

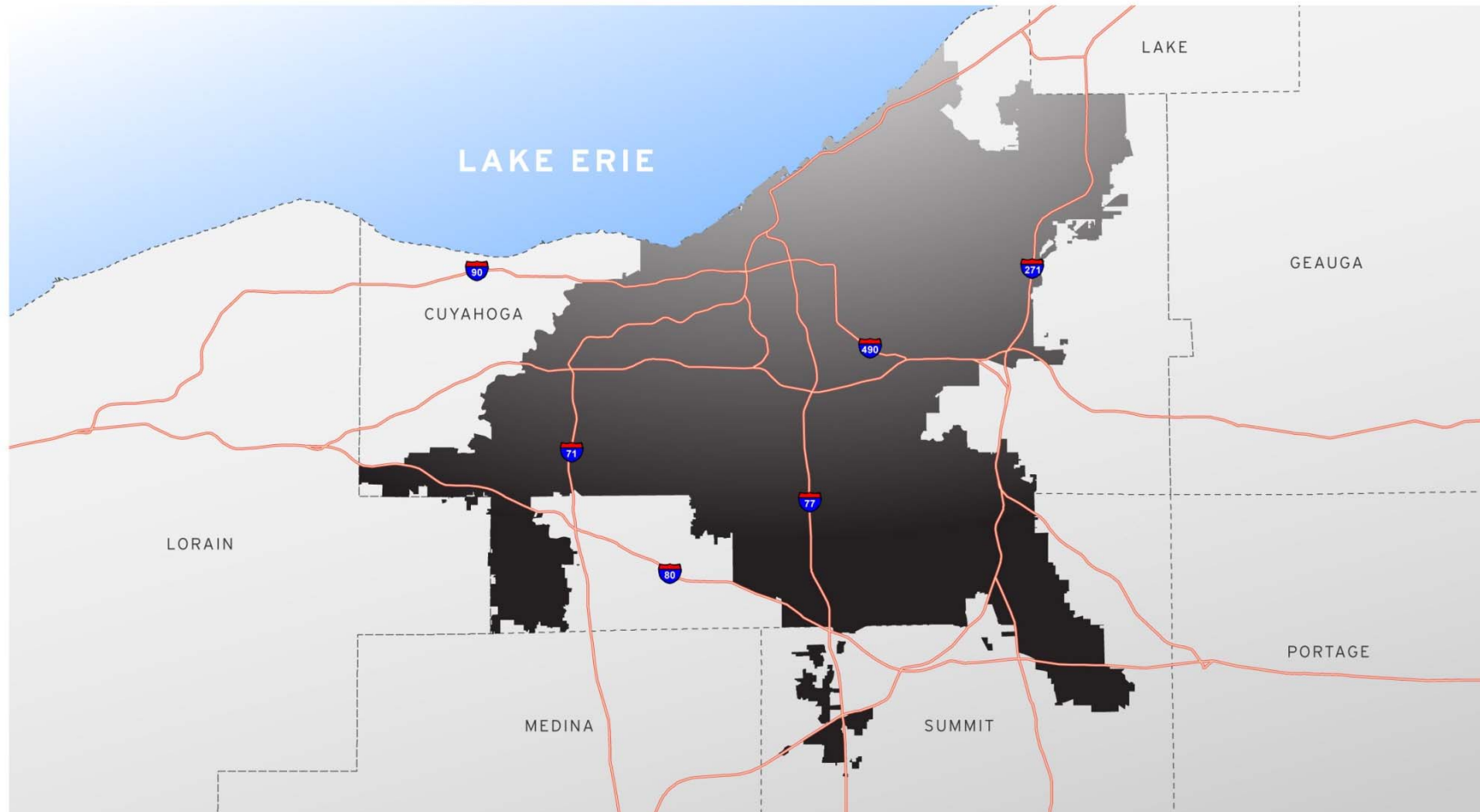
# Green Infrastructure for CSO Control: In the Decree & Out in the City



**Northeast Ohio  
Regional Sewer District**

# District Overview

*Service Area: 355 square miles*




■ District Service Area    — Interstate  
□ County Boundary

**NORTHEAST OHIO REGIONAL SEWER DISTRICT**



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# Who We Are...

- Political subdivision of Ohio
- Created in 1972 by Court Order
  - Code of Regulations
  - Governed by seven Trustees
- Separate and distinct from the City of Cleveland and Cuyahoga County



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# What We Do...

- Sanitary & regional stormwater services to Cleveland and 61 member communities
  - 1 million customers
  - 90+ billion gallons treated each year
- Water quality monitoring
- Lake Erie beach monitoring and maintenance



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# Northeast Ohio Regional Sewer District Responsibility



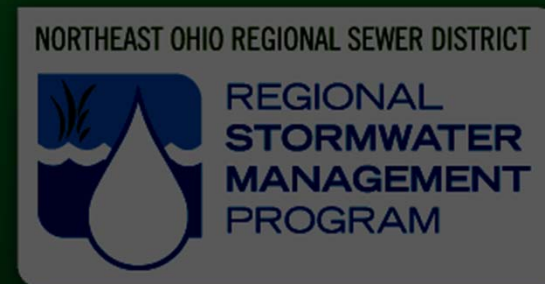
- \$3 billion in 25 years
- CSO control
- Sewer fees
- Regional flooding and erosion issues
- Impervious surface fee



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# Northeast Ohio Regional Sewer District Responsibility

