

# Mitigating RDII at Private Sources, Challenges and Opportunities

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5-Cities, Columbus Ohio – 2017



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

DEPARTMENT OF  
PUBLIC UTILITIES

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

# Topics

- Blueprint Columbus
- Level of Service and RDII Reduction
- Pilot RDII Mitigation Tests
- Challenges and Opportunities

# Wet Weather Requirements

- Two consent orders with the State of Ohio
  - Separate Sanitary Overflow
  - Combined Sewer Overflow

## Mayor, City Council Welcome Historic Ohio EPA Final Approval of \$2.5 Billion Plan to Reduce Sewage Overflows

(Columbus) Mayor Michael B. Coleman and City Council are pleased the Ohio Environmental Protection Agency (EPA) has given final approval to the City's \$2.5 billion, Wet Weather Management Plan (WWMP). The plan, once completed, will dramatically reduce sewer overflows and basement backups during heavy rains and result in cleaner local waterways. The WWMP, submitted to Ohio EPA July 1, 2005, will bring the City into compliance with two consent orders signed with the State of Ohio in 2002 and 2004.

"Columbus is again making history and leading the nation thanks to our hard work with Ohio EPA to finalize our innovative plan to reduce sewer overflows, improve our waterways and make basements drier for Columbus families," said Mayor Coleman. "This is a giant step forward toward a healthier, greener Columbus. It is also an expensive project, so we must stay vigilant to do all we can to keep water and sewer rates affordable."

To date, the City has invested nearly \$1 billion in consent order projects, including a \$106 million new Headworks facility at the Southerly Wastewater Treatment Plant, other upgrades at the plant, the Big Walnut Augmentation/Rickenbacker Interceptor and neighborhood sewer projects that will help reduce overflows and basement backups. Additional improvements to the Southerly and Jackson Pike wastewater treatment plants totaling \$329 million are to be completed by 2010 as required. These projects are part of the WWMP Interim Plan, which Ohio EPA approved in March 2008.

"These improvements will help the City of Columbus meet the increased demands being placed on our wastewater infrastructure in an environmentally friendly way," said City Council Public Utilities Committee Chair Eileen Paley.

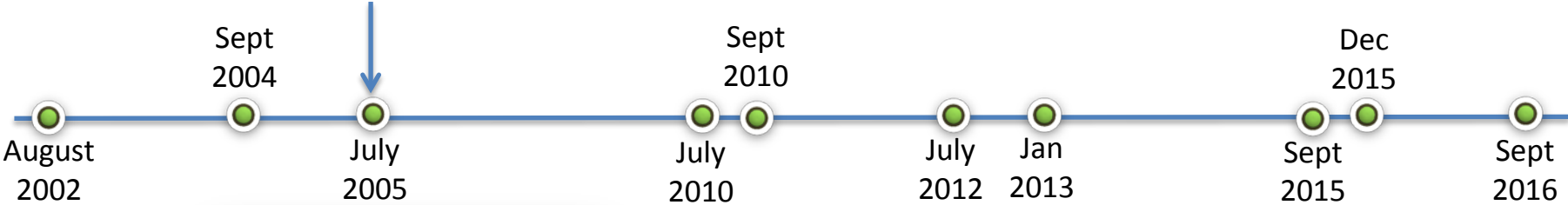
Ohio EPA approval of the WWMP covers projects in the plan except for the timetable for the final two phases of two large diameter underground tunnels that will run along the Olentangy River and Alum Creek. Ohio EPA's approval requires the City to submit an accelerated schedule for completion of the two large tunnels, as well as an affordability analysis and rate study by January 9, 2015, which will build on an extensive affordability analysis the City originally submitted with the WWMP in 2005. The deadline is a change from the July 1, 2016, date Ohio EPA set in its draft approval.

"This historic agreement is the result of the City's best and brightest working closely with our partners at Ohio EPA," said Department of Public Utilities Director Tatyana Arsh. "We remain committed to that relationship, making sure the plan is done in a fiscally and environmentally responsible way that better serves our ratepayers while doing all we can to keep rates affordable."

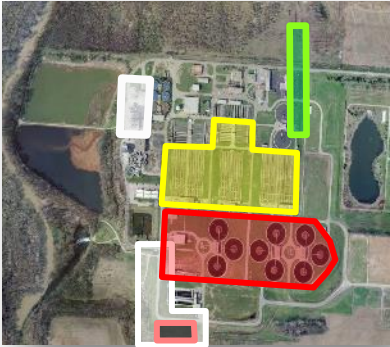
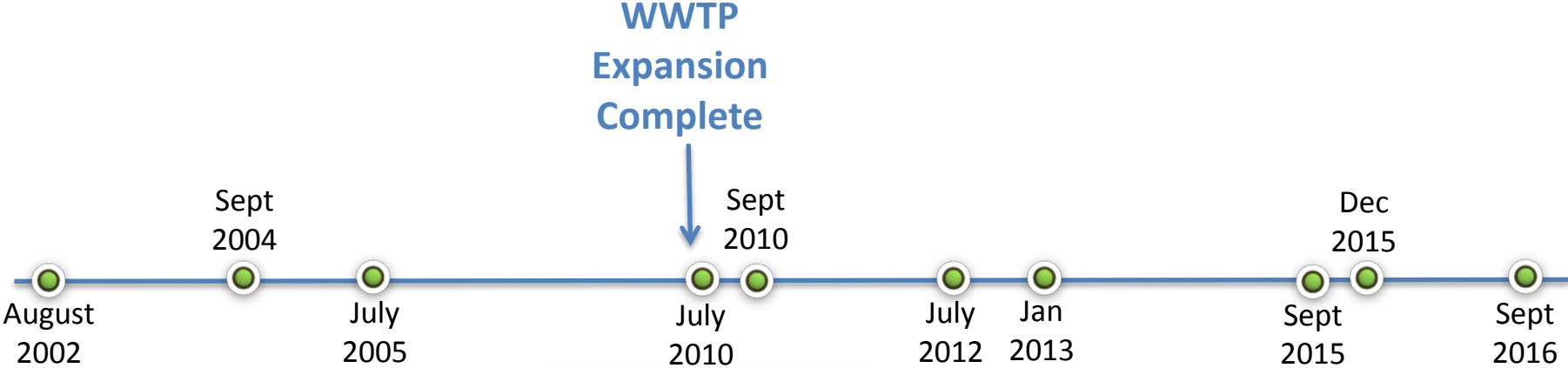
Since 2006, the City's Low Income Discount Program has provided a discount to ratepayers living in poverty who meet the program's qualifications. With City Council

