

Delaware County Infiltration & Inflow Reduction

CSEAO ANNUAL SUMMER CONFERENCE

JUNE 17, 2025



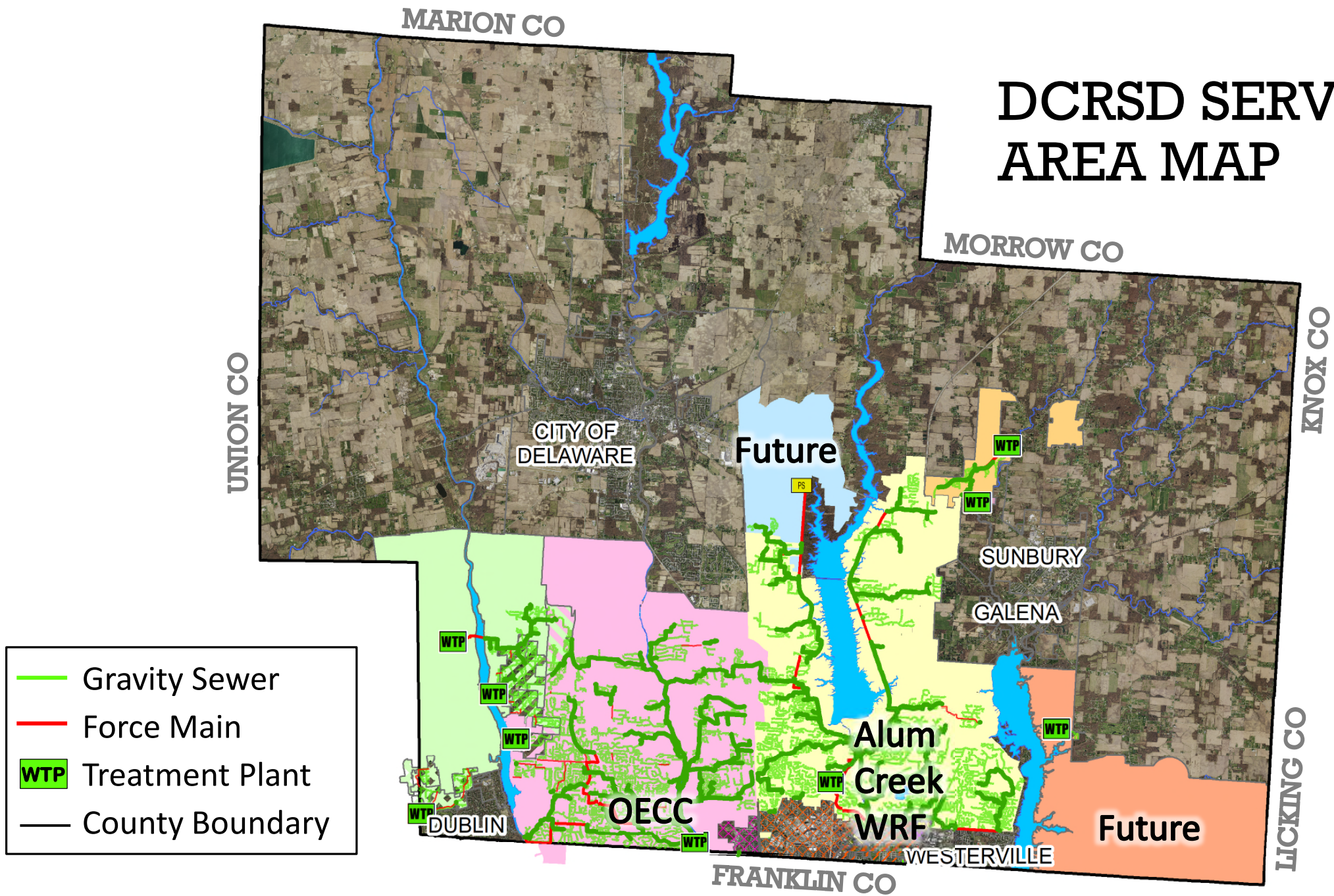
OUTLINE

- Delaware County Collection System Intro
- CMOM Data Collection
- Scioto Hills SSES and Rehab
 - Flow Monitoring Tactics
- Highmeadows SSES and Rehab
- Northstar Rehab

DELAWARE COUNTY REGIONAL SEWER DISTRICT

- Established 1969
- 9 treatment plants
 - 10 MGD Alum Creek WRF
 - 6 MGD Olentangy Environmental Control Center (OECC)
- 32 pump stations
- 37.7 miles of force mains
- 547 miles of gravity sewer
- Serve >60% of the Delaware County population

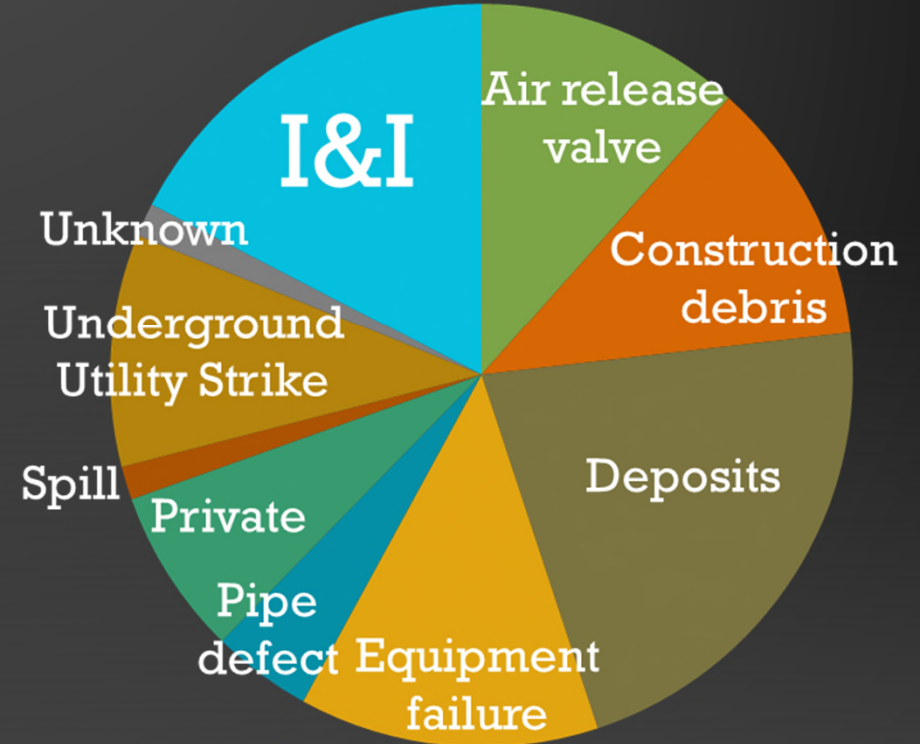
DCRSD SERVICE AREA MAP



DCRSD I&I ISSUES

- I&I contributed to only 17% of SSO/WIB events 2009-2024
- I&I impacts some pump station & treatment plant operations
- Proactive I&I reduction

SSO & WIB Causes 2009-2024



HOW WERE I&I REDUCTION AREAS SELECTED?

History of I&I impacts:

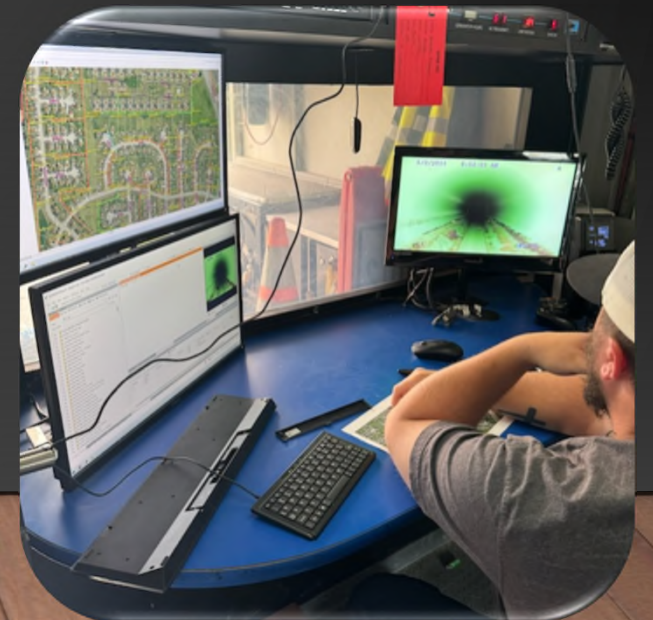
- Scioto Hills WRF
- Northstar WRF
- Leatherlips Pump Station
- OECC – facilities plan recommended future EQ

OECC areas identified from flow monitoring:

- Highmeadows
- The Retreat

DATA COLLECTION

- In-house data collection & studies
 - CCTV
 - Manhole Screening
 - Flow Monitoring
- Collections Dept began CCTV in 2004
 - Currently 2 CCTV trucks
 - 17.2 miles inspected in 2024
 - Granite / GraniteXP / GraniteNet since 2011



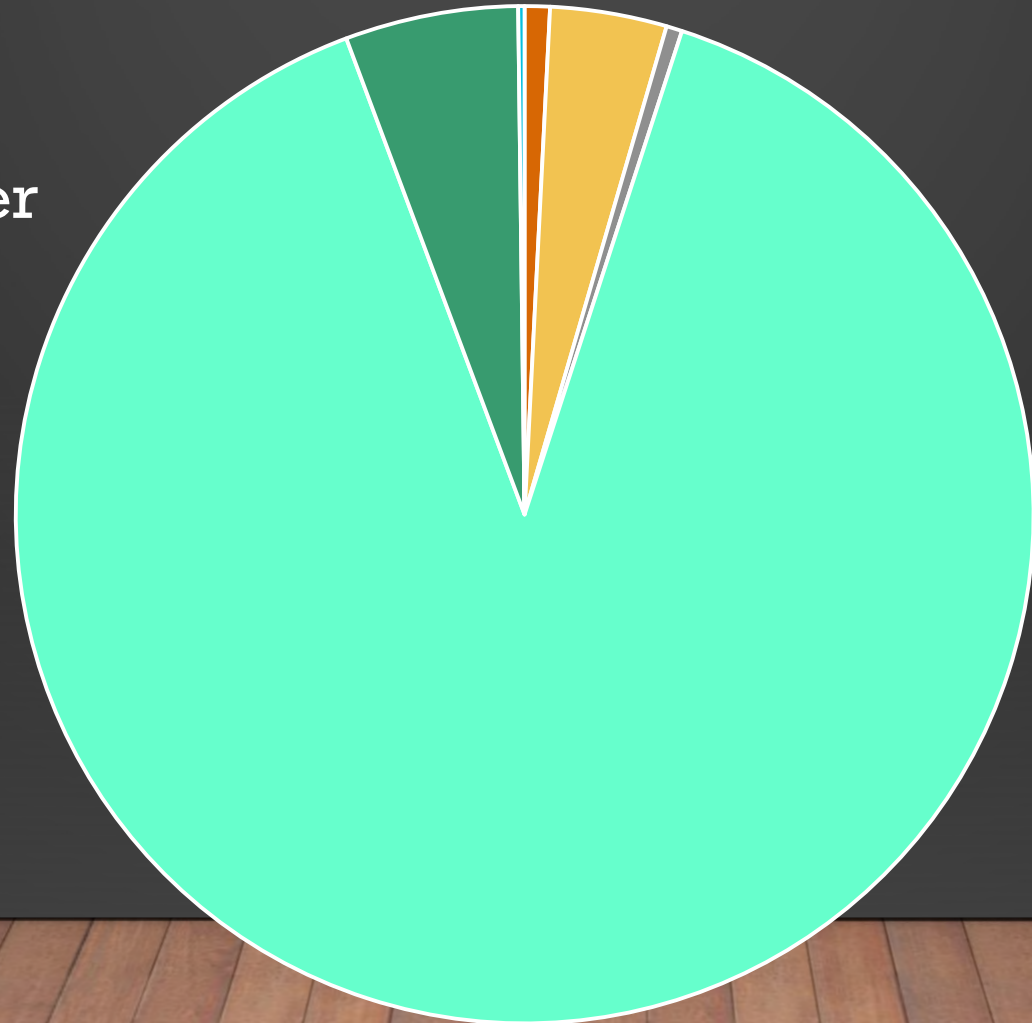
CCTV INSPECTION FINDINGS

- 2020 overall review of CCTV data
- Concrete, truss, and clay (common before 1989) had the most frequent infiltration defects

Pipe Material	Concrete	Truss	Clay	DIP	PVC
Length Inspected (ft) 2017-2020	16,819	73,731	10,875	6,385	598,212
No. of Infiltration Defects per 1000 LF	1.4	1.0	0.6	0.2	0.1

PIPE TYPES & SIZES

- 89.2% PVC
- 8" to 48" Diameter
- Oldest sewers installed in 1974

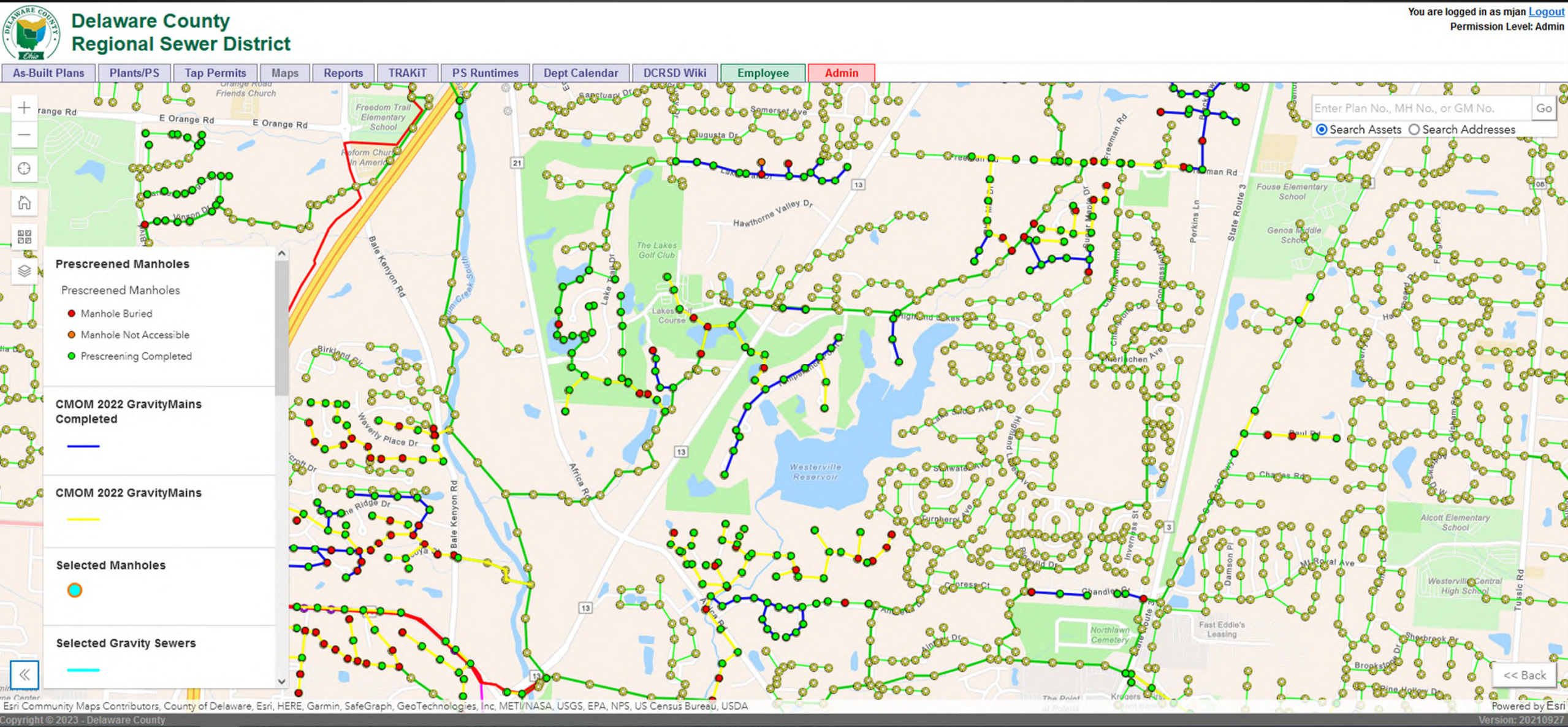


- Clay (4.3 mi)
- Concrete (20.1 mi)
- Ductile Iron (2.8 mi)
- PVC (488.9 mi)
- Truss (29.9 mi)
- Ultra Rib (1 mi)

SEWER BLOCKAGES (DEPOSITS, GREASE, RAGS) HAVE DECLINED SINCE CCTV

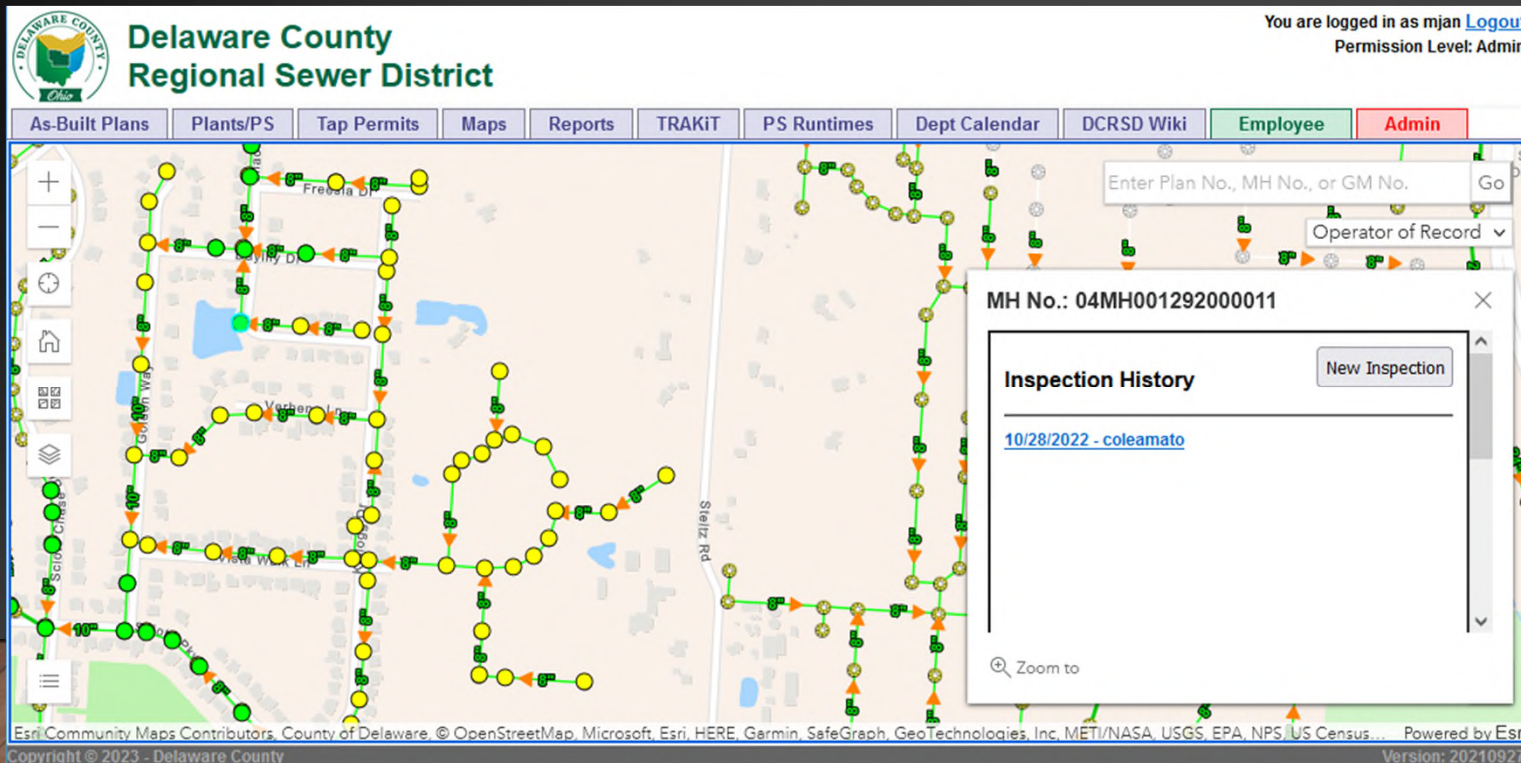


2022 CCTV PRIORITY BY SEWER AGE



MANHOLE SCREENING

- Mobile app developed in house
- Collections, Inspectors, & Operator of Record
- Manholes screened since 2022 = 3,508 (27%)