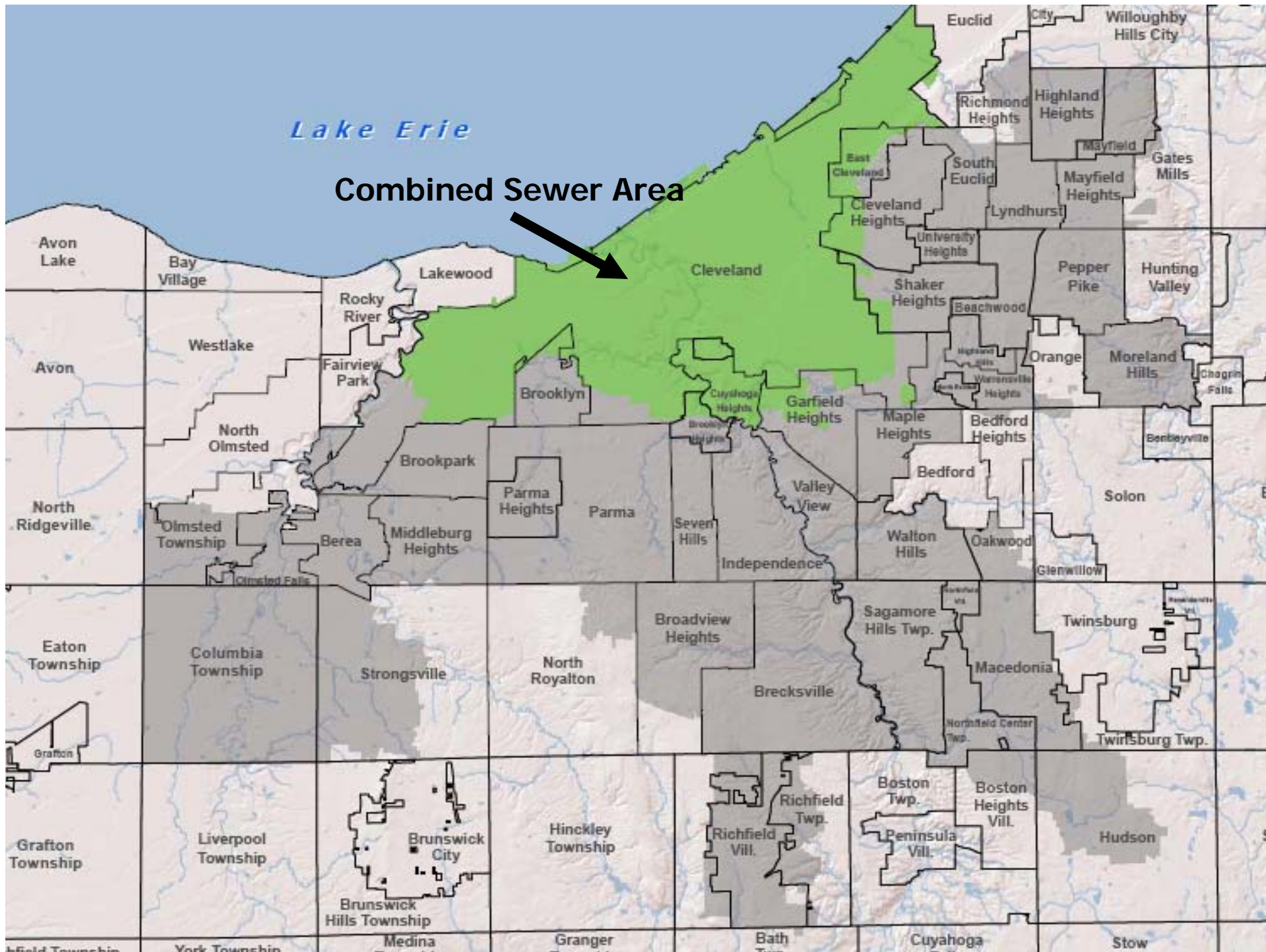


- \$3 billion in 25 years
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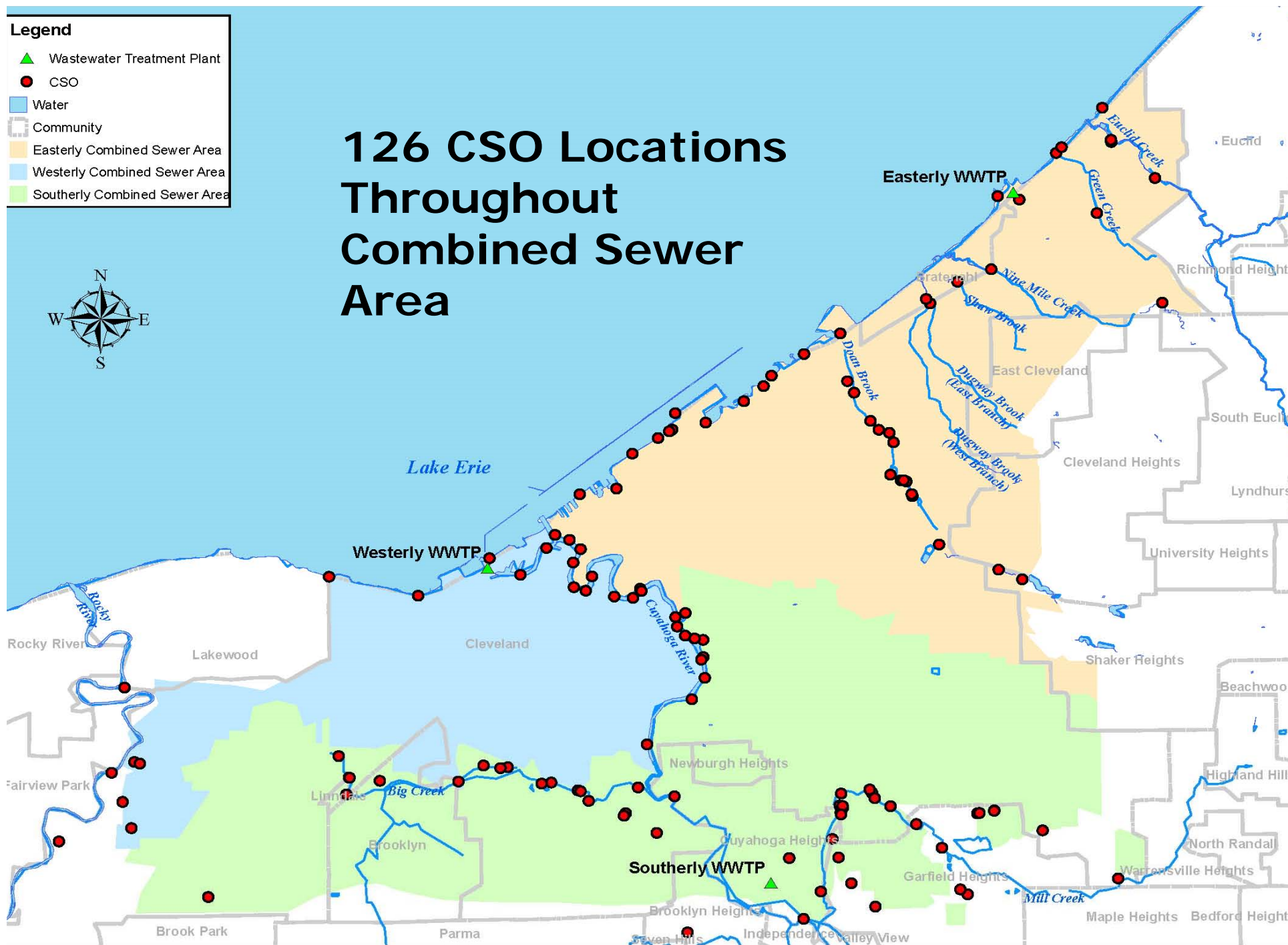
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## Legend

