

# The Benefits of Lateral Lining – One of The Four Pillars in Blueprint Columbus

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THE CITY OF  
**COLUMBUS**  
ANDREW J. GINTHER, MAYOR

DEPARTMENT OF  
PUBLIC UTILITIES

 **ARCADIS** | Design & Consultancy  
for natural and  
built assets

**BLUE  
PRINT**  
COLUMBUS  
Clean streams.  
Strong neighborhoods.

## Presenters

Hunter Kelly, P.E., City of Columbus DOSD

Qiuli Julie Lu, P.E., Arcadis

Hazem Gheith, P.E. Arcadis

# Agenda

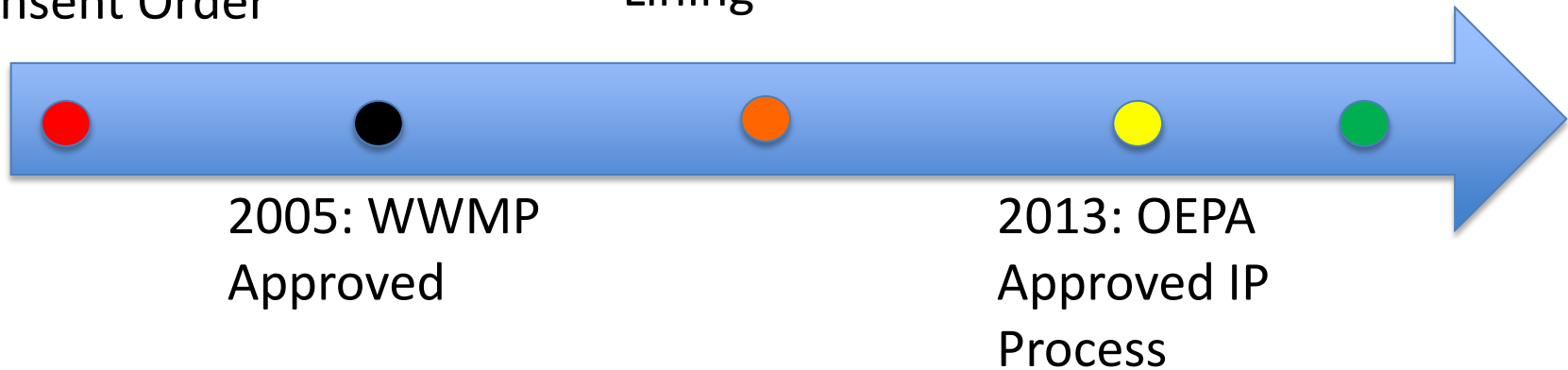
1. Blueprint Columbus Background
2. Flow Monitoring Program
3. Clintonville
4. Sewer Mains Lining and Lateral Lining Results
5. Lessons Learned

# Blueprint Columbus Timeline

2002: SSO  
Consent Order  
2004: CSO  
Consent Order

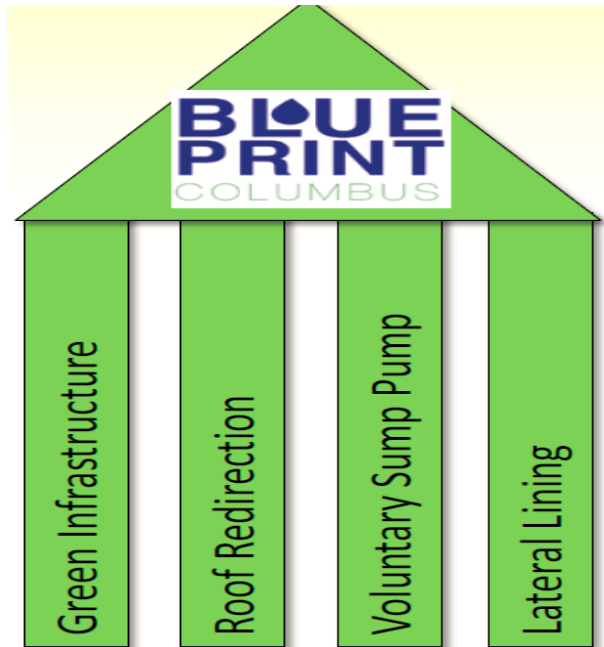
2010: Lateral  
Lining

2015:  
Blueprint  
Columbus  
Approved



## What is Blueprint Columbus?

- A new approach to eliminate sanitary sewer overflows (SSOs);
- Addresses the source of the problem;
- Keeps rain water out of the sanitary sewers.



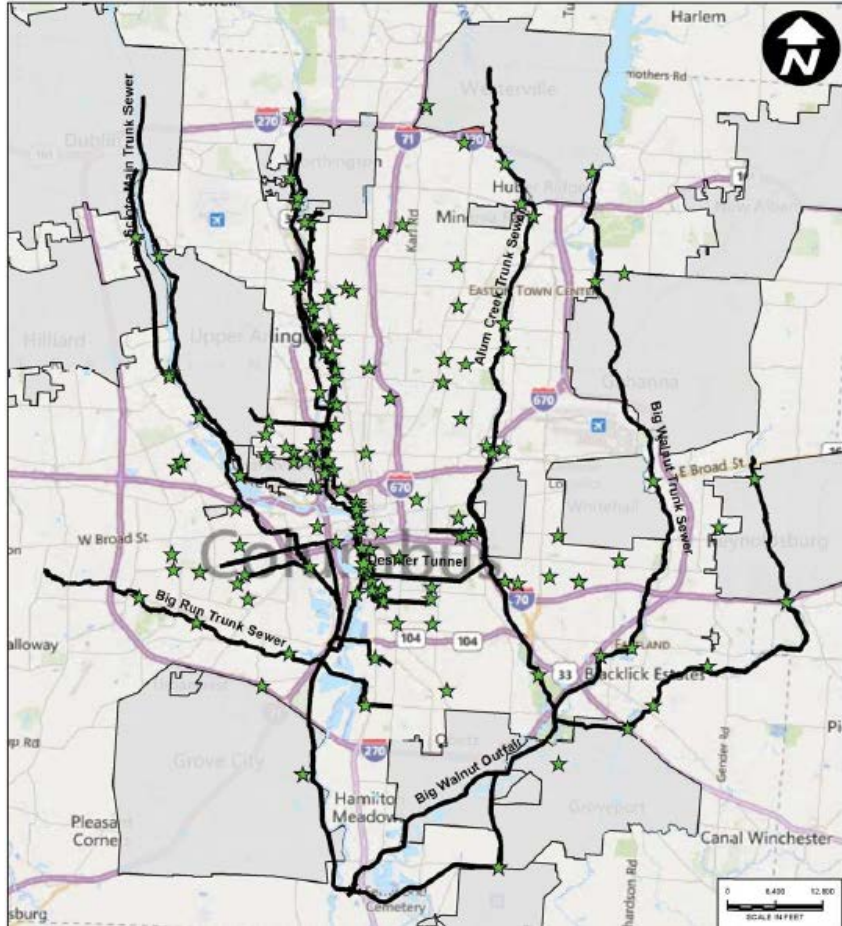
Blueprint has four pillars

- **Lateral Lining**
- Sump Pump
- Roof Redirection
- Green Infrastructure

# Agenda

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# Columbus Flow Monitoring Program