MH No.: 04MH001682000008

Access Type: ACCESSIBLE BY ROAD

Buried Y/N: NO

Lid Type: VENT HOLES

Bolt Down Lid: NO

Ground Surface: GRASS

Sink Holes Y/N: NO

Reset Reseal Y/N: NO

I/I Y/N: STAIN

Surcharge Y/N: NO

H2S: NONE

Structural Issues: NONE

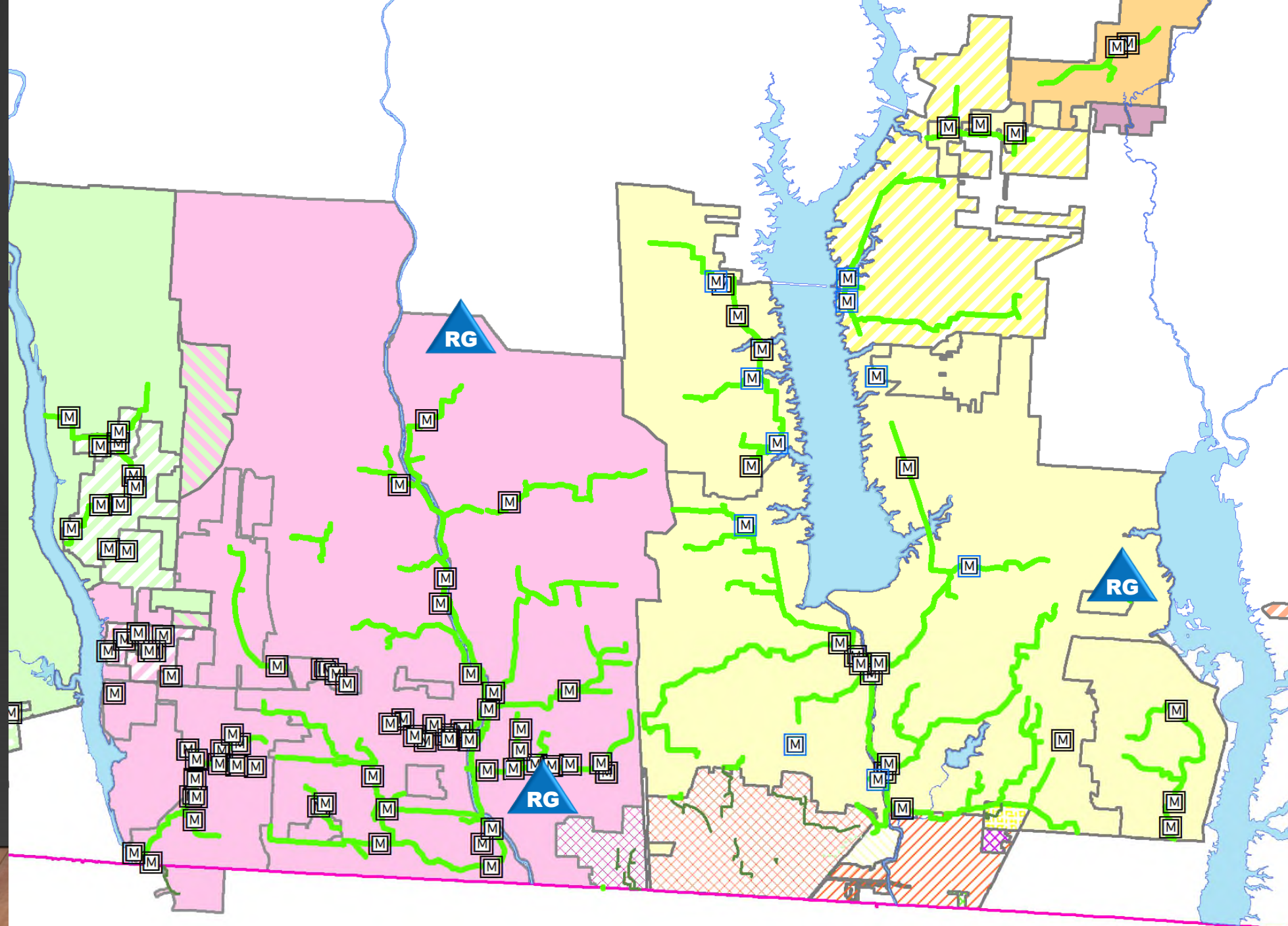
Comments: Not really I/I but has a vented lid with a sprinkler head right beside it

<< Back Save

Zoom to

FLOW MONITORING

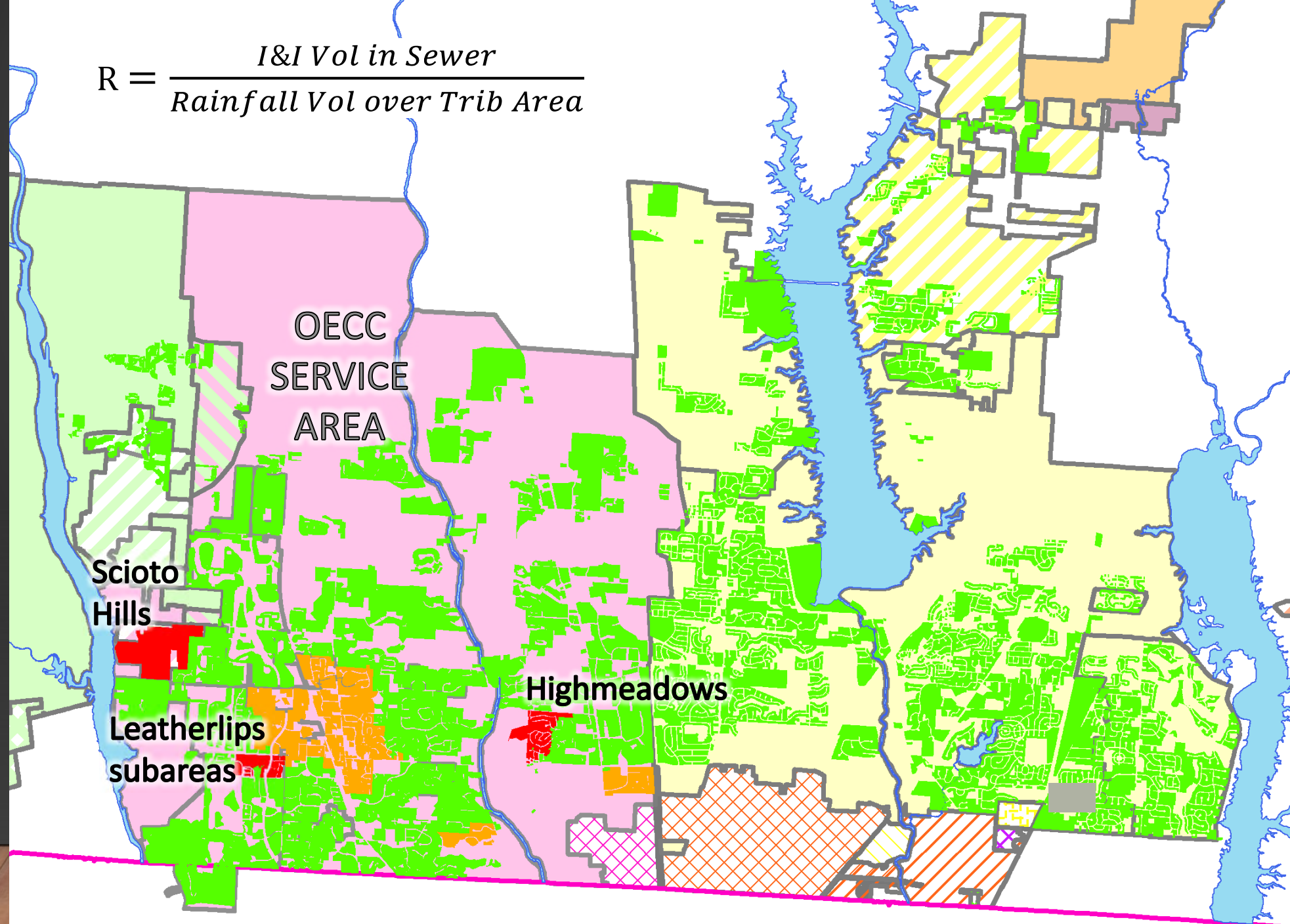
- 10 temporary flow meters
- 3 Rain Gauges
 - 2 Ohio EMA
 - 1 DCRSD



FLOW MONITORING ANALYSIS FINDS HIGH I&I AREAS

Median
Rainfall% (R) in
Sanitary Sewer

- <3%
- >3 - 6%
- >6 - 11.8%

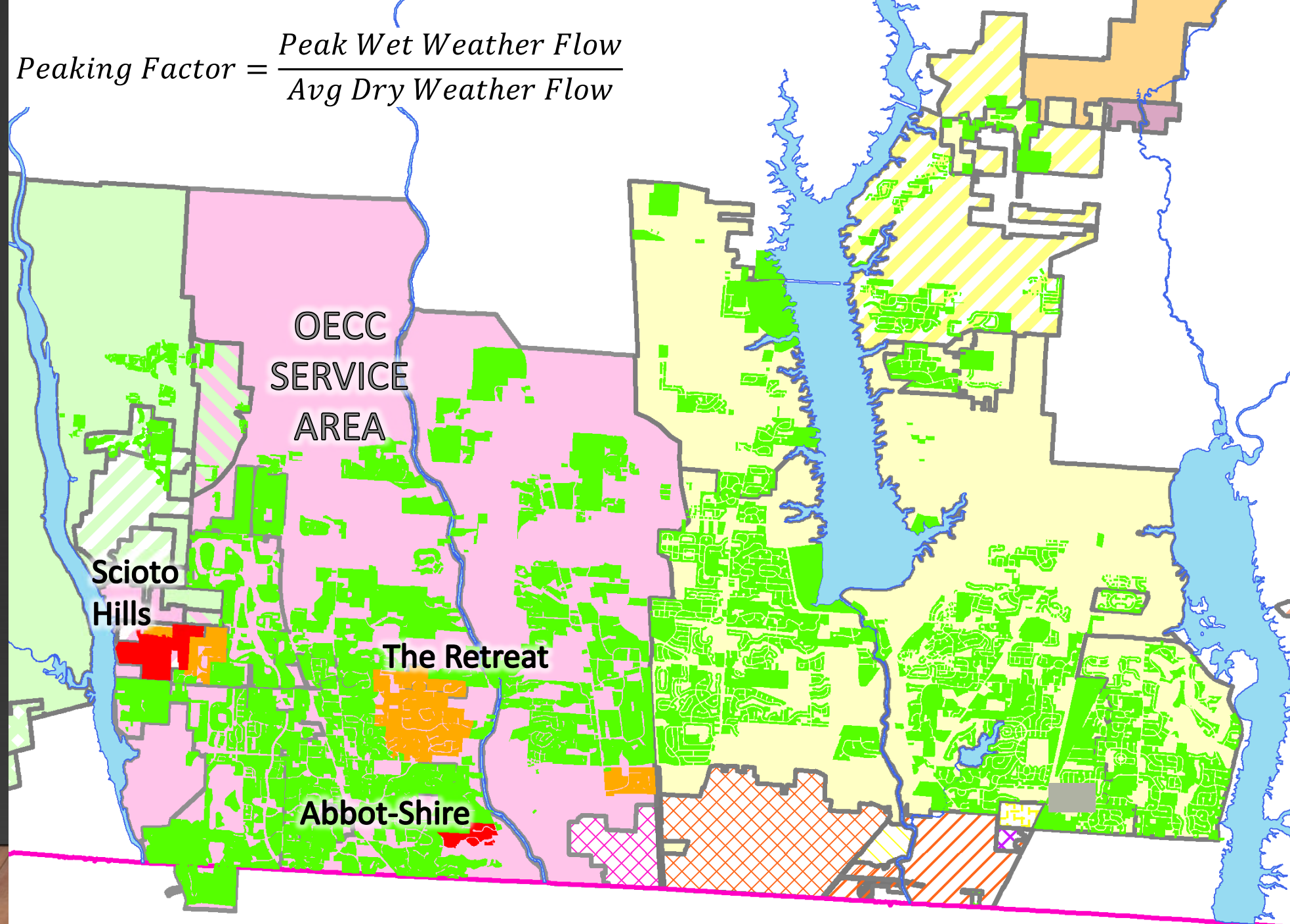


FLOW MONITORING ANALYSIS FINDS HIGH I&I AREAS

Average Wet-
Weather
Peaking Factor

- <3
- >3 - 6
- >6 - 9.2

$$\text{Peaking Factor} = \frac{\text{Peak Wet Weather Flow}}{\text{Avg Dry Weather Flow}}$$



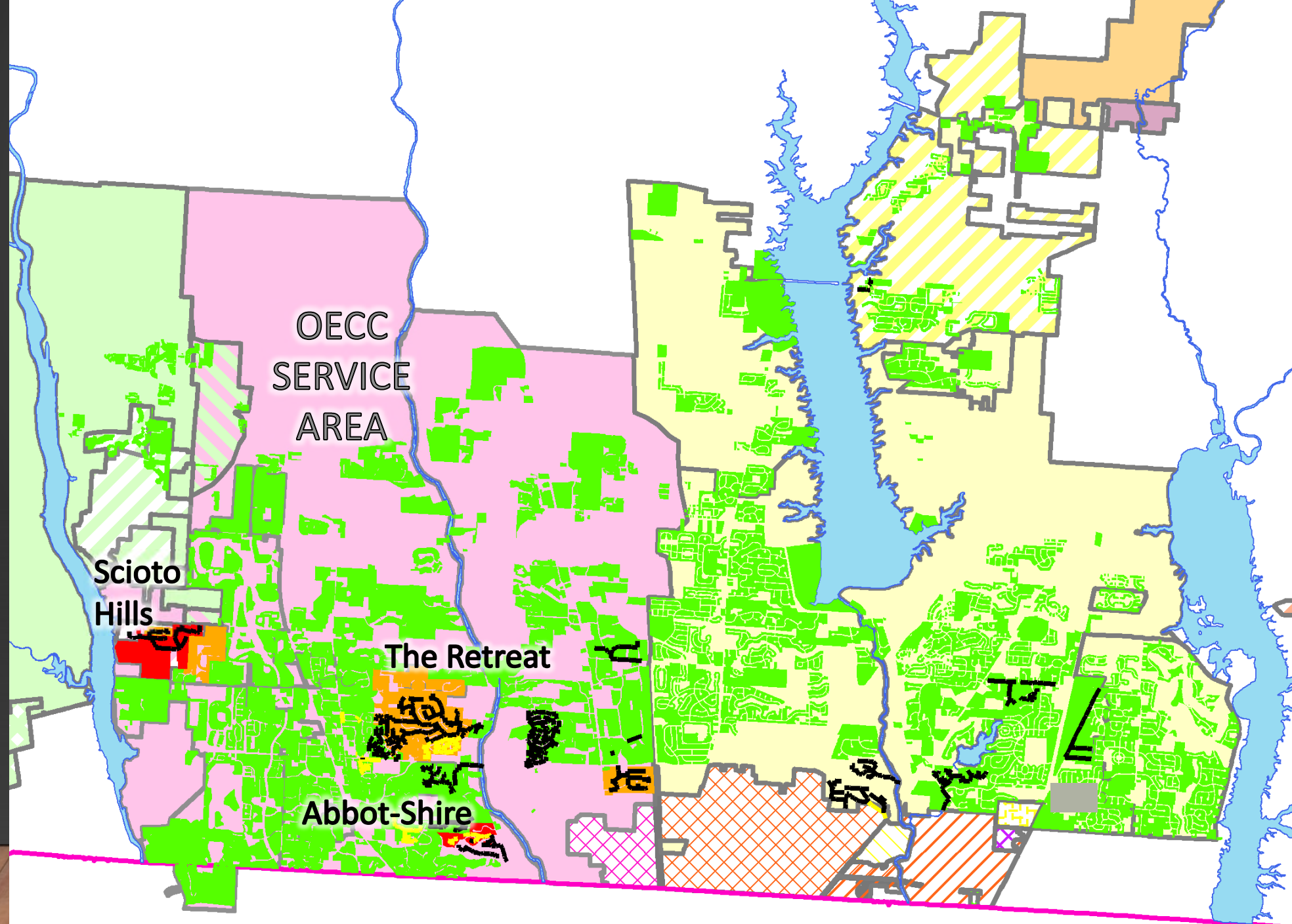
FLOW MONITORING ANALYSIS FINDS HIGH I&I AREAS

Average Wet-
Weather
Peaking Factor

- <3
- >3 - 6
- >6 - 9.2

— Truss

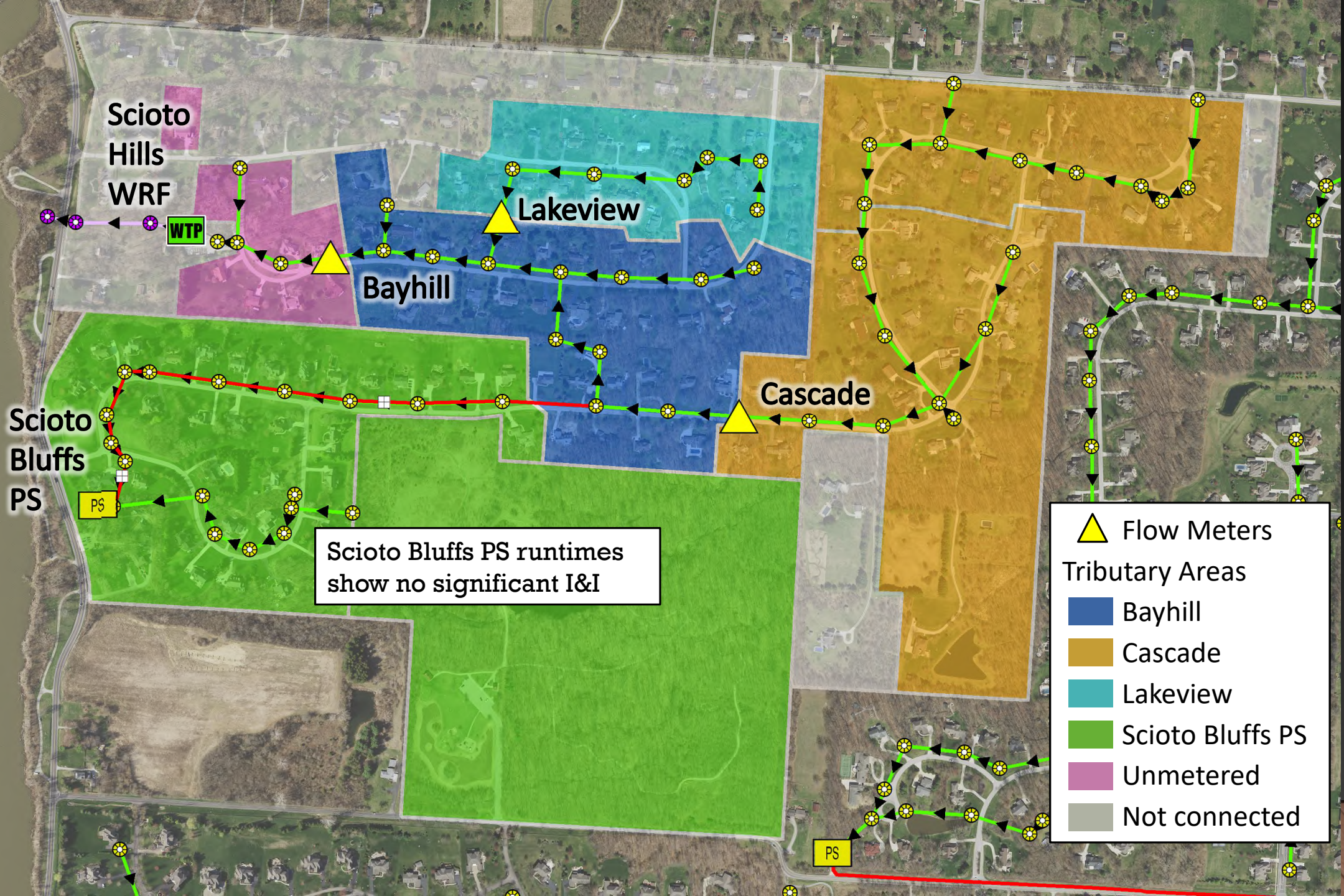
— Clay



SCIOTO HILLS

- 156-home subdivision
- Scioto Hills WRF constructed in 1974
- Design flow = 84,000 gpd
- Collection system installed in 3 phases: 1974 & 1978 (truss pipe), & 1989 (PVC)
- 2012 - Alternatives to address overflows at treatment plant:
 - Convert to pump station OR
 - Sanitary Sewer Evaluation Study (SSES)





2011-2013 SCIOTO HILLS SSES

- Flow Monitoring
 - Dec 2011 – Aug 2013 (21 months)
 - Before, during, and after rehab
- Mainline CCTV
- Manhole inspections
- Smoke testing
 - One direct connection – removed by homeowner
 - Also found 2 houses without roof vents – the smoke went in the house!
- No private property inspection or testing – Owners are responsible for entire service line beginning at branch joint of the wye