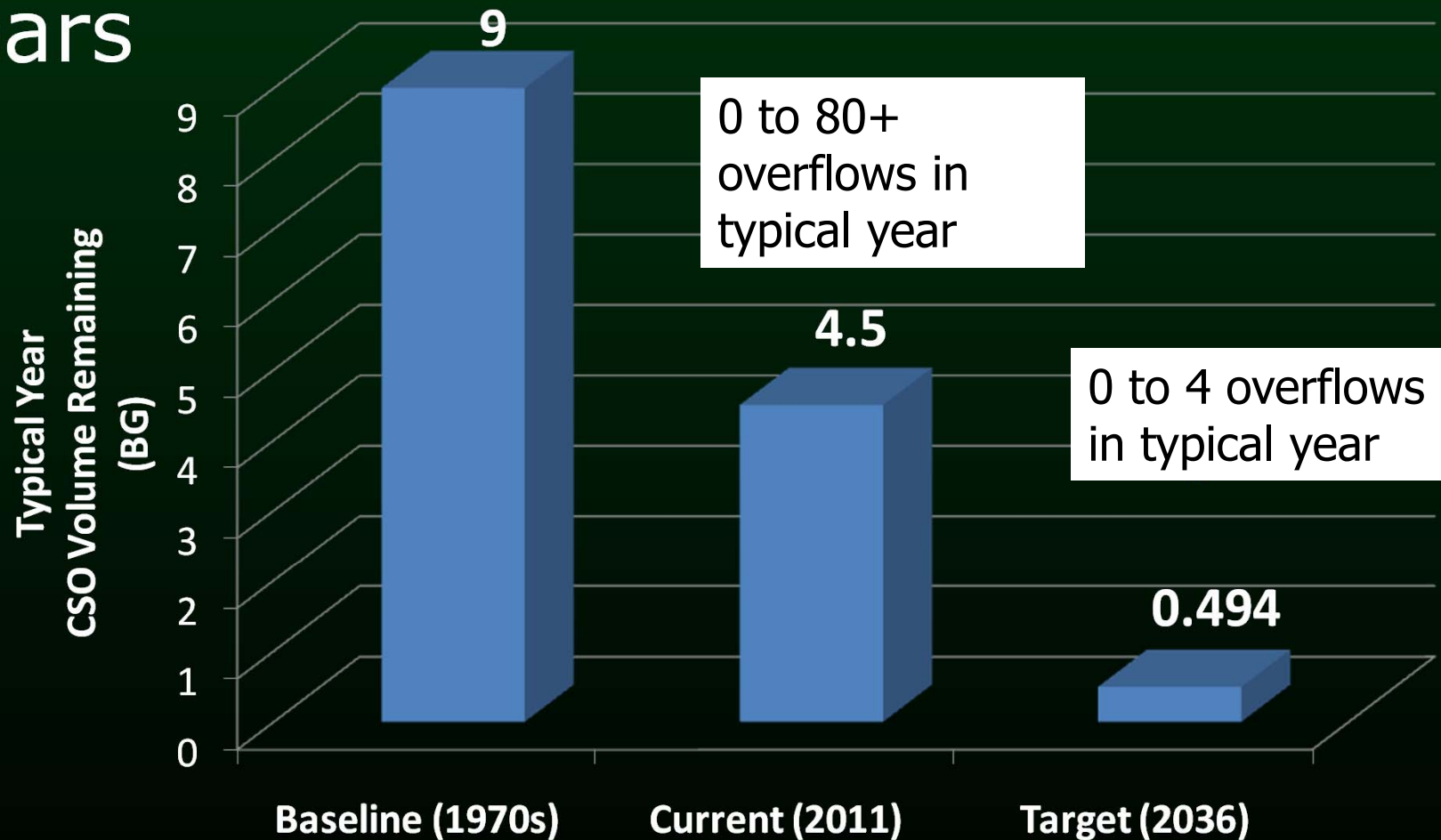
- ▲ Wastewater Treatment Plant
- CSO
- Water
- Community
- Easterly Combined Sewer Area
- Westerly Combined Sewer Area
- Southerly Combined Sewer Area

# 126 CSO Locations Throughout Combined Sewer Area






# Consent Decree Requires Northeast Ohio's CSO Problem Reduced in 25 Years



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# NEORSD CSOs *"By the numbers"*

Component	Baseline	Original Plan (2002)	Consent Decree Plan (2010)
Level of Control	0 to 80+ overflows/year	<4 overflows/year	<3 overflows/year (priority CSOs) <4 overflows/year
Remaining Overflow Volume (Typ. Year)	4,531,000,000 (reduced from 9 BG since 1970's)	1,097,000,000	494,000,000
Implementation Schedule	~40 Years	30 Years	
Costs	~\$1B invested to-date	\$2.3 B	
Percent Capture	N/A	97%	
Green Infrastructure	N/A	N/A	

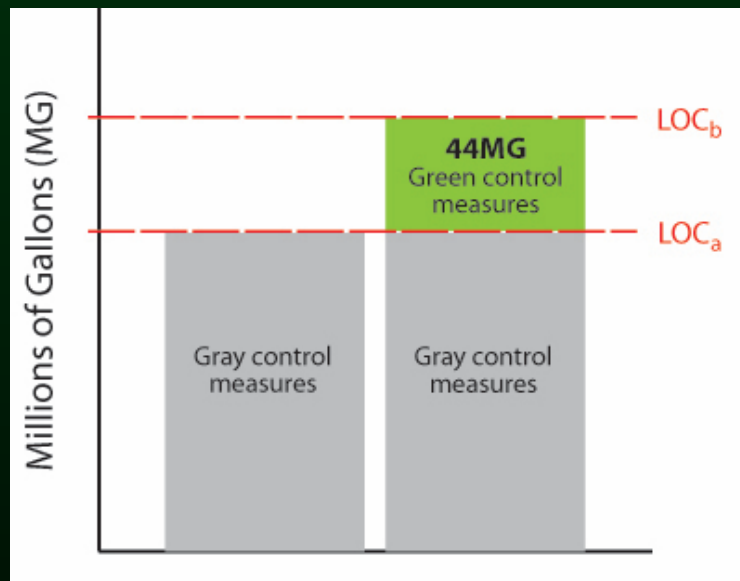


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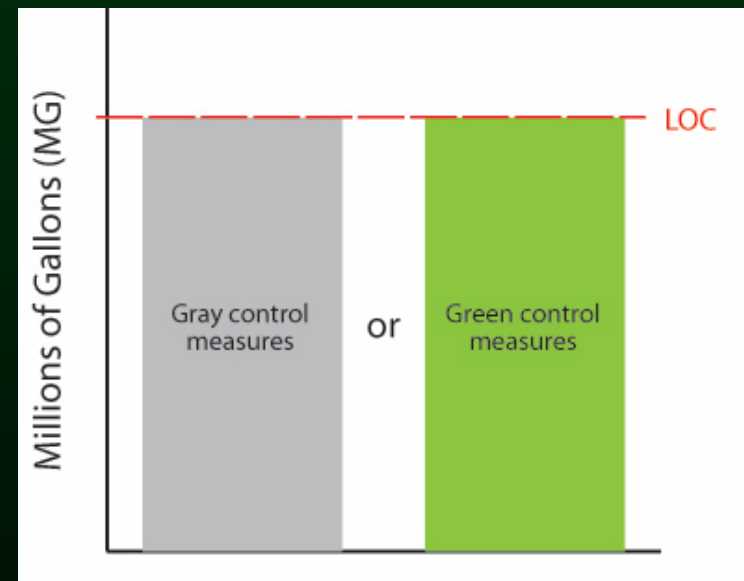


