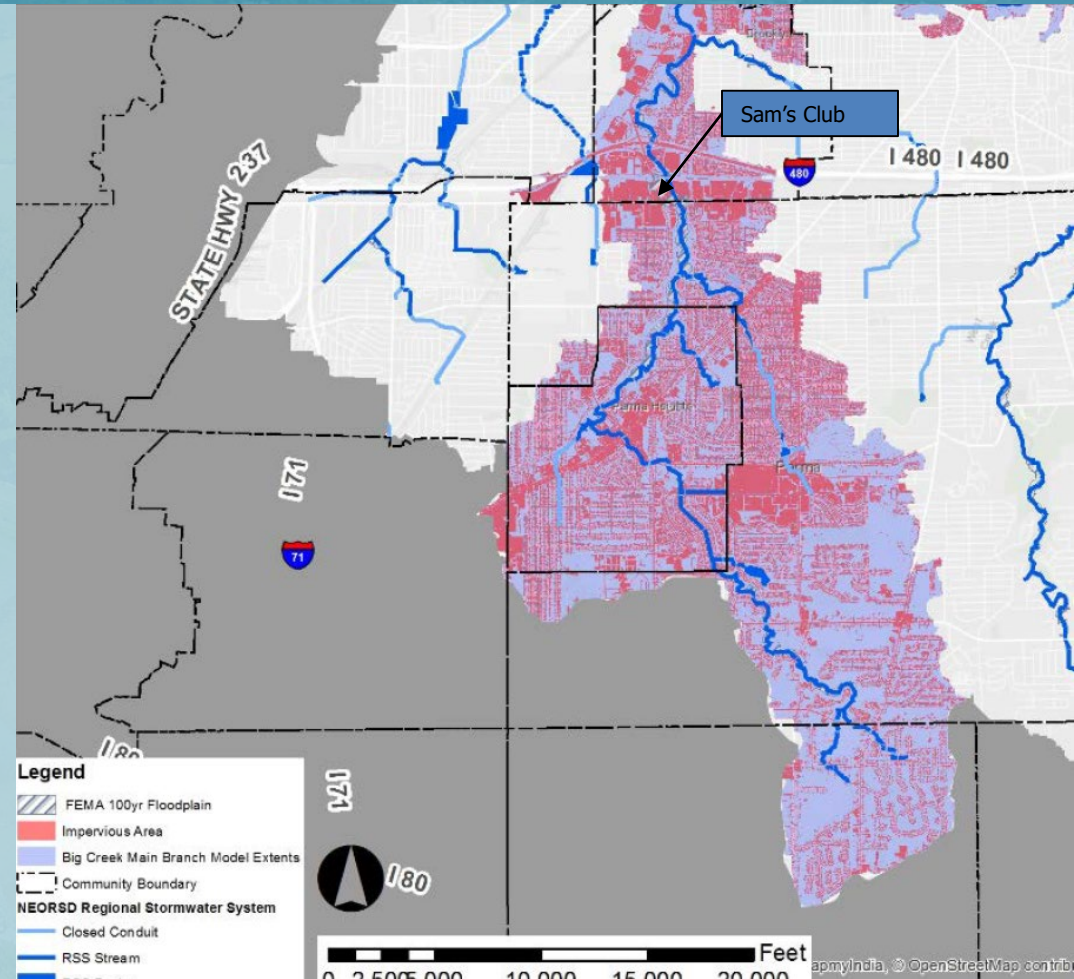


Stormwater Master Plan

Level of Service Evaluation

Problem Overview

- Sam's Club building & parcel site within both the 100-year FEMA & CRN SWMP model floodplains
- Total Drainage Area 8781 acres
- Percent Impervious 38% acres
- Problem Area Specific - Target volume to manage for 100-year LOS 1,800 acre-feet or $\approx 1,361$ football fields
- Watershed-wide: Target volume to manage for 100-yr LOS 3,300 acre-feet or 2,496 football fields



Stormwater Master Plan

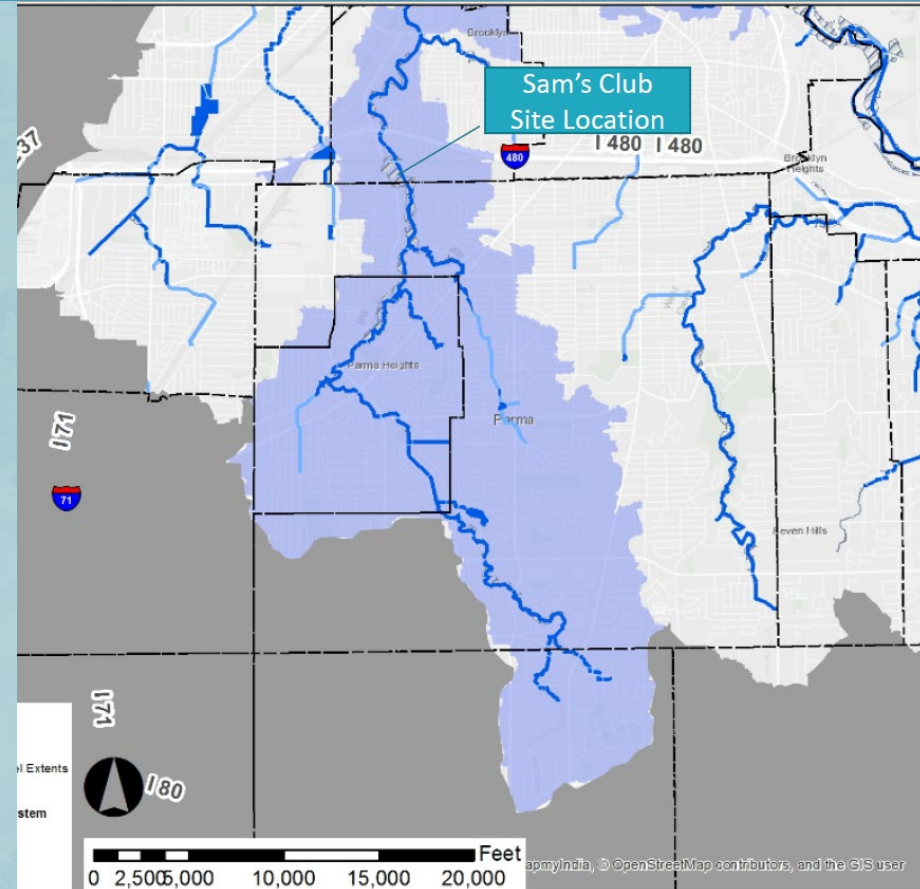
Level of Service Evaluation

No upstream development at all

- All impervious area (development) removed
- Review 100-yr design storm (CRN SWMP parameter)
- Review depth at Sam's Club entrance
767.3

Results

- Inundation depth 1 ft above Sam's Club entrance elevation



Stormwater Master Plan

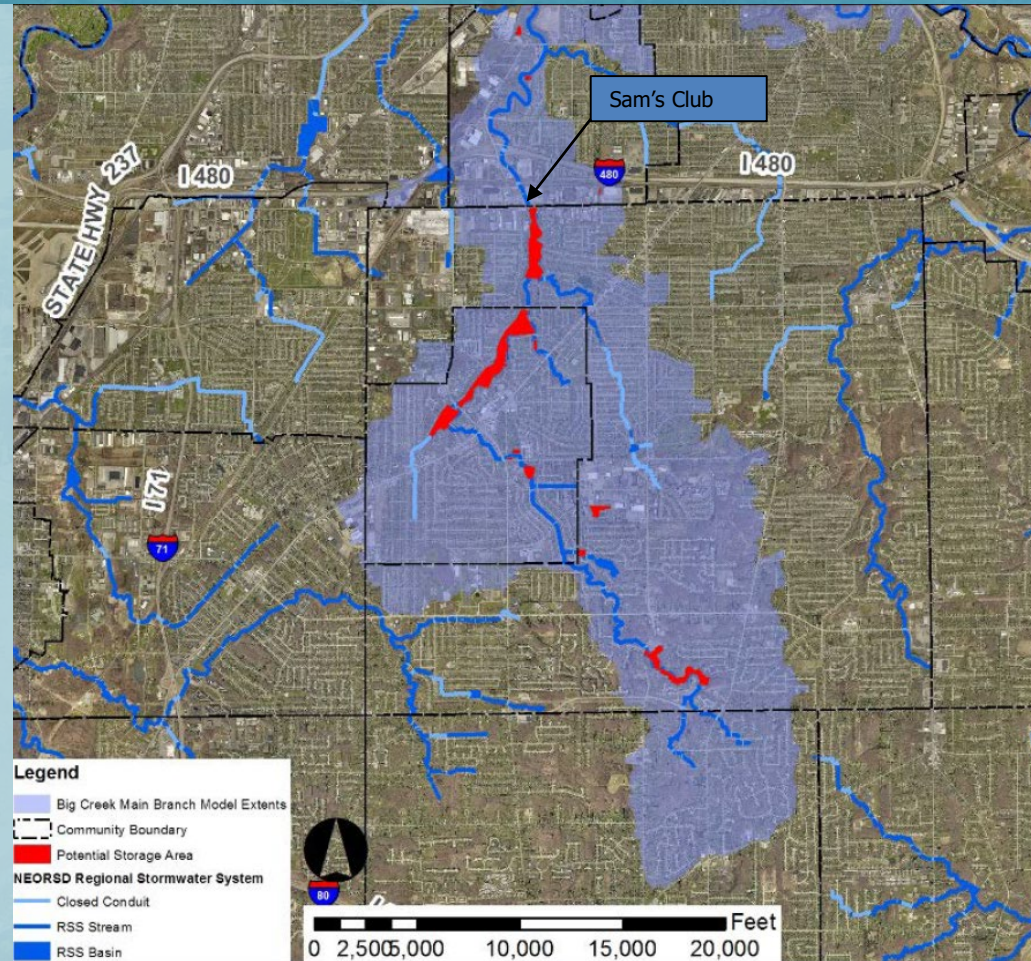
Level of Service Evaluation

Use open land areas –regardless of current ownership

- Review 100-yr design storm (CRN SWMP parameter)
- Review depth at Sam's Club entrance 767.3

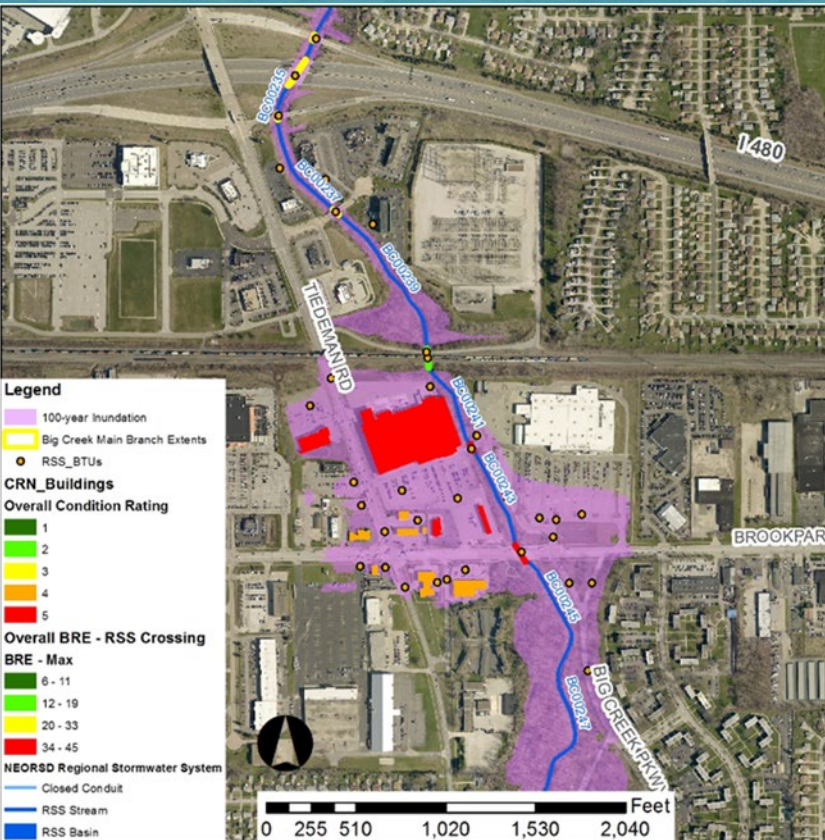
Results

- Potential open area is about 440 acres
- Needed storage of 1,500 acre-ft exceeds potential
- Current watershed does not have enough open areas to address levels of flooding
- Available open areas at Walmart locations for storage opportunities can not remedy issues