Flow Monitoring Program Started In 1995

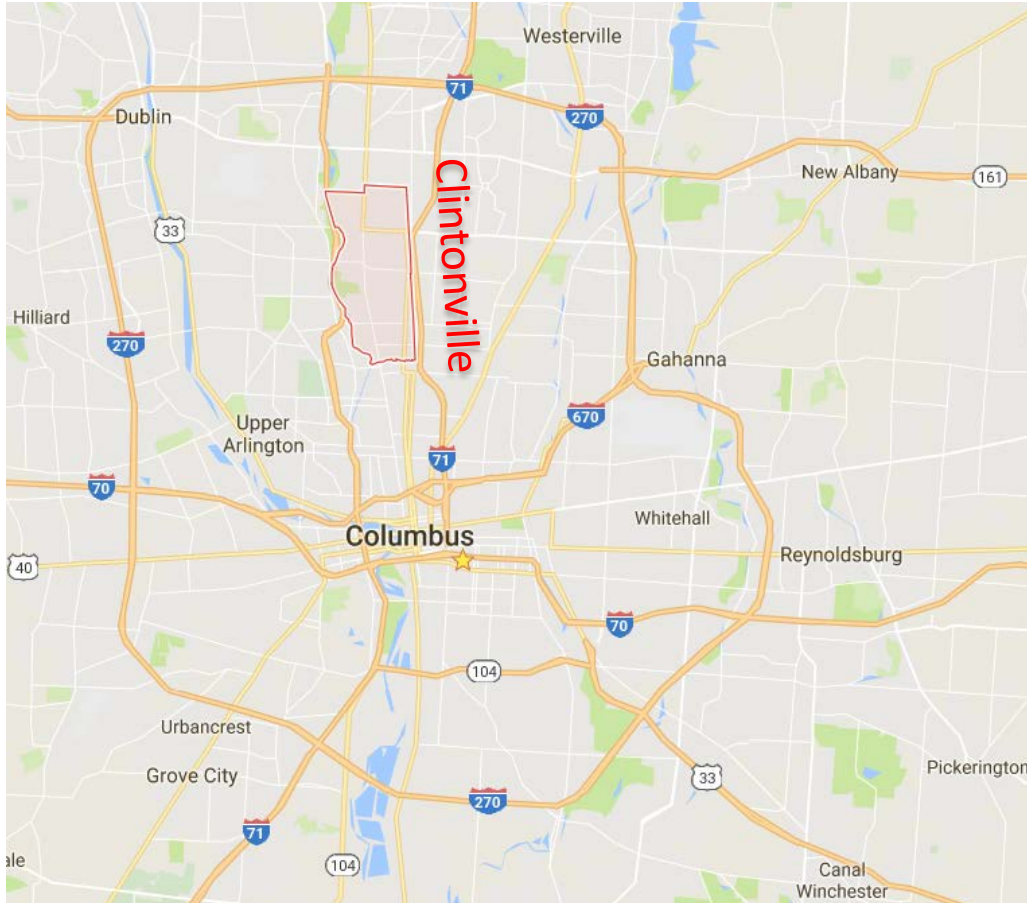
- Currently 180 Flow Meters Active
  - On Main Trunk Sewers
  - CSO Regulators
  - Mainline DSR/SSOs
  - For large sub-basin
- Pre and Post Blueprint Monitoring

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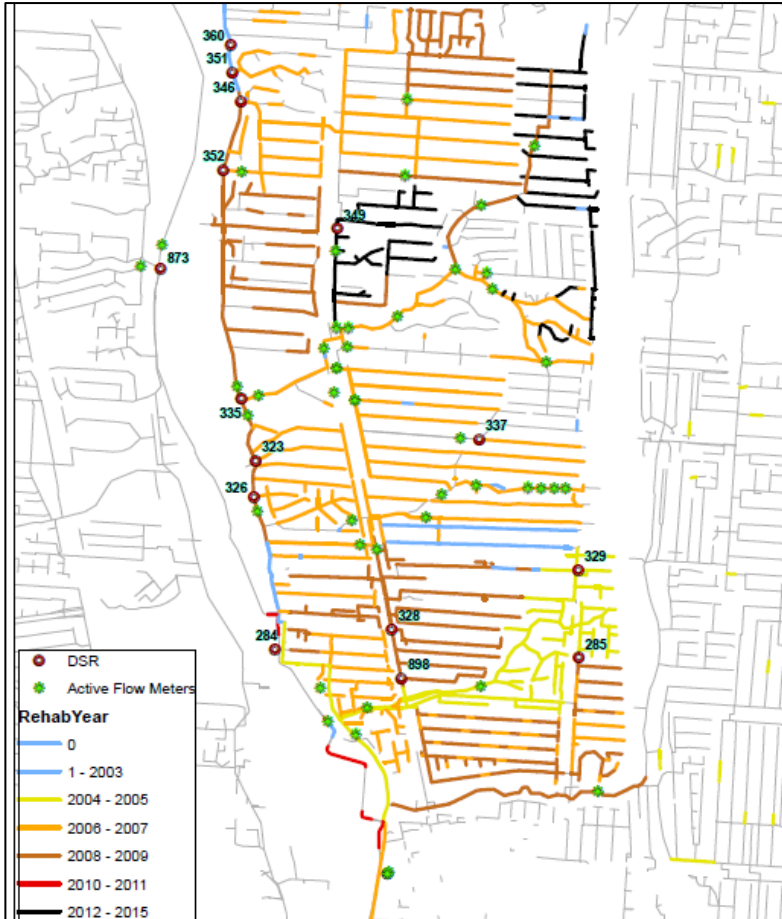


# Clintonville I/I



- First major I/I study in Columbus
- Comprehensive mainline/manhole lining/rehabilitation

# Sewer Rehab – Sewer Mains Lining



- Started in early 2000s
- 70% Sewer Mains lined
- Post-lining flow monitoring revealed limited I/I reduction

## Additional I/I Mitigation

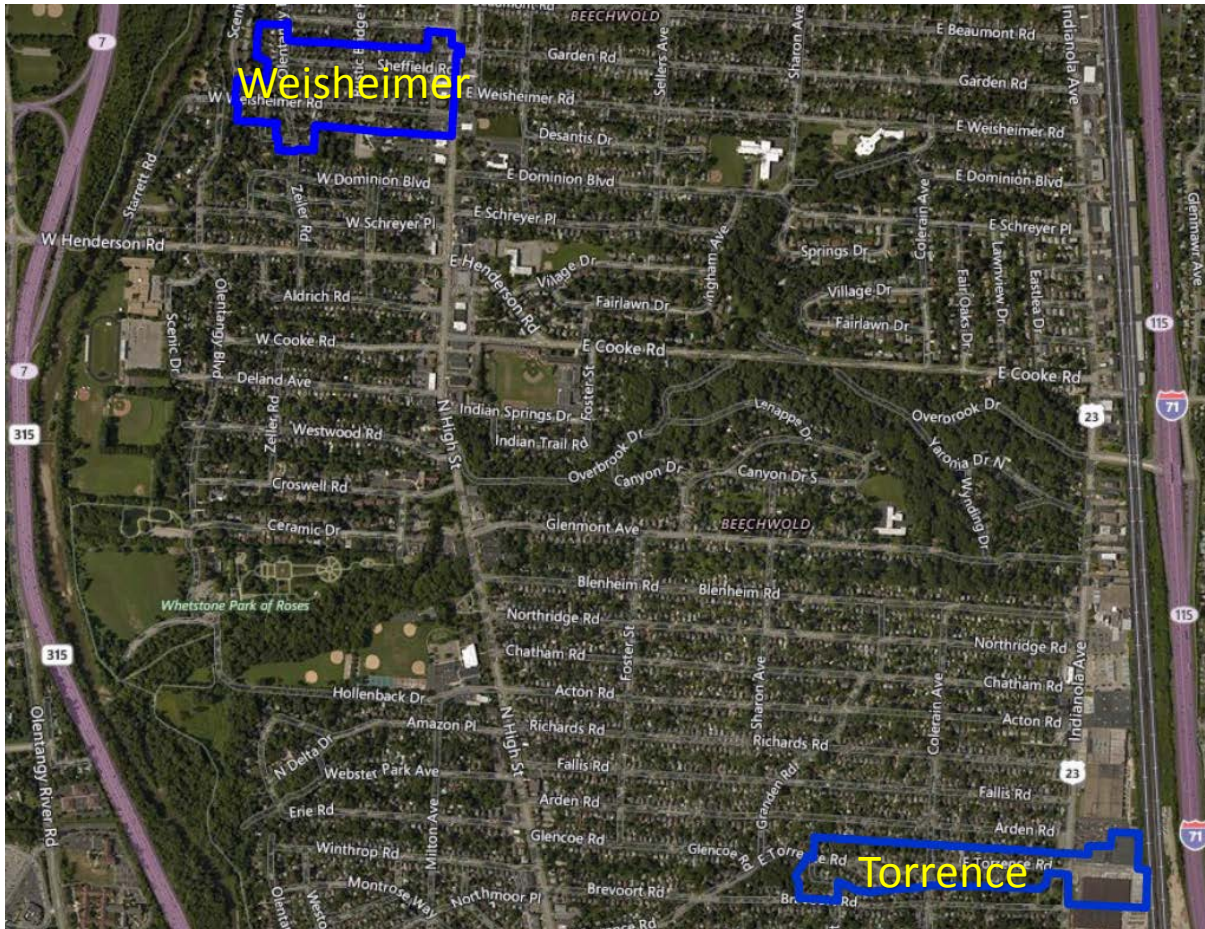
- Additional I/I Reduction Needed
- Large private source component to the I/I
- Lateral Lining is needed to address private source I/I