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# CSO Consent Decree includes two options for Green Infrastructure



Appendix 3: Mandatory green  
(District GI Plan, 2011)




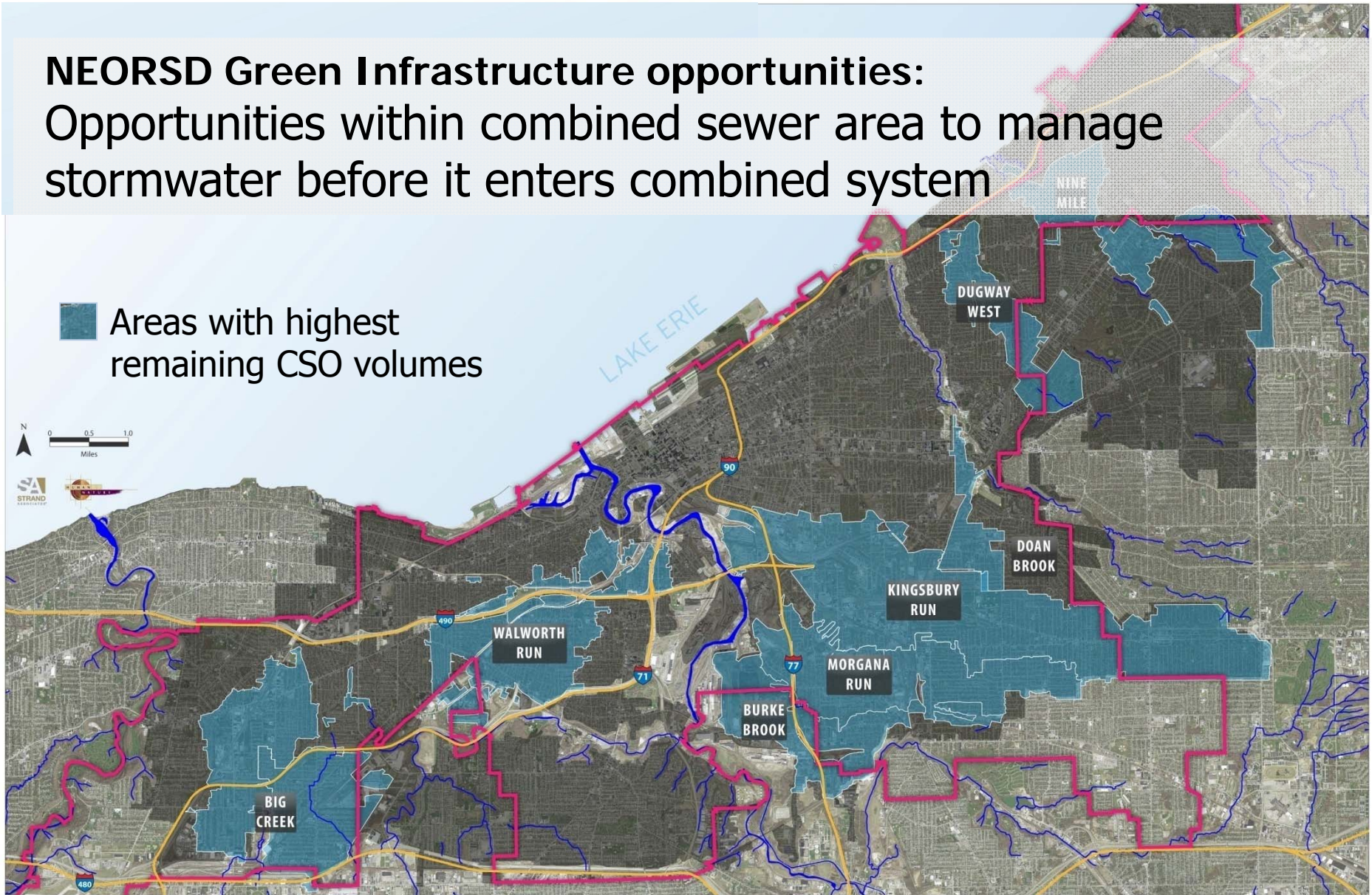
Appendix 4: Optimize gray  
using green

## Appendix 3 Green Infrastructure


**\$42 Million for 44 Million Gallons by 2019 with Green Infrastructure**

# NEORSD Green Infrastructure opportunities: Opportunities within combined sewer area to manage stormwater before it enters combined system