Stormwater Master Plan

Level of Service Evaluation – Mitigation Options



- **<2-year Scenarios**
 - Current conditions (Do Nothing)
 - Raise Brookpark Road
 - Channel re-alignment south of Brookpark Rd
 - Sam’s Club/Walmart bridge removal
- **<5-year Scenario (New)**
 - CSX crossing modification
- **<10-year Scenario**
 - Channel widening into Walmart parking lot
- **<25-year Scenario (New)**
 - Channel widening into Walmart parking, CSX crossing upsizing & width increase at Brookpark Rd
- **Results:**
 - Increased floodplain storage from <2-yr to <25-yr LOS (up to <10-yr with channel widening only)
 - Inundation depths reduced by about 1 inch at 100-yr
 - Downstream problem areas show increase inundation depths

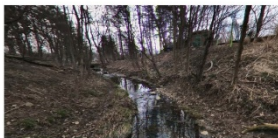
Project Definition Statement

CITY OF BROADVIEW HEIGHTS AND CITY OF NORTH ROYALTON PROJECT AREA CCPA09_A101, A102 & A103

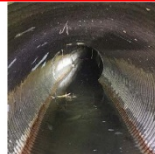
Problem Statement:

- One house has inundation at the foundation level starting in the 25-year design storm and first floor flooding starting in the 50-year design storm (CC00230_B010)
- One house has first floor flooding starting in the 50-year design storm (CC00230_B004)
- One house has inundation at the foundation level starting in the 50-year design storm and first floor flooding in the 100-year design storm (CC00230_B008)
- One house has inundation at the foundation level in the 10-year design storm and first floor flooding starting in the 50-year design storm (CC00230_B016)
- Three houses have inundation at the foundation level in the 10-year design storm and first floor flooding starting in the 25-year design storm (CC00230_B011, CC00230_B014 and CC00230_B017)
- Two roads (West Ridge Drive, CC00230_T018 and Echo Lane, CC00230_T019) are inundated but passable in the 10-year design storm, and become impassable (> 9" of water) in the 25-year design storm
- Two roads (Wallings Road, CC00183_T001 and Briarwood Drive, CC00184_T001) are inundated and impassable in the 10-year design storm and above
- One culverted stream (CC00183) has a hole with a visible, stream connectivity issues, and ongoing sedimentation issues

PROJECT LOCATION & EXISTING CONDITIONS



(A) View of open stream segment CC00184 taken facing downstream



(B) Culverted stream CC00183 at inlet facing downstream

CITY OF BROADVIEW HEIGHTS AND CITY OF NORTH ROYALTON PROJECT AREA CCPA09_A101, A102 & A103

Project ID	Project Elements
CCPA09_A101	Enlarge and deepen the basin at the north of Valley Lane Road and west of Ridge Drive from 1 to 2 acres (from 5 to 11 acre-feet of storage).
CCPA09_A102	Create 1,200 linear feet of channel restoration with connected floodplain along the north/south running open channel, acquire easements.
CCPA09_A103	Demolish existing culverted stream; create 630 linear feet linear feet of channel restoration with connected floodplain

Known Constraints/Challenges:

- Requires cooperation for property interest on 25 parcels. Some owned by city, some private owners.
- Geotech and soil samples will be needed to identify if any contaminated soils are targeted for excavation.

Project Results

- Eliminated first-floor flooding in seven houses through the 100-year design storm (CC00230_B010, CC00230_B004, CC00230_B008, CC00230_B016, CC00230_B011, CC00230_B014 and CC00230_B017)
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- Demolished degraded culverted stream (CC00183) and restored channel; improving floodplain connectivity, stream function, and stream health
- Restored additional 1,200 linear feet of channel with connected floodplain, improving stream function and health as well as improving floodplain access
- Expanded basin (CC00230) to increase storage; additional water quality volume further enhances stream function and health

Project Cost

\$12,852,000

*Costs do not include potential land acquisition unless noted

PROJECT ELEMENTS & RESULTS



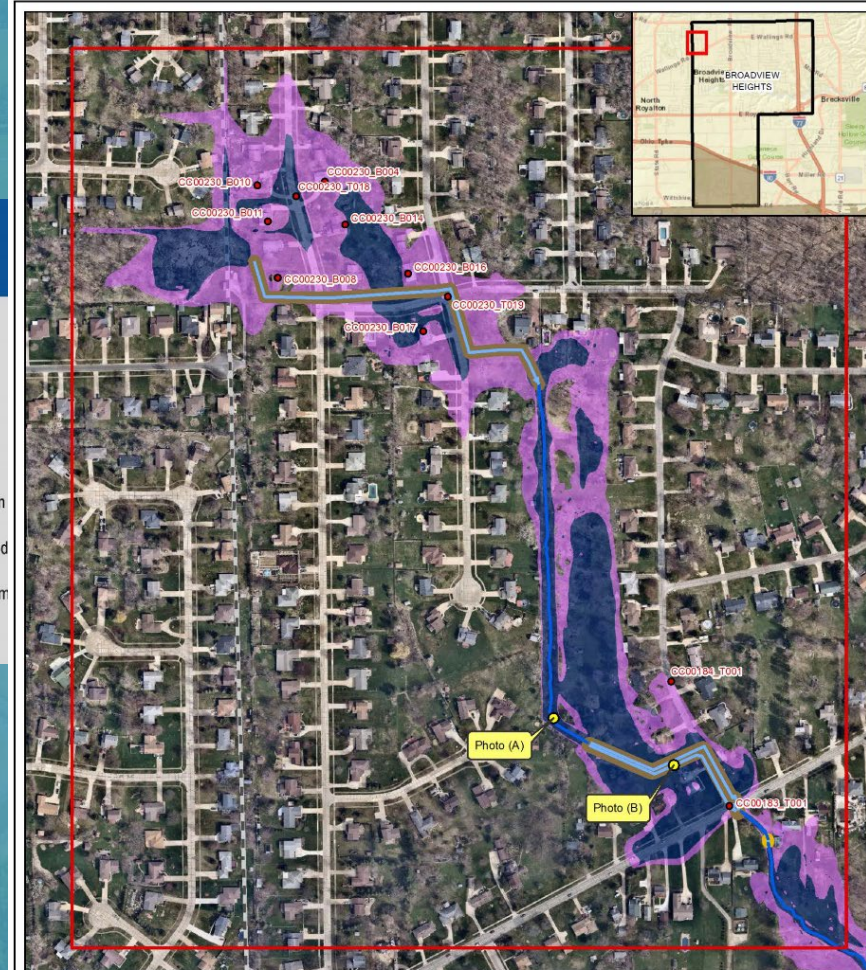
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PROJECT LOCATION & EXISTING CONDITIONS



1:4,000

0 165 330 495 Feet

Map Created: 9/7/2018

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- RSS BTU Asset
- RSS Closed Conduit
- RSS Stream
- CRS RSS Crossing
- CRS RSS Culverted Stream
- Existing 10-Year Flood Area
- Existing 100-Year Flood Area

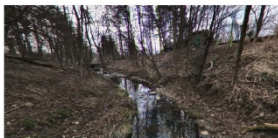
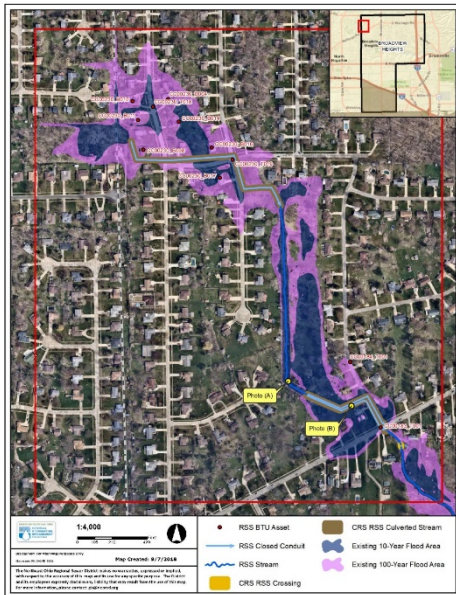
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CCFA09_A102	Create 1,200 linear feet of channel restoration with connected floodplain along the north/south running open channel, acquire easements.	• Geotech and soil samples will be needed to identify if any contaminated soils are targeted for excavation.
CCFA09_A103	Demolish existing culverted stream; create 630 linear feet linear feet of channel restoration with connected floodplain	

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Project Cost

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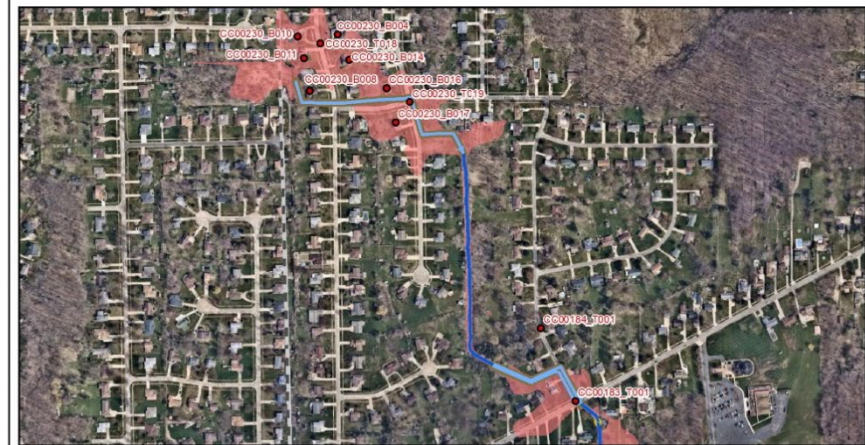
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PROJECT ELEMENTS & RESULTS



Project Definition Statement

PROJECT ELEMENTS & RESULTS



Scale: 1:6,700
 Source: NTRM SD GIS
 Map Created: 9/7/2018

Legend:

- RSS BTU Asset
- RSS Crossing
- Existing 100-Year Flood Area
- Project Limits
- RSS Culverted Stream
- All 1 100-Year Flood Area
- RSS Closed Conduit
- Parcel Boundary
- RSS Stream

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CITY OF BROADVIEW HEIGHTS AND CITY OF NORTH ROYALTON

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Next Steps after Master Planning

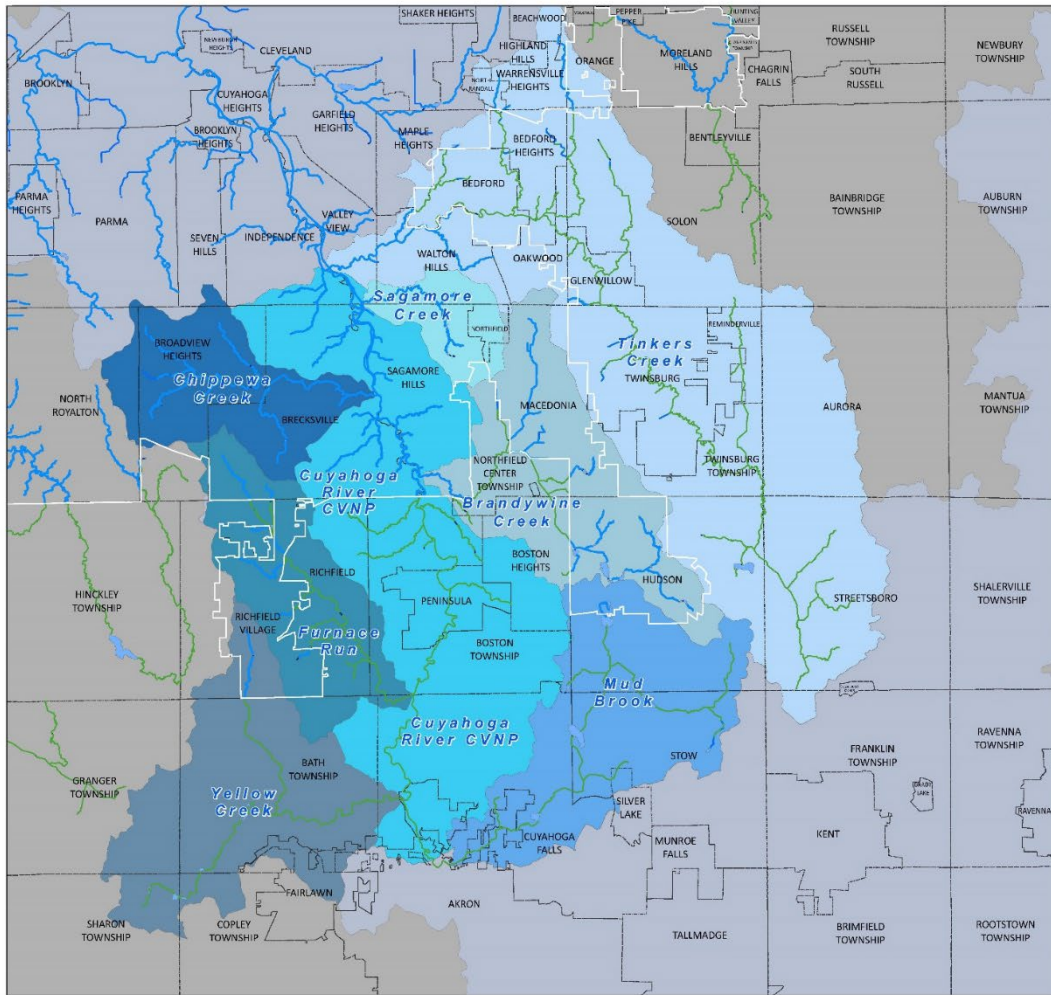
Recommended Projects to Date

- *Tinkers Creek*
15 Projects @ \$50.0M
- *Chippewa Creek*
14 Projects @ \$55.7M
- *Brandywine Creek*
19 Projects @ \$66.2M