# Background/Timeline

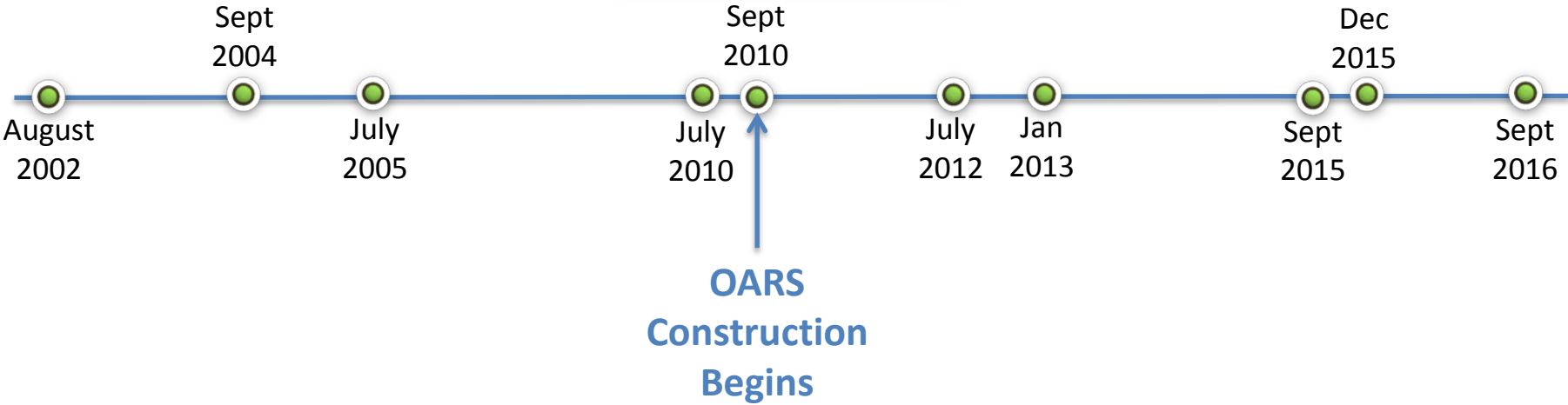
## Wet Weather Management Plan



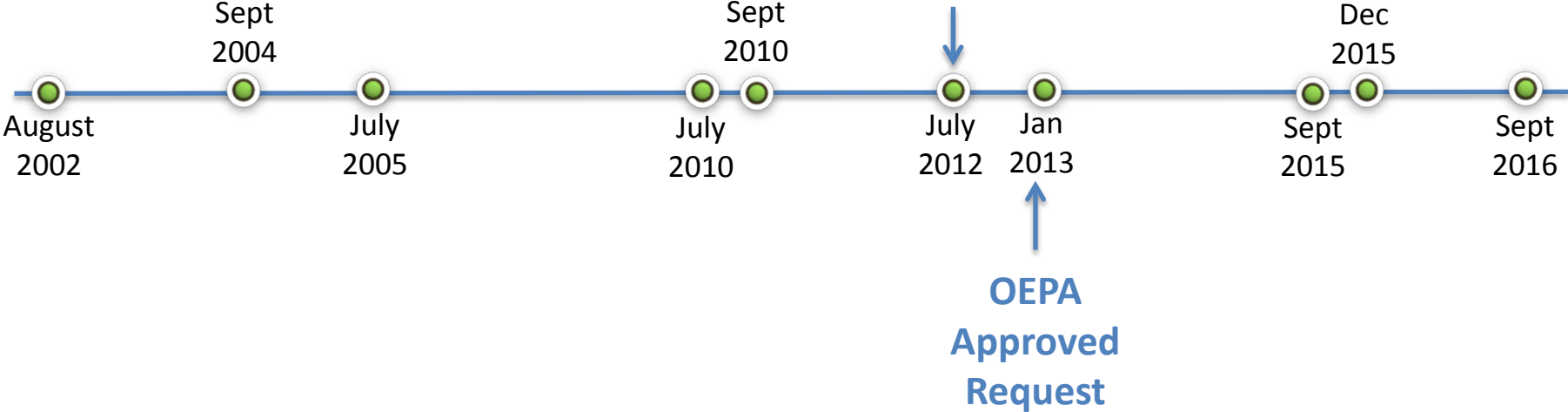
# Background/Timeline



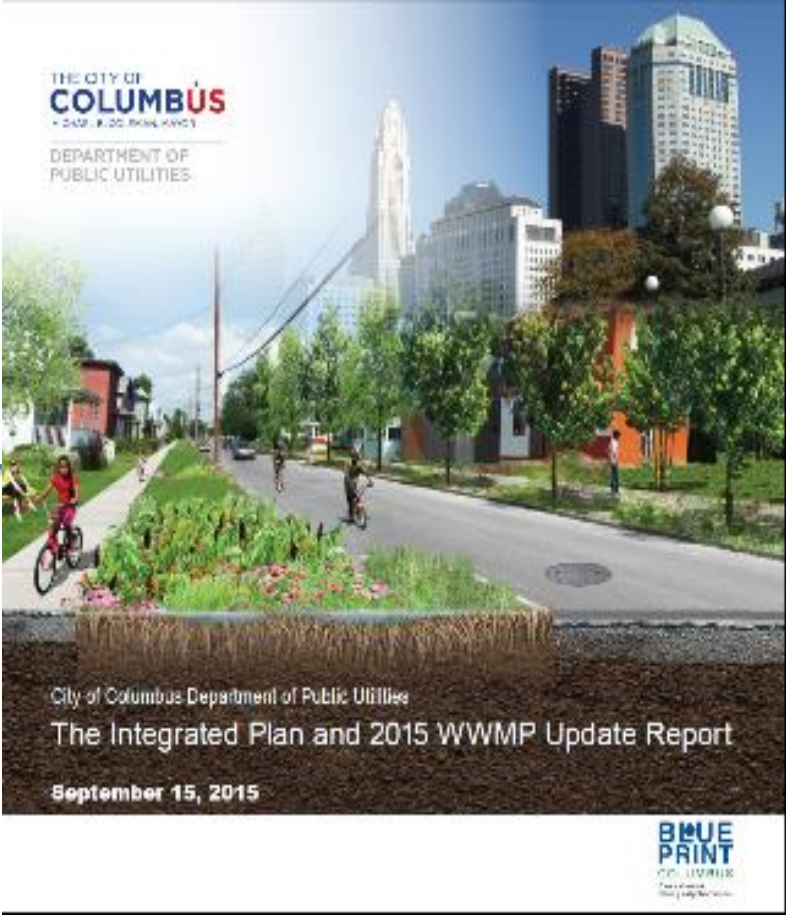
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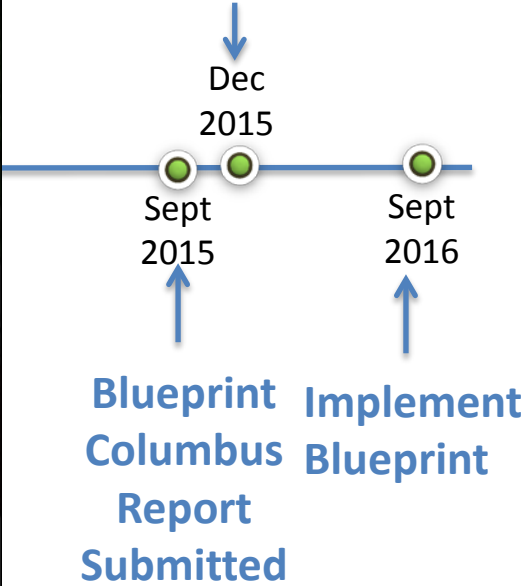
# Background/Timeline