 Areas with highest  
remaining CSO volumes



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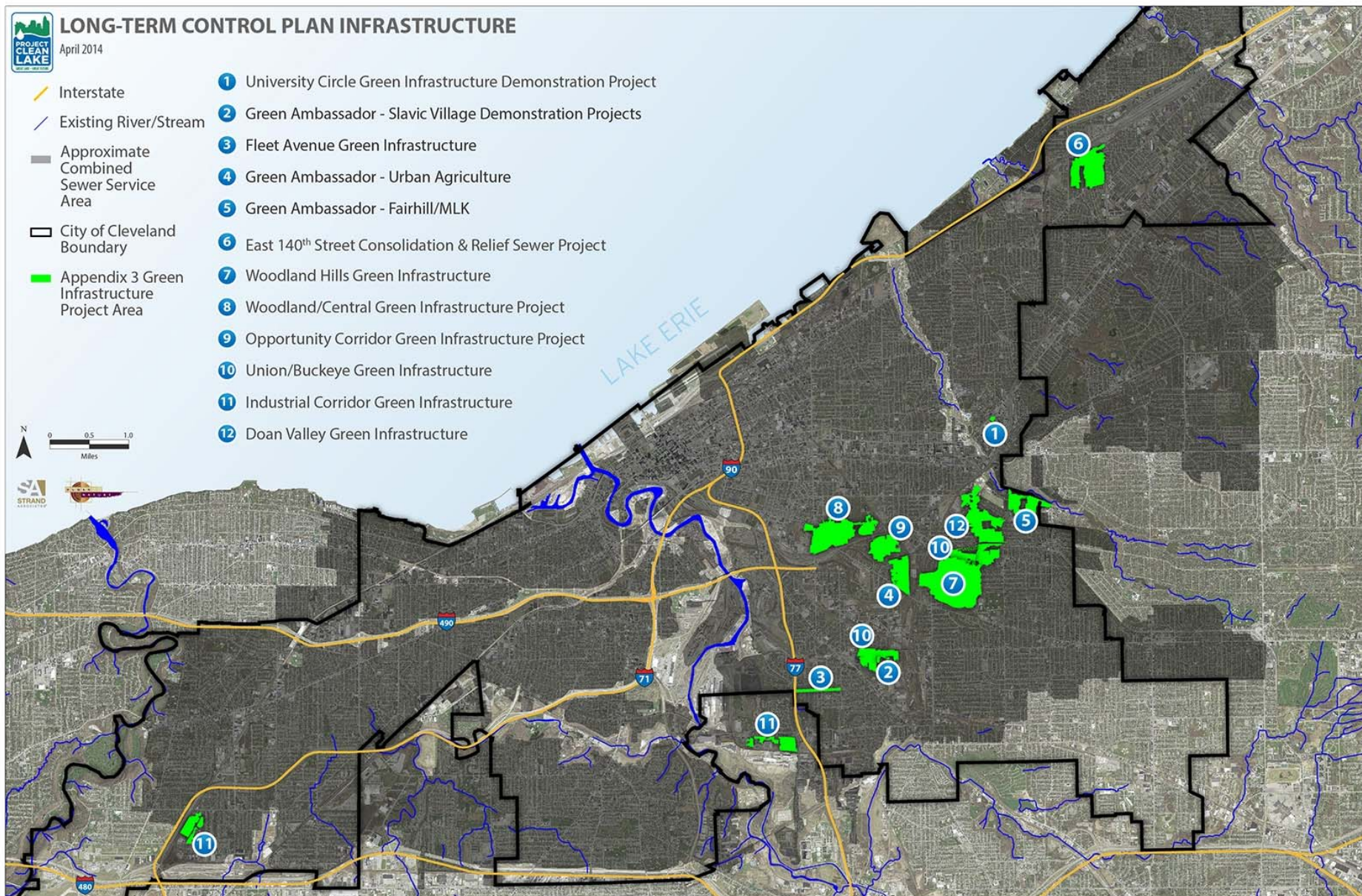


## LONG-TERM CONTROL PLAN INFRASTRUCTURE

April 2014

- Interstate
- Existing River/Stream
- Approximate Combined Sewer Service Area
- City of Cleveland Boundary
- Appendix 3 Green Infrastructure Project Area

- 1 University Circle Green Infrastructure Demonstration Project
- 2 Green Ambassador - Slavic Village Demonstration Projects
- 3 Fleet Avenue Green Infrastructure
- 4 Green Ambassador - Urban Agriculture
- 5 Green Ambassador - Fairhill/MLK
- 6 East 140<sup>th</sup> Street Consolidation & Relief Sewer Project
- 7 Woodland Hills Green Infrastructure
- 8 Woodland/Central Green Infrastructure Project
- 9 Opportunity Corridor Green Infrastructure Project
- 10 Union/Buckeye Green Infrastructure
- 11 Industrial Corridor Green Infrastructure
- 12 Doan Valley Green Infrastructure

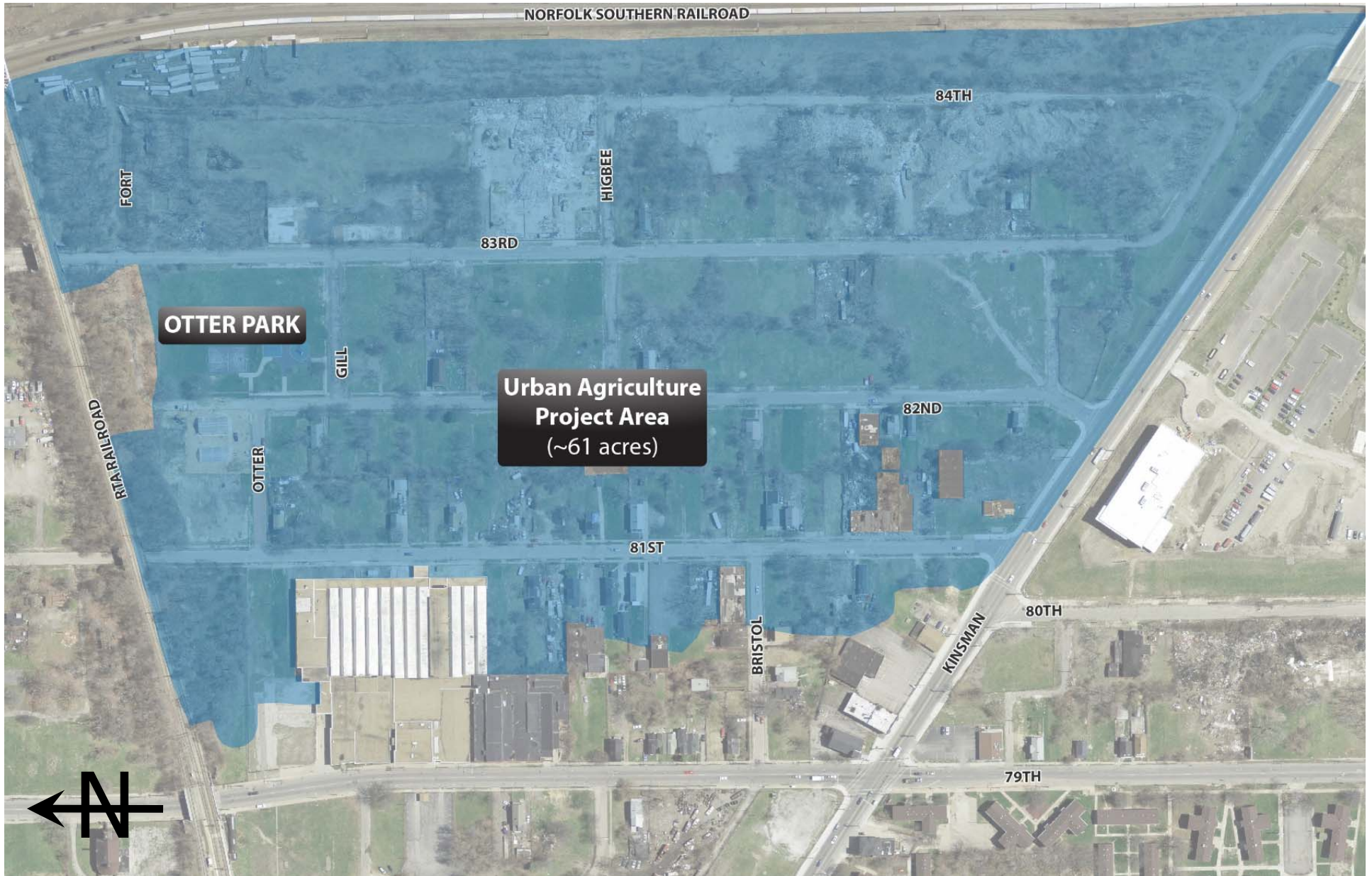


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NORTHEAST OHIO REGIONAL SEWER DISTRICT  
**GREEN AMBASSADOR**  
 URBAN AGRICULTURE  
 CONCEPT