Next Steps for Projects:

- Nomination to Construction Plan
 - Advanced Planning
 - Design
 - Design-Build
 - Property Acquisition
 - Prioritization
 - Phasing/Sequencing

Questions



Cuyahoga River - South

- Regional Stormwater System in NEORS Service Area
- Regional Stormwater System not in NEORS Service Area
- Service Area
- Community

Northeast Ohio Regional Sewer District

Coordinate System : Ohio State Plane North
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Stormwater Inspection and Maintenance (*SWIM*)



SWIM Agenda

- Introduce SWIM Team Members
- Urgent Storm Event Response Process
- Small Scale Maintenance Projects
- Upcoming Community Meetings on Crossings

Westside SWIM Team

- **Mark Link**
Supervisor
- **Christina Silea**
Inspector
- **Nikki Velez**
Inspector
- **Claire Posius**
Project Coordinator
- **Martina Jozanovic**
*Data Maintenance
Administrator*

Eastside SWIM Team

- **Keith McClintock**
Supervisor
- **Jon Brauer**
Inspector
- **Anne Roberto**
Inspector
- **Mark Hornyak**
Project Coordinator
- **Eric Baker**
*Data Maintenance
Administrator*

SWIM Agenda

- Introduce SWIM Team Members
- Urgent Storm Event Response Process
- Small Scale Maintenance Projects
- Upcoming Community Meetings on Crossings

SWIM Progress Status

Urgent Storm Response Case Study

April 15, 2018 Storm Event

SWIM Urgent Storm Event Response Process

- Review Advanced Warning Notifications
 - e.g., National Weather Service
- Field Check and Clean Known Problem Assets Prior to Storm
- Track Rainfall for Size of Storm (e.g., 10-yr, 24-hr) & Monitor Live Field Data for Evidence of Flooding
- Analyze Media, Customer & Member Community reported flooding

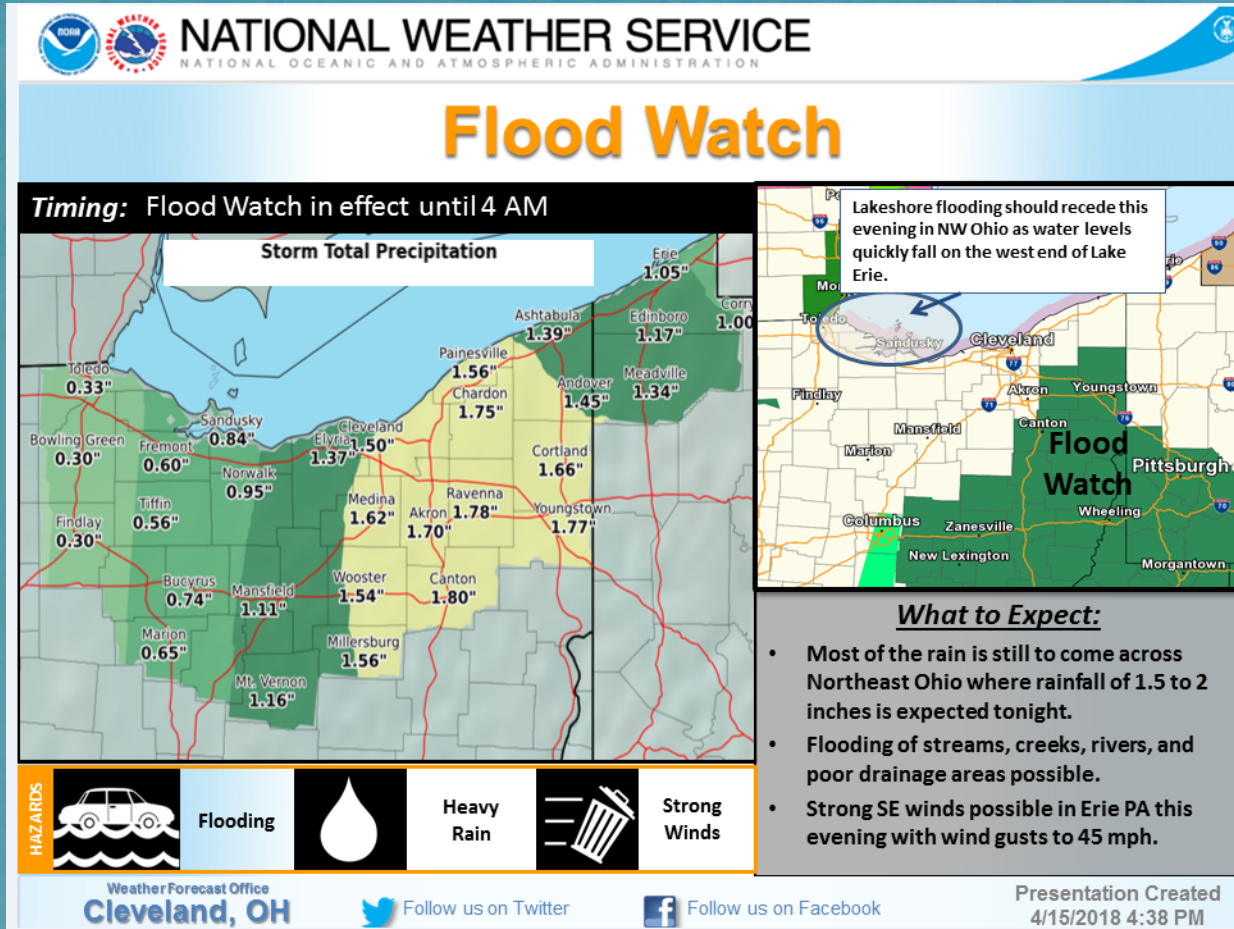
SWIM Urgent Storm Event Response Process

- Immediately Field Inspect Problem Assets Upon Receded Flooding
- Mobilize Contractors for Post-Storm Event Response Maintenance

Urgent Storm Event Response Case Study

April 15-16, 2018

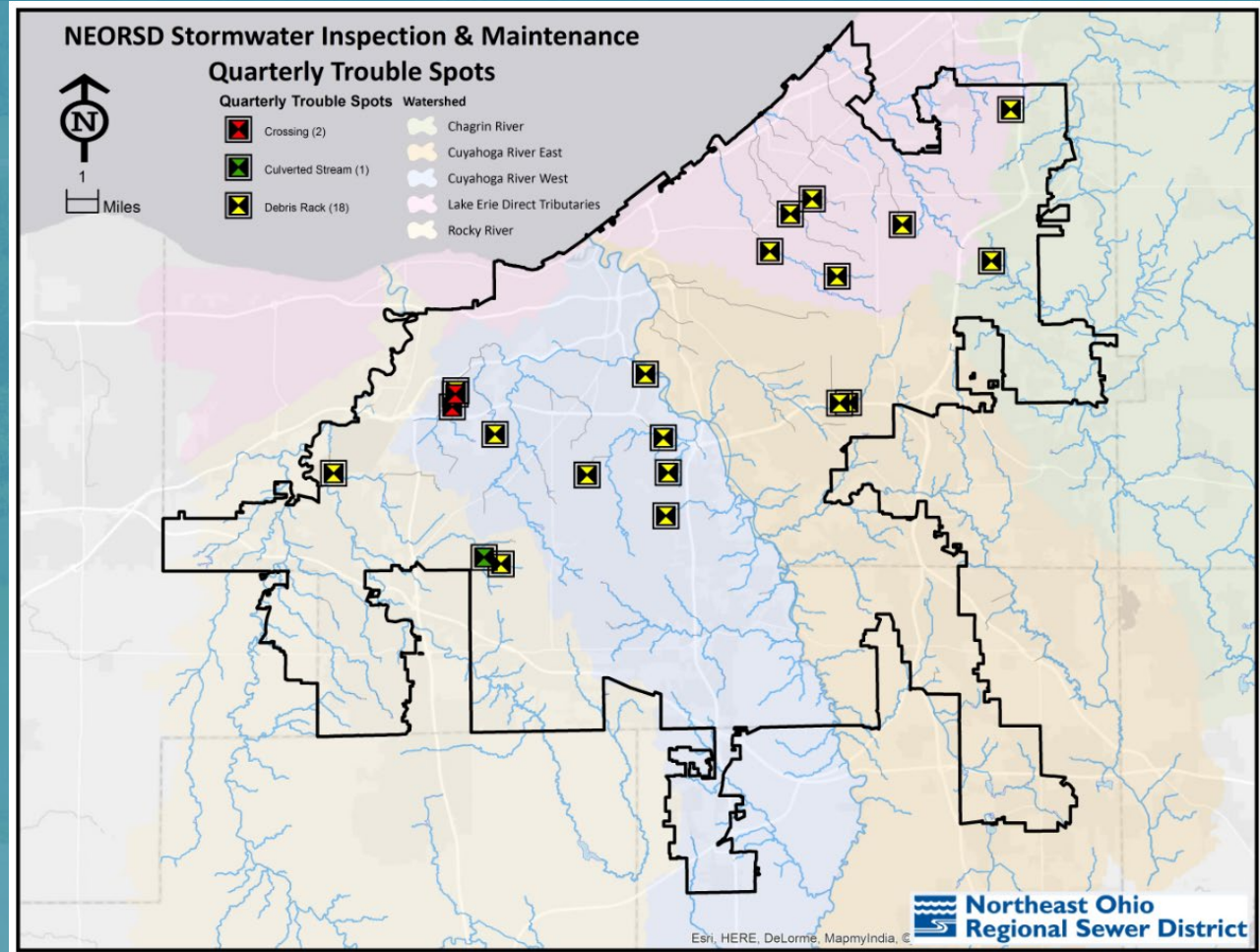
Review of Advanced Warning Notifications



4/15/18 NWS
Notifications
received at
5:02 PM
(Sunday)
immediately
prior to the
storm

Sites SWIM Routinely Checks for Debris and Prior to Large Storms with Advanced Warning

SWIM
routinely
visits 21 sites
for debris
maintenance



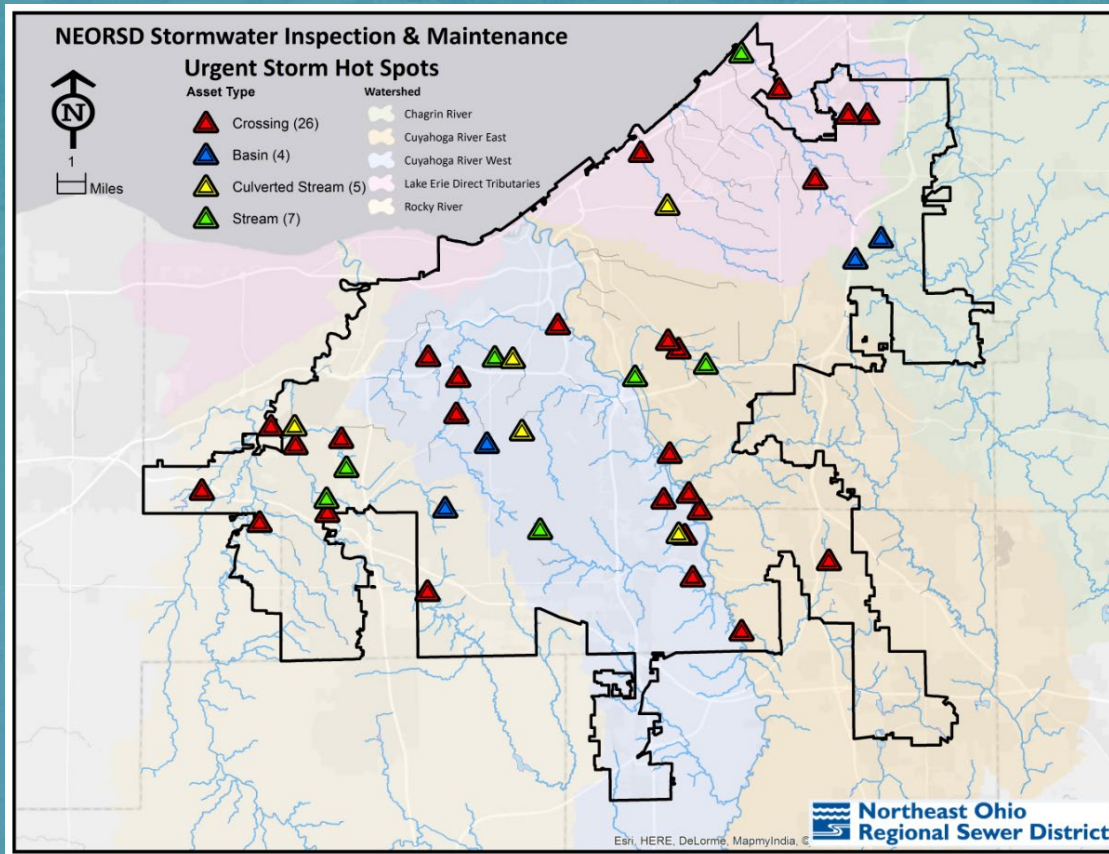
April 14, 2018: Debris Rack is Clear Before the Storm Event