# Lateral Lining Pilot

## Selection of pilot study sites

- ✓ **Representative of neighborhood as a whole**
- ✓ **Hydraulically Independent**
- ✓ **Levels of I/I and customer issues (e.g. WIB's)**
- ✓ **Manageable size (approx.100 households)**
- ✓ **Voluntary Participation**

# Pilot Lateral Lining Areas



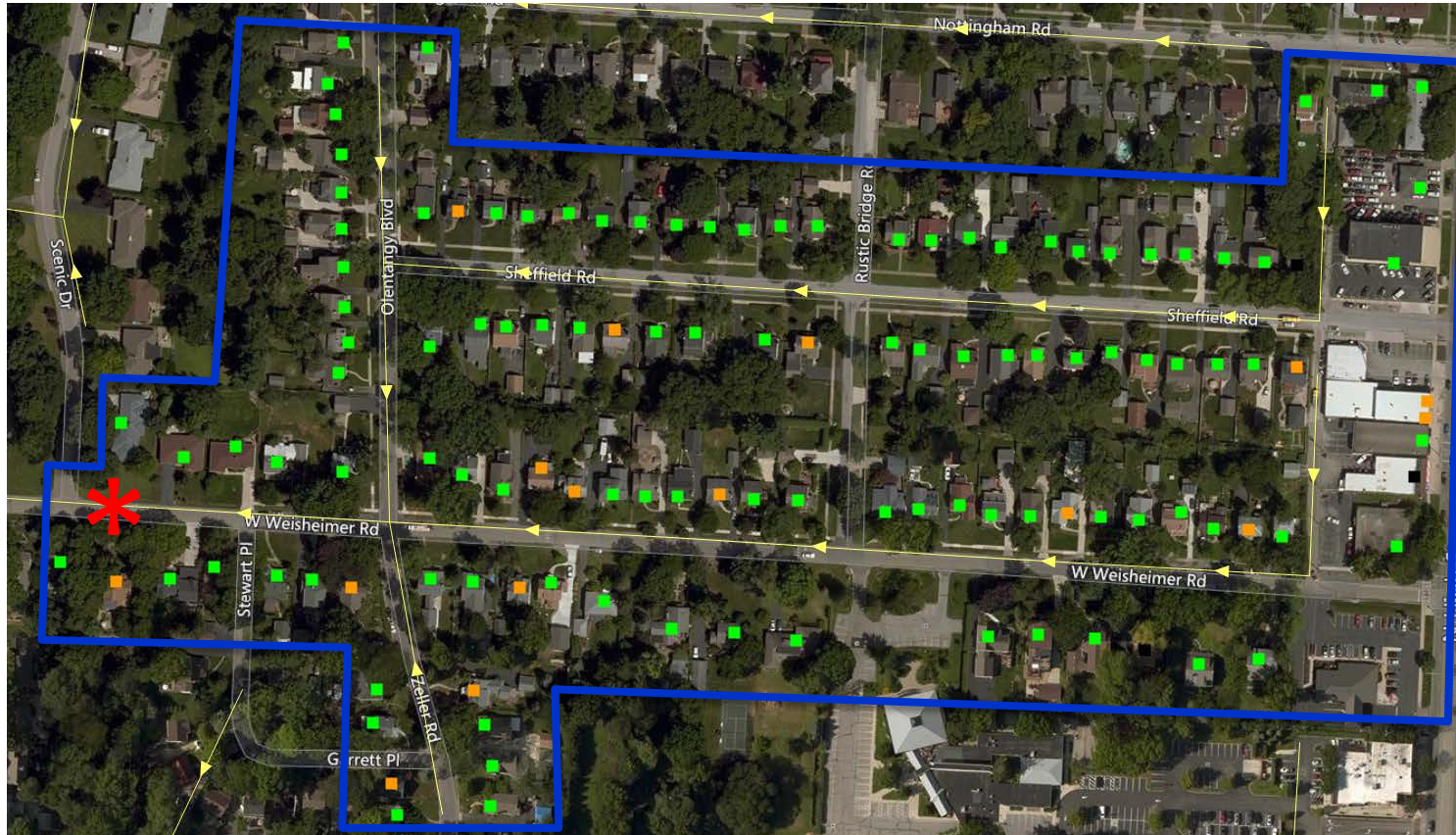
- Weisheimer: 130 Homes
- Torrence: 86 homes

## Weisheimer Lateral Lining

- Homes generally constructed in the 1940's
- Flat roadway cross-section
- Fewer mature trees, easier access to homes



# Weisheimer Rd Lateral Lining

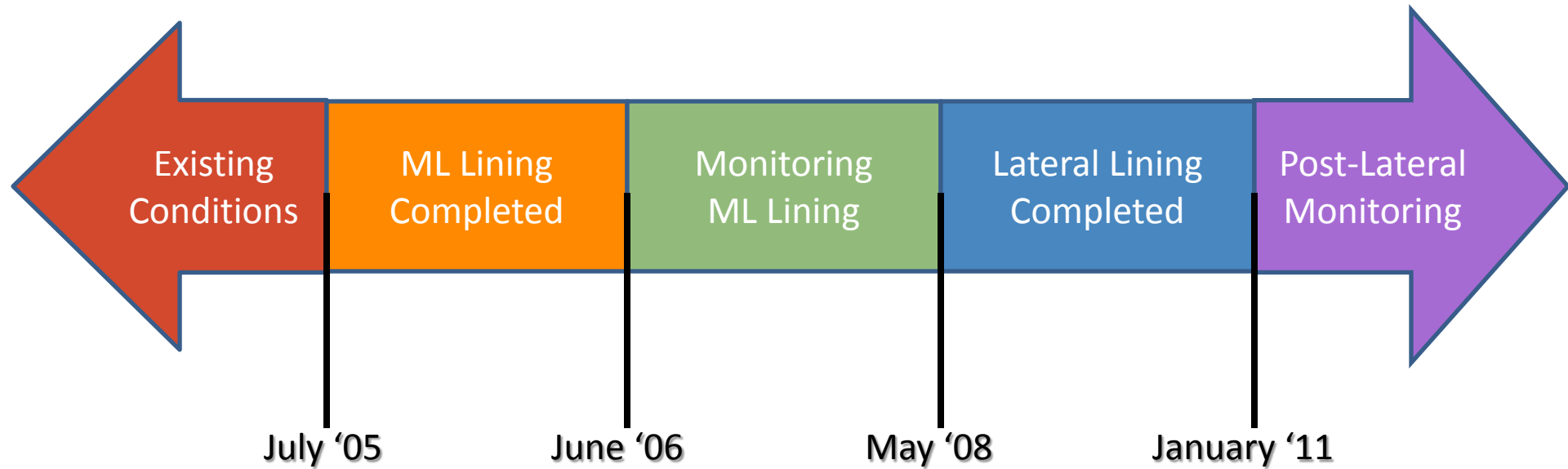


\* Flow Meter  
Columbus\_0192

■ Participated  
(105)

■ Not Participated  
(19)

# Weisheimer Lateral Lining Timeline





## Torrence Lateral Lining Pilot Area

- Homes generally constructed in the 1930's
- Homes elevated from road with terraced landscaping
- Many old growth mature trees