2012 SCIOTO HILLS CCTV



Leaking Joint

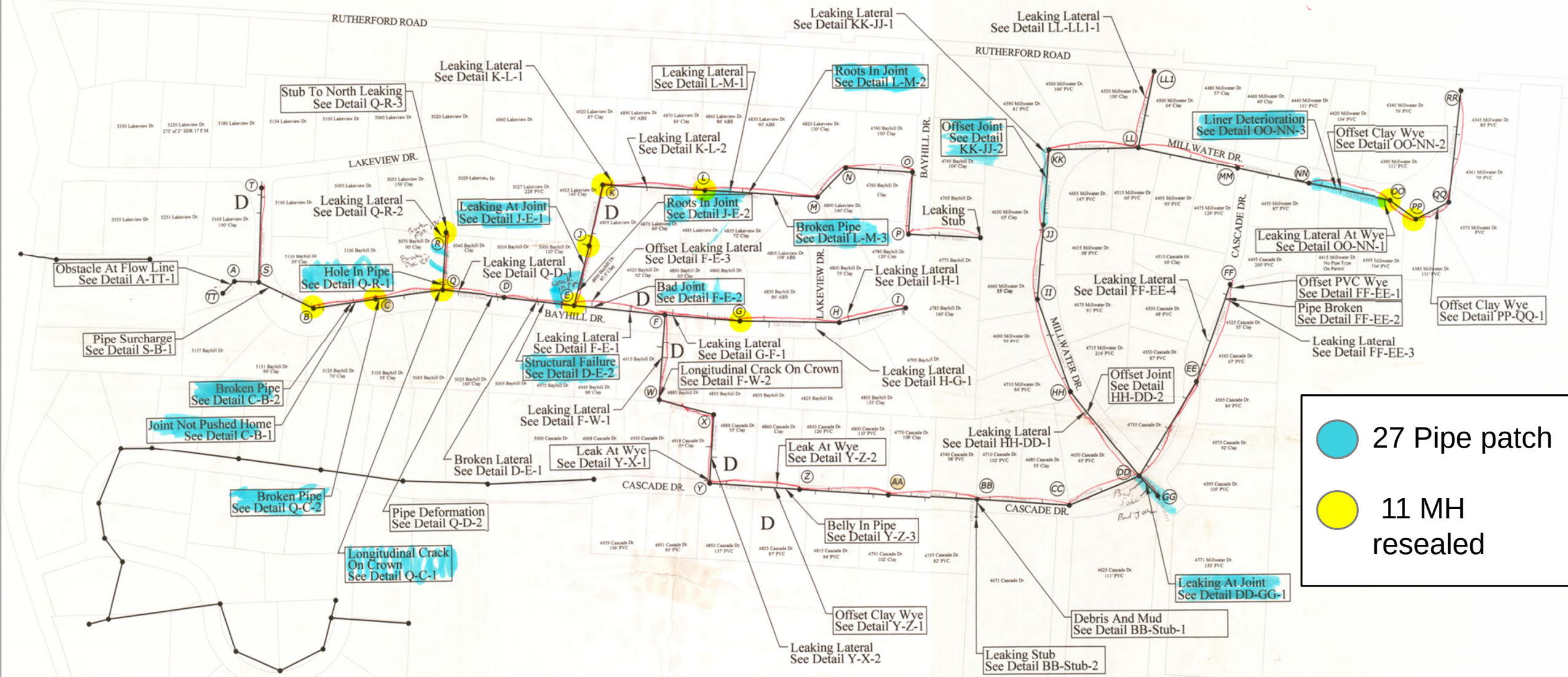


Leaking Stub

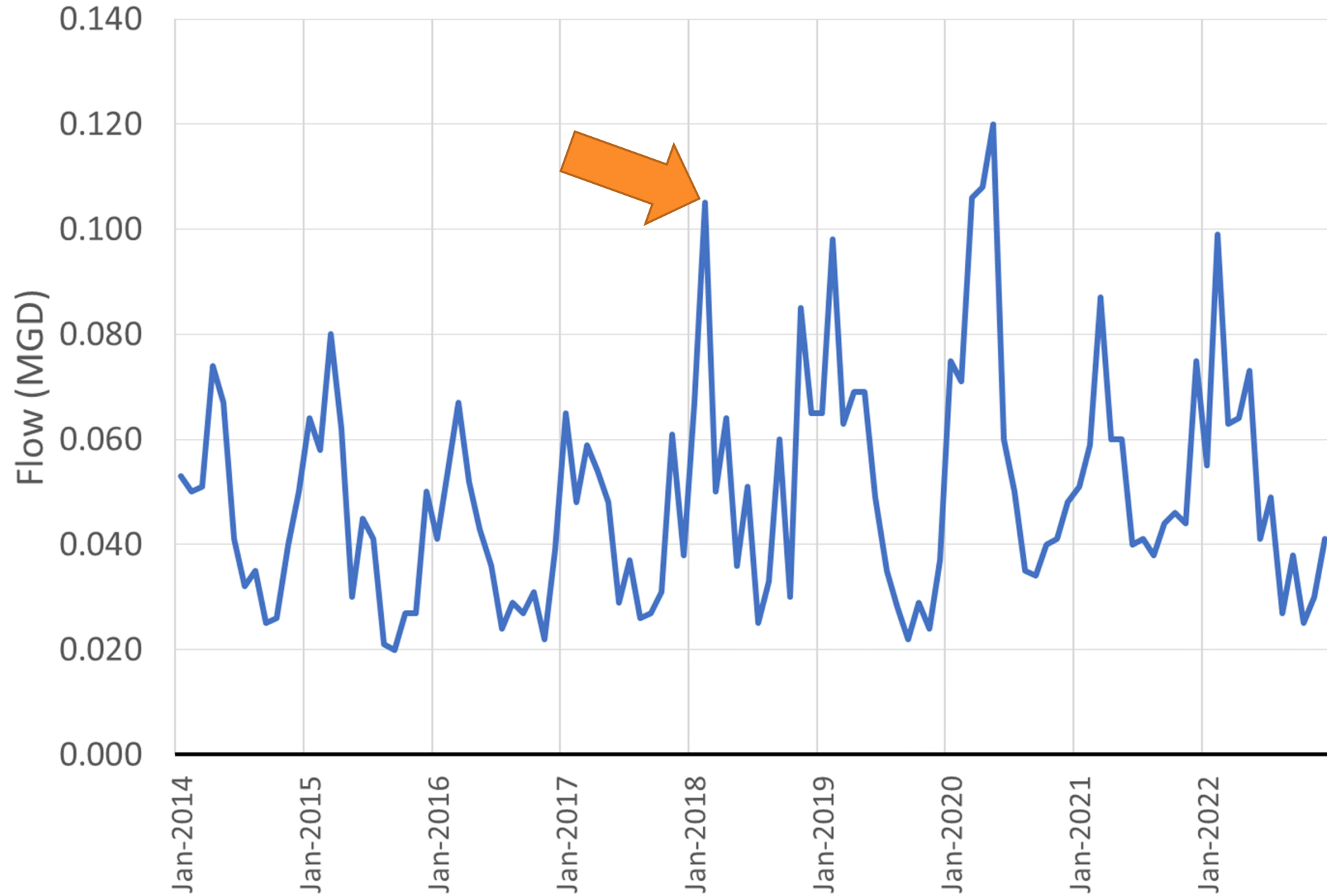


Leaking Wye

2012 SCIOTO HILLS POINT REPAIRS

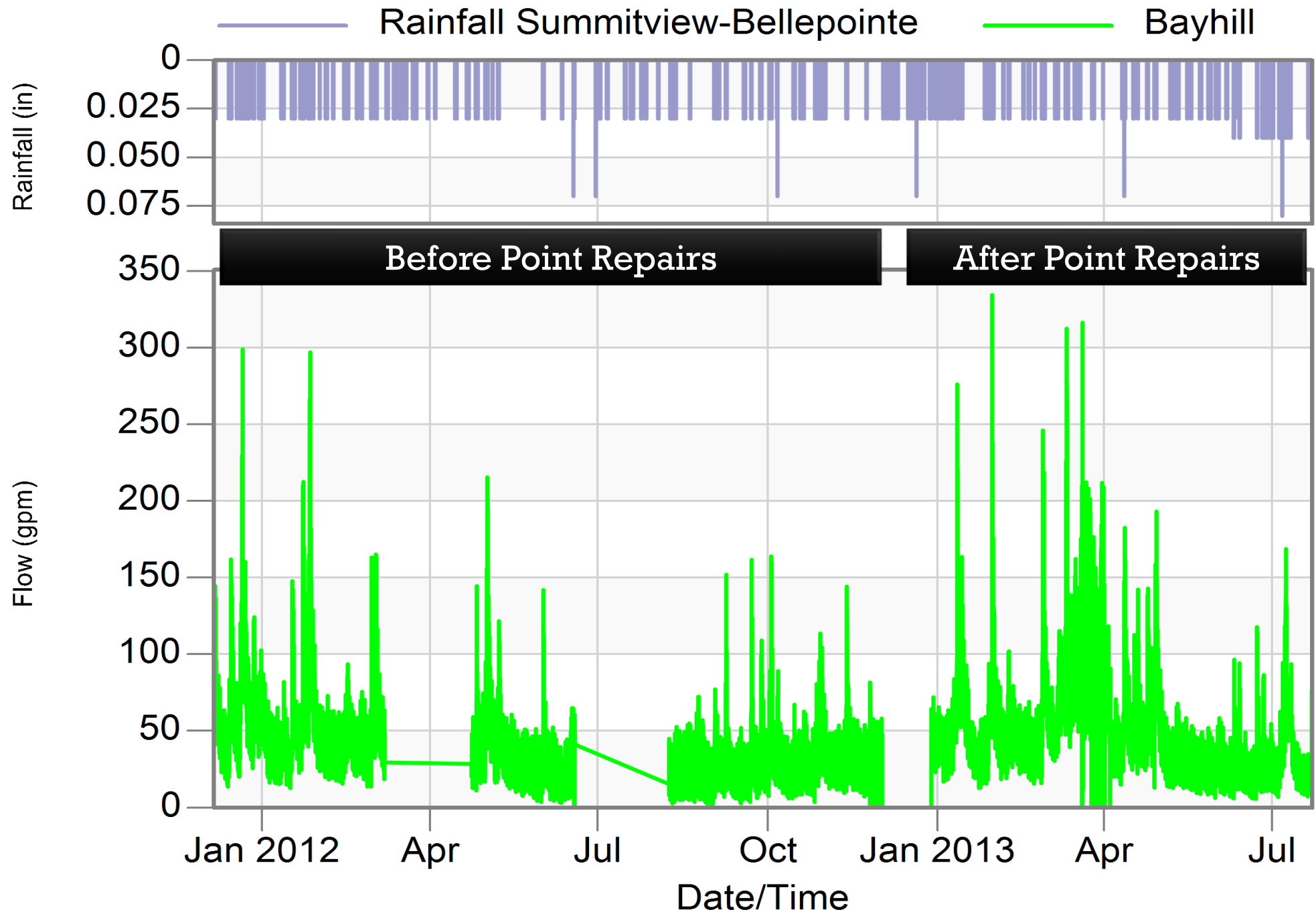


Scioto Hills WRF Average Monthly Flow



2021
POINT
REPAIR
CONDITION
AFTER 9
YEARS

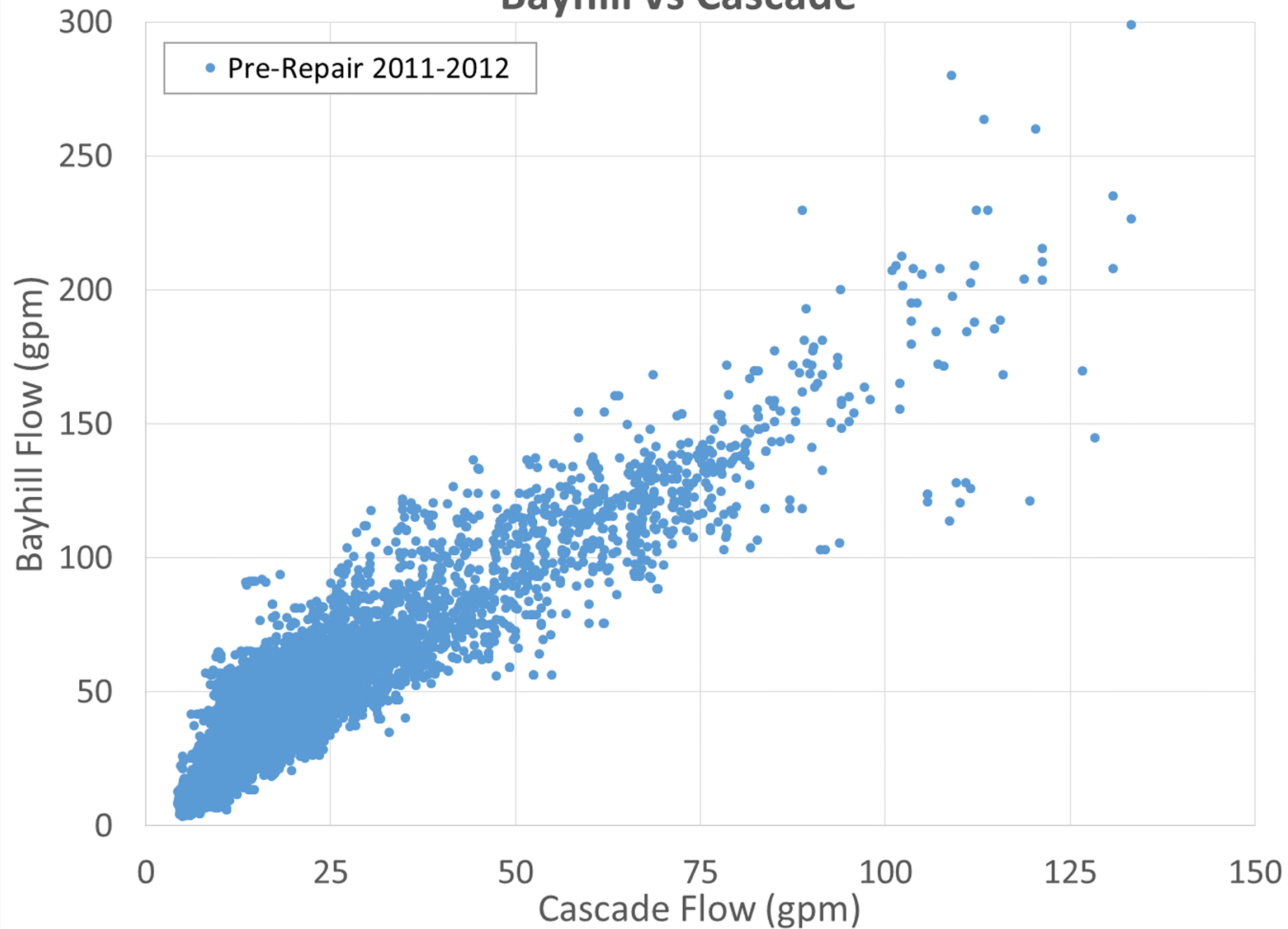




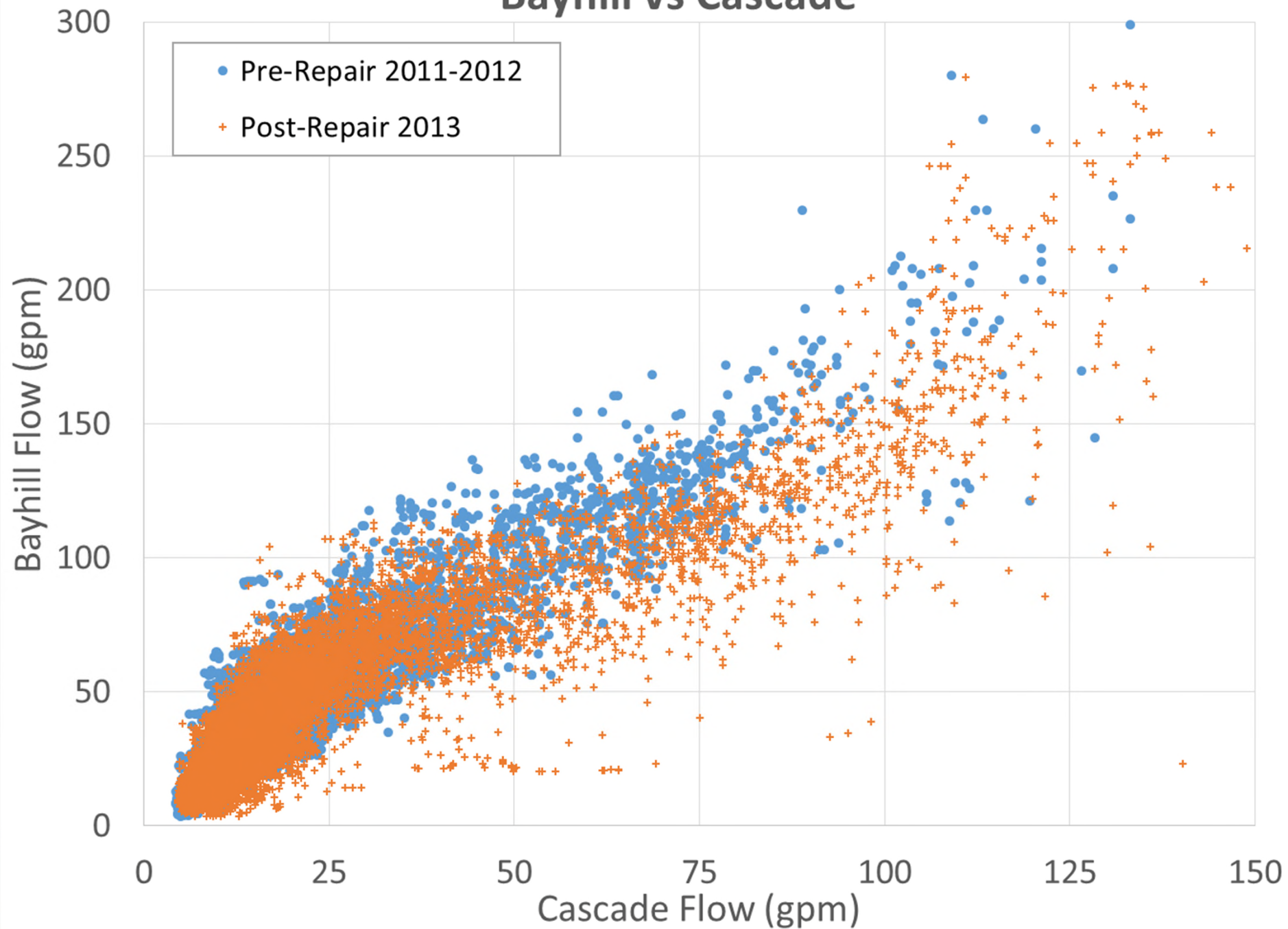
FLOW MONITORING TACTICS

- #1 TIP: Compare meters to meters, not to storms.