April 16, 2018: Peak Storm and Debris Accumulated on Rack



Immediately Field Inspected Problem Assets Upon Receded Flooding

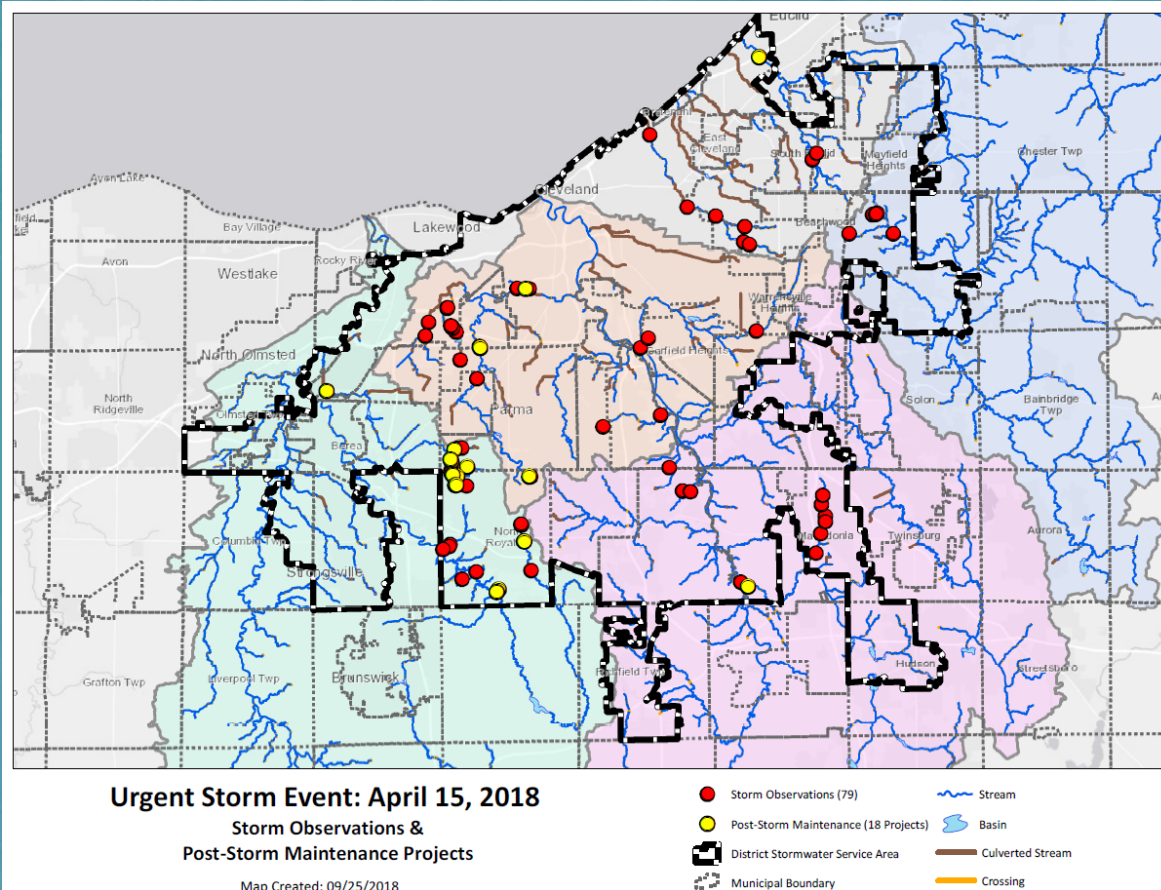


SWIM has a list of 42 known sites that are prone to flooding

Field inspected when reported heavy rainfall, high streams, or media reports of flooding in the area

Additional sites are added based on media reports or field observations

Mobilized Contractors to Perform Post-Storm Response Maintenance



79 site inspections

18 debris removal projects (many the same day as inspection)

Average yardage of debris was low compared to previous removals due to preventative maintenance

Rocky River: Rocky River East Branch
Member Community: North Royalton

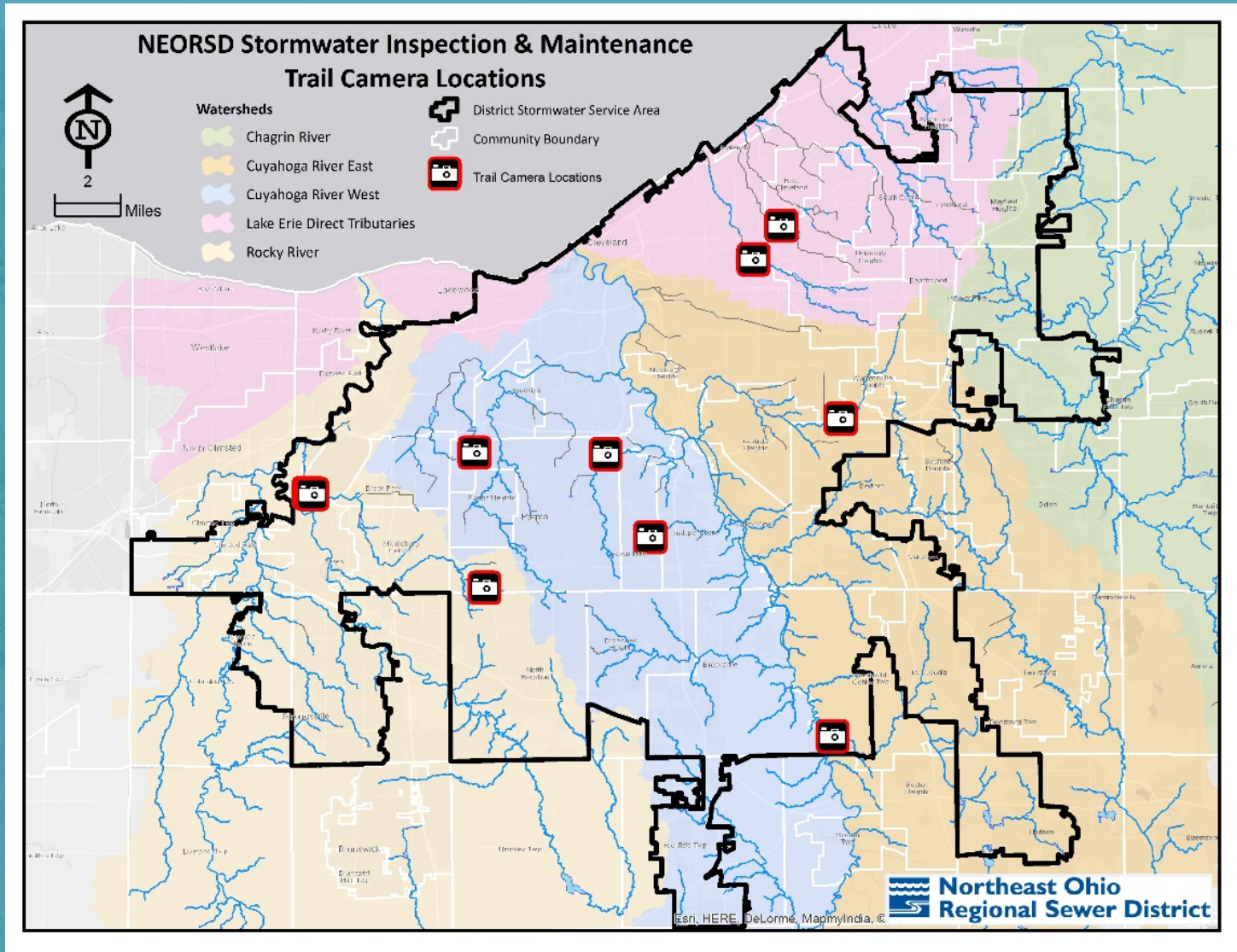
Asset ID: RY00434

Maintenance Project: Debris Removal (10 CY)



Debris was removed the same day it was inspected

Using Trail Cameras to Support the RSMP



Forest Overlook Basin
Hemlock Creek (Seven Hills)
Prior to Storm



Peak Storm Water Level (Rainfall was 1.62-inches)



SPARTAN

T

04/19/2017 20:15:26

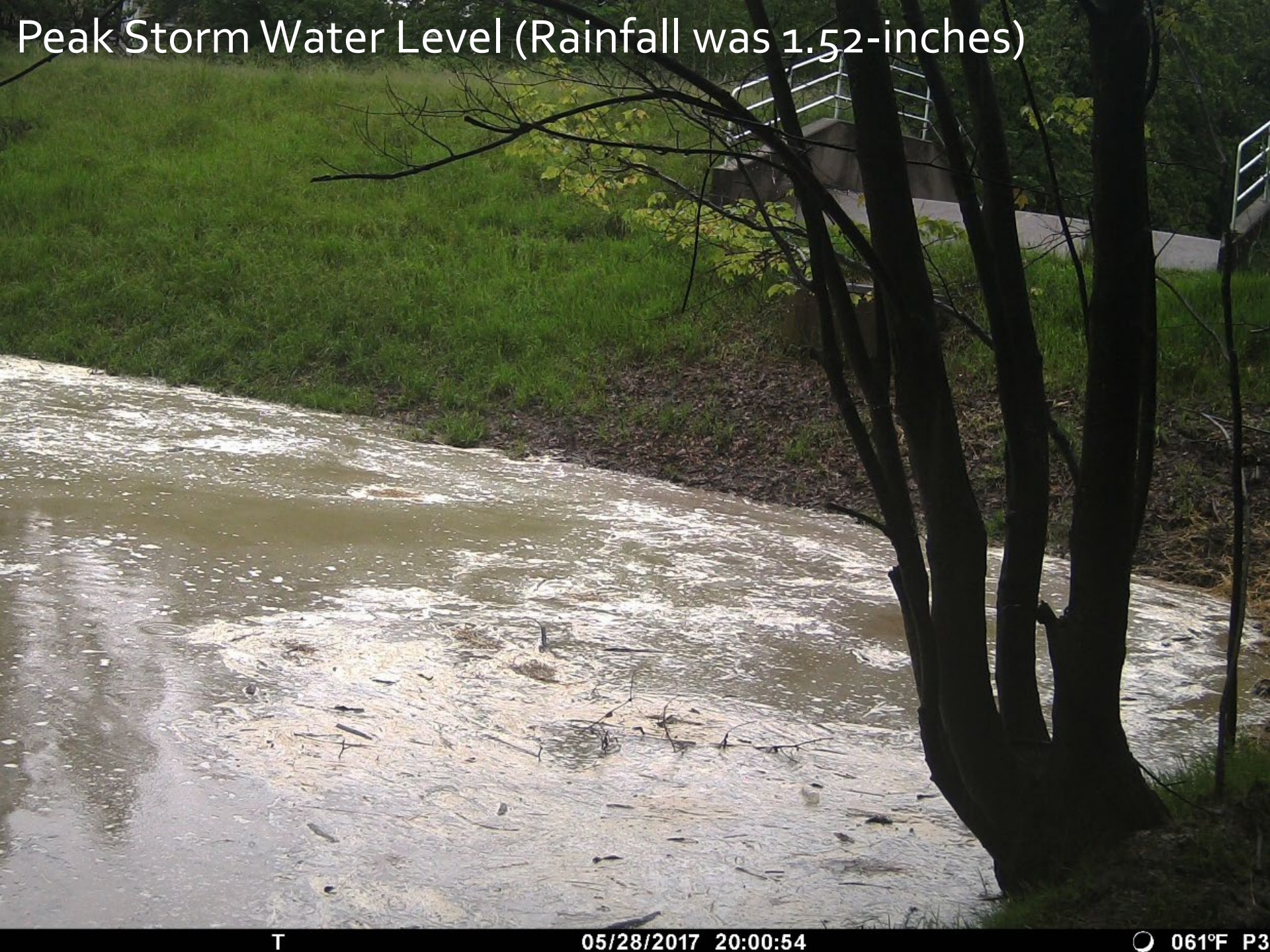
061°F P3

Post Storm (80 Cubic Yards of Sediment & Debris)