# Torrence Lateral Lining

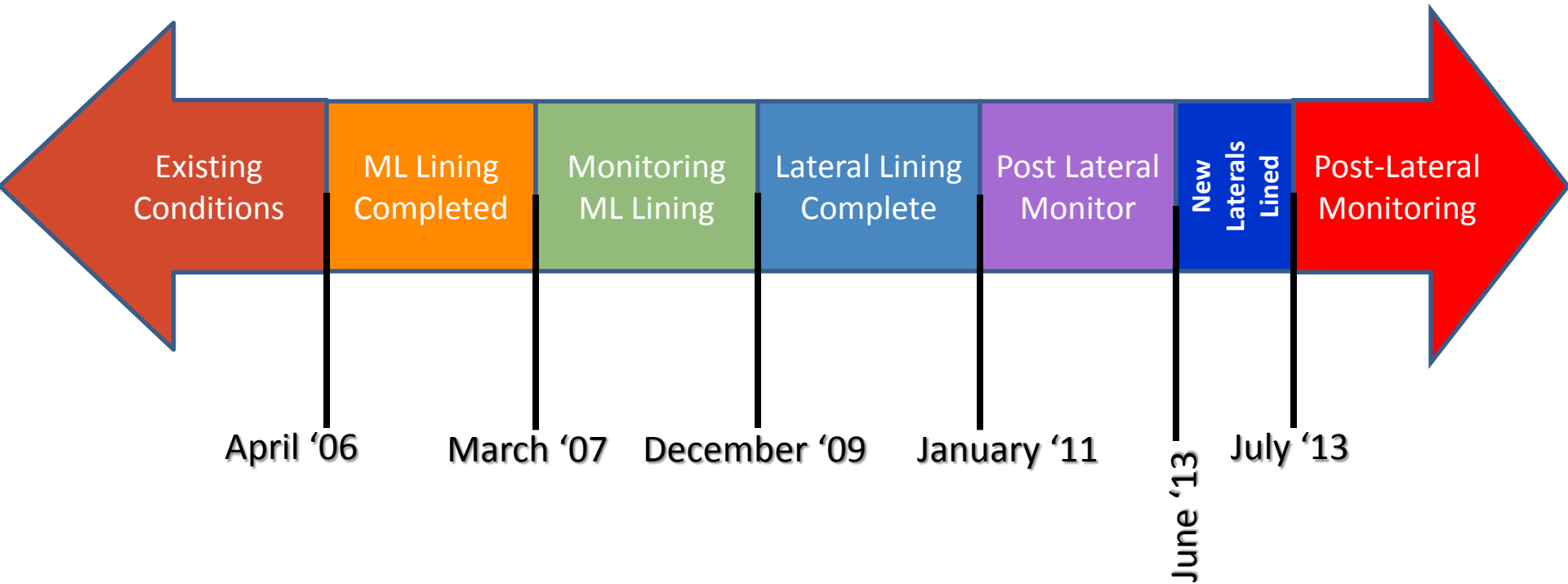


\* Flow Meter Columbus\_0370

■ Participated (71)

■ Not Participated (14)

# Torrence Lateral Lining Timeline



# Voluntary Pilot Lateral Lining Implementation

- Public meetings, letters, door to door
- Limited participation at first (20%)
- Word of mouth, quality of work
- Final participation 86%

Area	Total Houses	Lateral Lined Houses	% Lined
Weisheimer	124	109	88%
Torrence	85	71	84%

# Lateral Lining Technology



# Lateral Lining Technology



# Lateral Lining Data Analysis

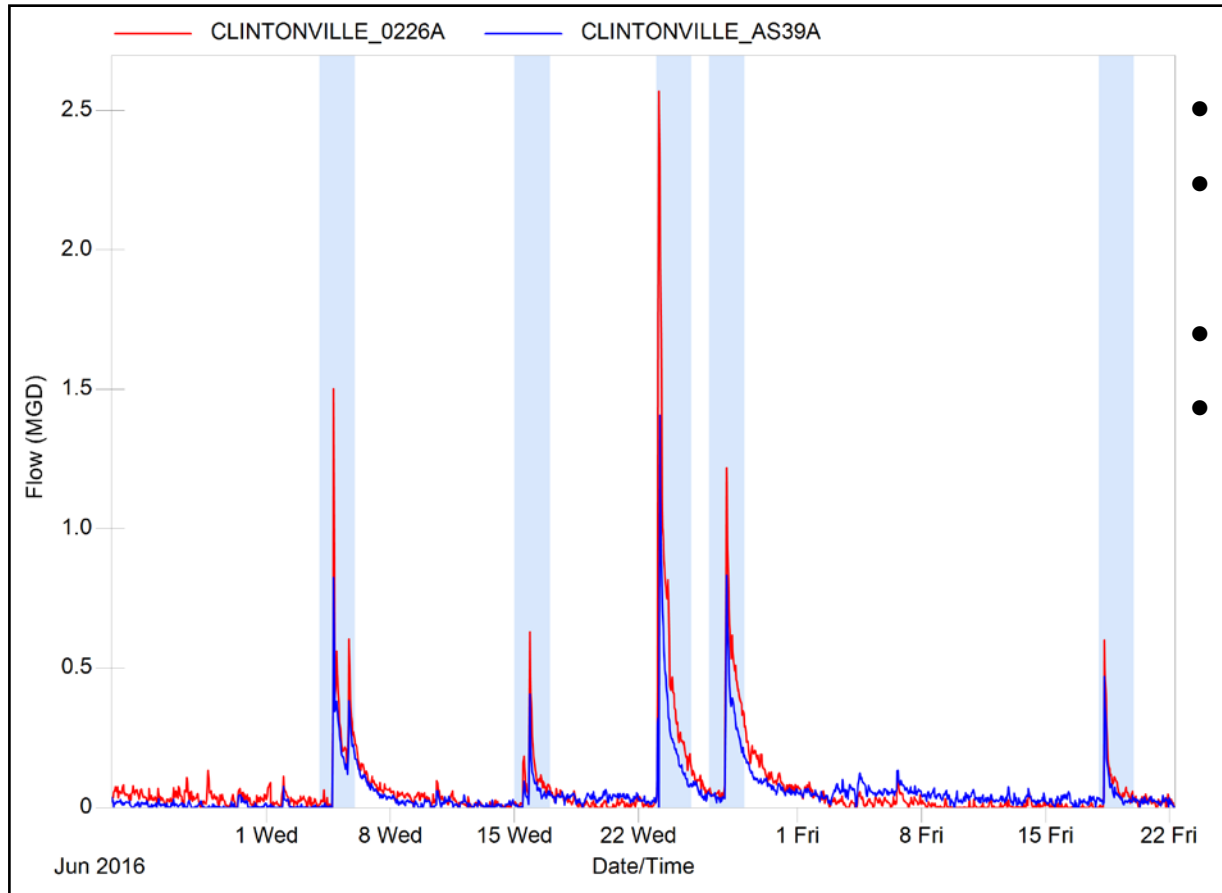
- Compare rainfall with pre and post lining meter data
- Control basin analysis (ARCADIS)
- RDII reduction field test