# Background/Timeline



Ohio EPA Approved Plan; City Council Legislation Enacted

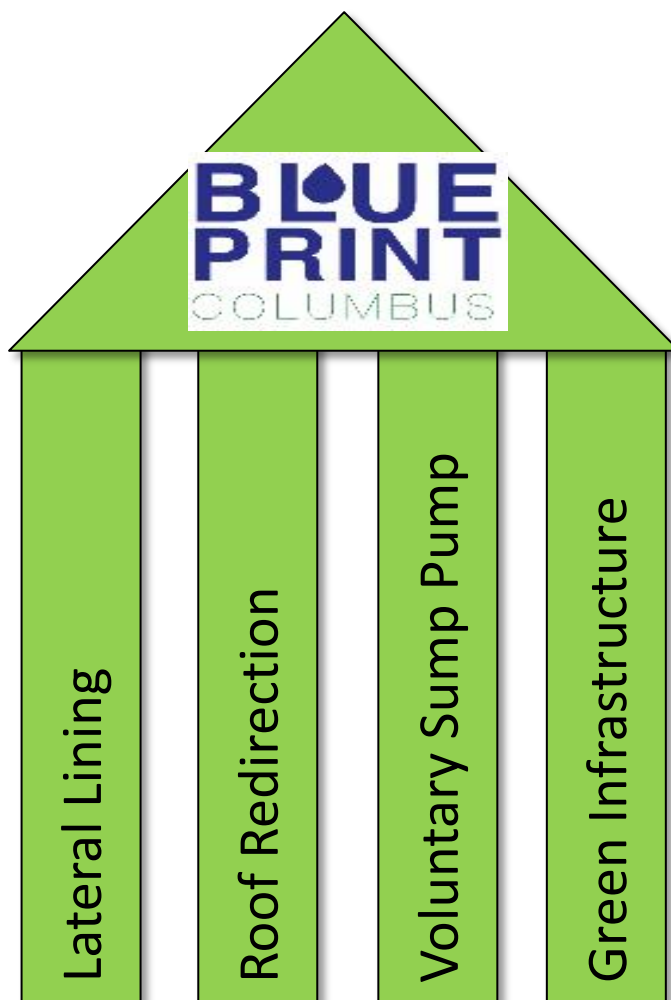




# BLUE PRINT COLUMBUS

Clean streams.  
Strong neighborhoods.

# The Four Pillars



# Topics

- Blueprint Columbus
- Level of Service and RDII Reduction
- Pilot RDII Mitigation Tests
- Challenges and Opportunities

## Level of Service – Typical Year

- Typical year used for CSO

Location in the Collection System	Overflows Allowed in a Typical Year Run
OARS Overflow	4
Whittier Street Storm Tanks	0
Alum Creek Storm Tanks	0
Non-Downtown CSOs*	0

# Level of Service – Historical Recurrence

- 20-year scenario used to determine SSO, WIB and bypass compliance

Location in the Collection System	Overflows Allowed in a 20-Year Run	Targeted Level of Service
<b>CSOs</b>		
Downtown CSOs*	2	10-Year
<b>SSOs and Manholes</b>		
All SSOs	2	10-Year
All Manholes	2	10-Year
<b>WIBs</b>		
All WIBs**	2	10-Year
<b>WWTPs</b>		
Jackson Pike	0	10-Year
Southerly	12	1.4 Year

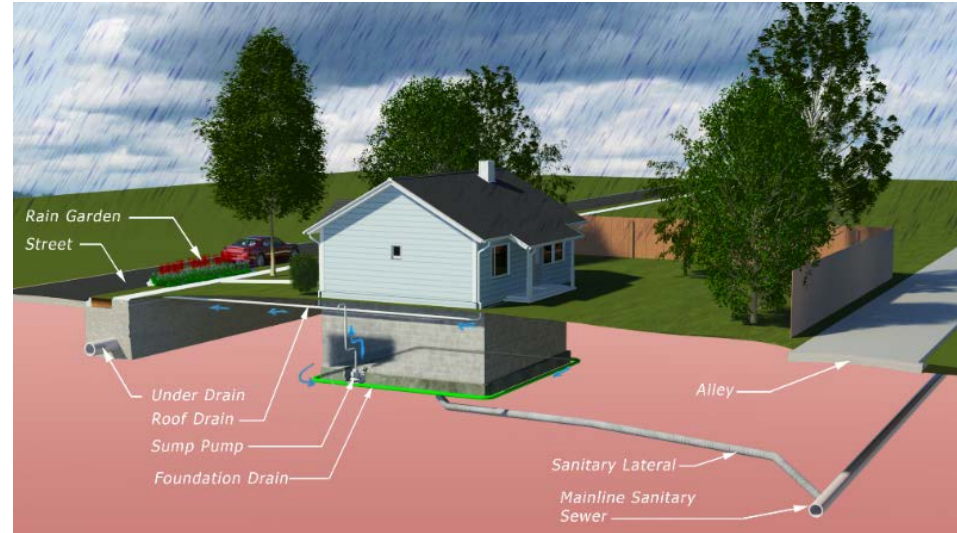
# Level of Service - Stormwater

- Quantity Control
  - Do-no-harm for localized flooding
  - No increase in peak flow to Streams
- Quality Control
  - 20% Total Suspended Solids



# Roof redirection and Sump Pumps

- Target peak RDII flow reduction is 60-65% to achieve LOS
- Blueprint assumption
  - 50% Roof redirection Participation (with 50% effectiveness due to potential poor gutters condition)
  - 25% Sump pumps Participation (90% effectiveness)