Post Storm Event Response





Peak Storm Water Level (Rainfall was 1.52-inches)

Post Storm



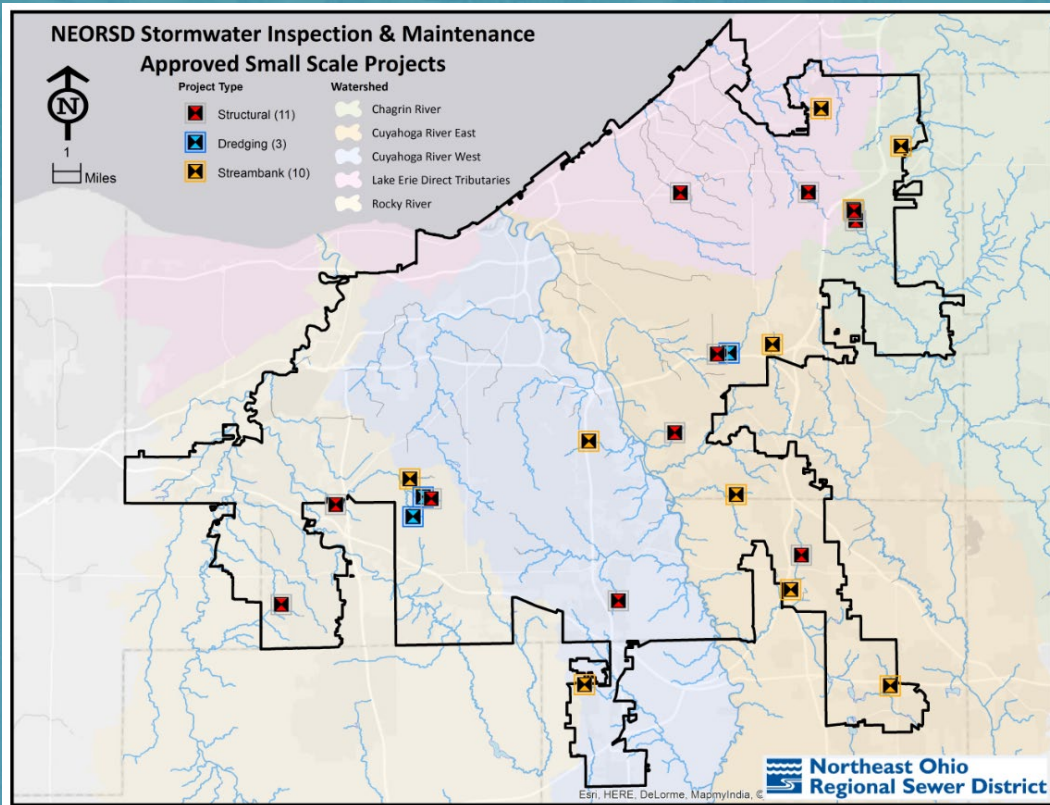
T

05/29/2017 06:00:03

SWIM Agenda

- Introduce SWIM Team Members
- Urgent Storm Event Response Process
- **Small Scale Maintenance Projects**
- Upcoming Community Meetings on Crossings

Small Scale Maintenance Projects



21 small scale maintenance projects are underway as a pilot preventative maintenance program

- 11 Structural Maintenance projects
- 10 Streambank Stabilization projects

Small Scale Maint Project: Streambank Stabilization Cuyahoga River South: Indian Creek

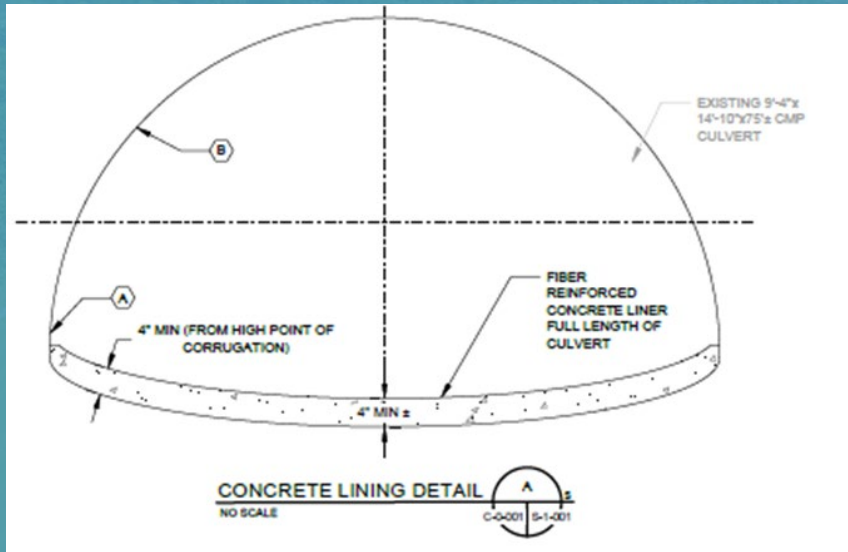
Asset #: IC00077

Macedonia: Berkshire Drive

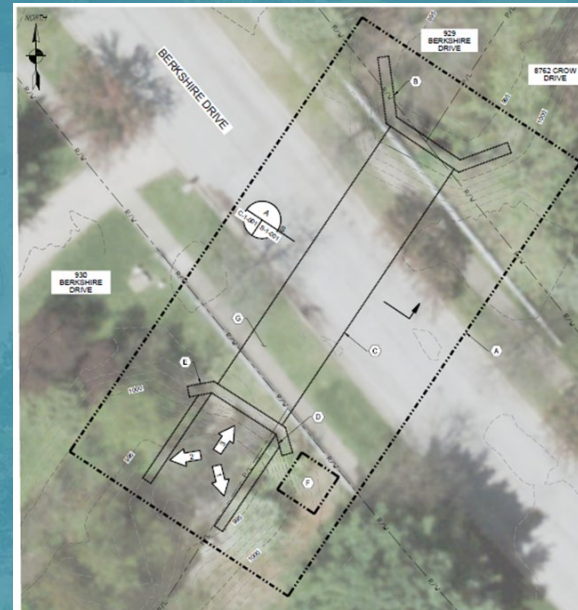
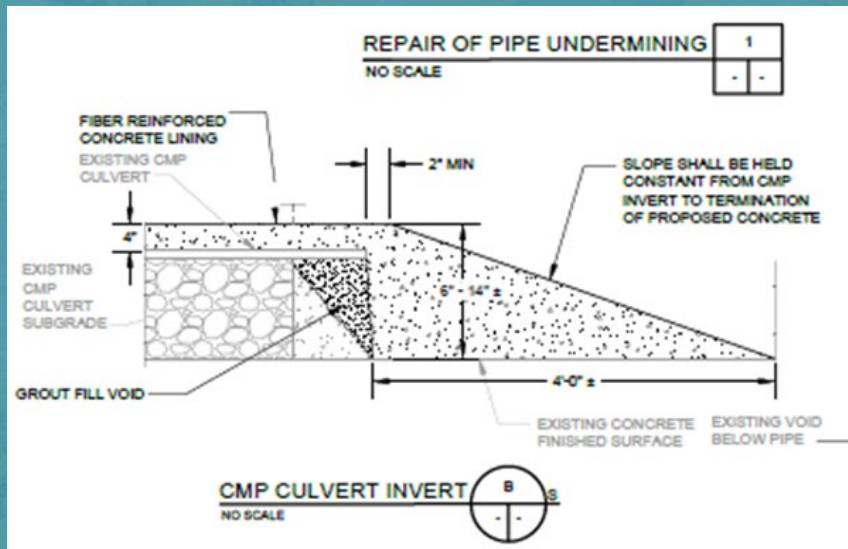
Structural BRE = 12



Small Scale Maint Project: Structural Repair Cuyahoga River South: Indian Creek



- Line invert to protect rusting CMP
- Provide structural concrete support in undermined area at outlet



Small Scale Maint Project: Streambank Stabilization Cuyahoga River South: Furnace Run

Asset #: FR00100

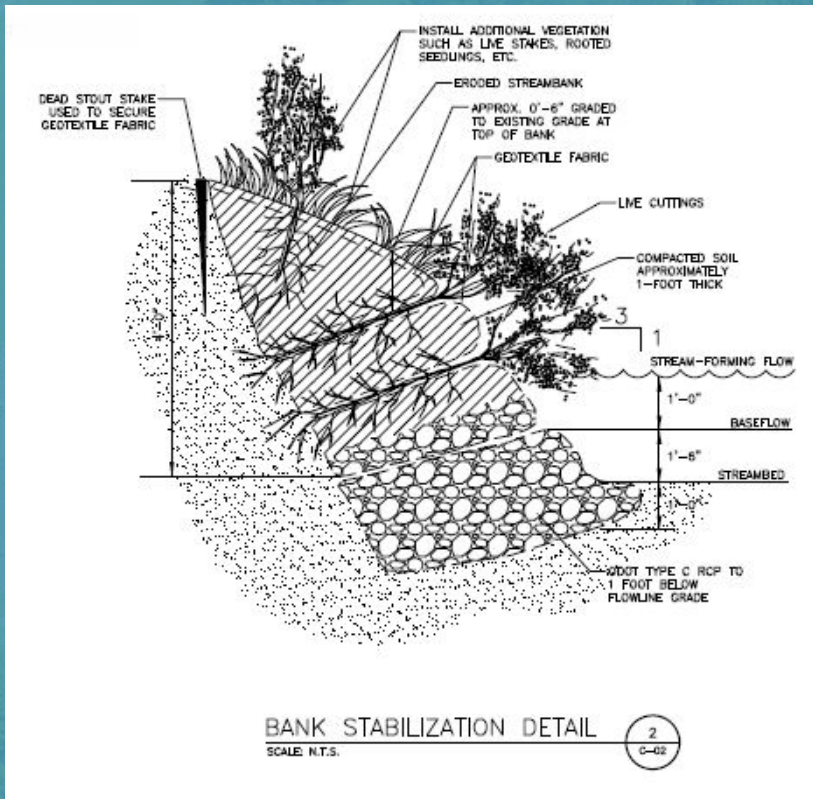
Richfield Village: 4125 Brush Road

Structural BRE = 12



Small Scale Maint Project: Streambank Stabilization Cuyahoga River South: Furnace Run

- Lay banks to a stable slope
- Install live branch layering and rock toe protection



SWIM Agenda

- Introduce SWIM Team Members
- Urgent Storm Event Response Process
- Small Scale Maintenance Projects
- Upcoming Community Meetings on Crossings

Upcoming Community Meetings to Discuss State of RSS Crossings

District Stormwater Service Area

2018 SWSA Structural Integrity Report Card	SWSA Subwatersheds
A	12
B	38
C	5
D	1
F	0
Total	56

The District continues to inspect RSS assets (55%)

Almost all RSS crossings have been inspected

Meetings will review SWIM findings and next steps for implementation and financing

- 327 SWSA RSS assets with Condition Rating = 4 or 5
- 63 SWSA RSS Crossing assets Condition Rating = 4 or 5

Upcoming Community Meetings to Discuss State of RSS Crossings

2018 Cuyahoga River South WAC Structural Integrity Report Card

RSS SUBTOTAL		904	406 ▲	45%	B	▲	2.15 ✓	10.35
ASSET CLASS TYPE	RSS COUNT	COND SCORE COUNT	Percent Inspected	Report Card Grade (per structural integrity condition)	Average Structural Integrity Condition	AVG BRE		
BASIN	21	11 ▲	52%	A	✓ 1.4	✓ 9.5		
CROSSING	308	205 ✓	67%	B	▲ 2.1	▲ 12.9		
CULVERTED_STREAM	25	14 ▲	56%	B+	▲ 1.9	▲ 15.9		
Major Structure	3	- ○	0%					
STREAM	547	176 ✘	32%	B-	▲ 2.3	✓ 7.0		

- 68 CRS RSS assets with Condition Rating = 4 or 5
- 15 CRS RSS Crossing assets with Condition Rating = 4 or 5

Questions





Stormwater Design and Construction Program

Cuyahoga River South

NOTICE: London Road Relief Sewer Assessm

Doing business with us ▶

Industrial Customers ▶

Engineering & Construction

Plan Review

Procurement

Register as a New Vendor /
iSupplier Login

Bids and Proposals: Active,
Closed, and Awarded

Business Opportunity Program:
Get certified

Event Calendar

GovDeals Surplus Items

Capital Improvement Plan

**Stormwater Construction
Program**

Opportunity Corridor on-site
stormwater management
strategy report

[Home](#) > [Business Home](#) > Stormwater C

Stormwater Construction

Thank you for your interest in assisting the Sewer District with the implementation of the Stormwater Construction Program. The format of the five-year program is designed to provide more information to Small Business Enterprise (SBE), Minority Business Enterprise (MBE) and Woman Business Enterprise (WBE) participants in the District's [Business Opportunity Program](#), to allow you to better participate in the District's [Business Opportunity Program](#) (BOP) to highlight planned Regional Stormwater Management Program projects and provide information on the District's Award and Construction Award. It is our hope that you will find this succinct format helpful as you work over the next several years.