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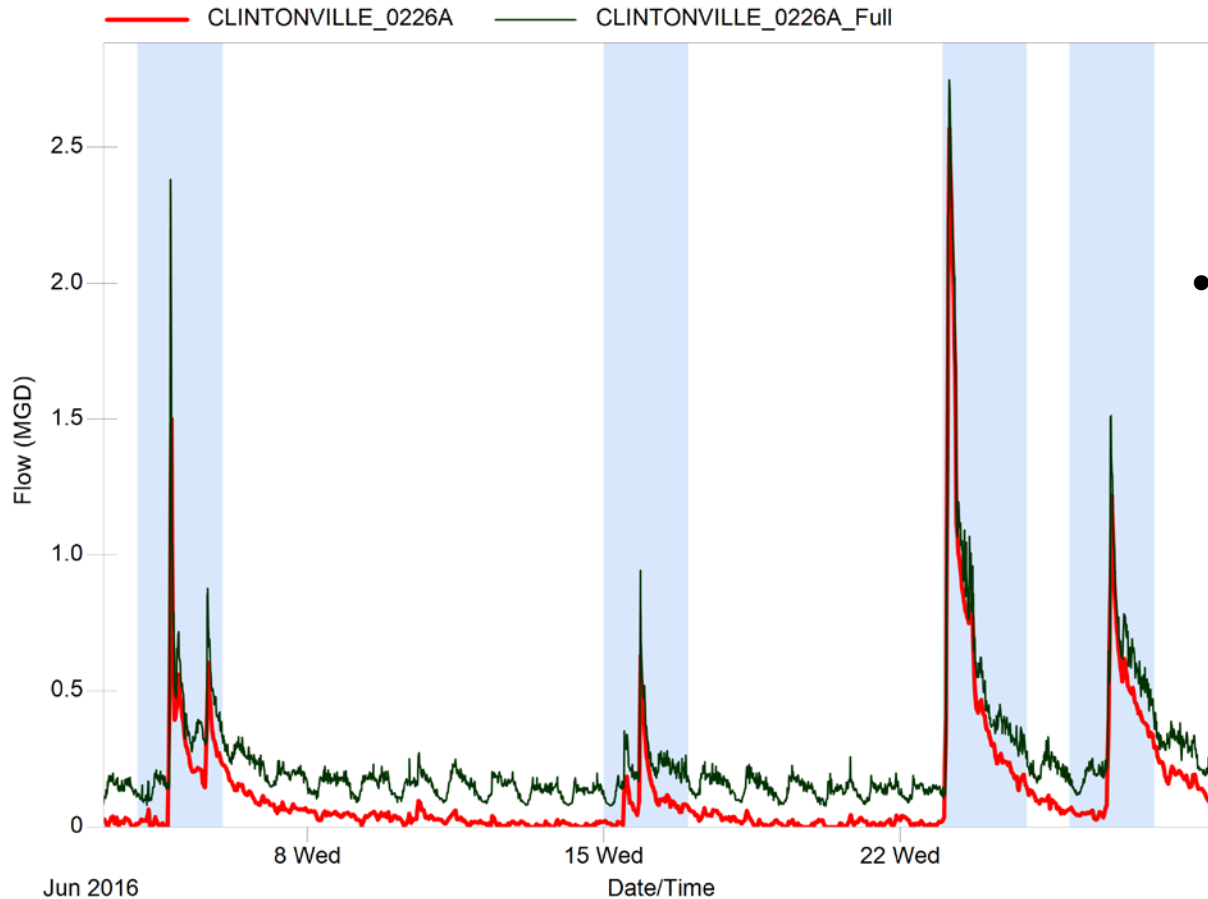


# Control Basin Comparison Approach



- Hydraulically independent
- Spatially close – Same rainfall intensity and duration
- Flow response follows a trend
- Appropriate for pre and post RDII reduction comparison

# Focusing on Wet Weather Flow



• Subtract DWF

# Comparison 1: Sewer Mains Lining



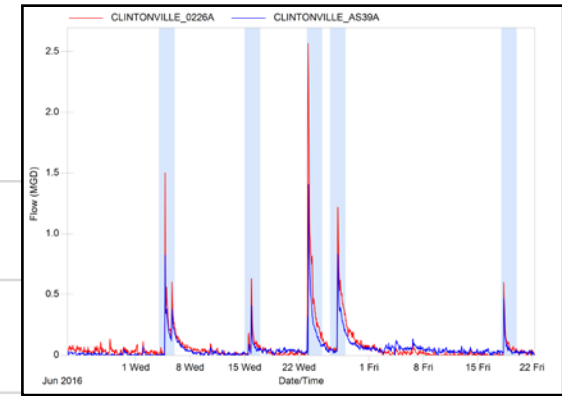
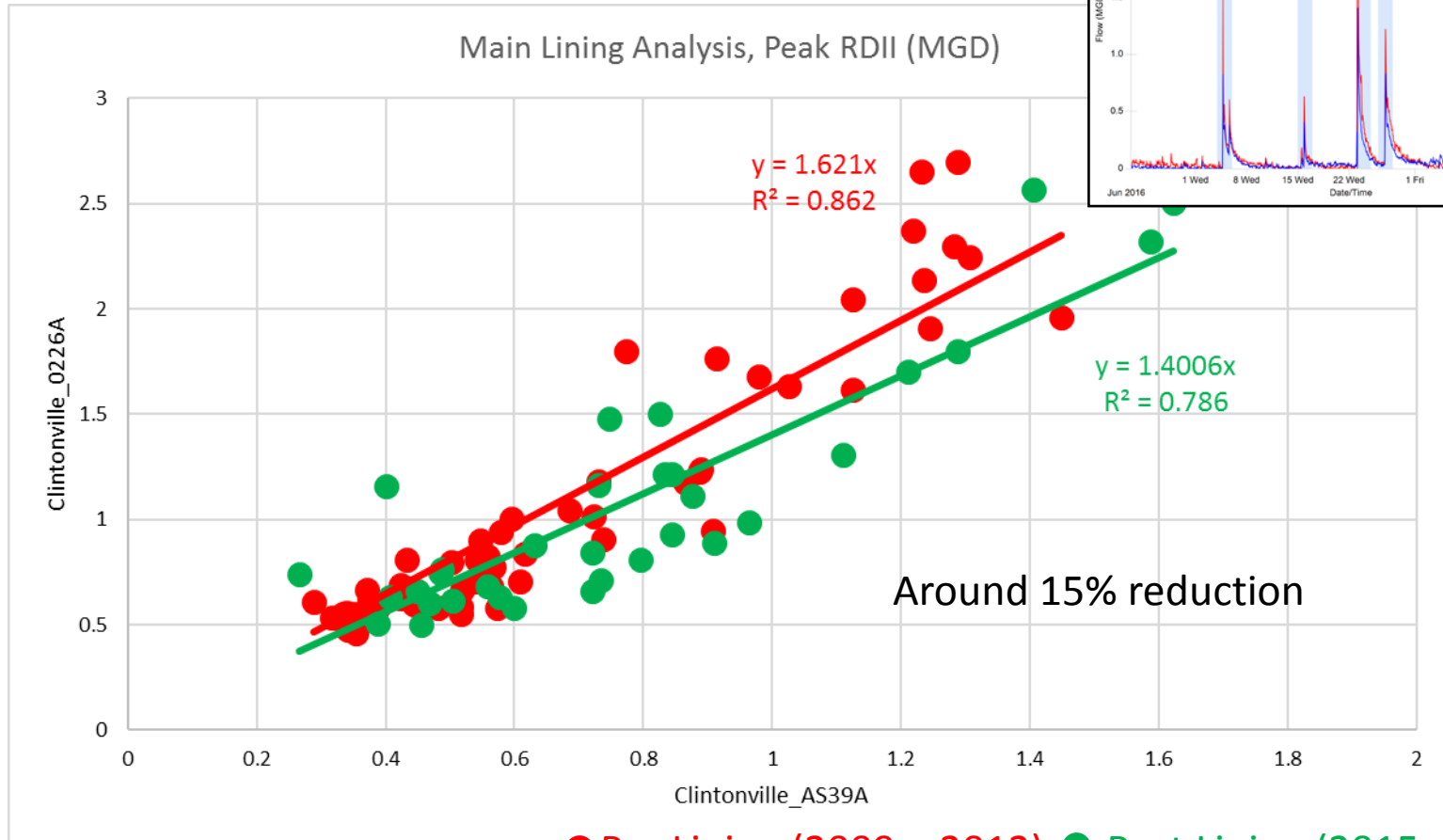
- Basin Clintonville\_0226A:
  - Most sewers lined during 2013 and 2014
- Control Basin AS\_39A
  - Sewers lined in 2008