GREEN INFRASTRUCTURE DESIGN • MARCH 2014 • PRELIMINARY DRAFT FOR DISCUSSION PURPOSES ONLY



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Appendix 3 GI Project	Annual Stormwater (MG)	Annual CSO Reduction (MG)	Preliminary Construction Cost	\$/Gallon (CSO)
University Circle	1	0.10	\$186,684	\$1.87
Slavic Village	0.2	0.05	\$218,717	\$4.37
Fleet Avenue	9	0.90	\$2,300,000	\$2.56
Urban Agriculture	7	1.20	\$4,894,900	\$4.08
Fairhill-MLK	17.5	2.37	\$6,118,100	\$2.58
Aspinwall	10.0	0.11	\$5,011,000	\$1.73
Woodland	10.0	0.11	\$5,011,000	\$1.98
Woodland/Central	41.3	8.00	\$13,029,850	\$1.63
Opportunity Corridor	9	2.00	\$4,595,919	\$2.30
Union/Buckeye	20.2	3.33	\$7,060,055	\$2.12
Industrial Corridor	25.6	5.10	\$10,269,203	\$2.01
Doan Valley	52.5	7.40	\$11,654,535	\$1.57
<b>TOTAL</b>	<b>265</b>	<b>42.03</b>	<b>\$82,450,963</b>	<b>\$1.96</b>

•6 gallons stormwater = 1 gallon of CSO reduction

•Green Infrastructure Construction Costs = \$1.96/gallon CSO Reduced



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# Project Clean Lake

## Lessons Learned with GI for CSO Control in Cleveland

- Volume
- Vacancy
- Cost



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# Project Clean Lake

## Lessons Learned with GI for CSO Control in Cleveland

- **Volume**

Stormwater volume  $\neq$  CSO control

- **Vacancy**

- **Cost**



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# Volume: Combined Sewers Capture Stormwater

Weather Flow  
tment plant

eyance  
for

wet-weather

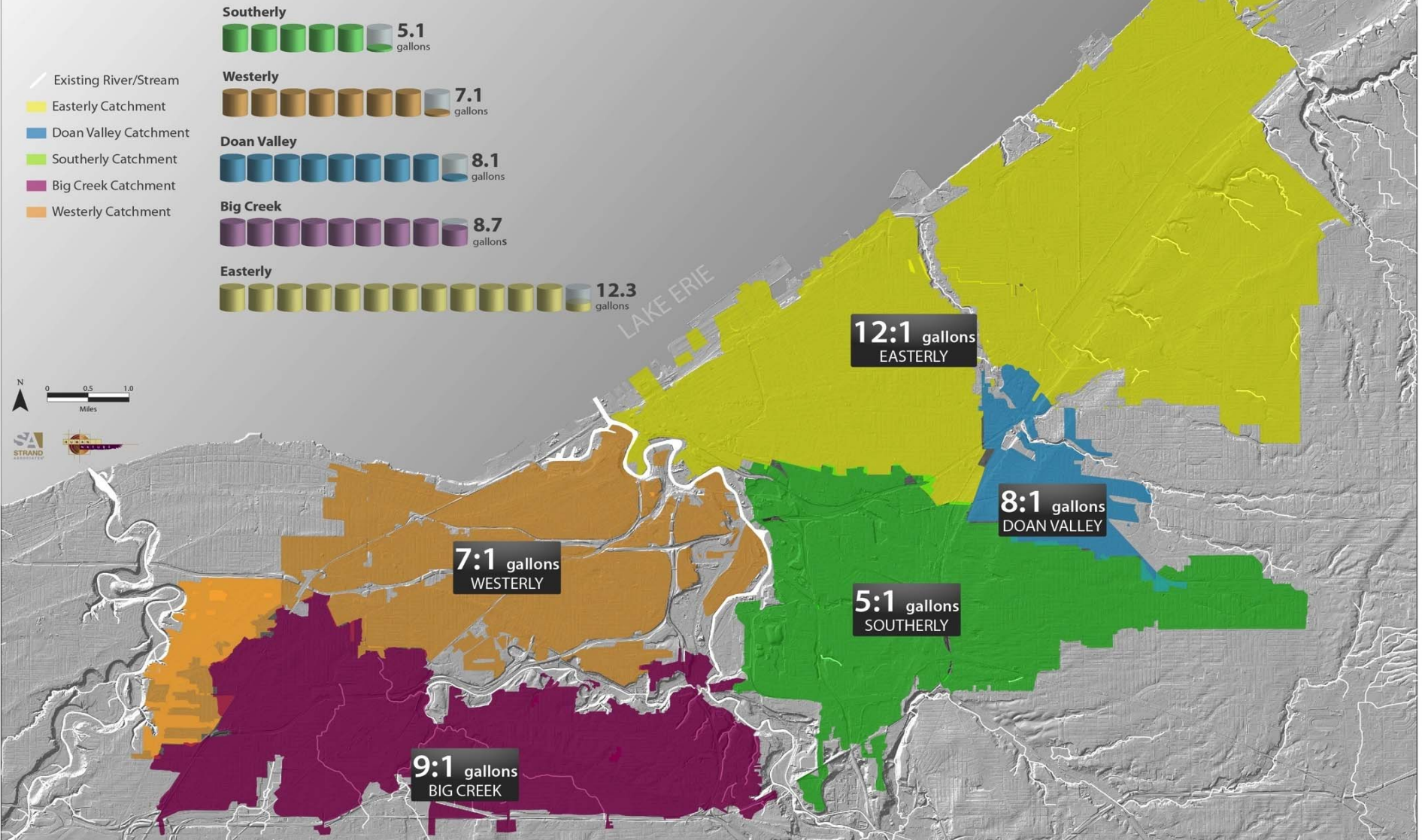
Combined Sewer  
Overflow Discharge to  
Stream/Lake





# Stormwater/CSO Ratios: Appendix 3 Requires Greater Stormwater Capture

## RATIO OF STORMWATER CAPTURE TO CSO REDUCTION



# Project Clean Lake

## Lessons Learned with GI for CSO Control in Cleveland

- Volume


- Vacancy

Vacant land  $\neq$  available land

- Cost



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# Vacant Land is Not All Available for Permanent Stormwater Management

## SUMMARY OF OPPORTUNITY/DISTRESSED PARCELS

GREEN INFRASTRUCTURE DESIGN • APRIL 2012 • DRAFT

**23,000** Number of opportunity/distressed parcels in the City of Cleveland

**3,581** Acres of opportunity/distressed parcels in the City of Cleveland

**16,000** Number of **vacant buildings** in the City of Cleveland

**750** **Buildings demolished annually** by the City of Cleveland  
(this does not include buildings demolished by Cuyahoga County)

0 0.5 1.0  
Miles





# Project Clean Lake

## Lessons Learned with GI for CSO Control in Cleveland

- Volume

- Vacancy

- Cost

- ✓ Separate storm sewers?
- ✓ Vacant property?
- ✓ Partner?
- ✓ Off load to stream or soil?