NEW: [Stormwater Design 2018 preview](#) | As presented at our Business Opportunity Program

If this page does not automatically redirect, [proceed to the latest Stormwater Construction Program](#) as this plan is updated monthly during the year to reflect the updated status of these projects.

Stormwater Construction Program Storymap

NEORS D Stormwater Design & Construction Program

Navigate using the tabs below and by clicking the images to view more details on our completed, current design, and current construction stormwater projects. Zoom in to view satellite imagery and Regional Stormwater System features (e.g. streams, culverts, conduits, etc). Use the "Zoom To" drop down menu to



FEATURED POSTS

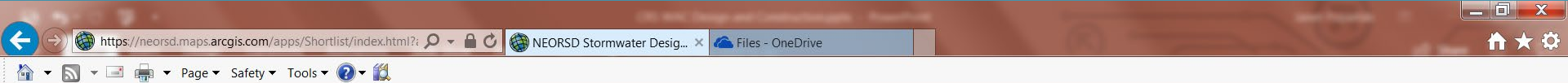
[Community Cost-Share Program](#)

[Stormwater Construction Table of Projects](#)

[Member Community Infrastructure Program \(MCIP\)](#)

RELATED LINKS

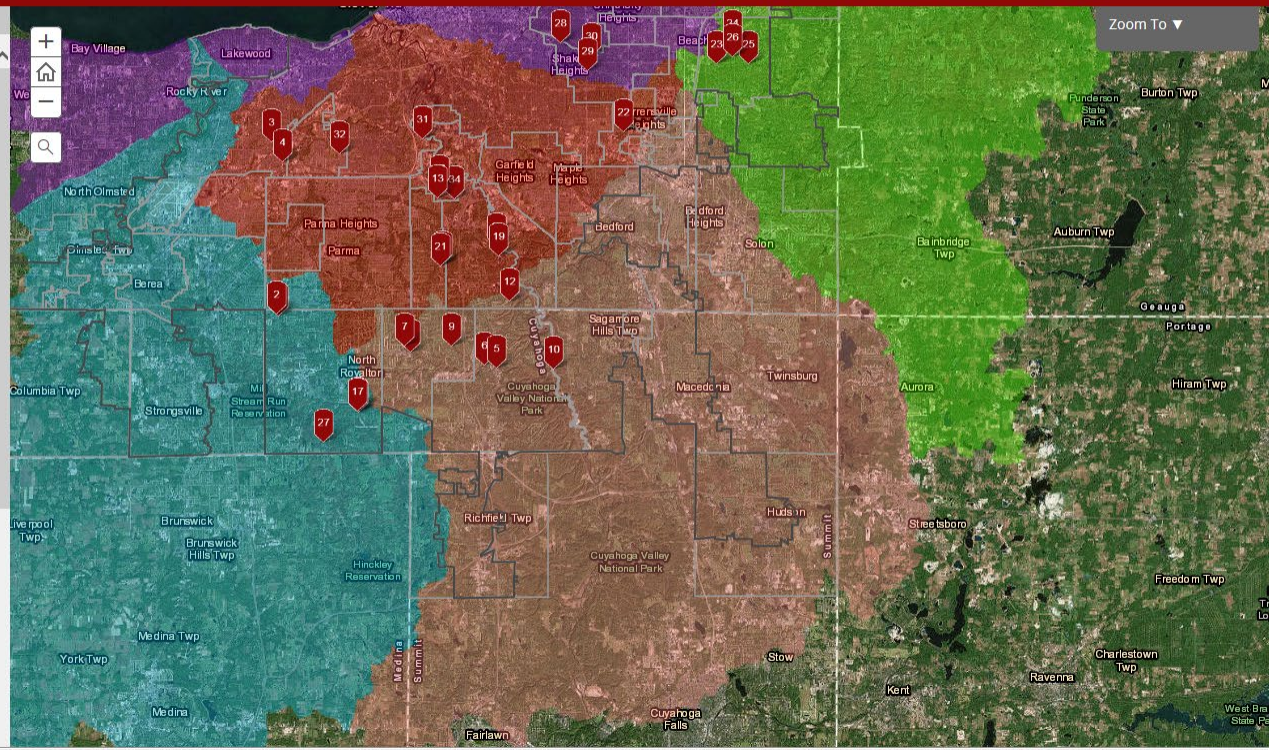
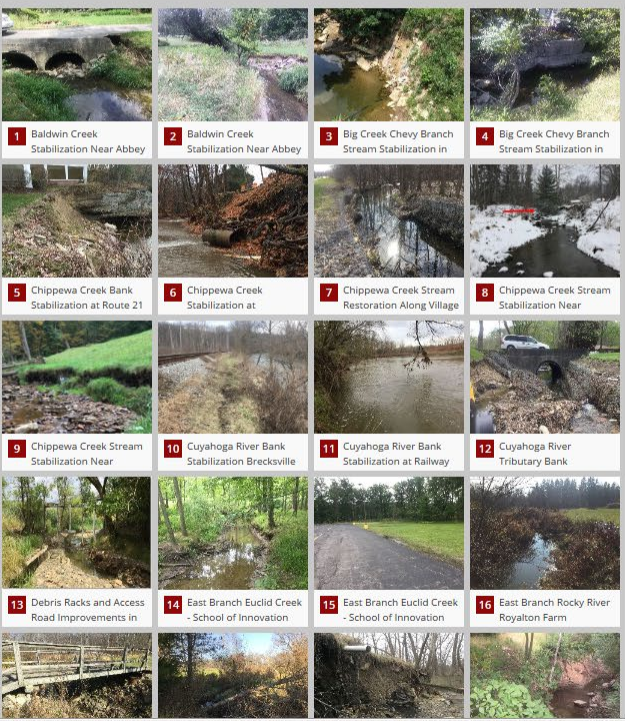
Cuyahoga River South



NEORSD Stormwater Design & Construction Program

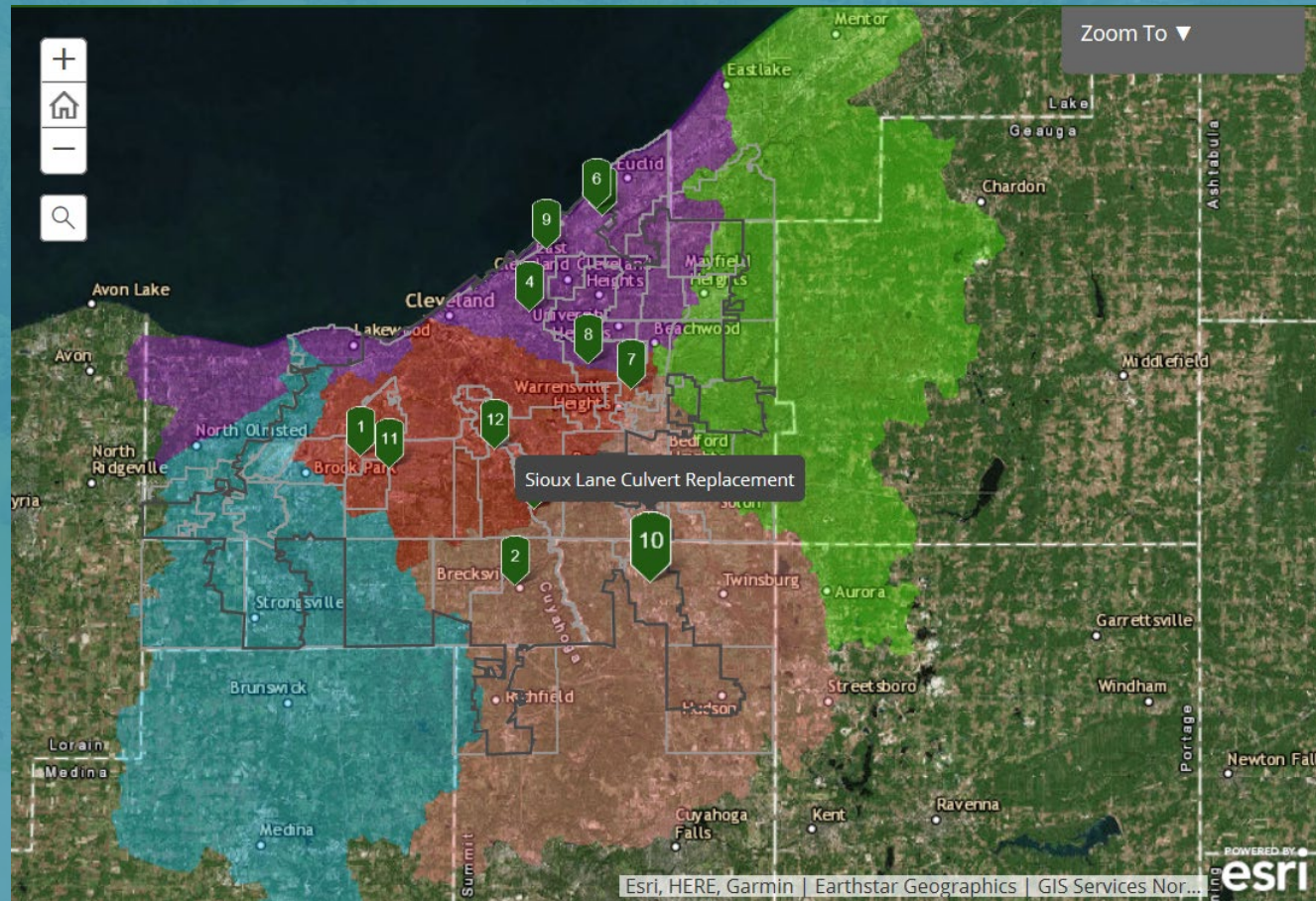
Navigate using the tabs below and by clicking the images to view more details on our completed, current design, and current construction stormwater projects. Zoom in to view satellite imagery and Regional Stormwater System features (e.g. streams, culverts, conduits, etc). Use the "Zoom To" drop down menu to locate your watershed.

- All Projects
- Design
- Construction
- Complete



Cuyahoga River South Watershed Construction

Sioux Lane
Culvert
Replacement in
Macedonia



Sioux Lane Culvert Replacement

Before Construction: existing 6 corrugated metal culvert pipes

After: New structure restores flow capacity and improves maintenance by reducing debris build-up



https://neorsd.maps.arcgis.com/apps/Shortlist/index.html?&... NEORSD Stormwater De


Page Safety Tools

NEORSD Stormwater Design & Construction Program

Navigate using the tabs below and by clicking the images to view more details on our completed, current design, and current construction. To " drop down menu to locate your watershed.