# Sewer Mains Lining Basins



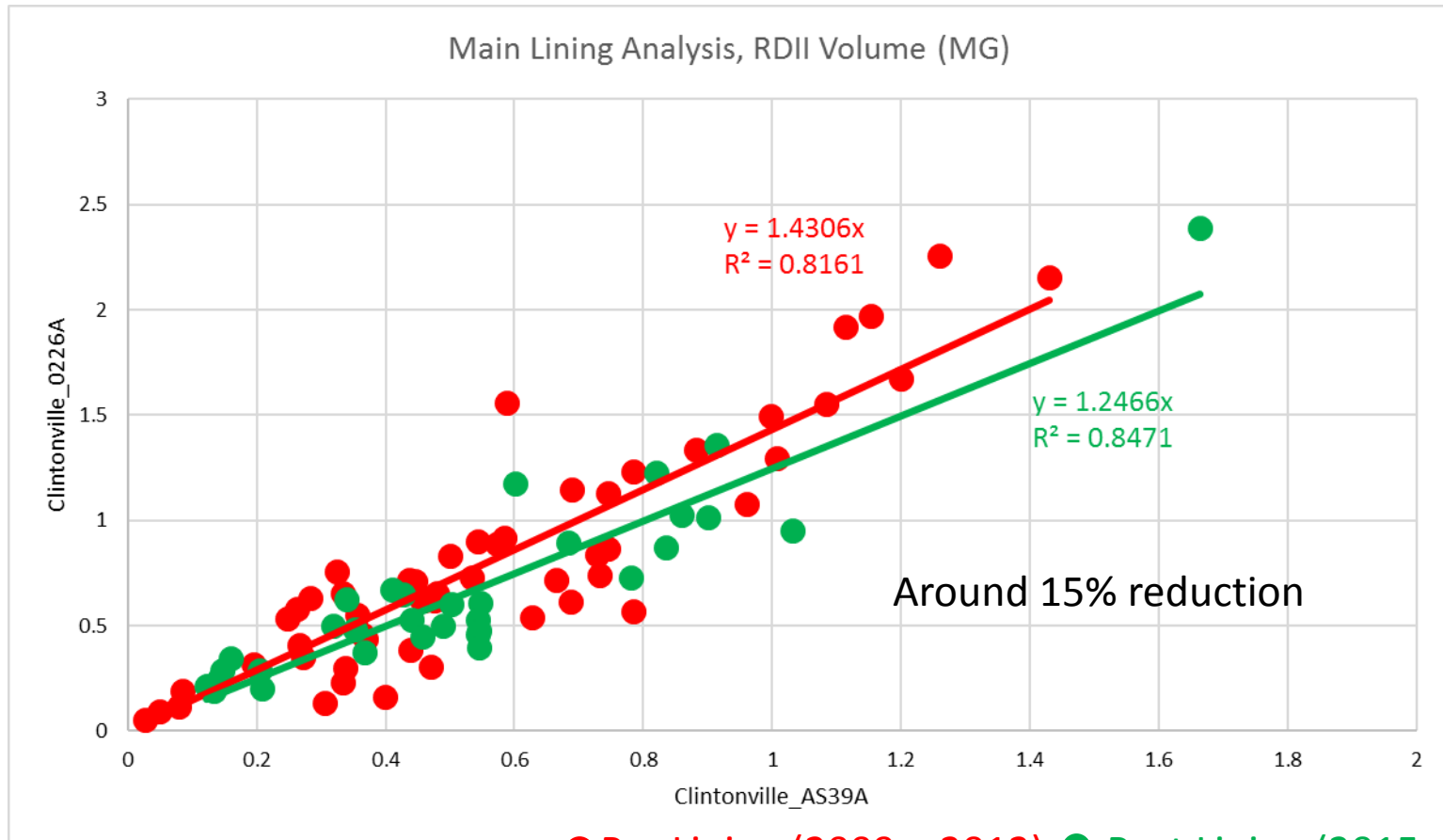
- Control Basin AS\_39A:
  - ~ 90 acres
- Basin Clintonville\_0226A:
  - ~ 225 acres
- Similar Landuse
- Comparison Duration
  - Pre Lining (2009 – 2012)
  - Post Lining (2015 – 2016)

# Sewer Mains Lining Results – Peak Flow



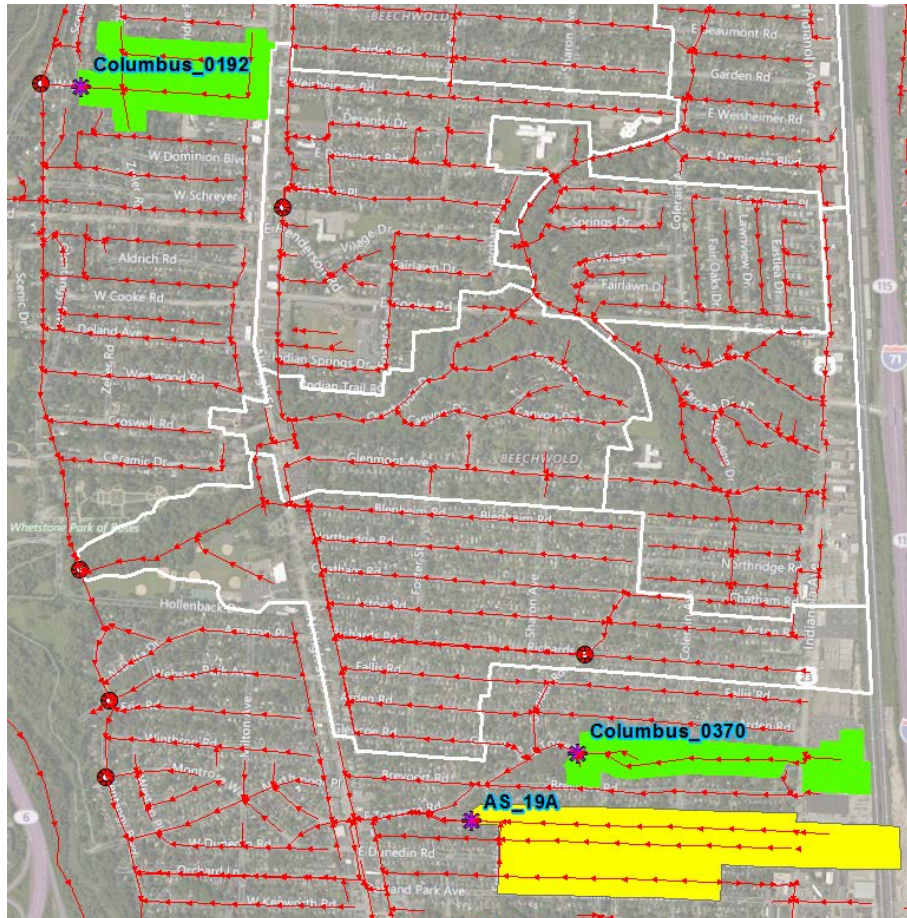
● Pre Lining (2009 – 2012) ● Post Lining (2015 – 2016)