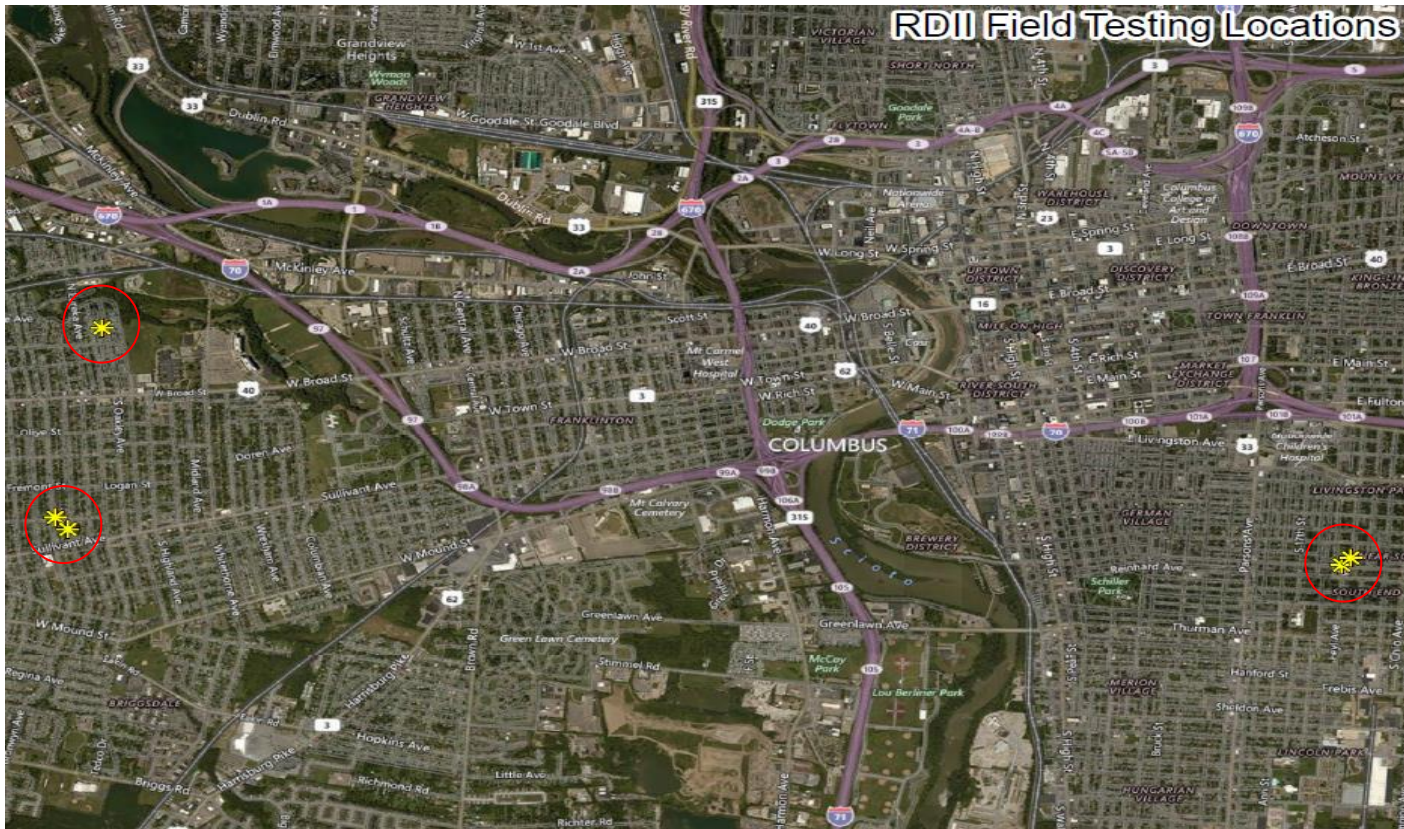
# Topics

- Blueprint Columbus
- Level of Service and RDII Reduction
- **Pilot RDII Mitigation Tests**
- Challenges and Opportunities



# Pilot RDII Mitigation Tests

- Five Houses



# Lateral Flow Monitoring

## RDII Mitigation Technologies Tested

- Lateral Lining (LL)
- Roof Redirection (RR)
- Traditional Sump Pump (TSP)
- Deep Sump Pump (DSP)

## Controlled storms applied

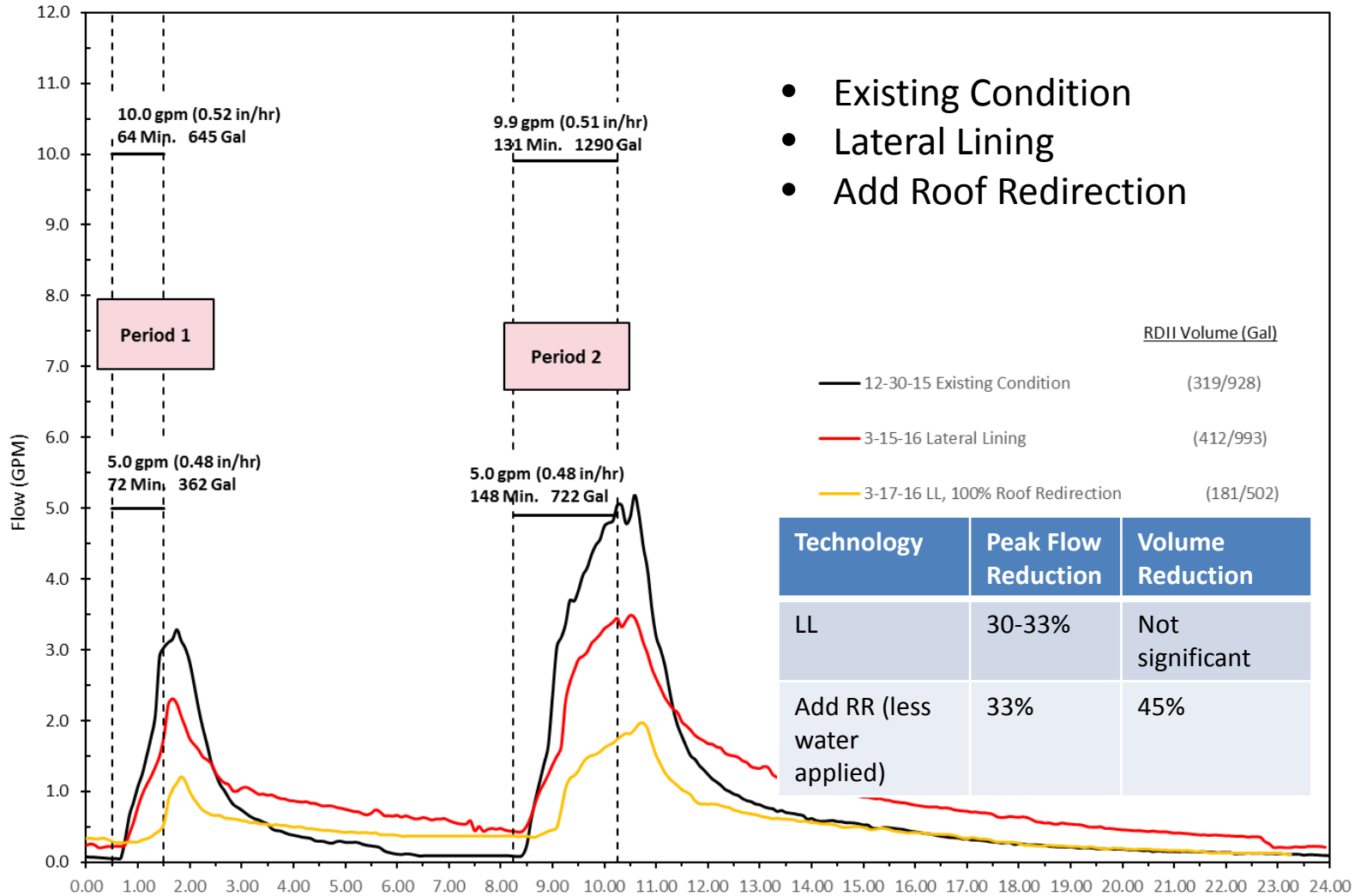
- 3-month in the morning
- 1-year in the evening