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## Courtyard by Marriott: Redevelopment + Sand = GI Opportunity

- No stormwater runoff from this site through 100-yr storm



Hotel

Parking Lot

- \$186,684 *CONSTRUCTION ONLY*
- 0.1 MG CSO Control
- \$1.87/CSO gallon
- 1 MG SW Control
- \$0.19/SW gallon

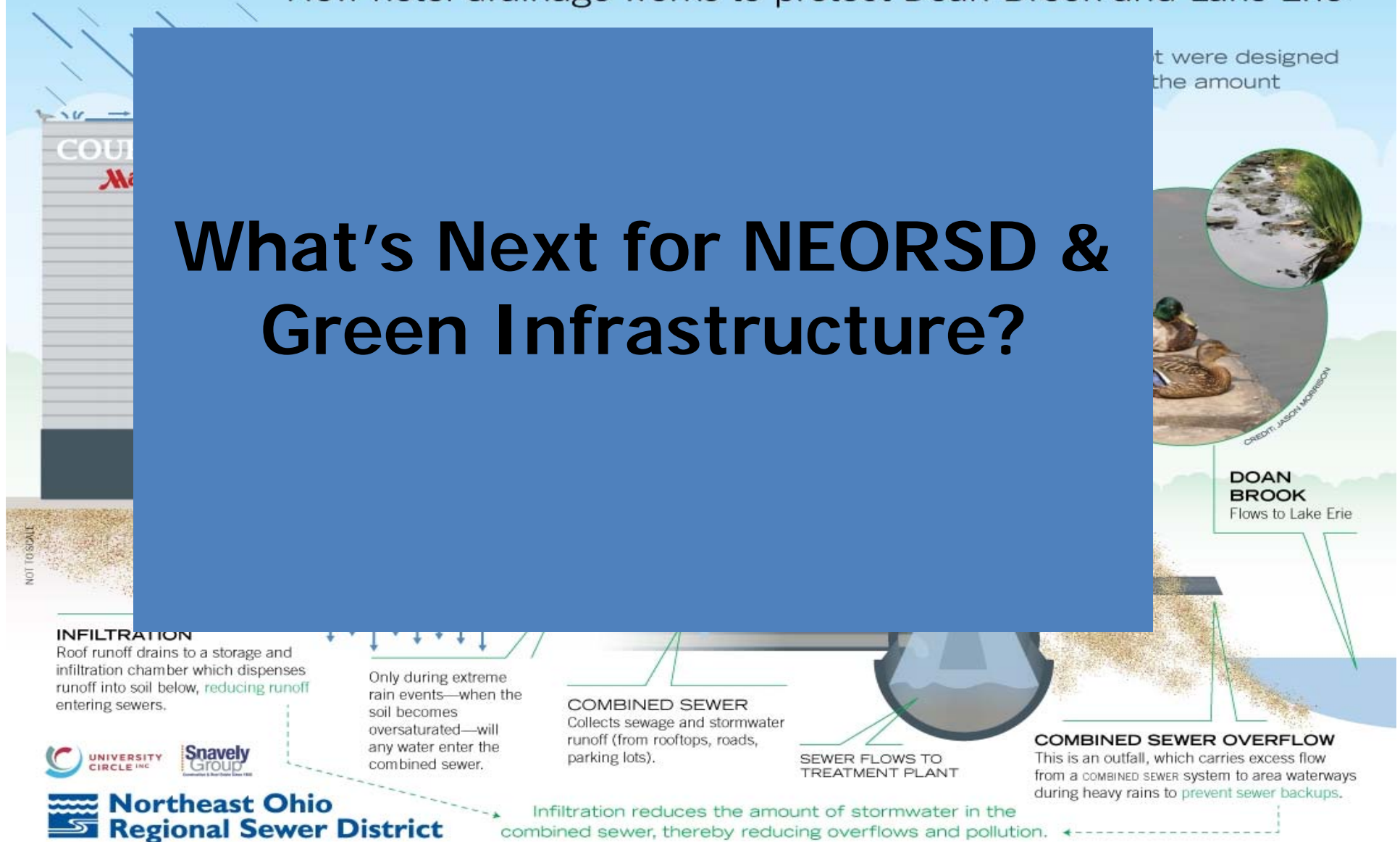




# Keeping our Great Lake great.

How hotel drainage works to protect Doan Brook and Lake Erie

## What's Next for NEORSD & Green Infrastructure?





# Promote On-Site Stormwater through Regional Stormwater Management Program




# Looking Ahead for GI Opportunities

## Advanced Facilities Planning

- Evaluating all CSO projects in next 2 yrs
- Optimizing CSO control (gray AND green)
- Highlighting opportunities
  - ✓ Separate storm sewers?
  - ✓ Vacant property?
  - ✓ Partner?
  - ✓ Off load to stream or soil?



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# Looking Ahead for GI Opportunities