# Sewer Mains Lining Results – RDII Volume



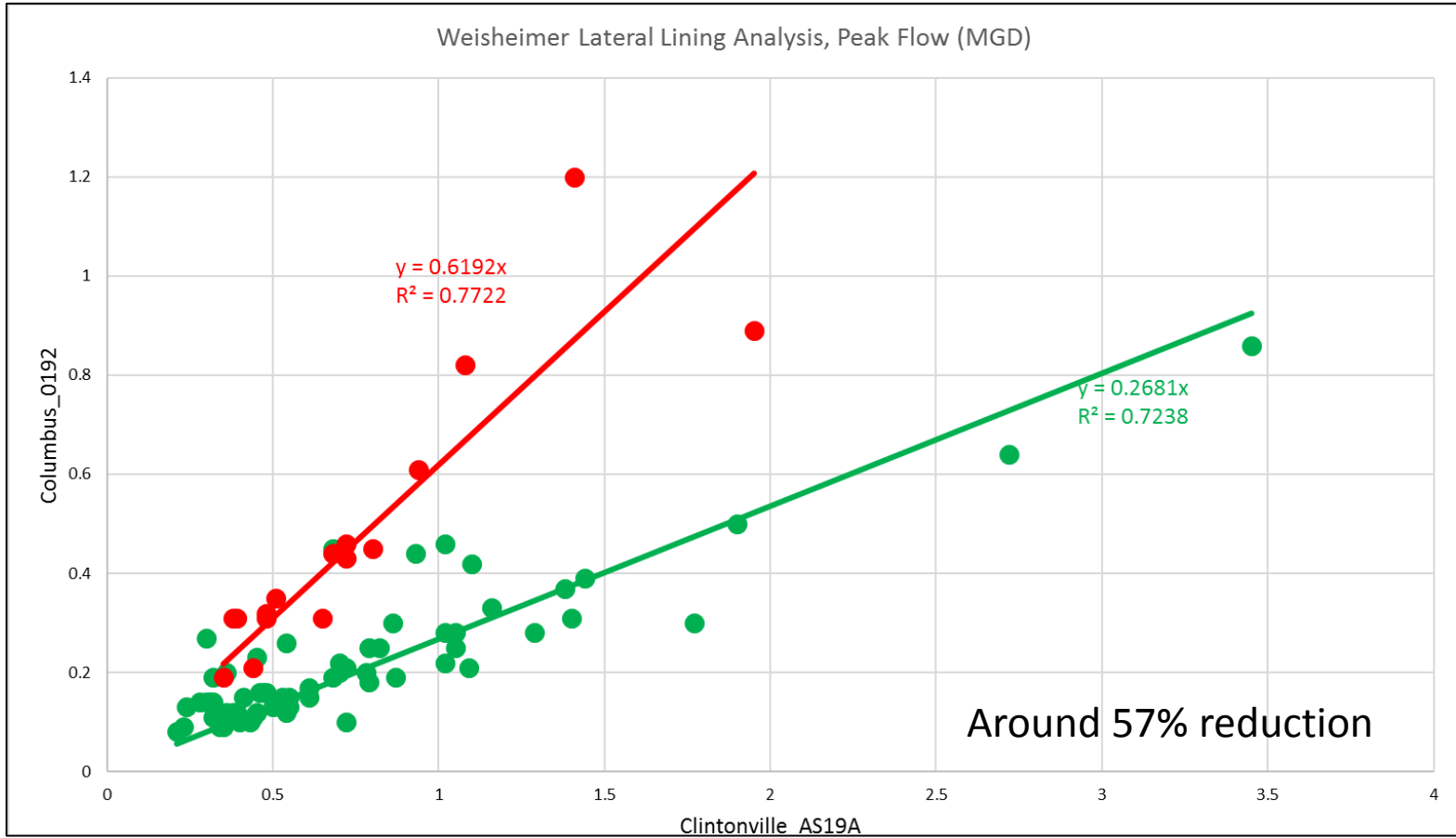
● Pre Lining (2009 – 2012) ● Post Lining (2015 – 2016)

## Comparison 2: Lateral Lining



- Two lateral lining basins
  - Columbus\_0192
    - Pre Lining (2007-2008)
    - Post Lining (2012-2016)
  - Columbus\_0370
    - Pre Lining (2007-2009)
    - Post Lining (2012-2016)
- AS\_19A as control basin

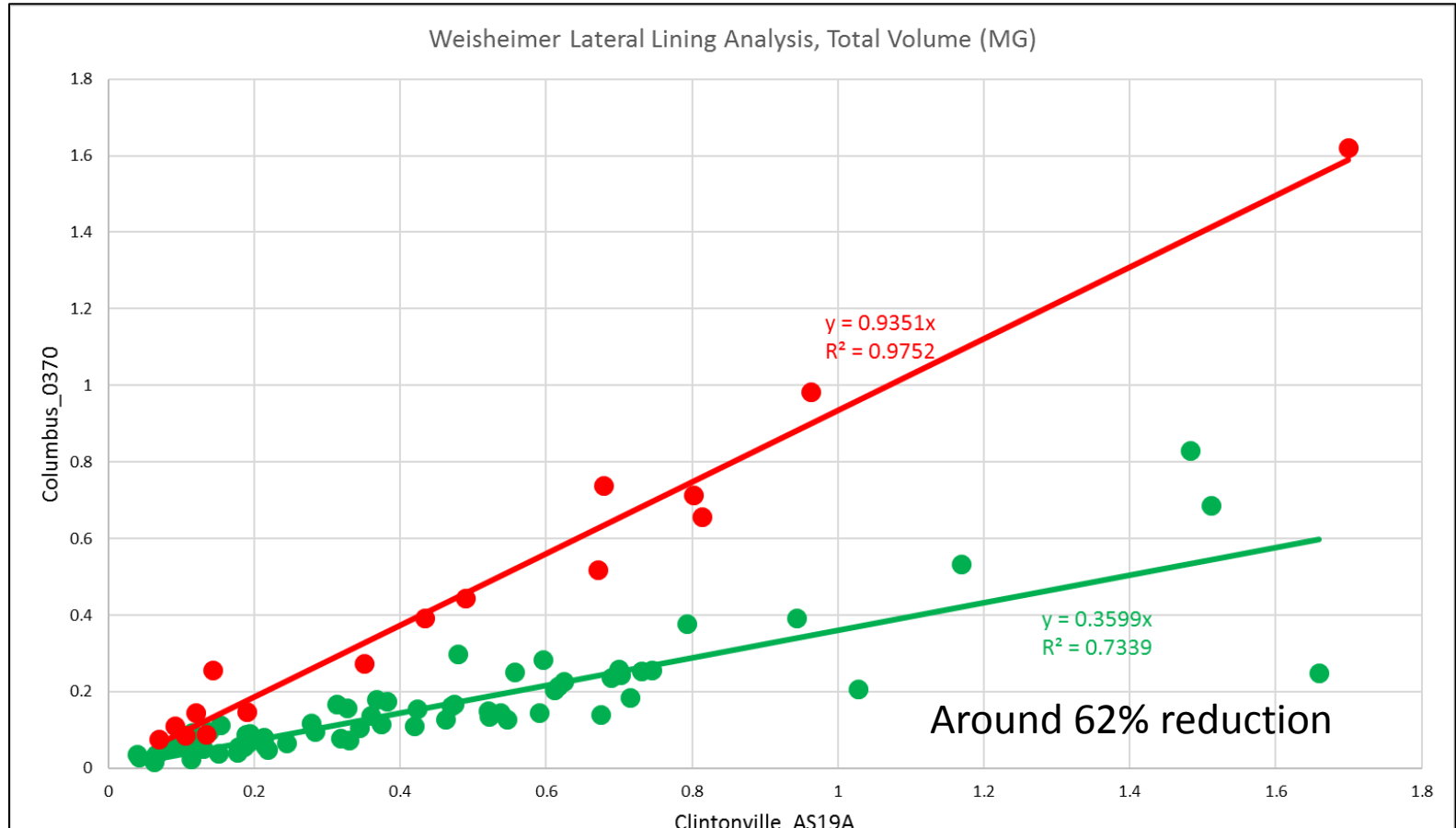
# Weisheimer Lateral Lining Results – Peak Flow



● Pre Lining (2007-2008) ● Post Lining (2012-2016)