## Water Application

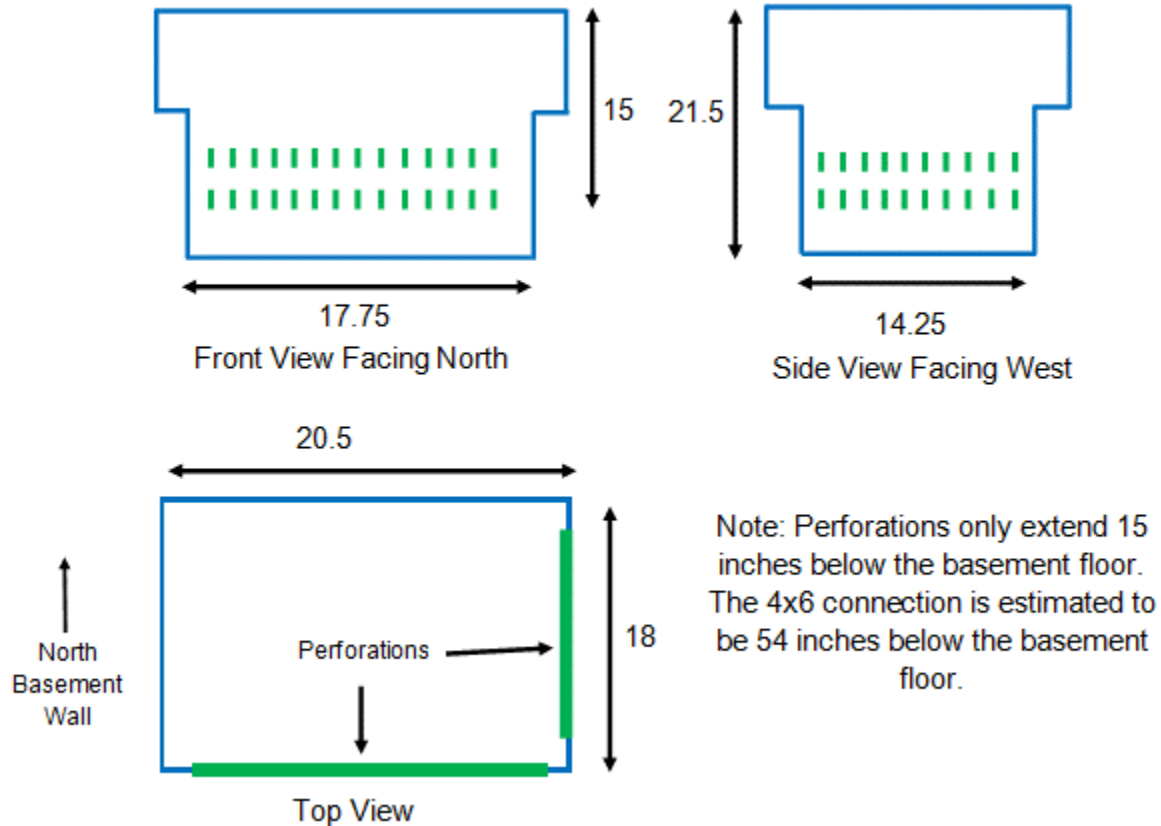
- 6' buffer around the house
- 6' buffer above lateral pipe



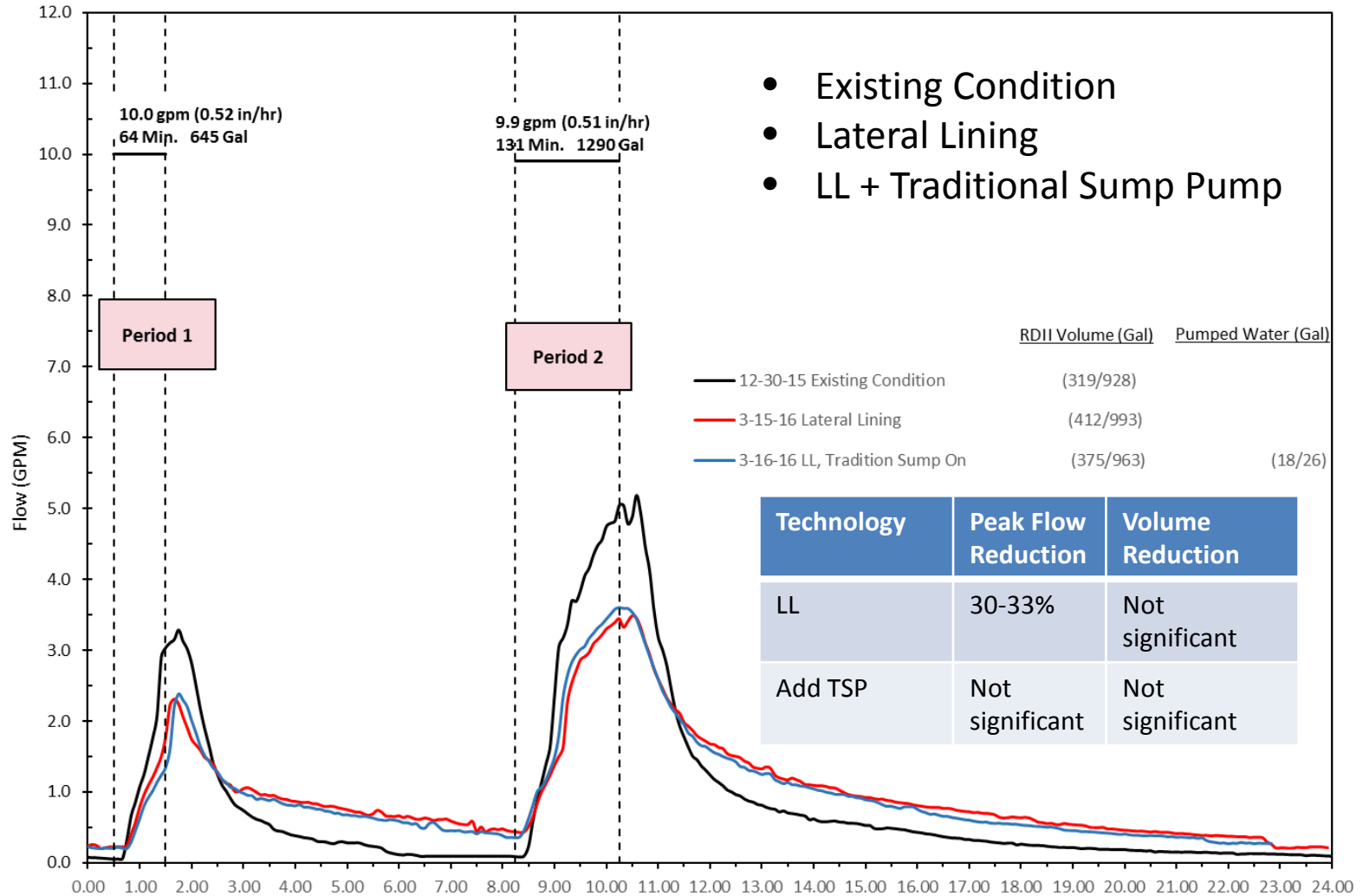
# House 1: 764 E Whittier St – LL, RR, TSP, DSP