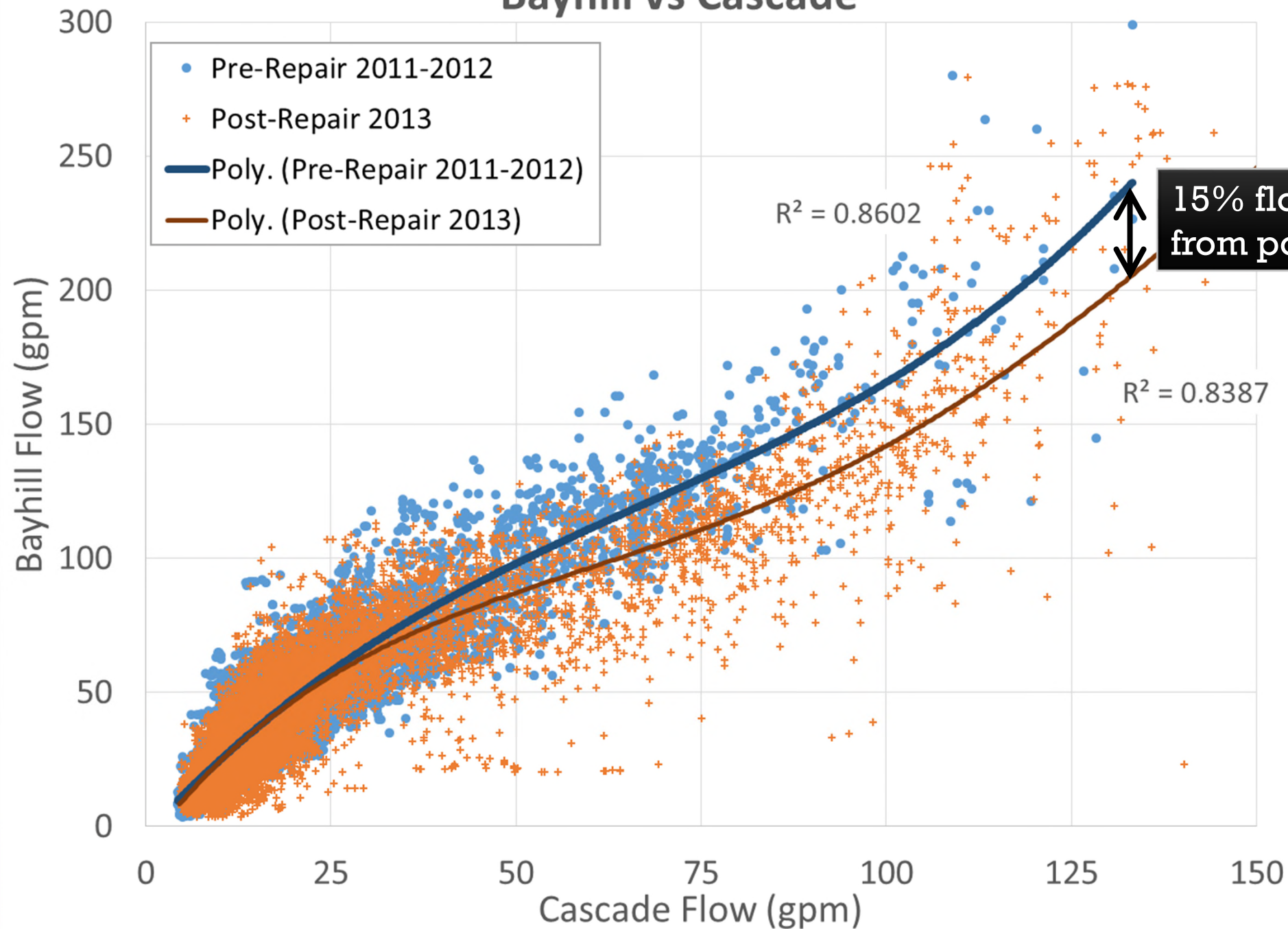
Bayhill vs Cascade



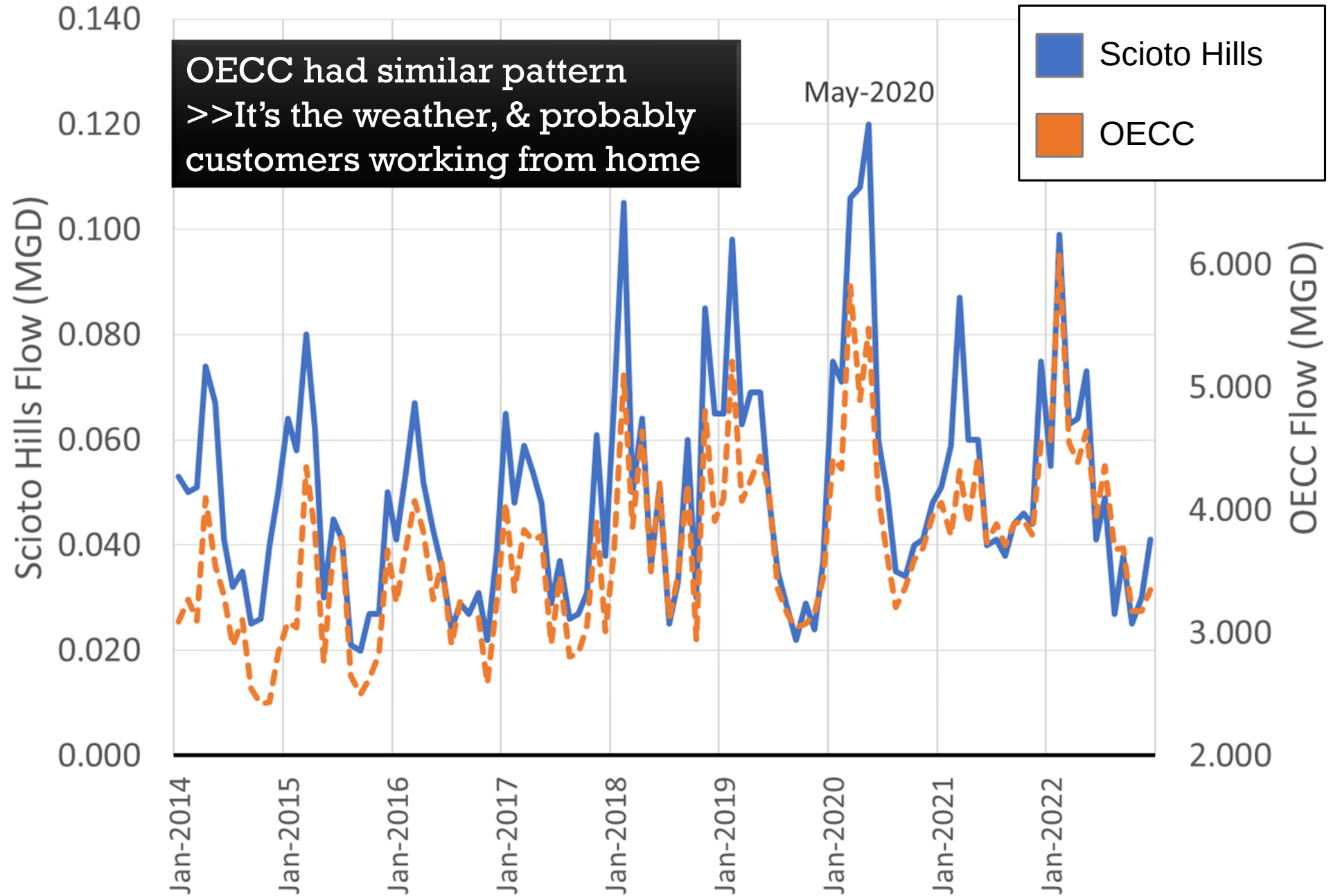
Bayhill vs Cascade

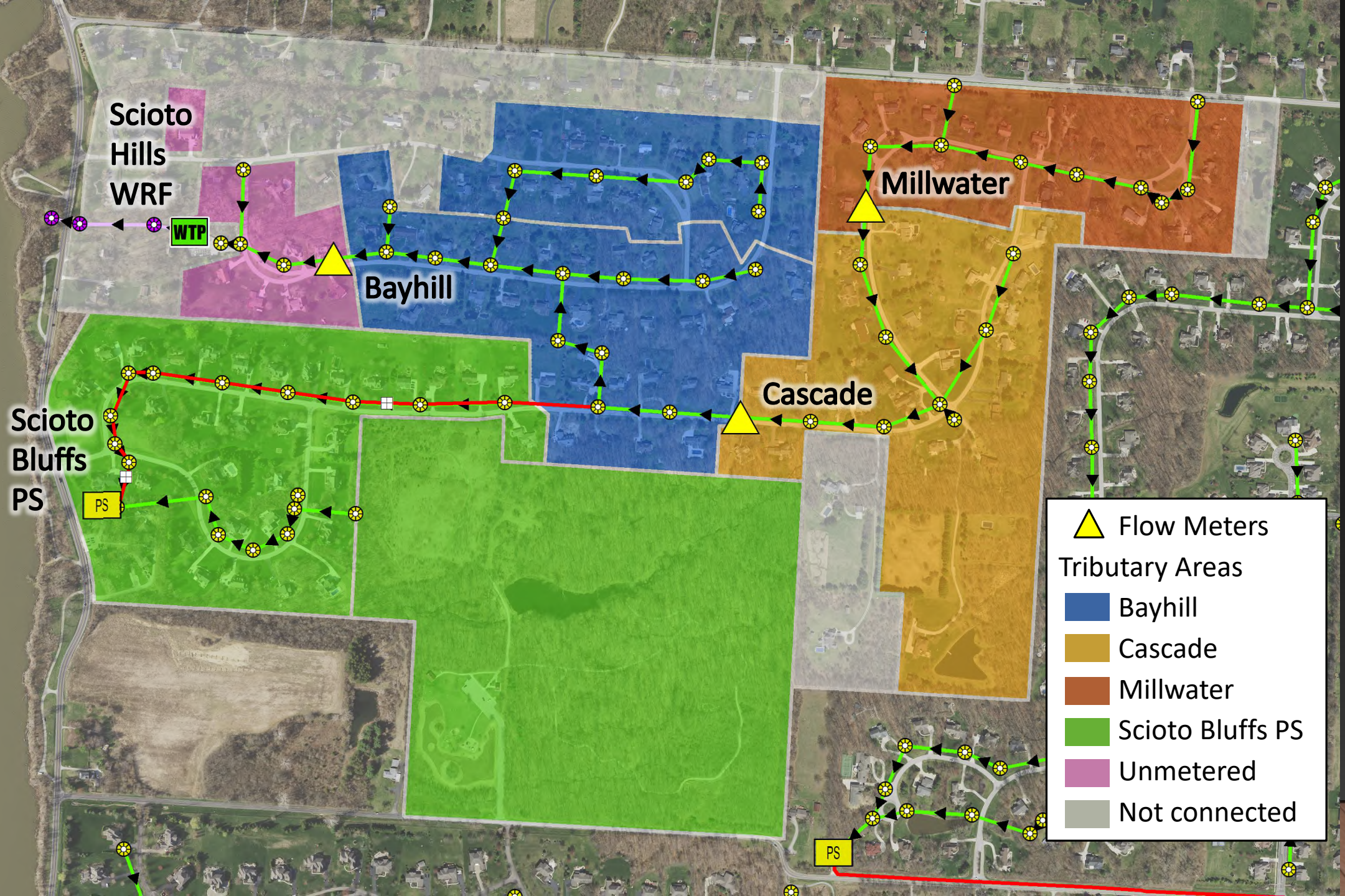


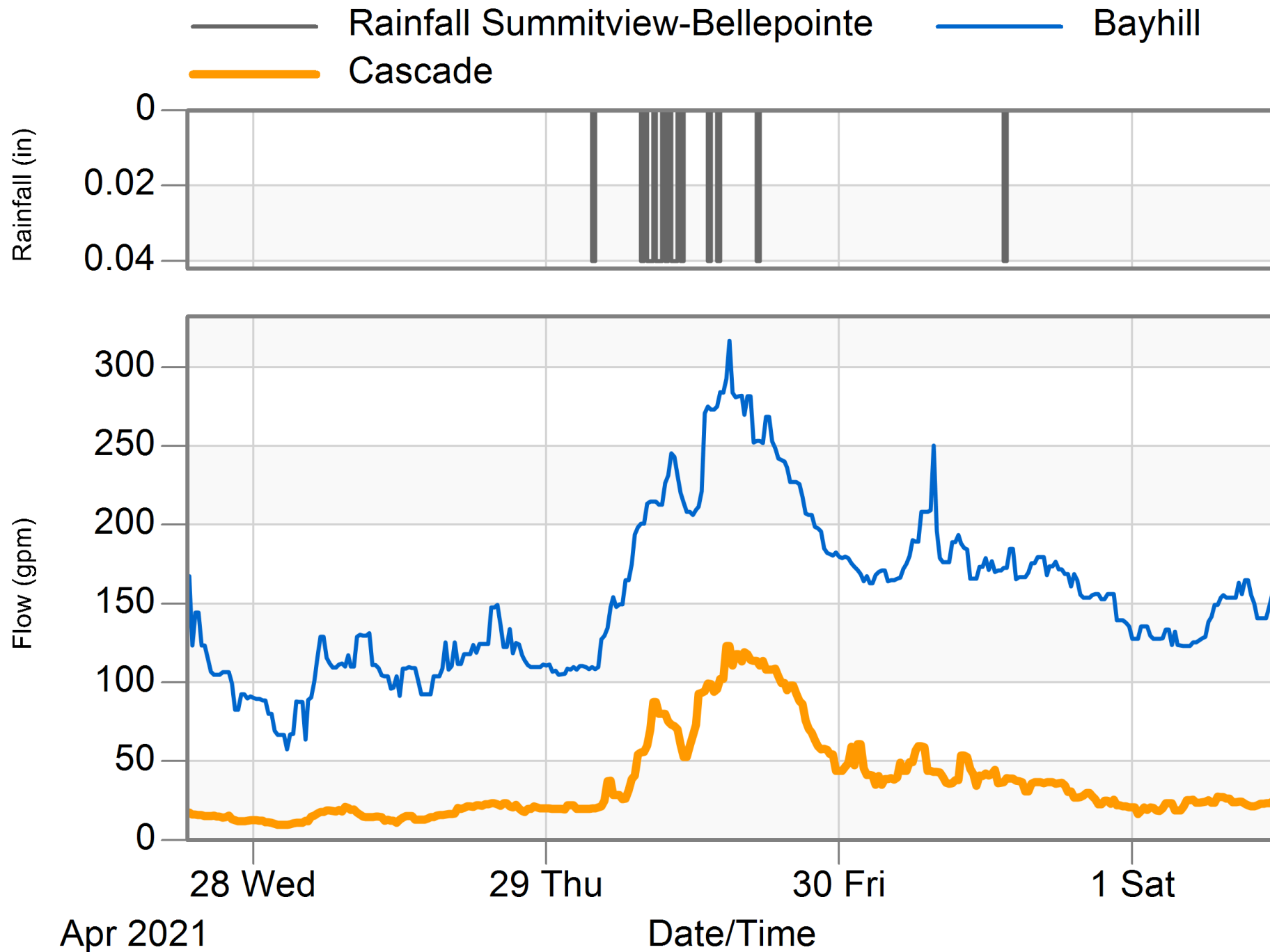
Bayhill vs Cascade

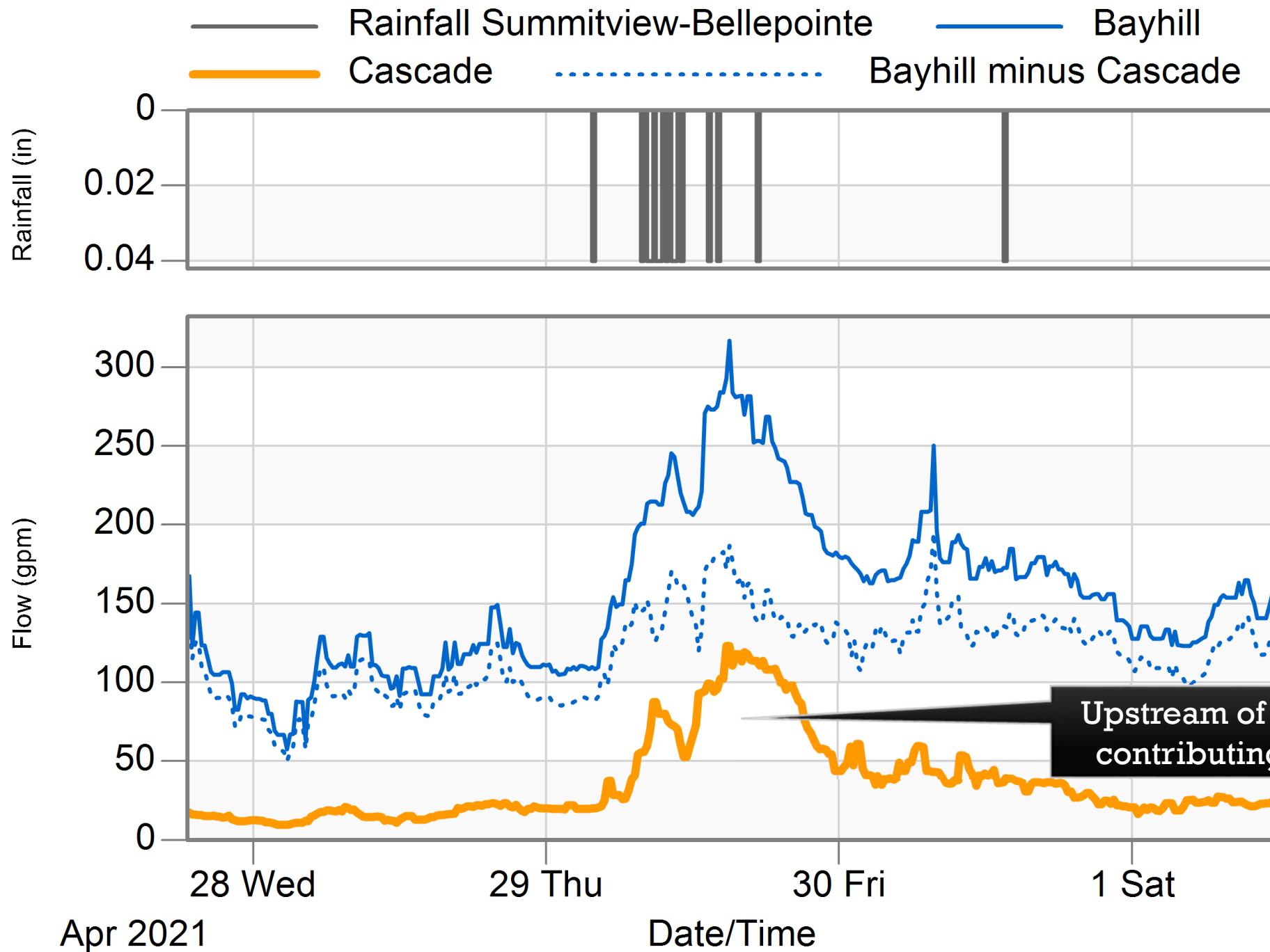


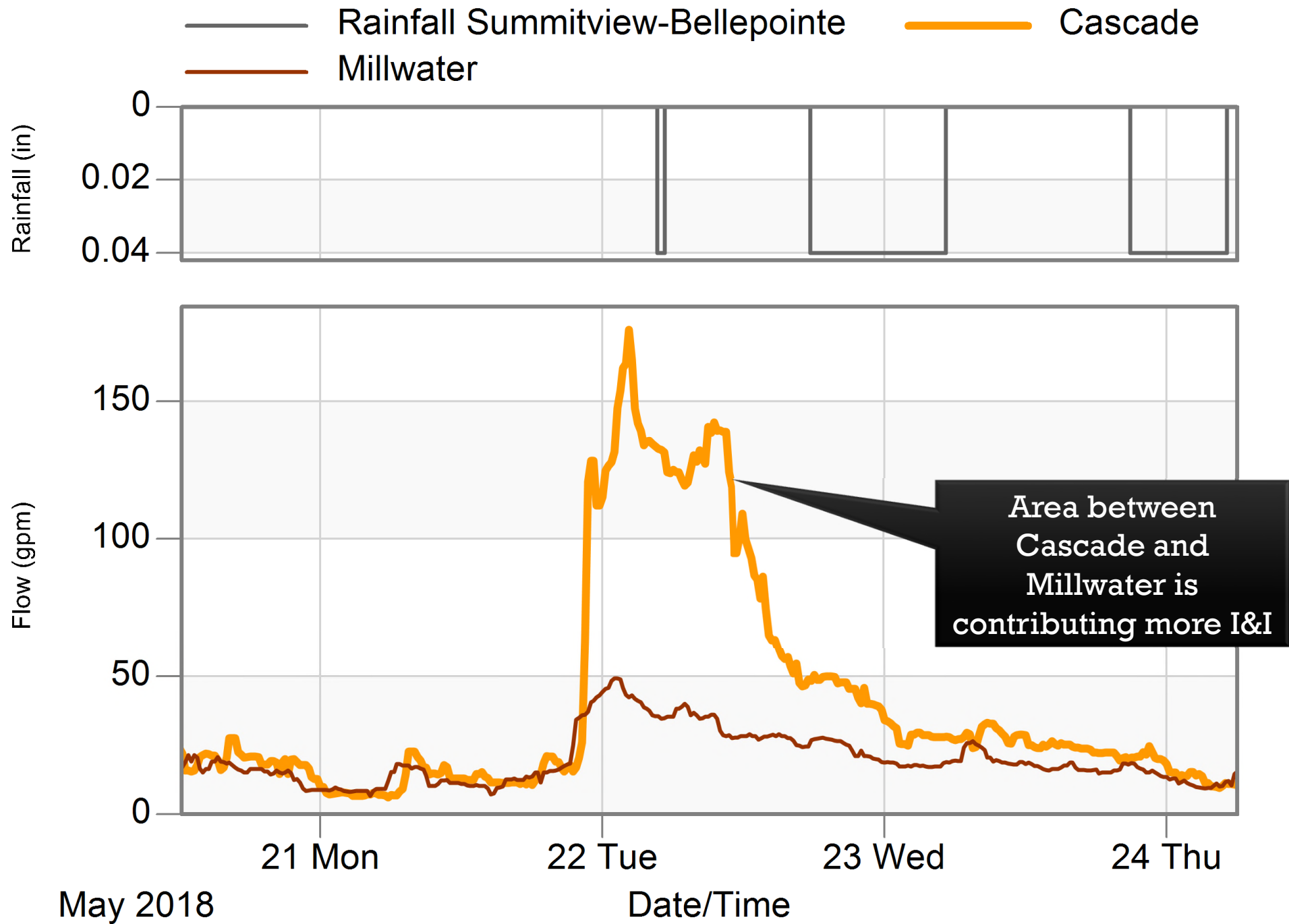
Scioto Hills vs OECC Average Monthly Flow