All Projects Design Construction Complete

5 Chippewa Creek Bank Stabilization at Route 21



Project Name: Chippewa Creek Bank Stabilization at Route 21
 Community: Brecksville
 Watershed Team Leader: **R. Webb**
 Watershed: Cuyahoga River South
 Subwatershed: Chippewa Creek

CHIPPEWA CREEK BANK STABILIZATION AT ROUTE 21

Brecksville, Ohio

CUYAHOGA RIVER
SOUTH
WATERSHED

•

CHIPPEWA CREEK
SUBWATERSHED



Project Details

Asset Number:
CC00030

Contract Type:
GES/Bid/Build

Construction Cost:
\$1,500,000

Anticipated Construction NTP:
1st QTR 2020

Watershed Team Leader:
WebbR@neorsd.org

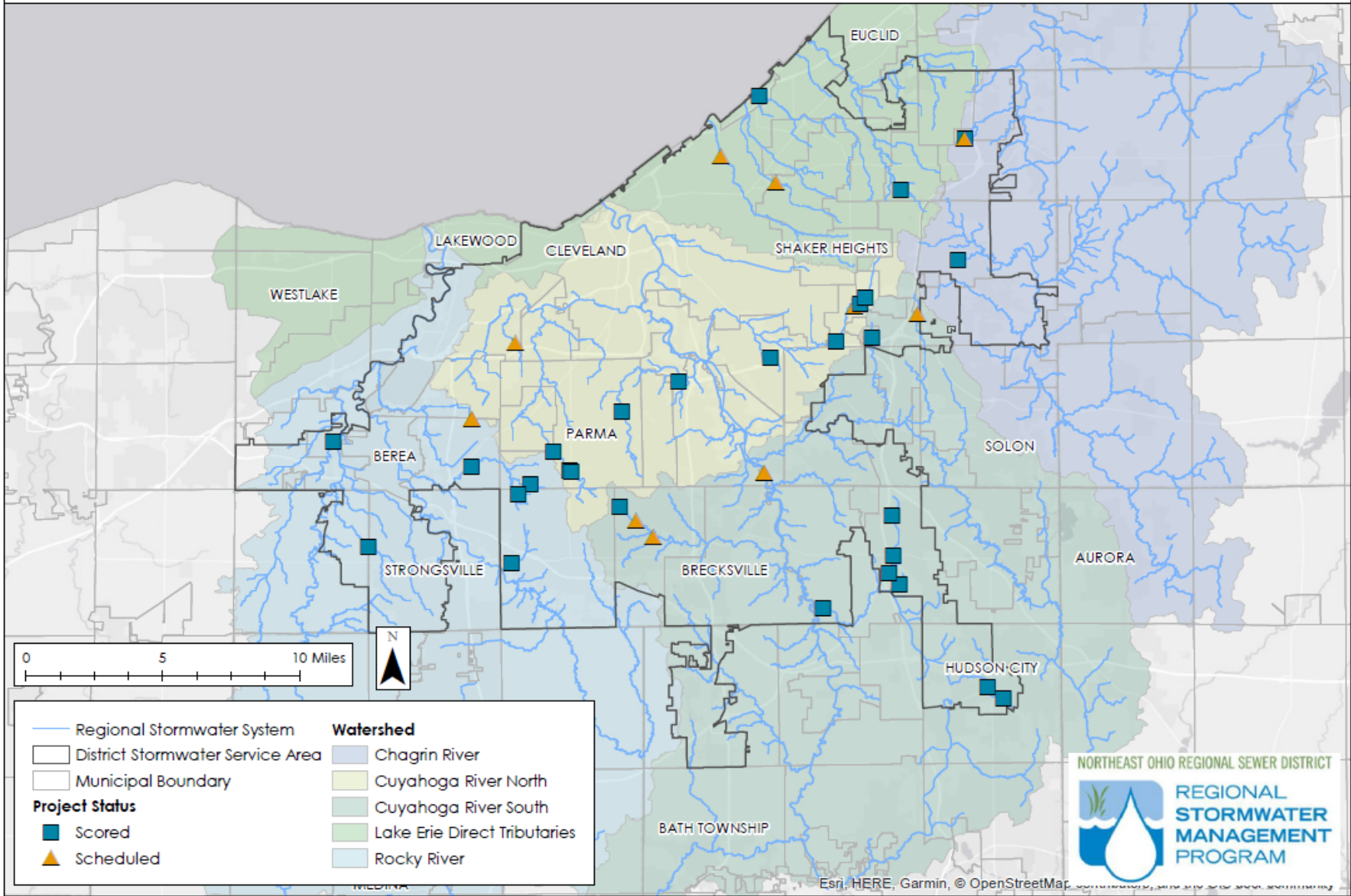
SUMMARY

The project will address erosion issues along the left bank of Chippewa Creek that threatens structural integrity of a commercial building.

This stabilization project is necessary to help realign the stream away from the high bank and protect the building from potential damage.

Northeast Ohio Regional Sewer District

Stormwater Design & Construction Program

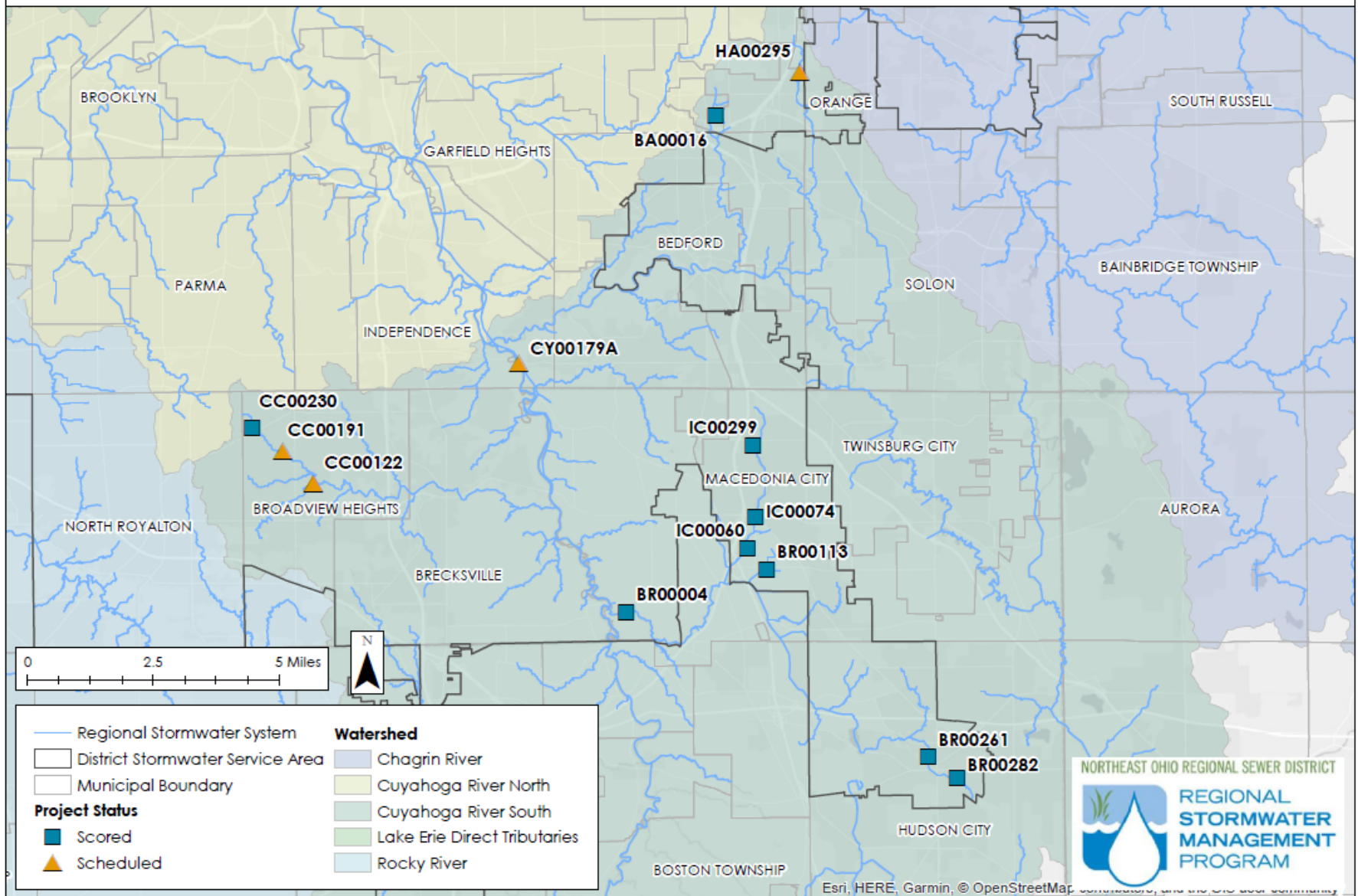


New Design and Construction Projects Cuyahoga River South

	Proposed Project Name	RSS Asset ID(s)	Subwatershed	Project Community	Total BRE
1	Lower Brandywine Creek Stabilization in Sgamore Hills Twp	BR00003, BR00004, BR00008	Brandywine Creek	Sagamore Hills Township	72
2	Bear Creek Culvert Removal in North Randall	BA00015, BA00016, BA00017	Bear Creek	North Randall	67
3	Brandywine Creek - Owen Brown Bridge Replacement in Hudson	BR00261	Brandywine Creek	Hudson	32
4	Chippewa - Broadview Hts Echo Lane Flooding Project	CC00231, CC00230, CC00184, CC00183	Chippewa Creek	Broadview Heights	32
5	Indian Creek - Bedford/Ledge	IC00303, IC00302, IC00301, IC00300, IC00299, IC00298, IC00088, IC00087	Indian Creek	Macedonia	27
6	Indian Creek - Valley View/E Aurora	IC00072, IC00073, IC00074, IC00075, IC00076	Indian Creek	Macedonia	27
7	Indian - Bank Stabilization U/S Bluejay	IC00060	Indian Creek	Macedonia	25
8	Brandywine - E Highland Restoration	BR00110, BR00112, BR00113, BR00114, BR00116, BR00118	Brandywine Creek	Macedonia	24
9	Brandywine Creek - Barlow Community Center Dam Improvements	BR00281, BR00282, BR00283, BR00284	Brandywine Creek	Hudson	13

NEORSD Stormwater Design & Construction Program

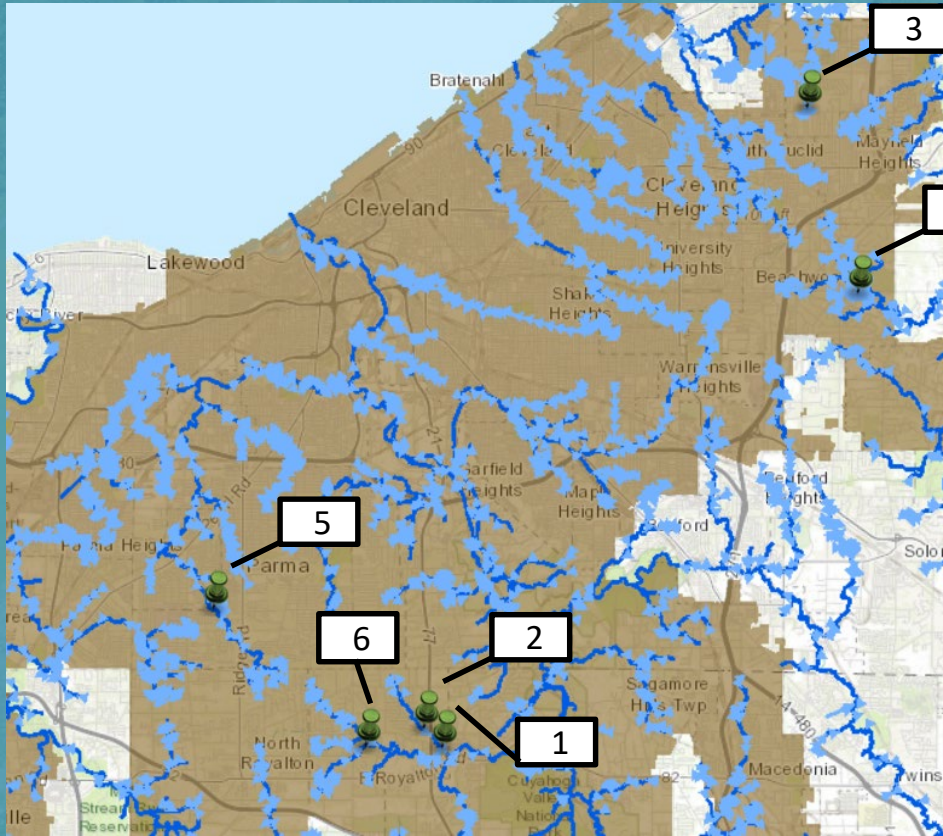
Cuyahoga River South Watershed



Project Delivery Methods

- GES- Bid-Build
- Design-Bid-Build
- Design-Build
- Small Scale Projects
 - Under \$50K
 - \$50K-\$250K

Multi-Site Streambank Stabilization



Metrics of Success

- **9,336 LF** of Stream Restored/Stabilized
- **23,725 Tons** of Sediment Removed
- **6.6 Acres** of Floodplain Reconnected
- **575 LF** of Culverts Repaired/Replaced