# Traditional Sump Pump

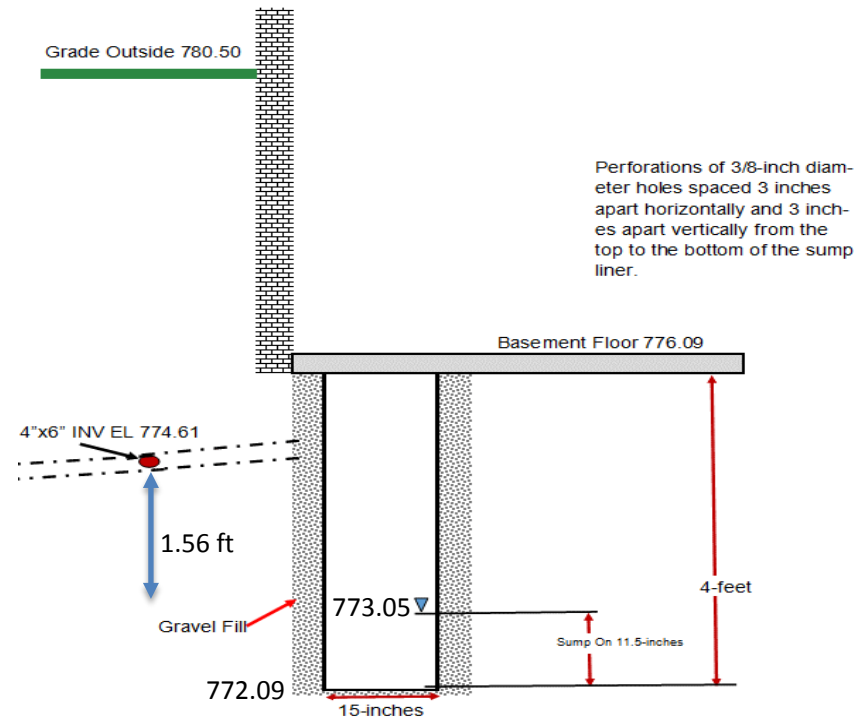


# House 1: 764 E Whittier St

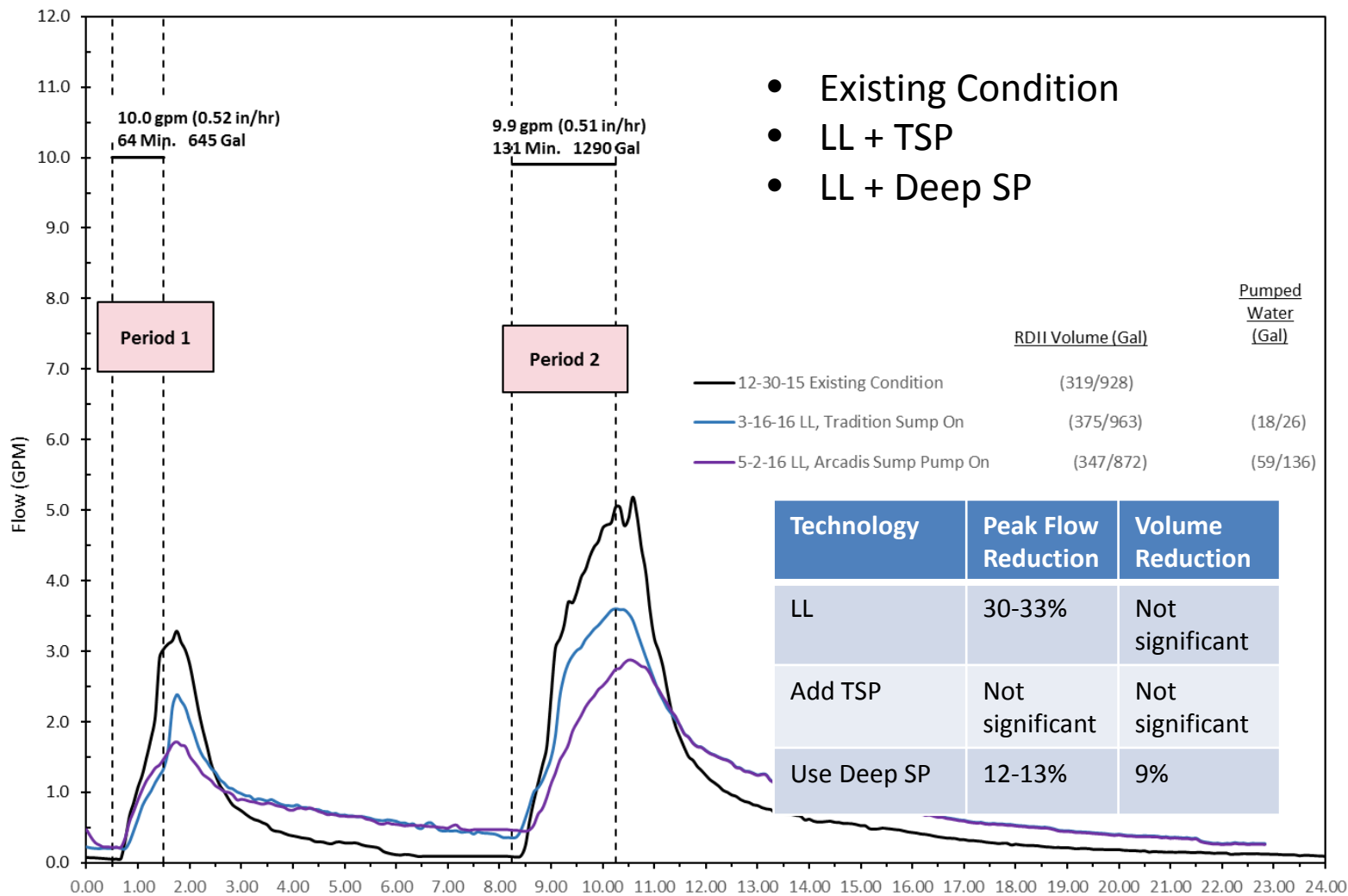


# Deep Sump Pump Design

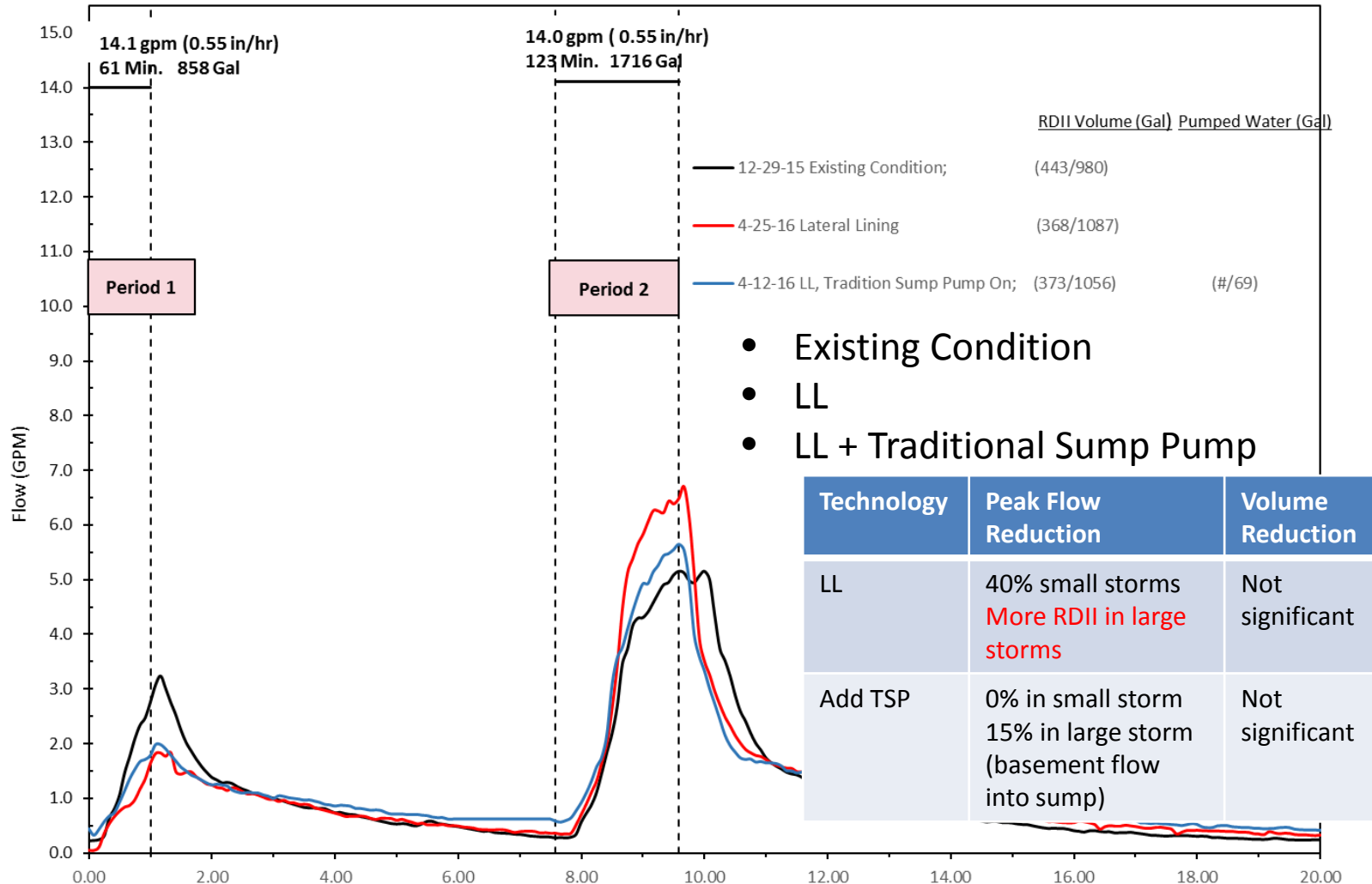
- Draw groundwater table down around the 4" x 6" connection



# House 1: 764 E Whittier St



# House 2: 227 N Oakley Ave





# House 2: 227 N Oakley Ave

- Existing Condition
- LL + TSP
- LL + Deep SP

Technology	Peak Flow Reduction	Volume Reduction
LL	40% small storms More RDII in large storms	Not significant
Add TSP	0% in small storm 15% in large storm	Not significant
LL + Deep SP	13% in small storms 0% in large storms	15%

# House 3: 985 Carpenter St – TSP, DSP (no LL)

- Existing Condition
- TSP
- Deep SP

Technology	Peak Flow Reduction	Volume Reduction
TSP	Not Significant	20%
Deep SP	30 - 37%	41%