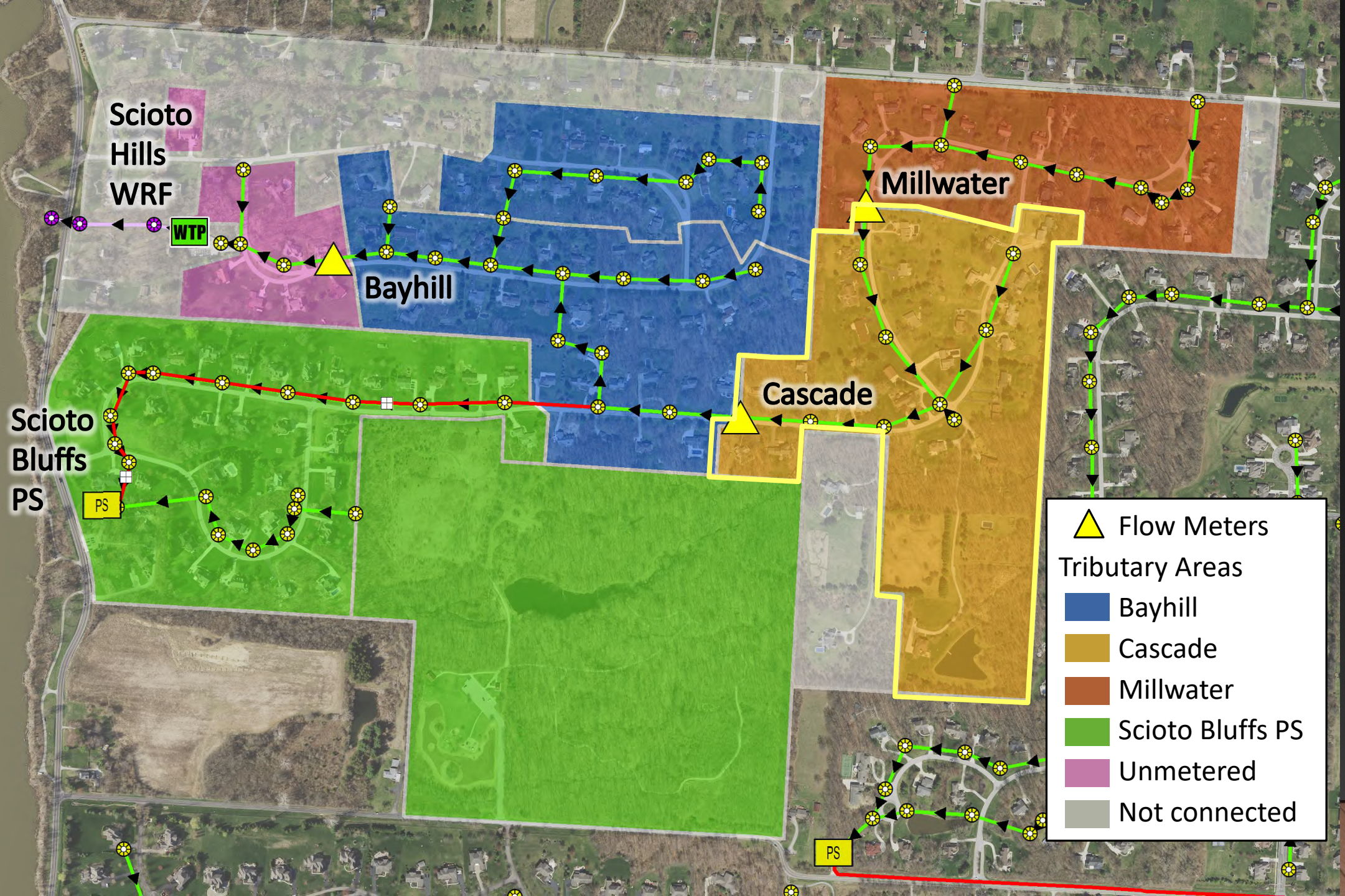




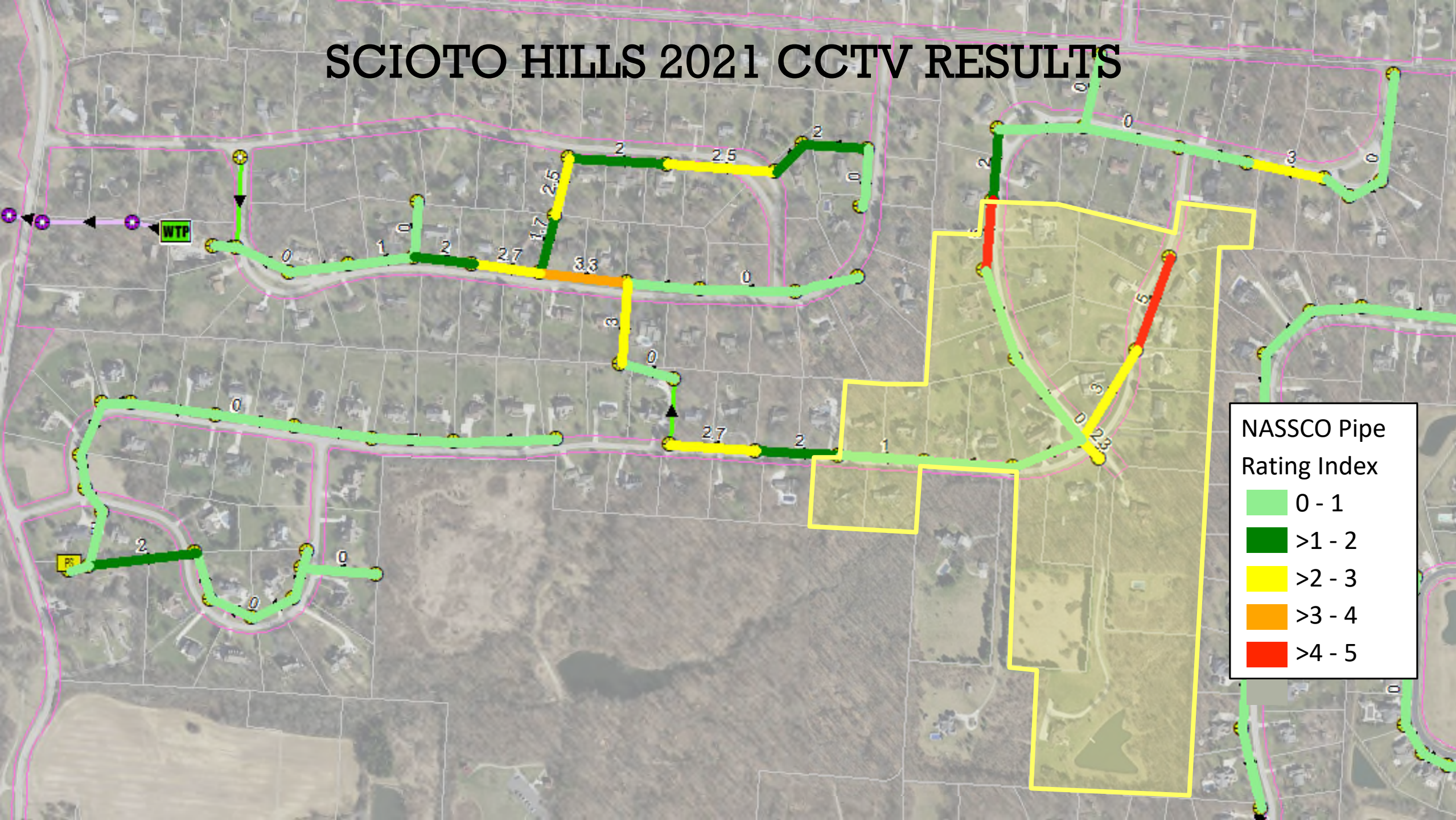








SCIOTO HILLS 2021 CCTV RESULTS



SCIOTO HILLS 2021 CCTV RESULTS

Infiltration at Tap



Broken Soil Visible



Broken Soil Visible

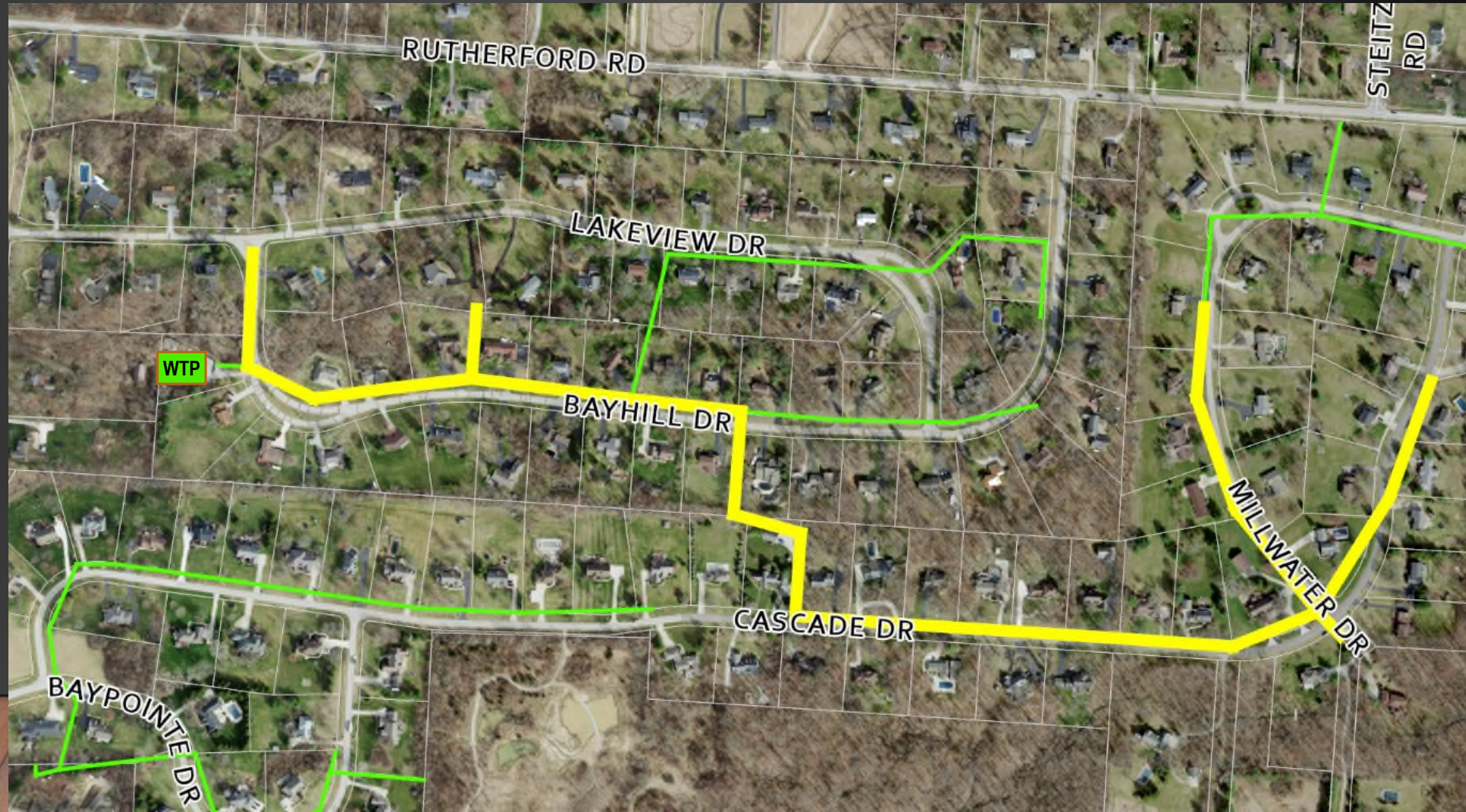


Joint Separated



2023 SCIOTO HILLS SEWER REHAB PROJECT

- CIPP Lining
6,300 LF
(41%) of 8"
pipe



2023 SCIOTO HILLS SEWER REHAB PROJECT

- 42 full-wrap lateral liners with 5' extension
- 3 taps not restored
- 5 open-cut tap repairs
- Only defective taps were lined/repaired (47 of 69)
 - Break-in/hole
 - Infiltration
 - Encrusted deposits
 - Joint offset/ separated
 - Protruding



2023 SCIOTO HILLS SEWER REHAB PROJECT

- DCRSD Rules & Regulations: owners are responsible for O&M of entire service line beginning at the branch joint of the wye or tap connection
- Notices sent to owners of defective taps with two options:
 - Agree to County's repair & remain responsible for service line OR
 - Decline repair & be responsible for hiring contractor & cost of repair
- 100% Agreed

2023 SCIOTO HILLS SEWER REHAB PROJECT

- Design complete: July 2023
- Bid opening: Sept 2023
 - 5 bids received
 - Lowest & Best: \$573,384
- Contract allowed 365 days to substantial completion
- CIPP lining began Nov 2024
- 13 weeks to complete all but 4 taps



2023 SCIOTO HILLS SEWER REHAB PROJECT

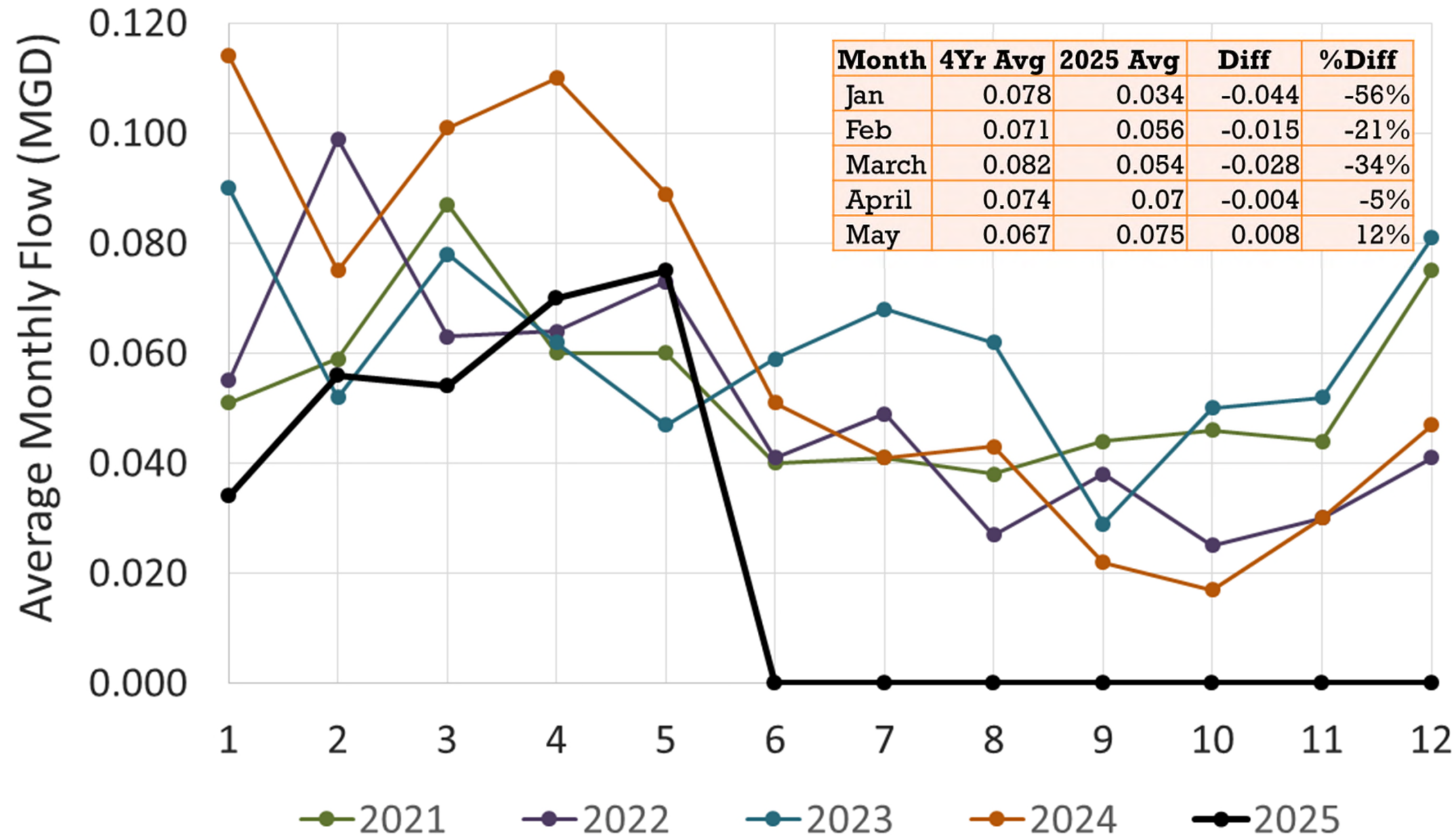
- LESSONS LEARNED:
- Require notice before cleaning & inspection
- I&I migrated between liner and host pipe to two taps that were not lined
 - Consider lining ALL taps



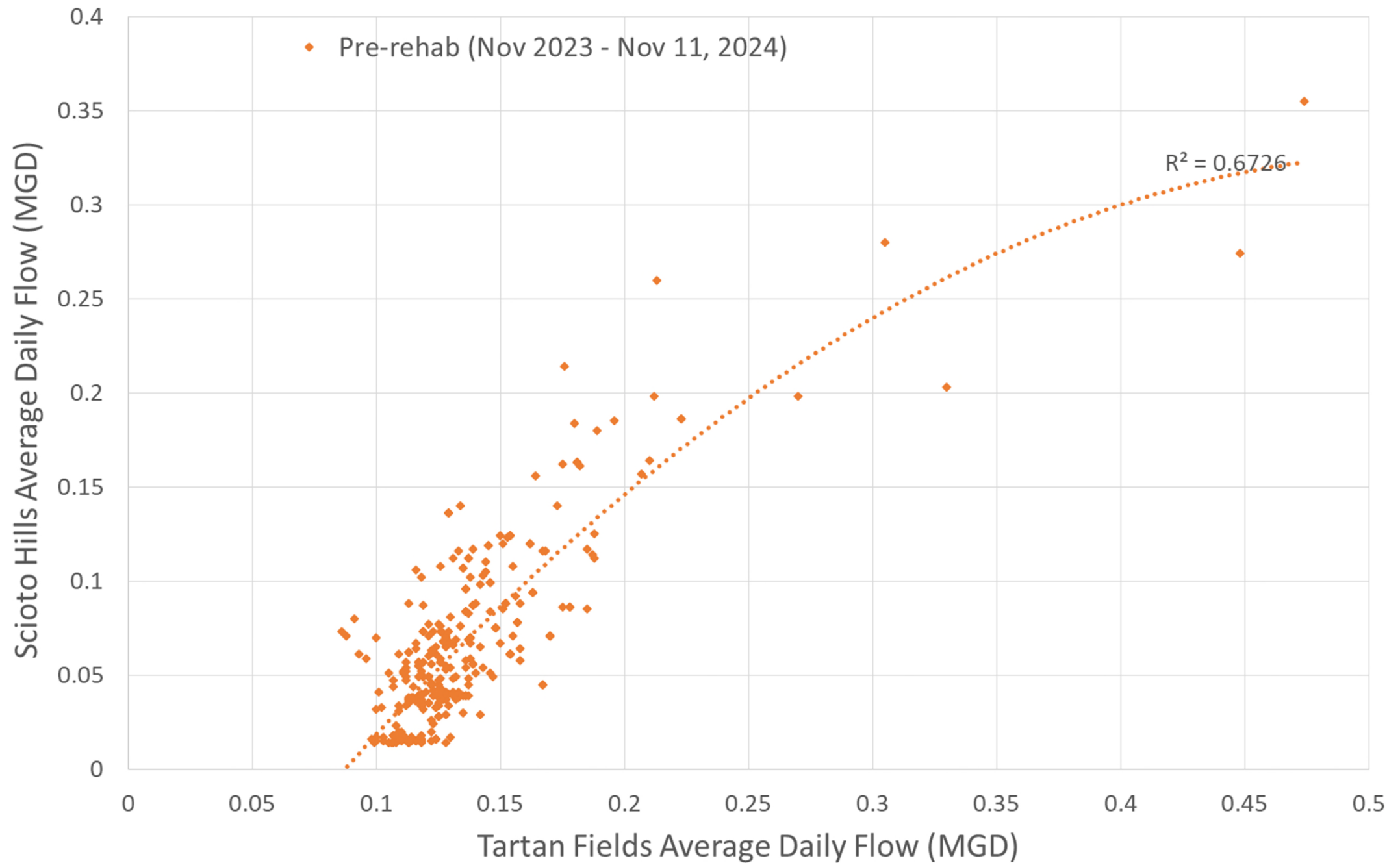
2024/12/06

104.0 ft

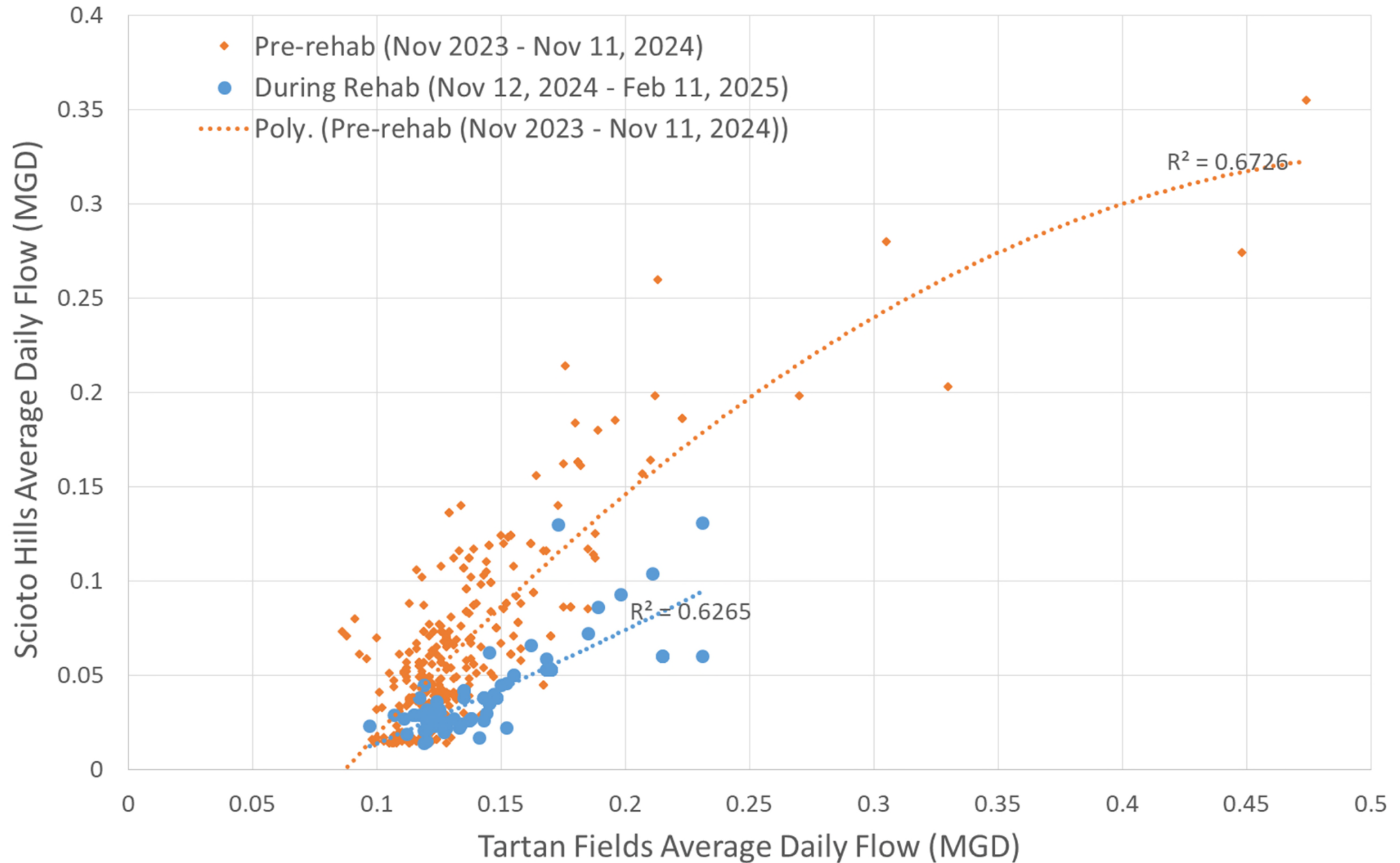
SCIOTO HILLS WRF AVERAGE MONTHLY FLOW



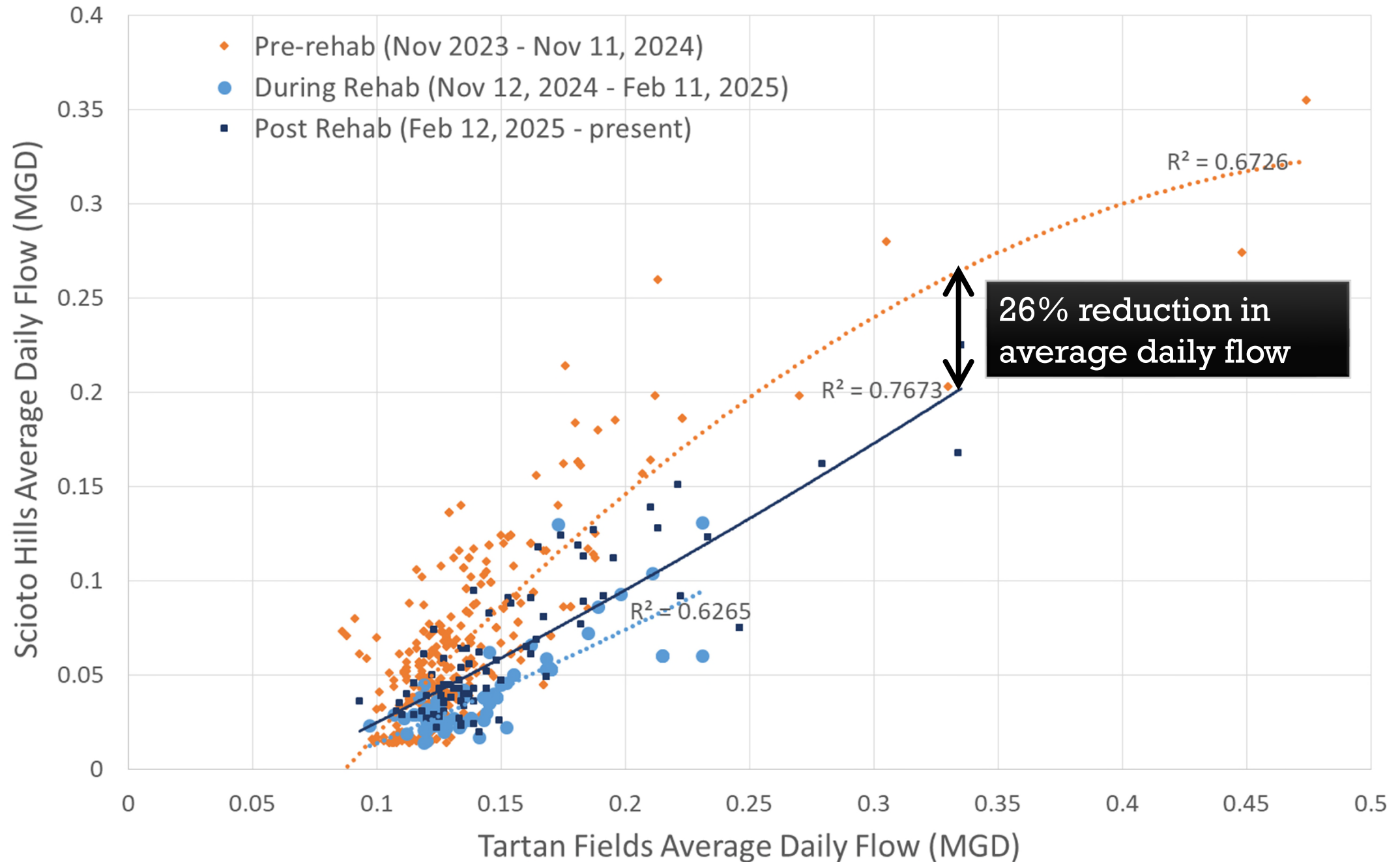
Scioto Hills WRF vs Tartan Fields WRF Effluent Flow