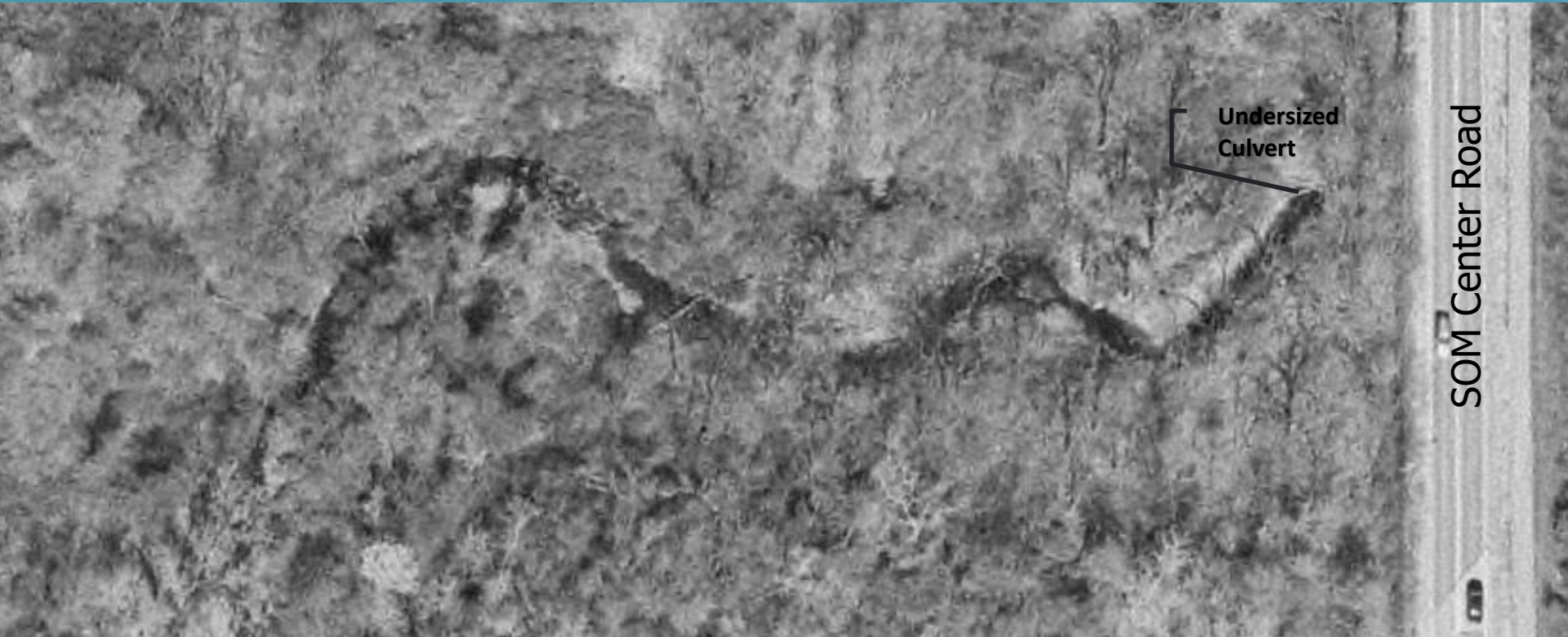
- **Property Interests Obtained**
 - **2** Fee Simple Acquisitions (18 acres)
 - **17** Permanent Easements Acquired

Beecher's Brook Bank Stabilization

Stream Focused Solutions

- Flooding
- Erosion
- Water Quality

Beecher's Brook Culvert 2002



Beecher's Brook Culvert 2002



Beecher's Brook Culvert 2006



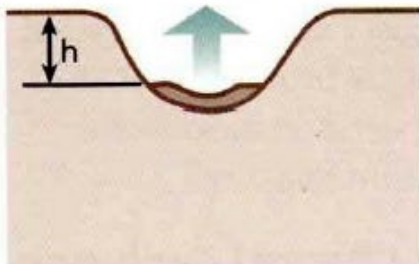
Northeast Ohio
Regional Sewer District



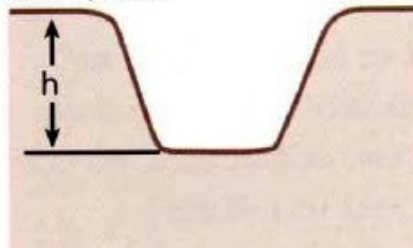
@neorsd

CHANNEL EVOLUTION MODEL (SIX STAGES) Simon and Hupp, 1986

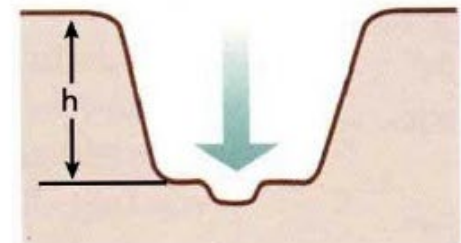
Class I. Sinuous, Premodified
 $h < h_c$



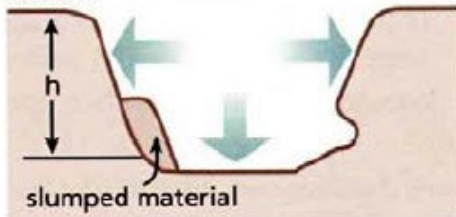
Class II. Channelized*
 $h < h_c$
floodplain



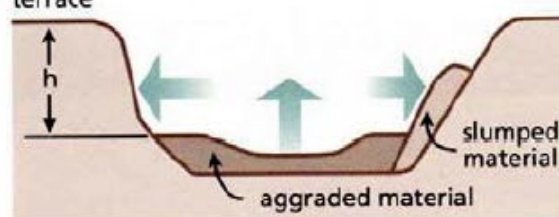
Class III. Degradation
 $h < h_c$



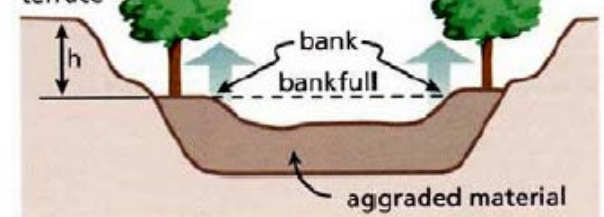
Class IV. Degradation and Widening
 $h > h_c$
terrace



Class V. Aggradation and Widening
 $h > h_c$
terrace



Class VI. Quasi Equilibrium
 $h < h_c$
terrace

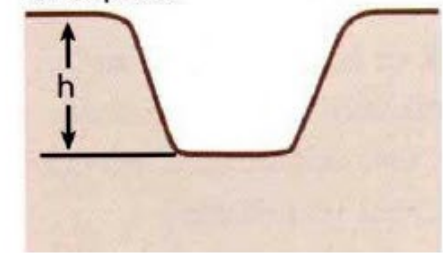


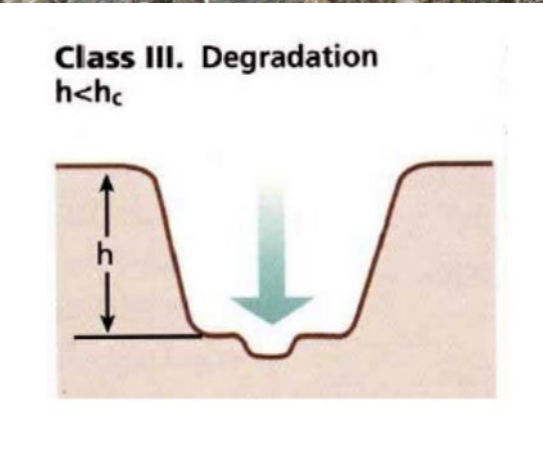
*Anthropogenic



Class II. Channelized*
 $h < h_c$

floodplain



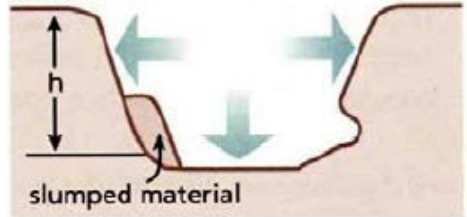




Class IV. Degradation and Widening

$h > h_c$

terrace



Beecher's Brook Culvert 2017





Northeast Ohio
Regional Sewer District



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**Northeast Ohio
Regional Sewer District**



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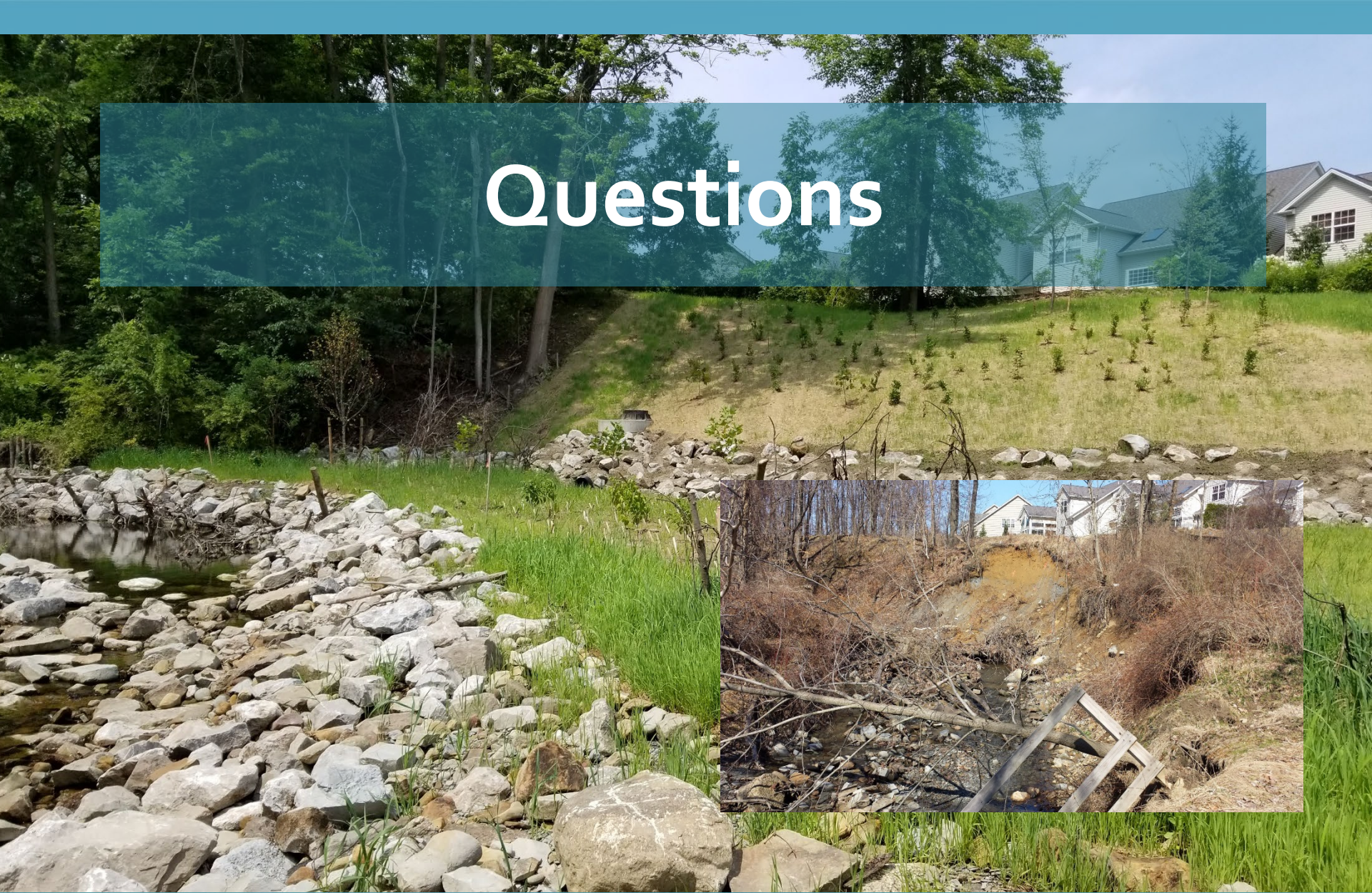


**Northeast Ohio
Regional Sewer District**



@neorsd

Questions



What's Next

- District Stream Restoration Site Visit
 - October 25 (Thursday) from 2 to 3 pm
 - Meet at 6700 Beta Drive, Mayfield OH, 44143
- Annual WAC Representative Designation – January 2019
- Next WAC Meeting – March 2019

Questions

Rachel Webb

216-881-6600 Ext. 6645

webbr@neorsd.org

Donna Friedman

216-881-6600 Ext. 6768

friedmand@neorsd.org



Stormwater Program: Community Resources

<http://www.neorsd.org/communitystormwaterresources.php>