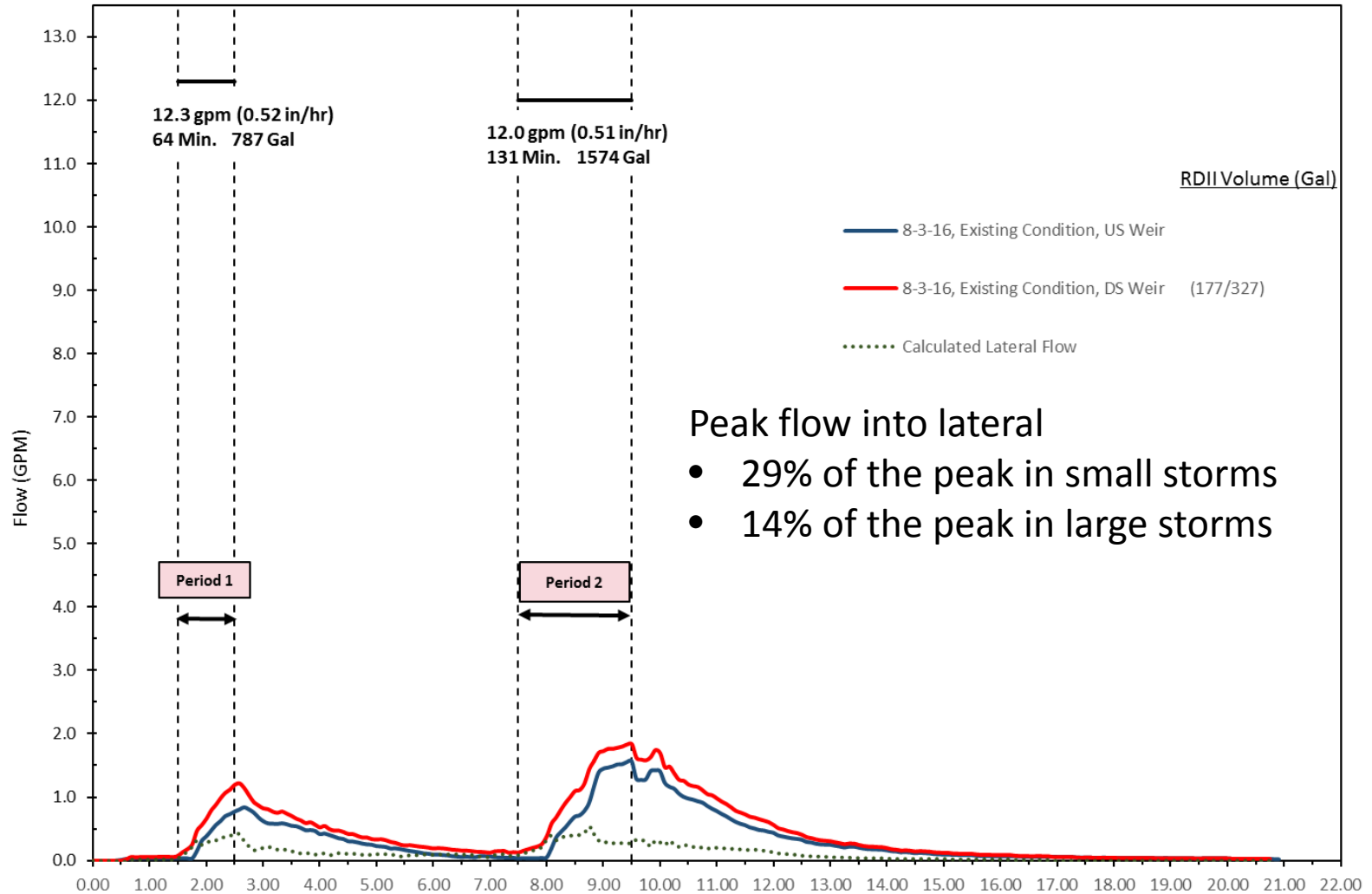
# 445 Terrace Avenue Site Plan

Additional monitor was placed at upstream end of the lateral pipe

## Technologies Tested:

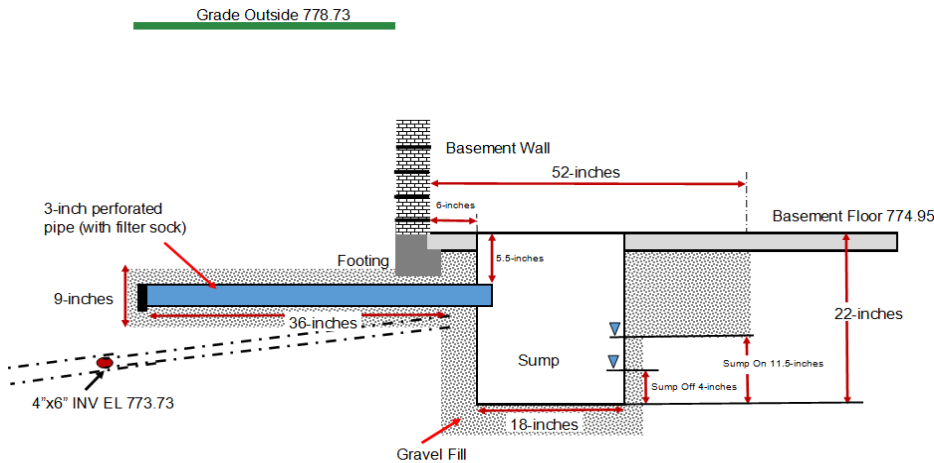
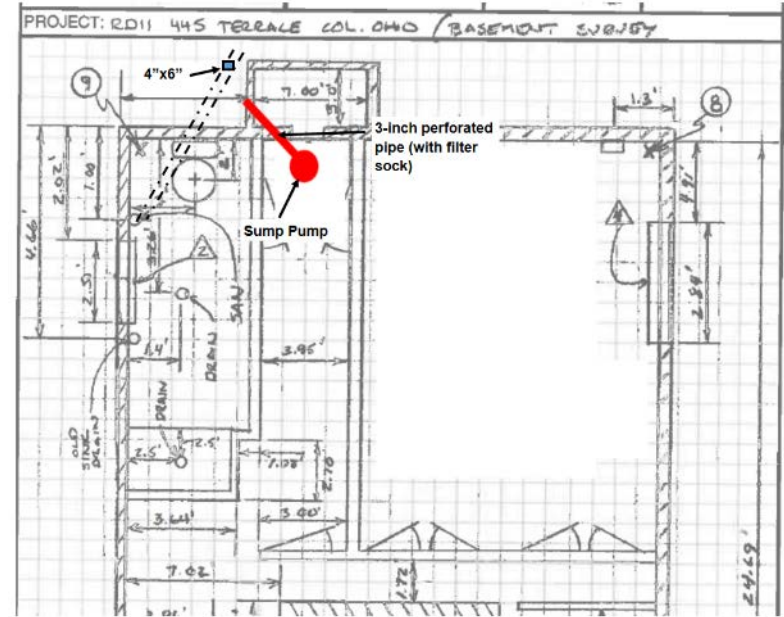
- Traditional Sump Pump