Scioto Hills WRF vs Tartan Fields WRF Effluent Flow

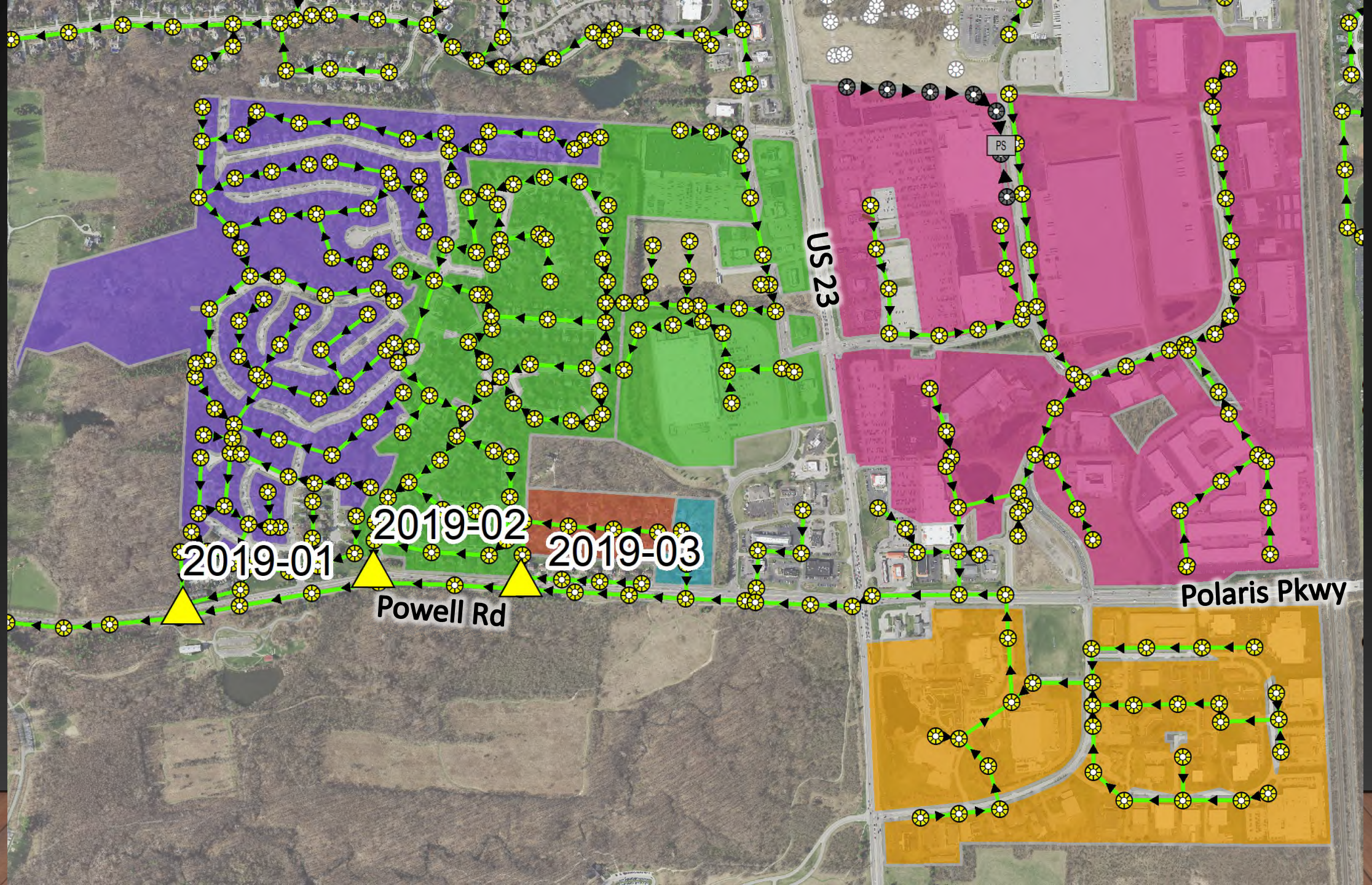


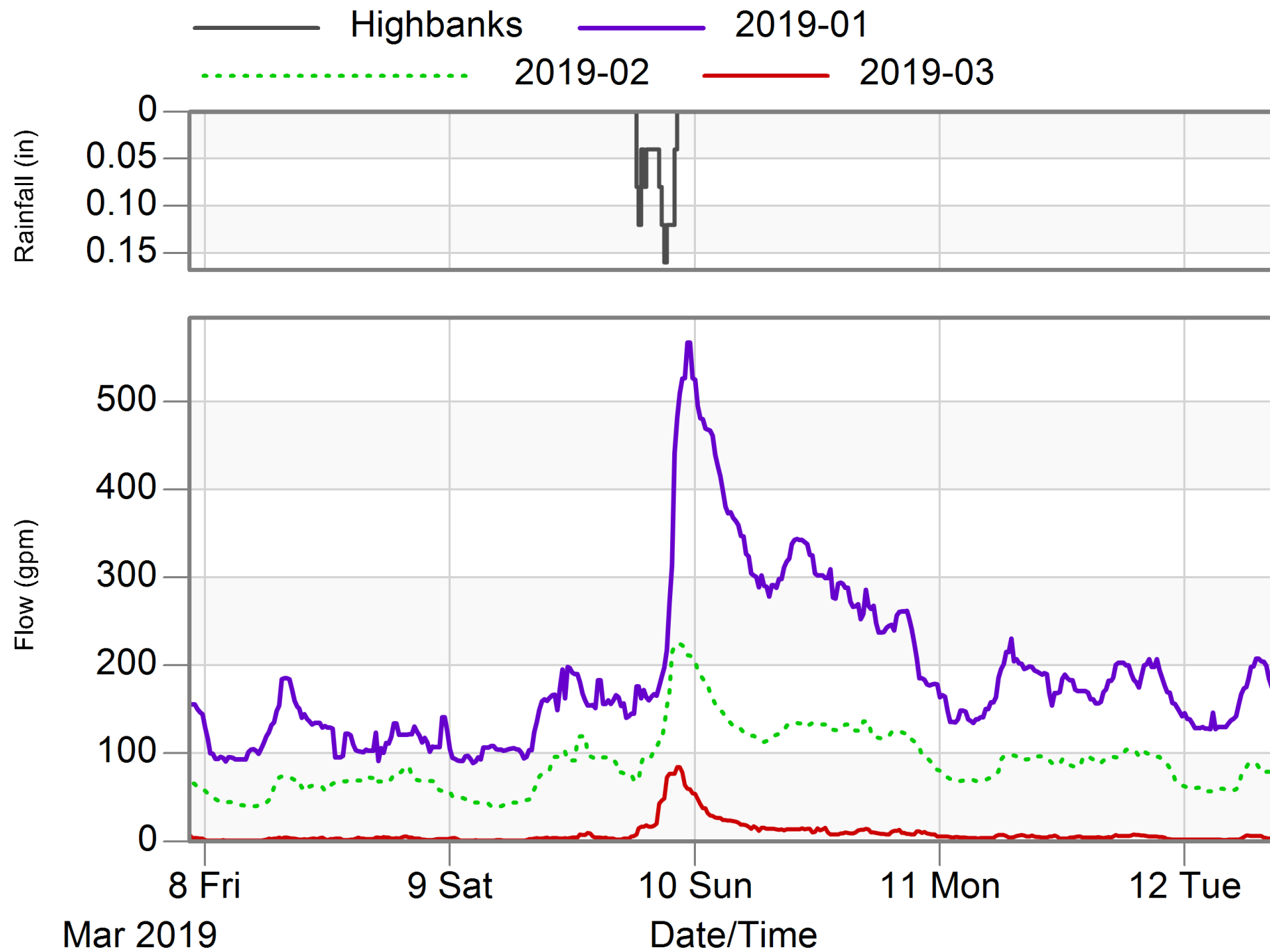
Scioto Hills WRF vs Tartan Fields WRF Effluent Flow

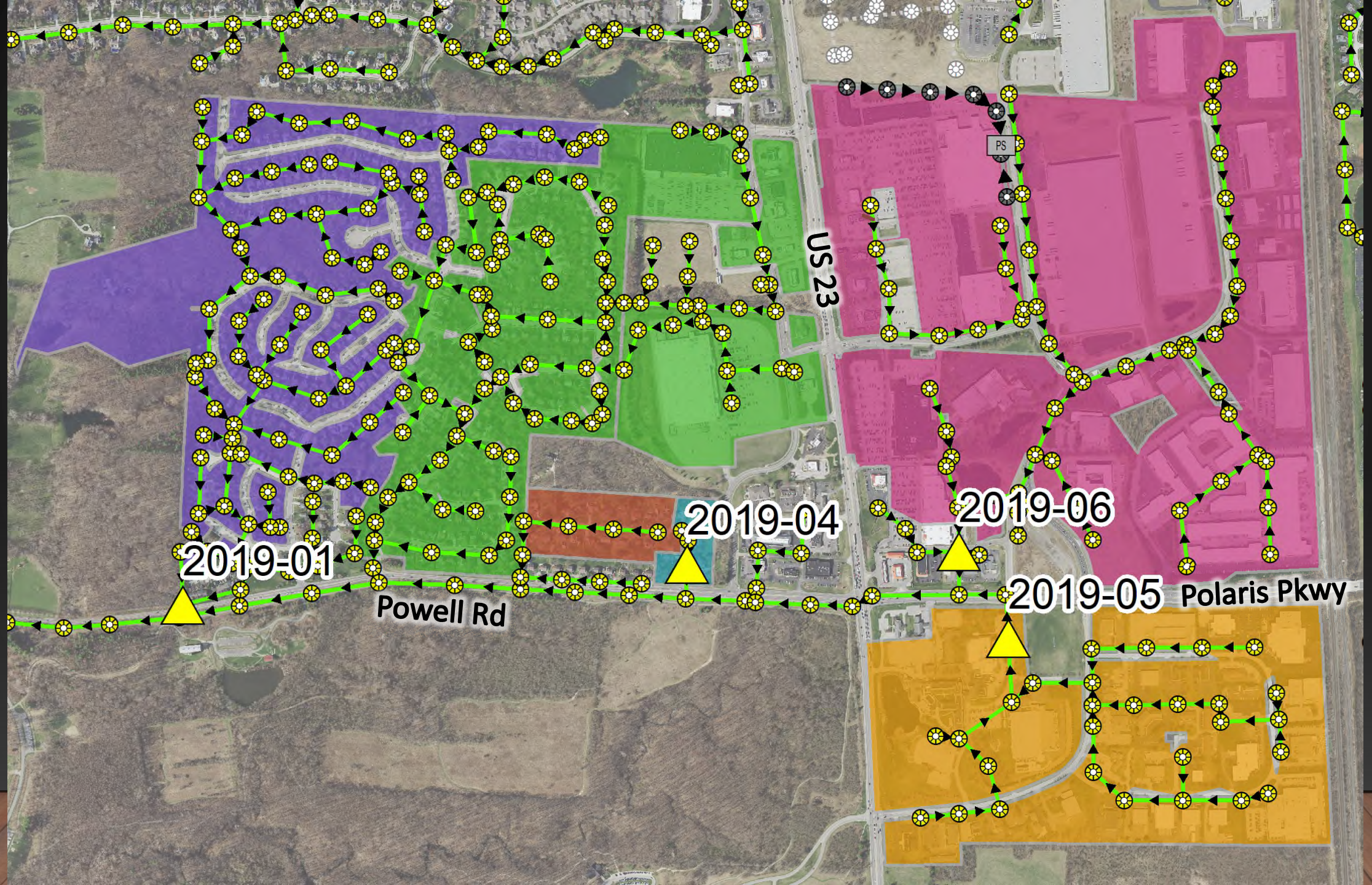


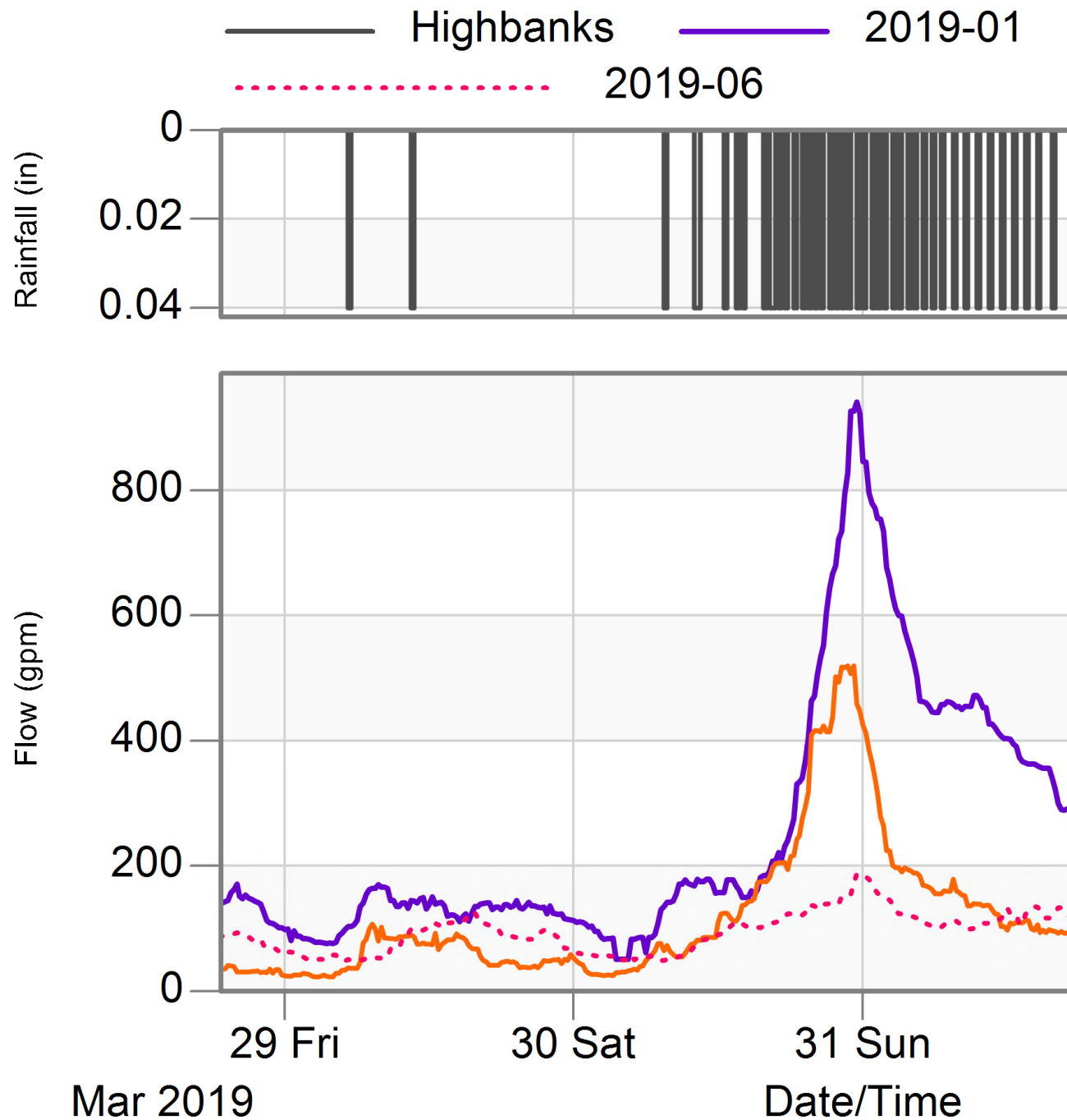
HIGHMEADOWS

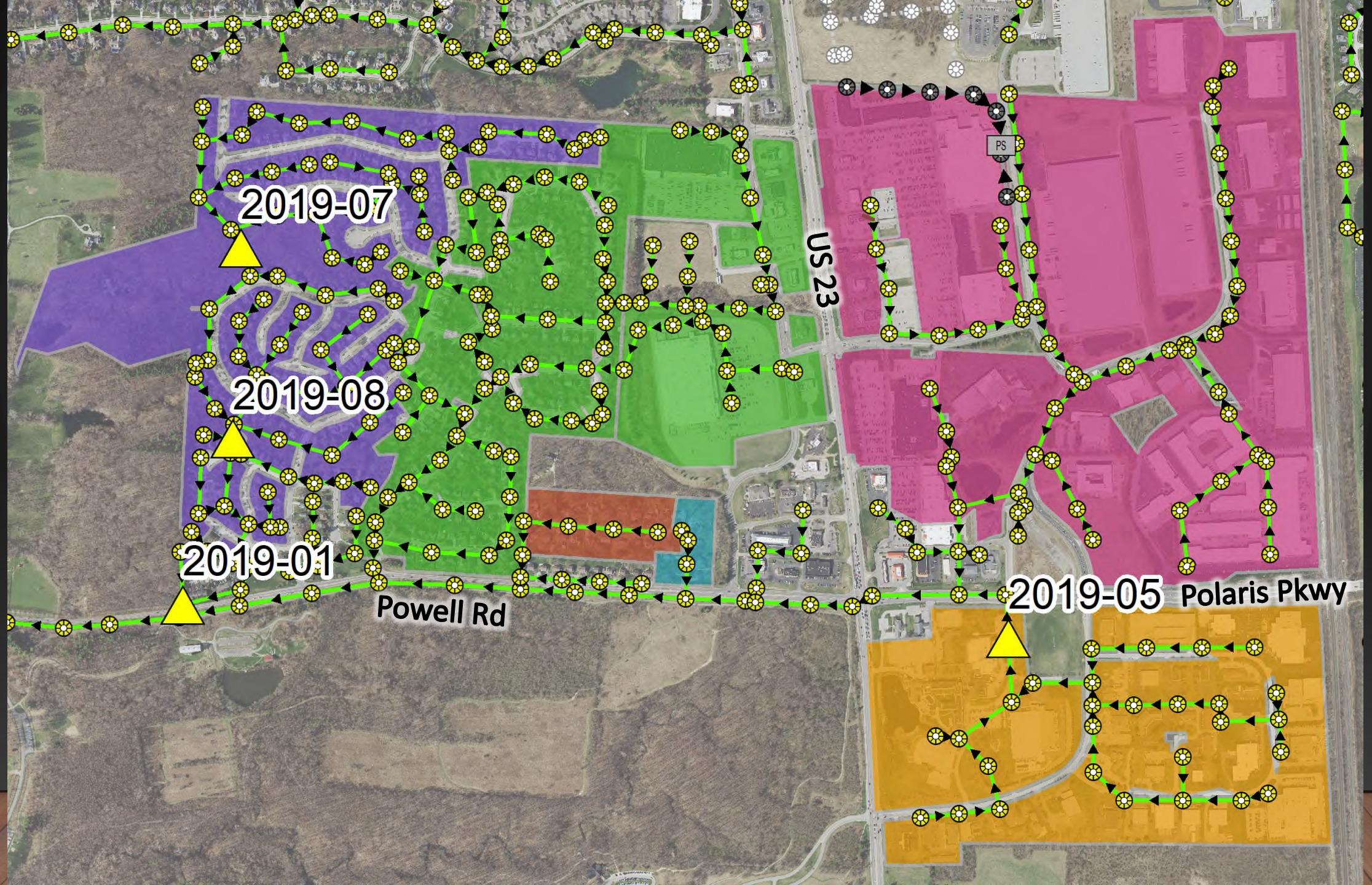
- 1980s residential subdivision and commercial / light industrial
- 43% truss or clay pipe
- 2015-2017 flow monitoring
 - Avg peaking factor = 1.7
 - Median % of rainfall volume in sewer (R value), Nov-May = 5.4%
- I&I volume impacting future EQ at OECC