## Community engagement

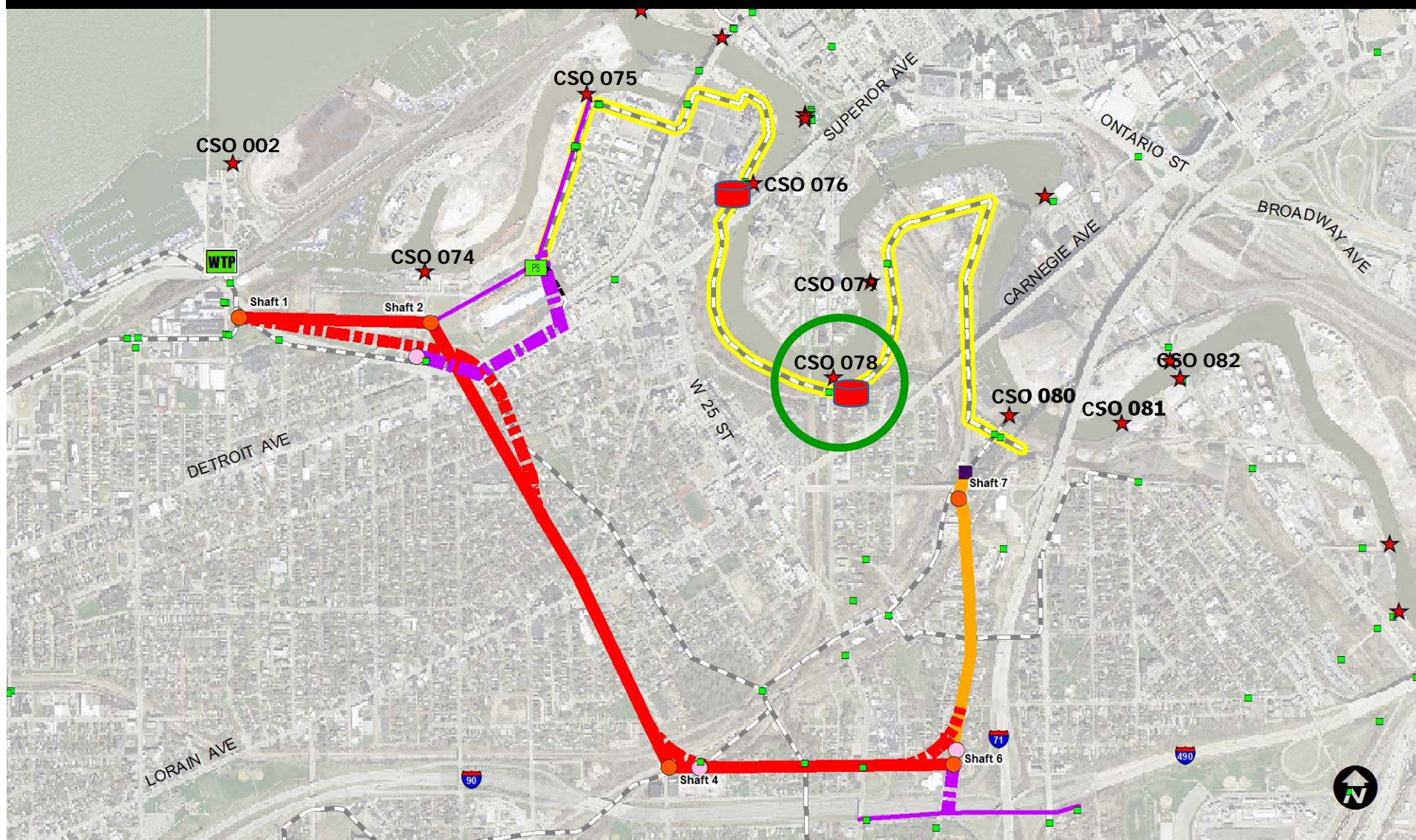
- Advance GI before detailed design
- City/private partners on GI implementation



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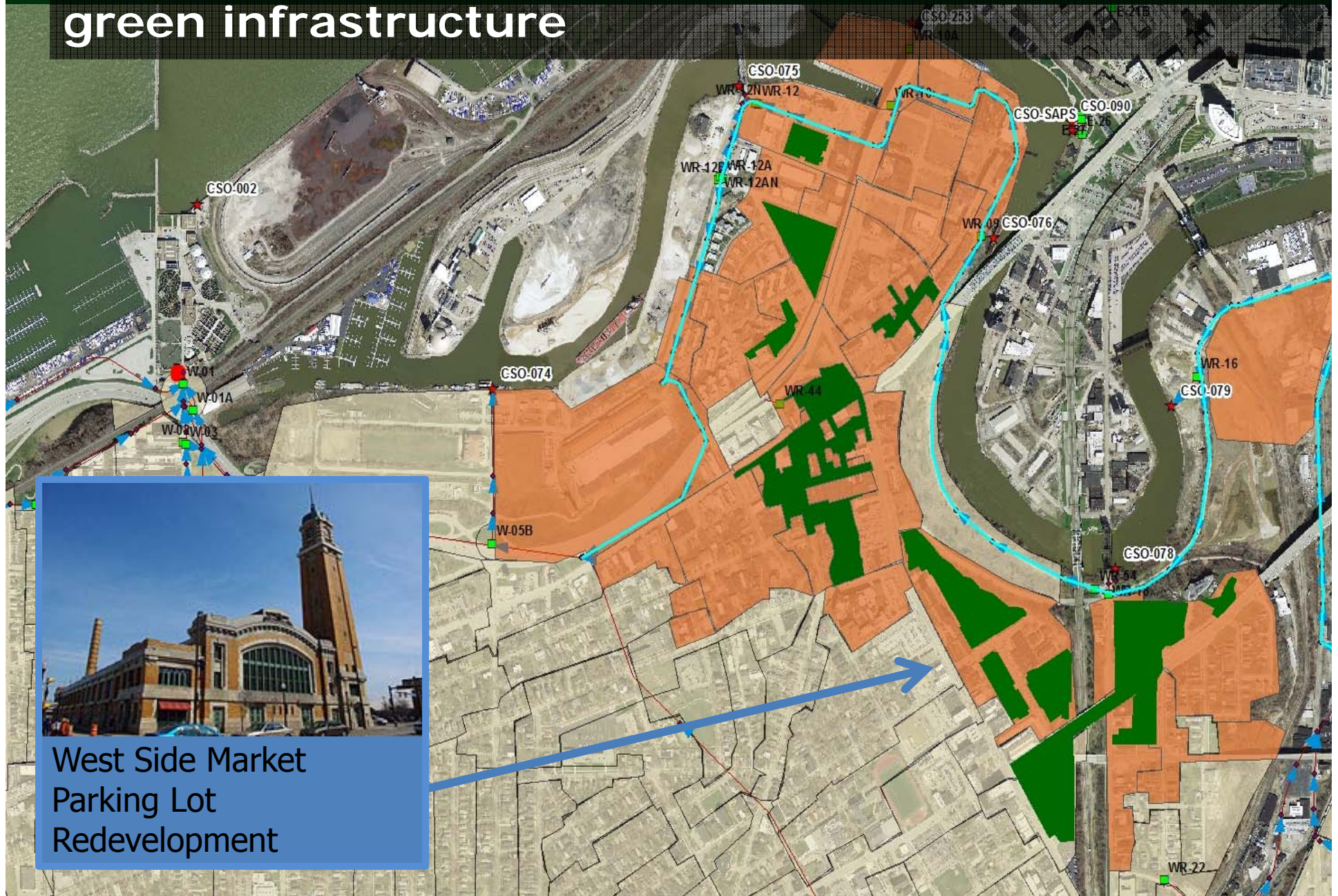
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# Consent Decree: Storage Tank at Columbus Road (CSO 078)





# Replace storage tank with green infrastructure





IN SUMMARY

# Green Infrastructure for CSO Control: In the Decree & Out in the City

GI added flexibility into Consent Decree


- *Ability to optimize* during 25-year implementation

Important lessons learned 4 years in...

- Volume is hard to get
- What looks vacant may not be
- Avoid "always cheaper"
- Look for green opportunities everywhere



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CONTACT US

## For more information

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Manager of Watershed Programs

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See More GI Around Cleveland  
[neorsd.org/green78](https://neorsd.org/green78)



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# Consent Decree: Storage Tank at Columbus Road (CSO 078)