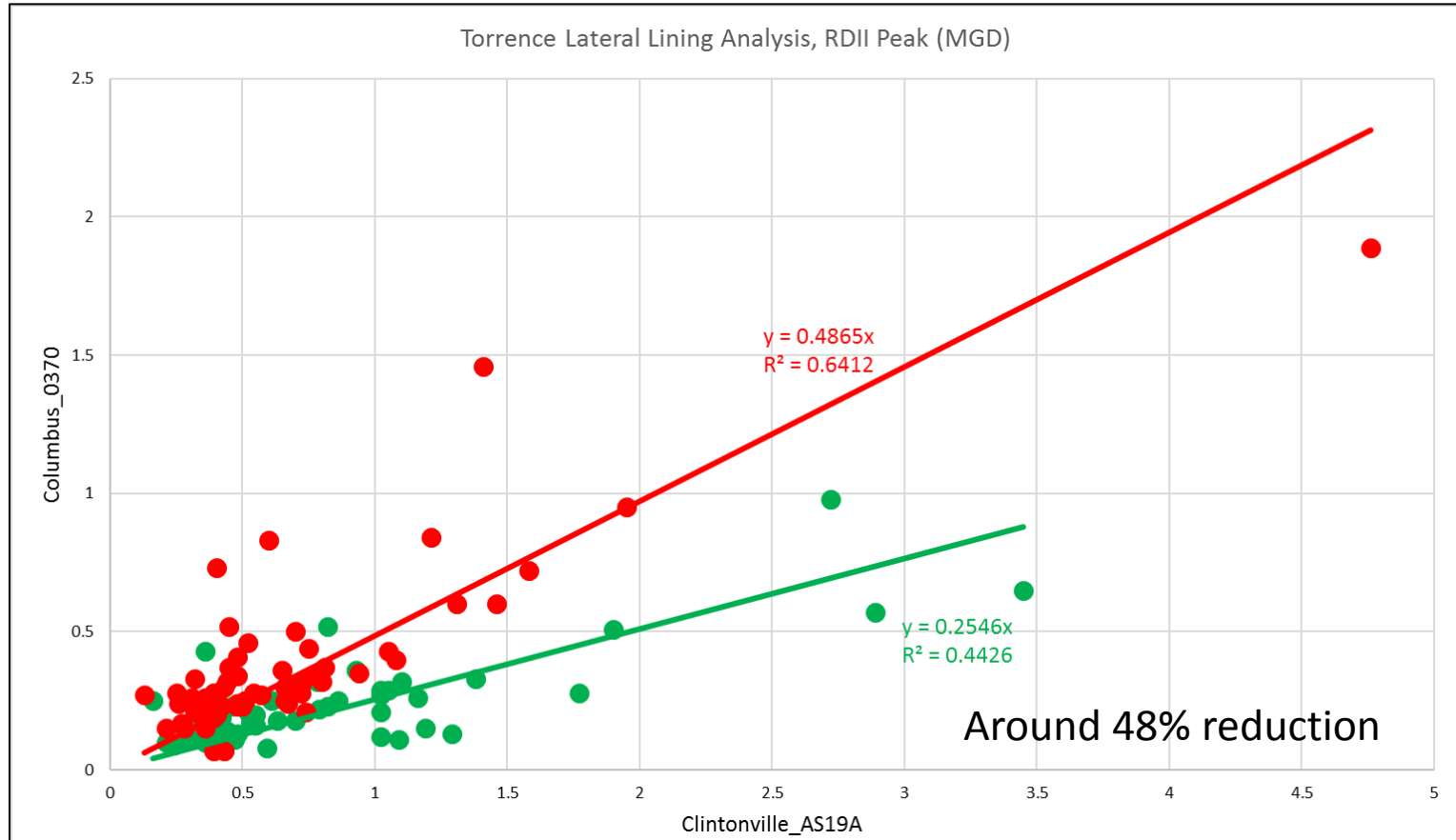


# Weisheimer Lateral Lining Results – RDII Volume



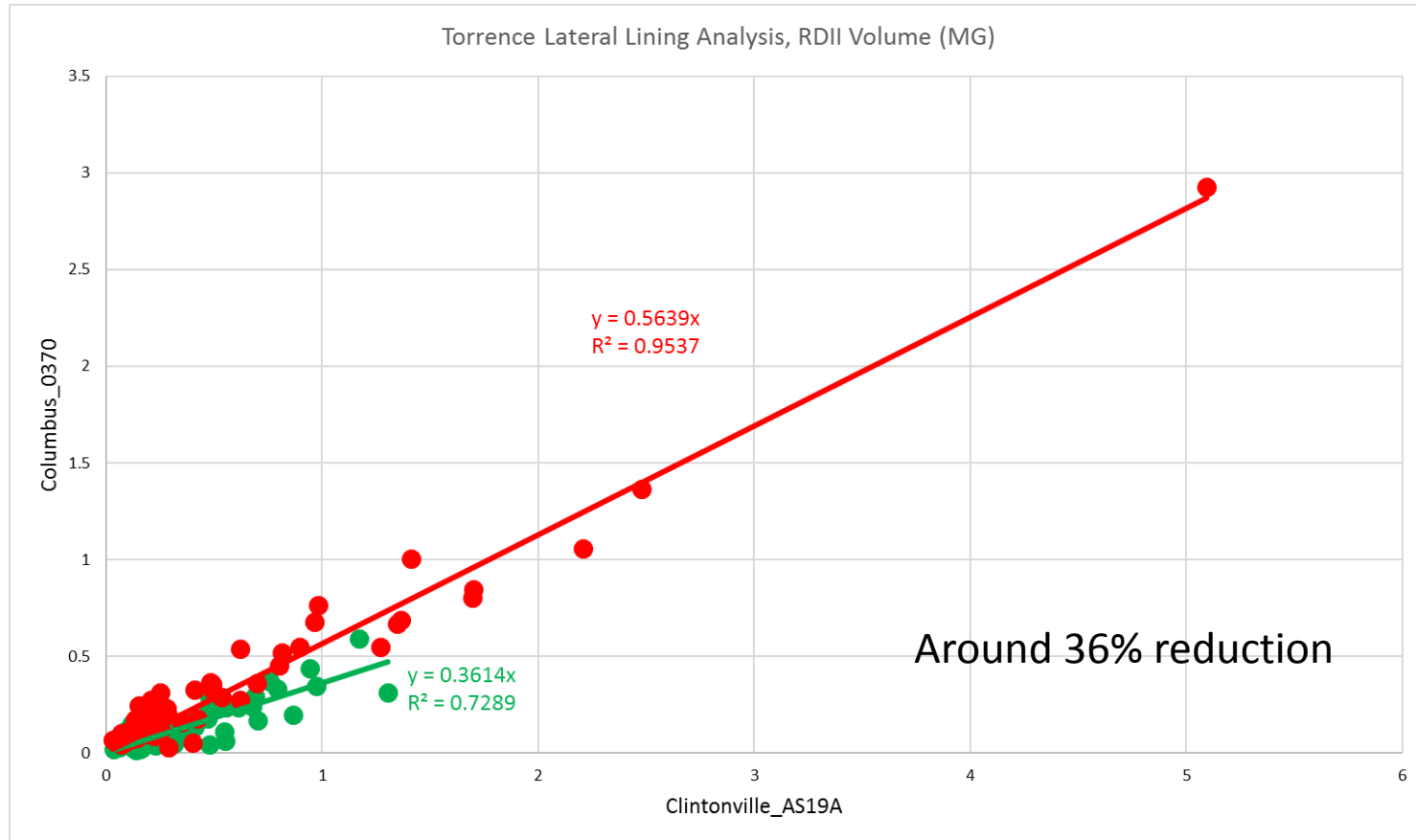
● Pre Lining (2007-2008) ● Post Lining (2012-2016)

# Torrence Lateral Lining Results – Peak Flow



● Pre Lining (2007-2009) ● Post Lining (2012-2016)

# Torrence Lateral Lining Results – RDII Volume



● Pre Lining (2007-2009) ● Post Lining (2012-2016)

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## Lessons Learned

- Main sewers lining reduces peak flow and volume by around 15%
- Lateral lining (up to the house 4" x 6" connection) brings additional reduction in peak flow 48-57% and volume 36-62%
- CIPP Lining is a very effective tool for I/I mitigation (approximately 58% total peak flow reduction)
- These results led to Lateral Lining becoming one of the Pillars of Blueprint
- Communication with residents is extremely important
- Quality flow monitoring data is crucial for analysis

# Questions?

Hunter Kelly, P.E.

[HWKelly@Columbus.gov](mailto:HWKelly@Columbus.gov), 614-645-0239

Qiuli Lu, Ph.D., P.E.

[Qiuli.Lu@arcadis.com](mailto:Qiuli.Lu@arcadis.com), 614-985-9155

Hazem Gheith, Ph.D., P.E.

[Hazem.Gheith@arcadis.com](mailto:Hazem.Gheith@arcadis.com), 614-634-0670