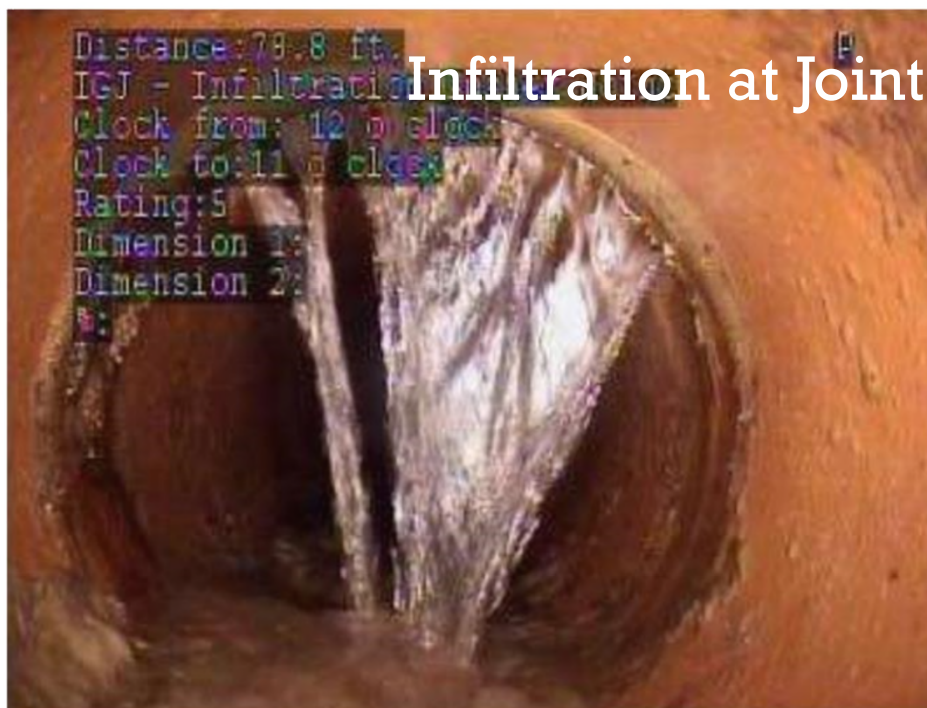








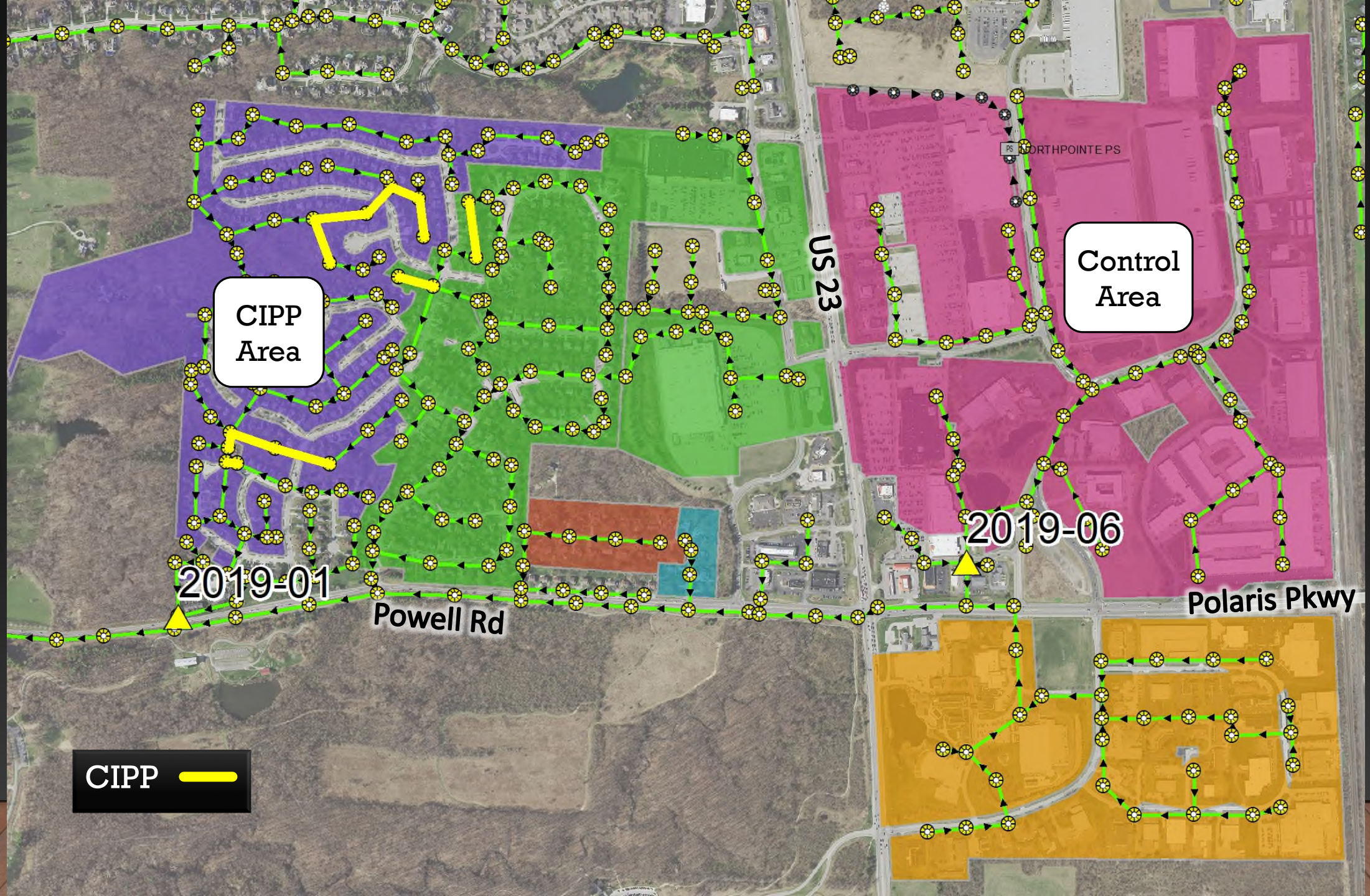




2022 HIGHMEADOWS VILLAGE SEWER REHAB PROJECT

- Delaware County's 1st sewer lining project
- 2,890 LF cured-in-place pipe (CIPP)
- Geopolymer lining of manholes
 - 2 in Highmeadows
 - 7 in Alum Creek service area





CIPP
Area

Control
Area

2019-01

2019-06

CIPP —

US 23

Powell Rd

Polaris Pkwy

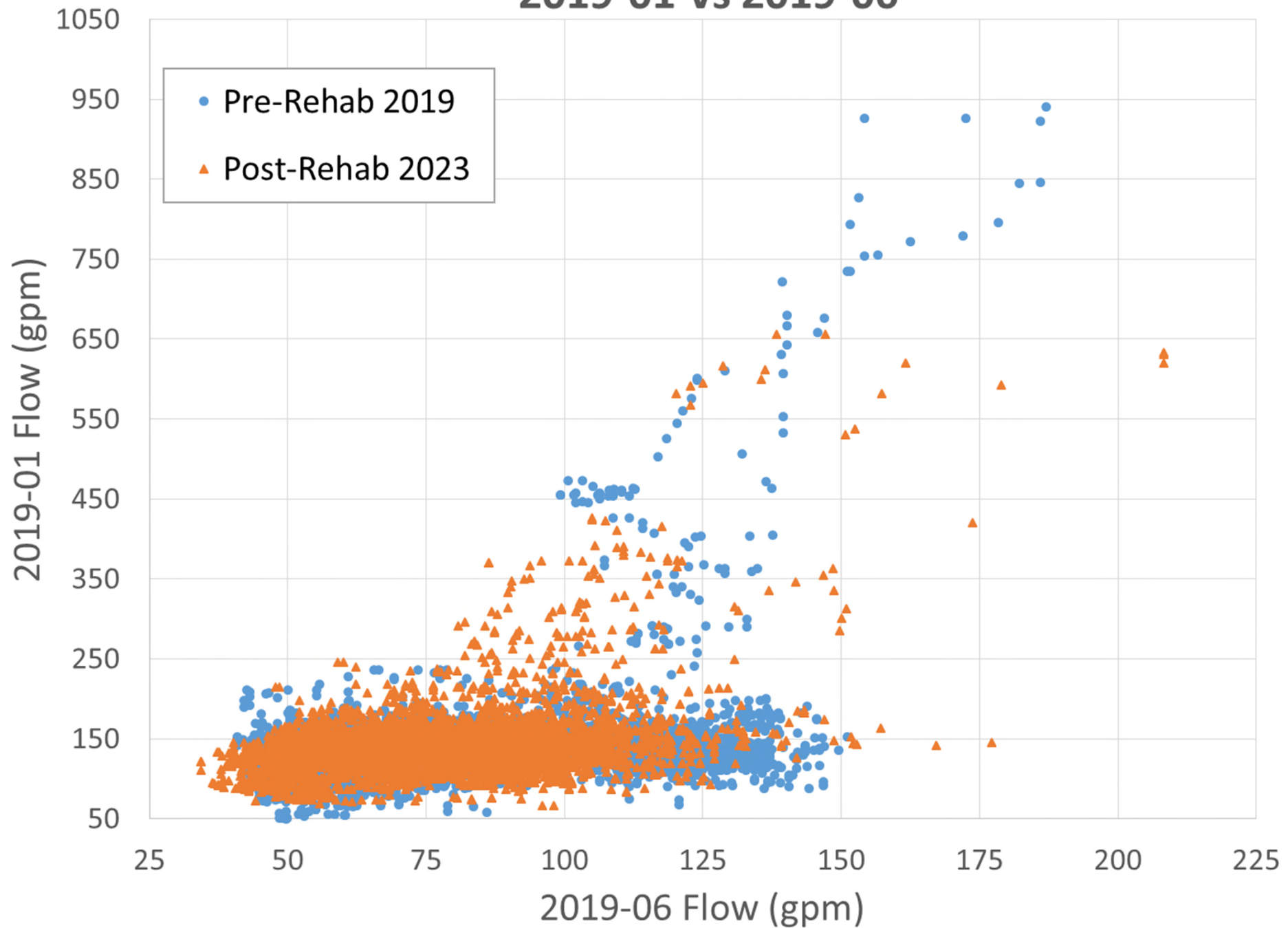
NORTHPOINTE PS

2019-01 VS 2019-06

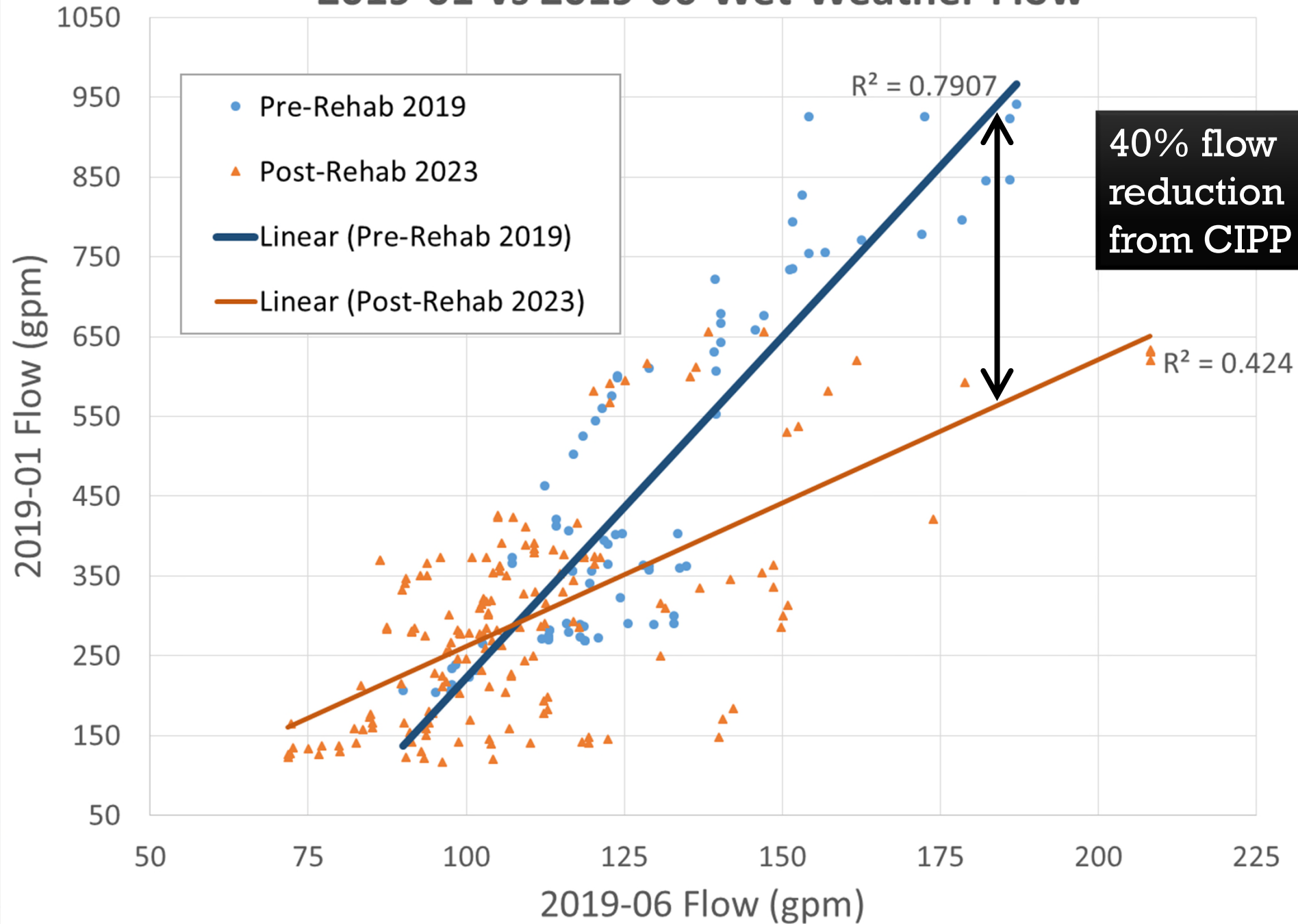
• Pre-Rehab 2019
▲ Post-Rehab 2023

2019-01 Flow (gpm)

2019-06 Flow (gpm)



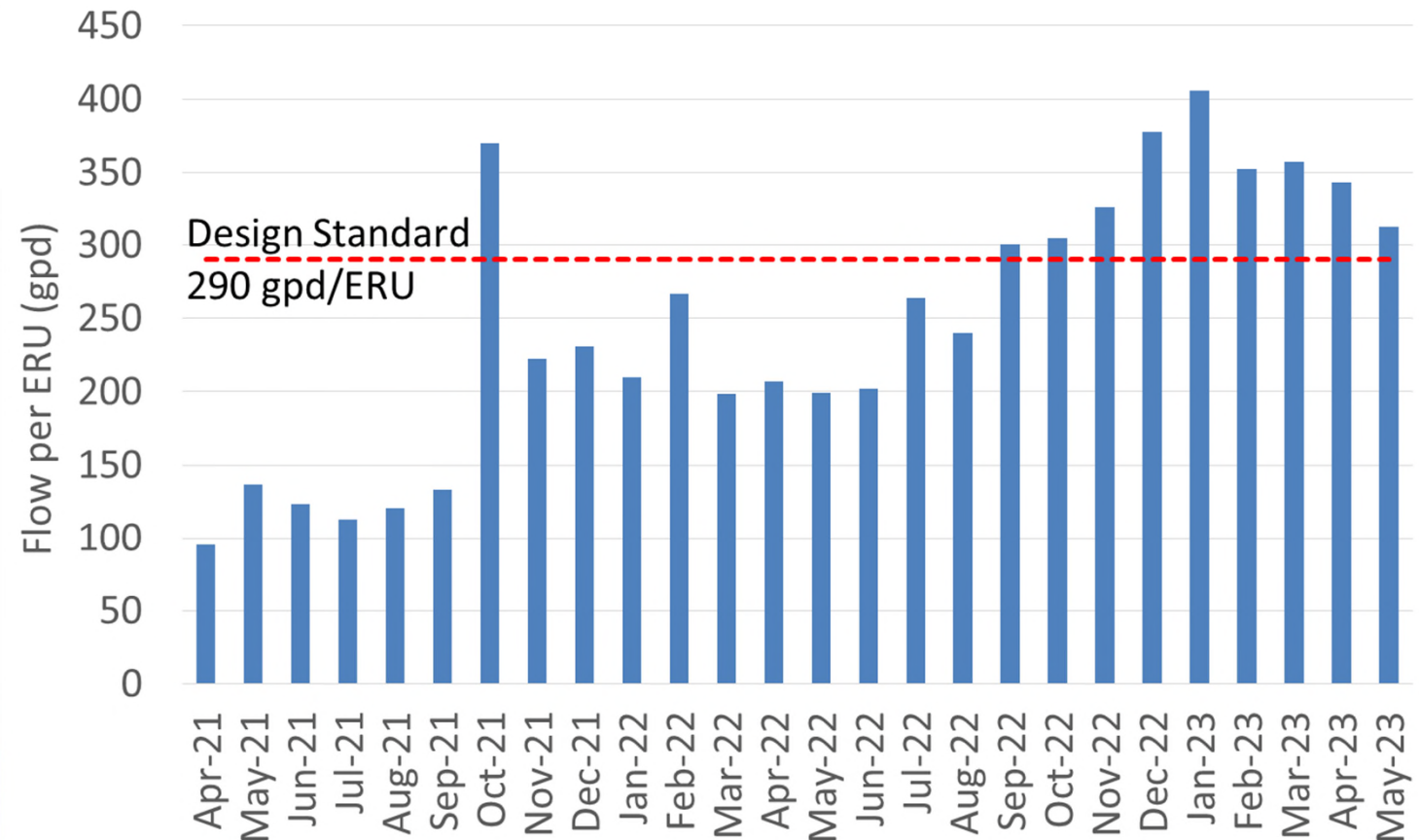
2019-01 vs 2019-06 Wet-Weather Flow



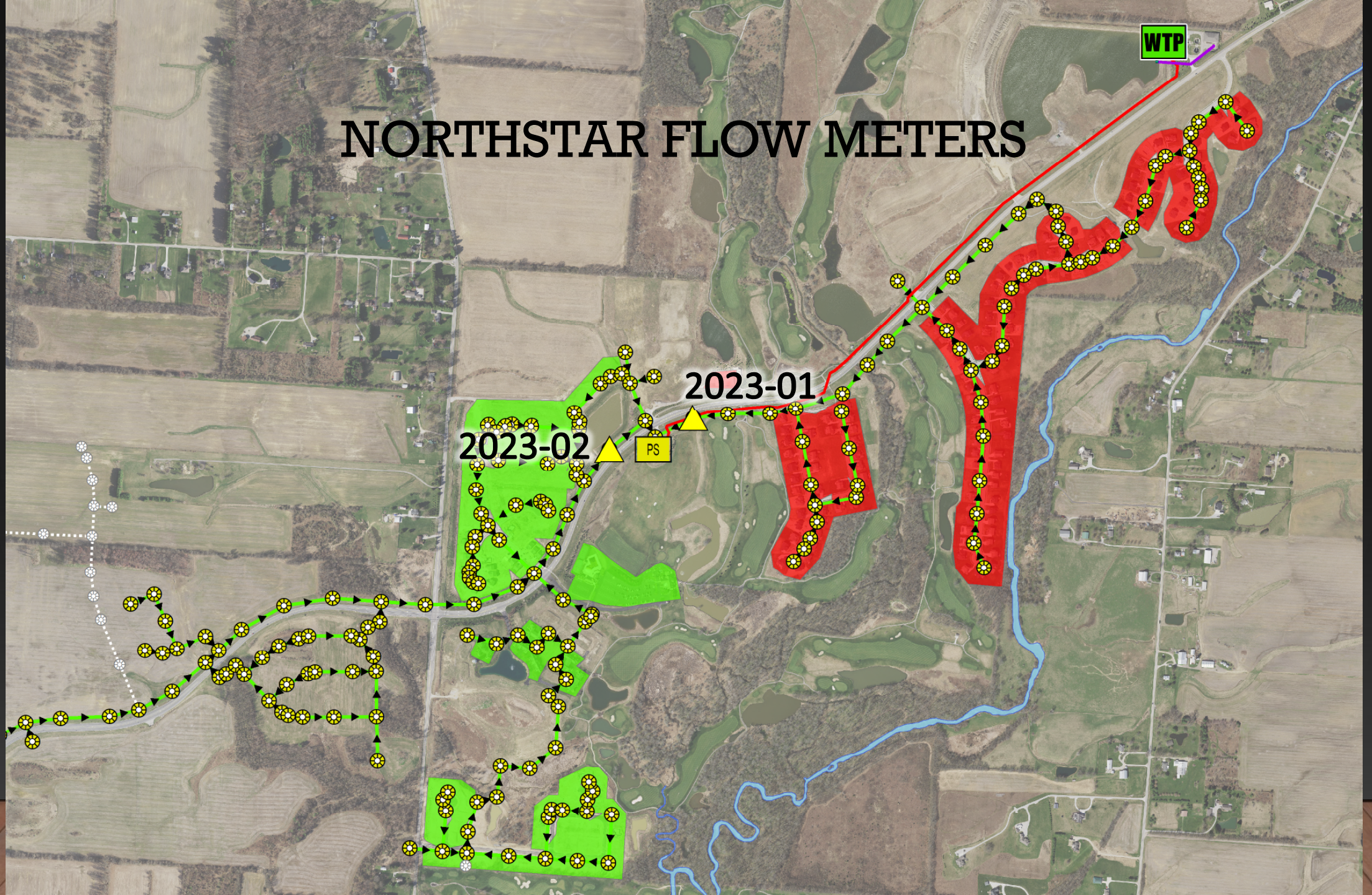
NORTHSTAR

- 304 homes & a golf course
- Oldest sewers 2009
- PVC and ductile iron pipe
- 3x flow per equivalent residential unit (ERU) in two years!
- Impacting effluent pond

Northstar WRF Average Monthly Flow Per ERU



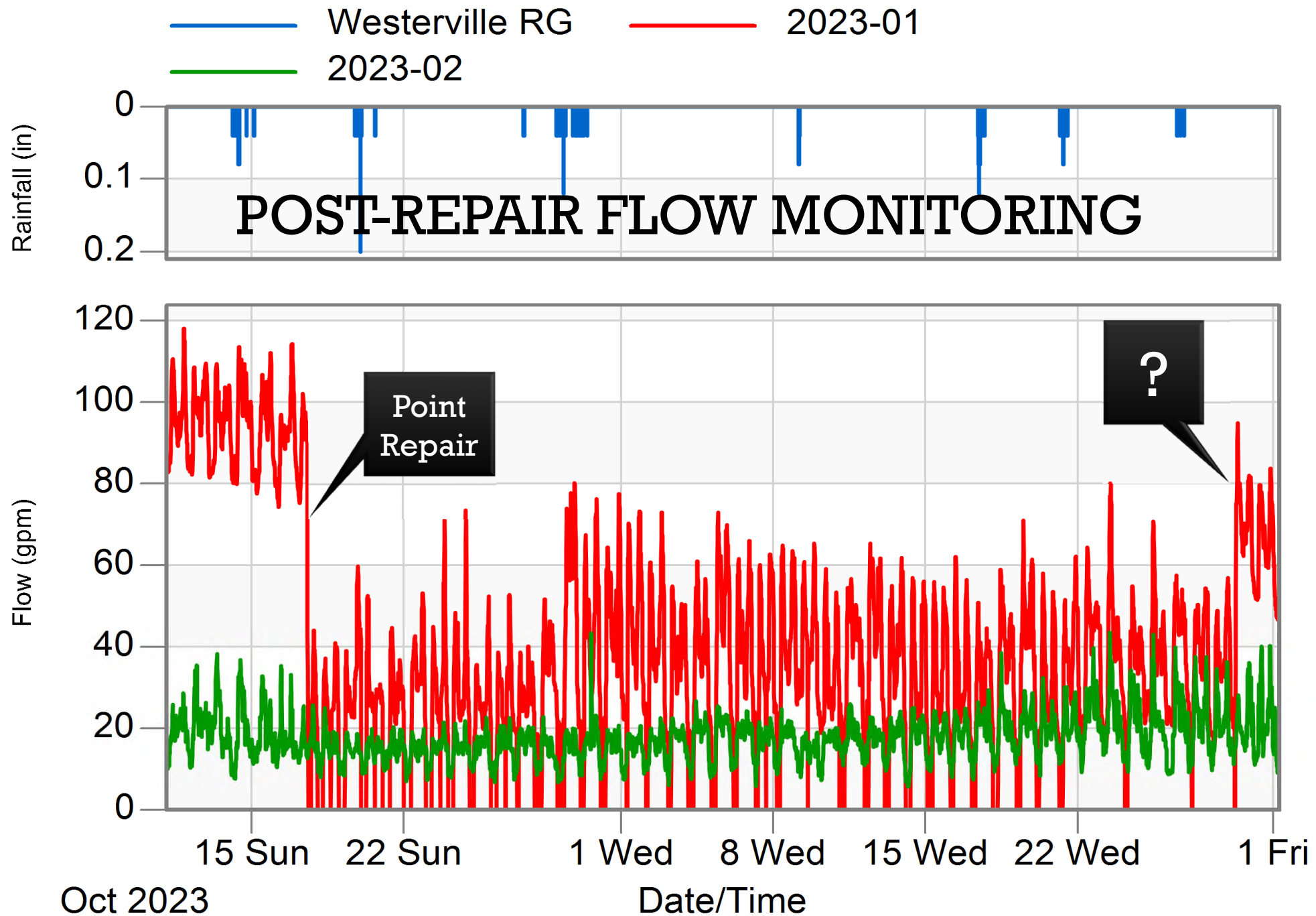
NORTHSTAR FLOW METERS



HOW MANY GALLONS PER DAY?

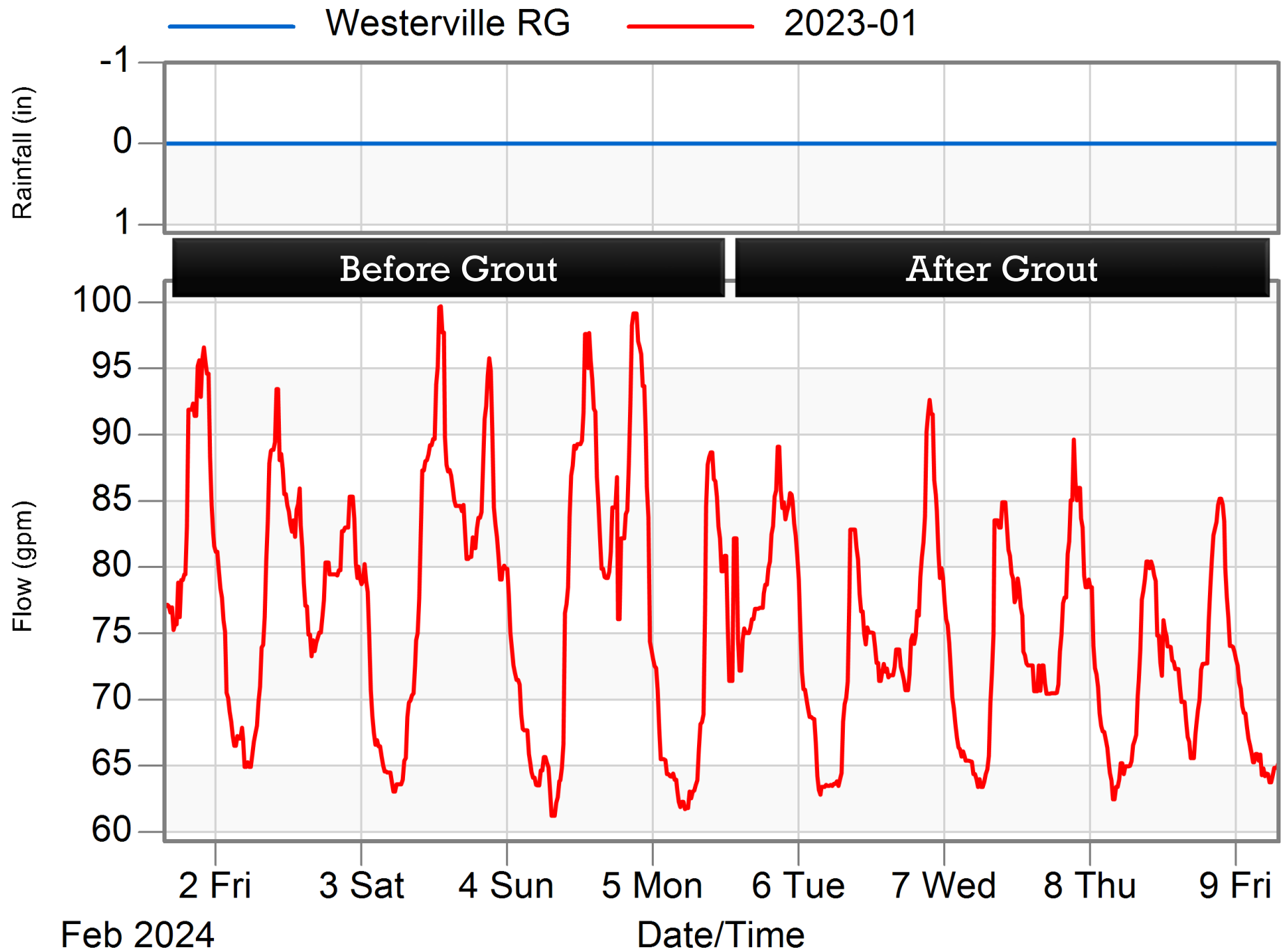
- A. 8,000 gpd
- B. 24,000 gpd
- C. 76,000 gpd





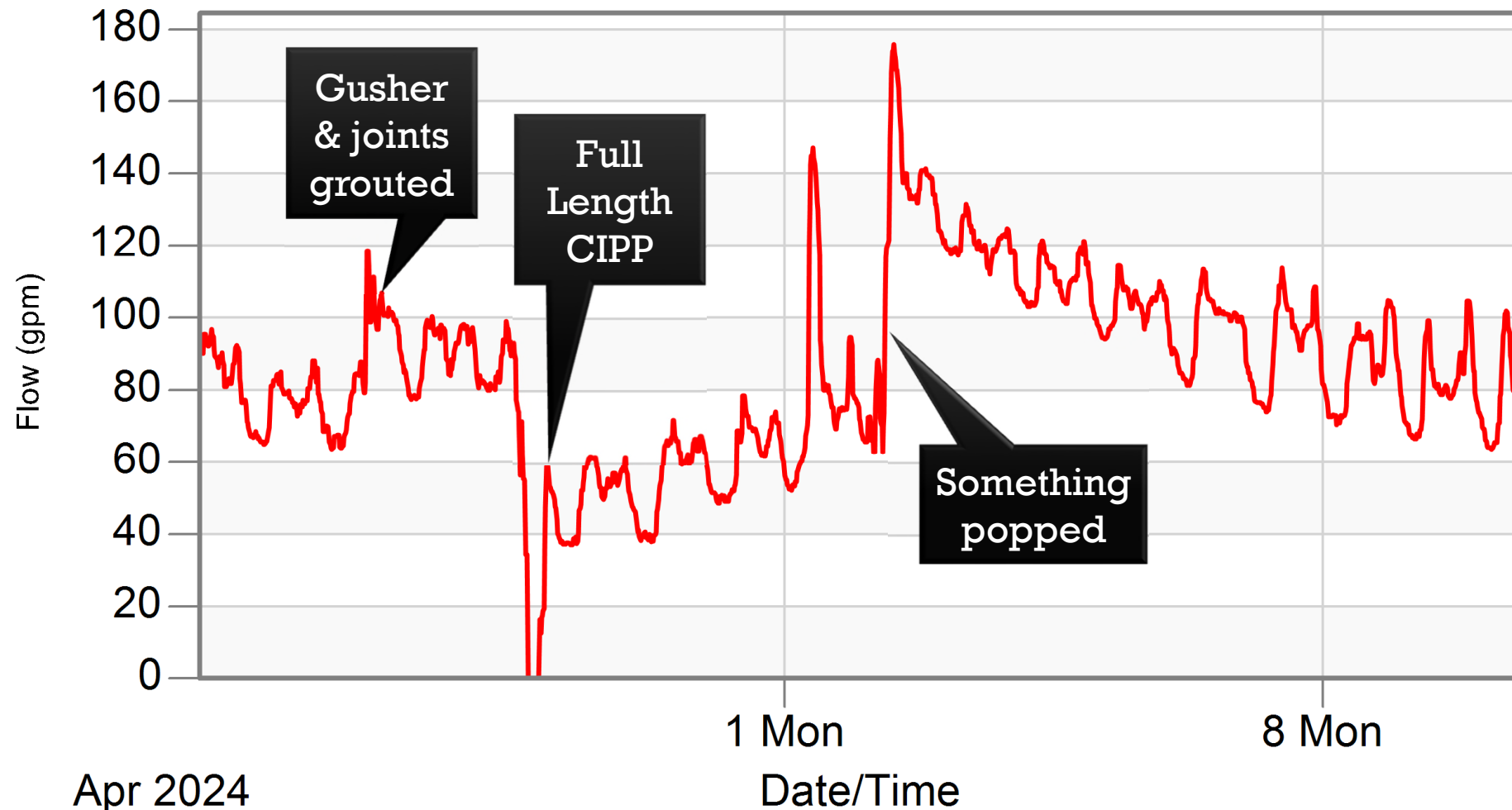
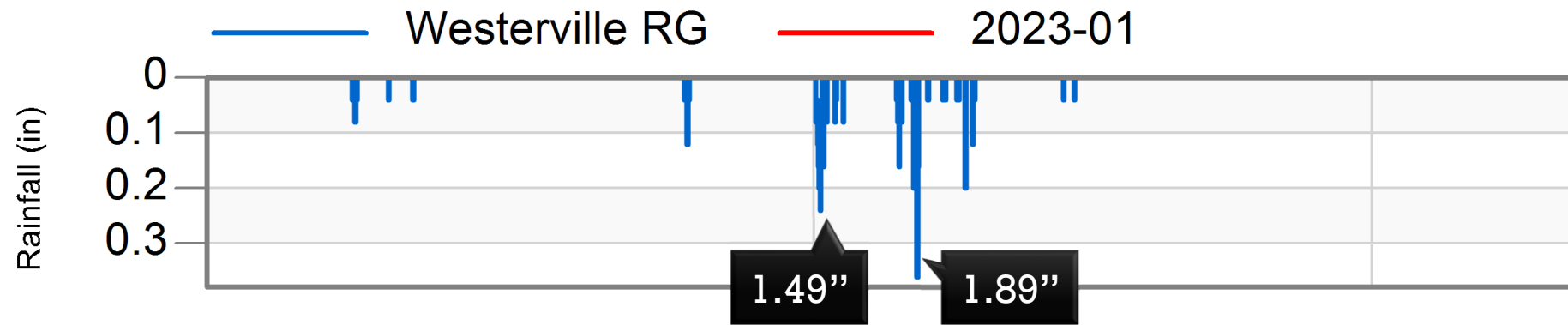
GUSHER #2 AT NORTHSTAR



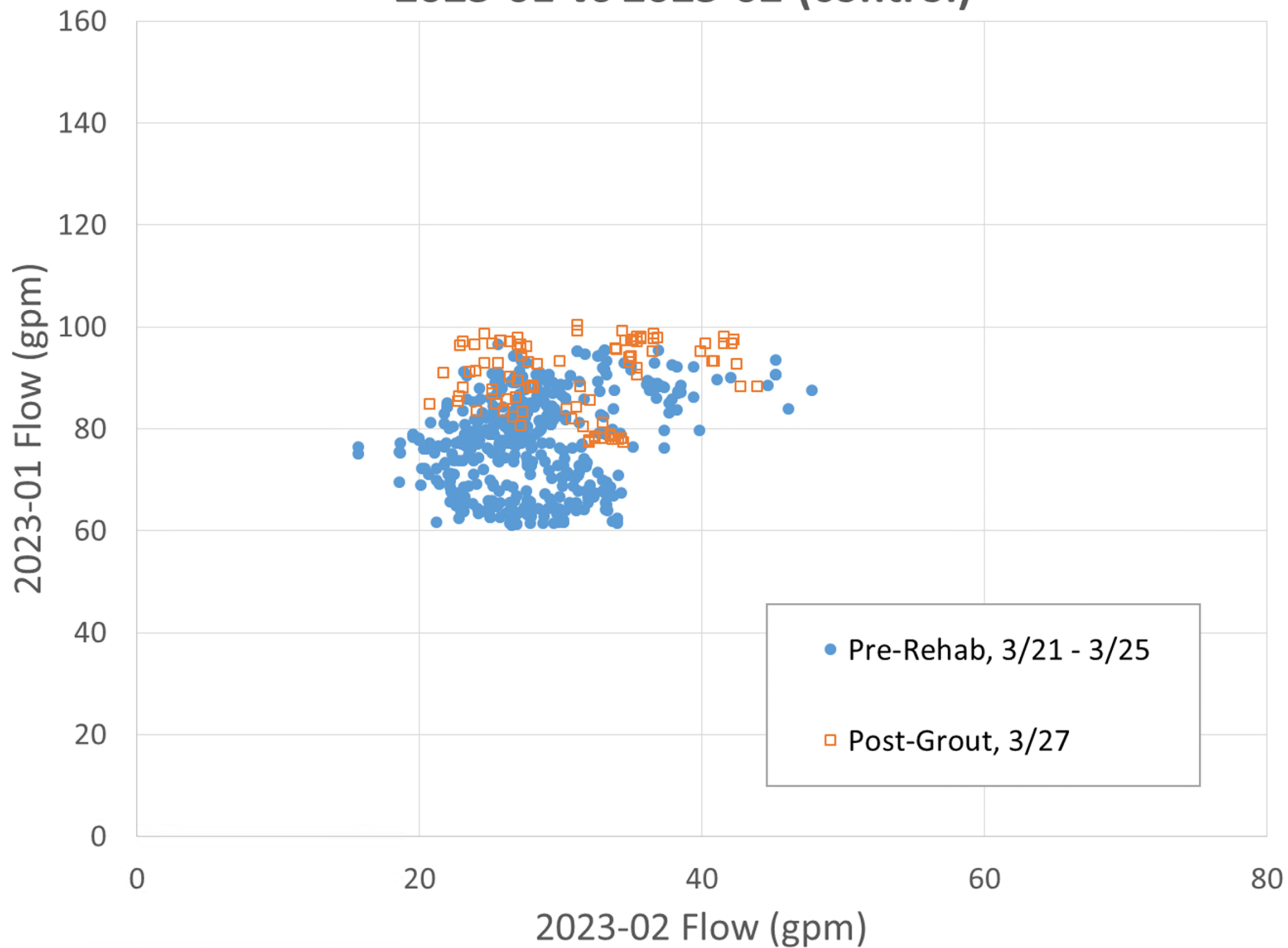


GUSHER #3 AT NORTHSTAR

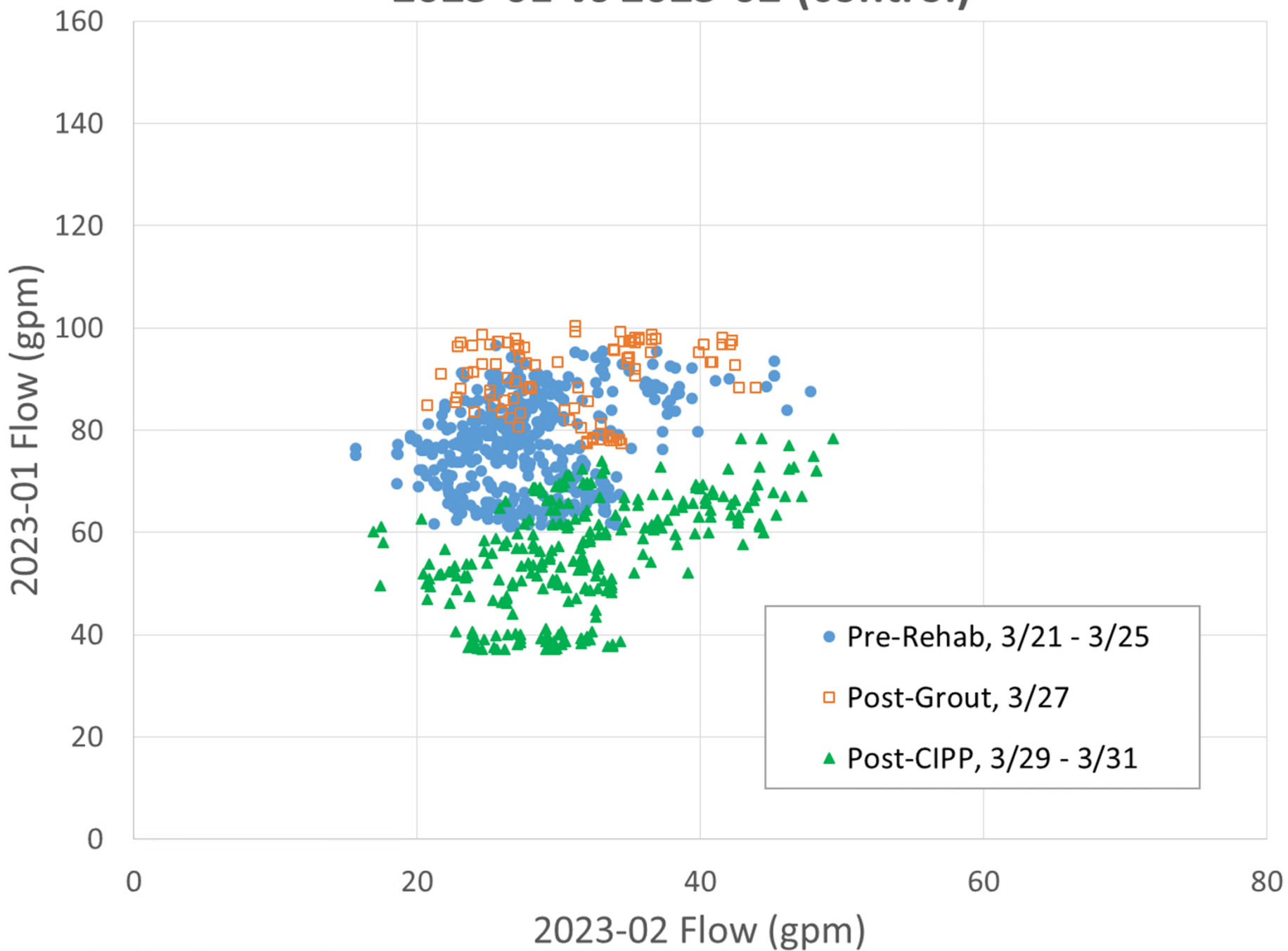




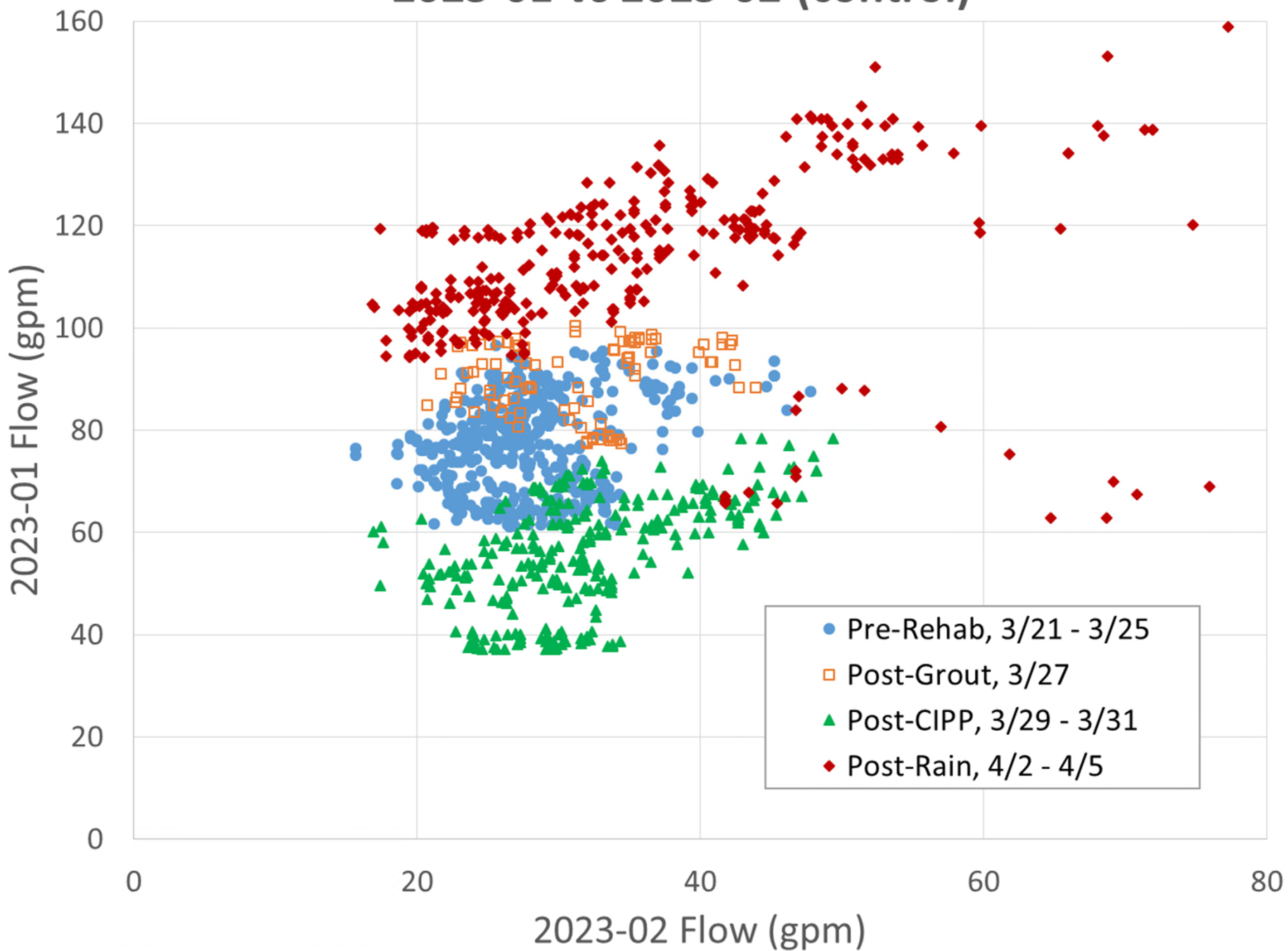
2023-01 vs 2023-02 (control)



2023-01 vs 2023-02 (control)



2023-01 vs 2023-02 (control)



WRINKLE IN 25' OF FULL-LENGTH LINER



LEAKS AROUND OVERLAP IN PARTIAL LINERS



2ND FULL-LENGTH CIPP POST-LINING



DCRSD MISSION STATEMENT

“To deliver regulatory-compliant, reliable, and affordable services for the citizens of Delaware County”