- Traditional Sump Pump with a Pipe below foundation to collect flow around the 4" x 6" connection

# House 4: 445 Terrace Ave – TSP, Modified SP Configuration

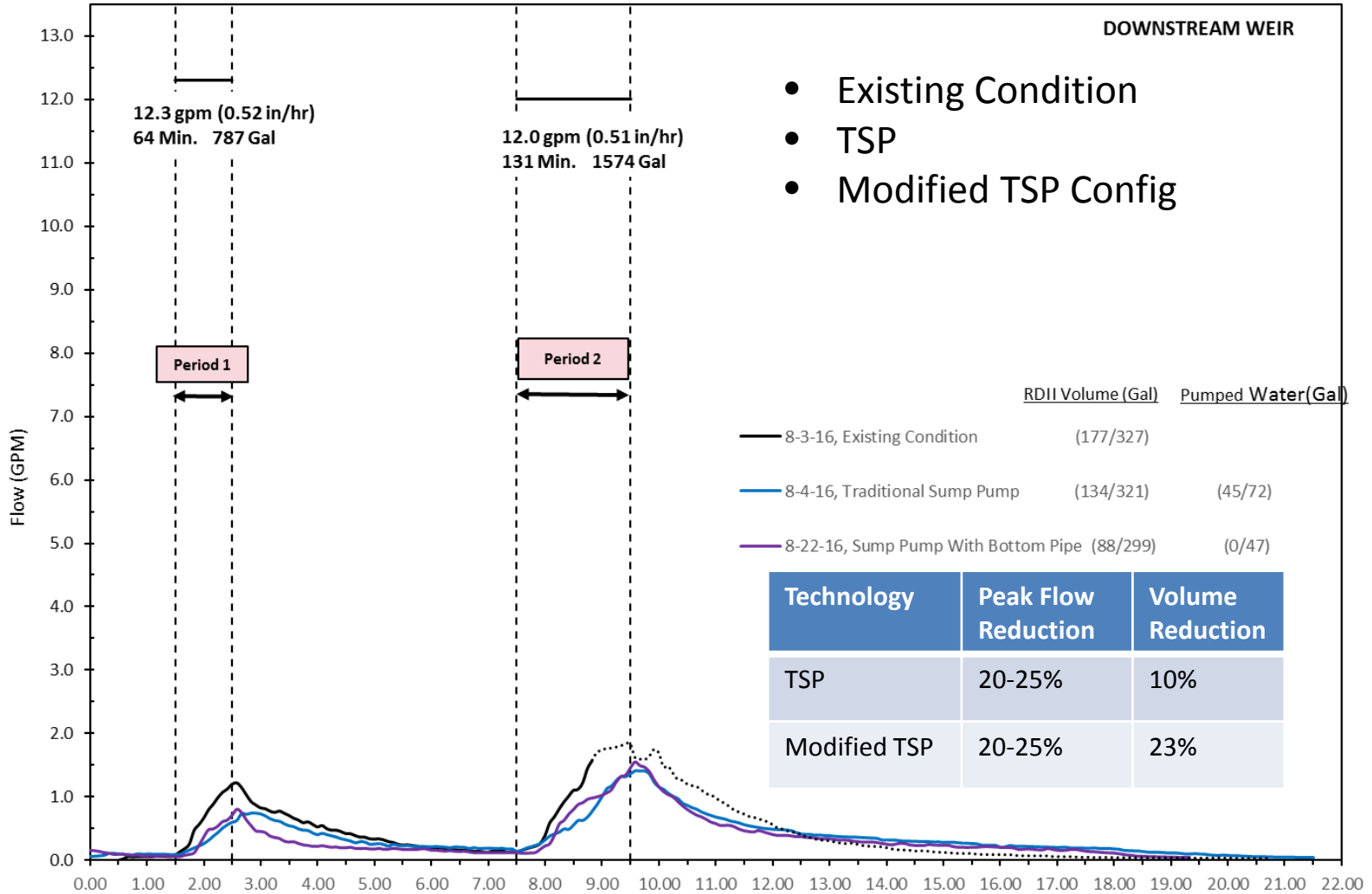


# Modified Sump Pump Configuration

- Extend perforated pipe under foundation to collect flow around the 4" x 6" connection



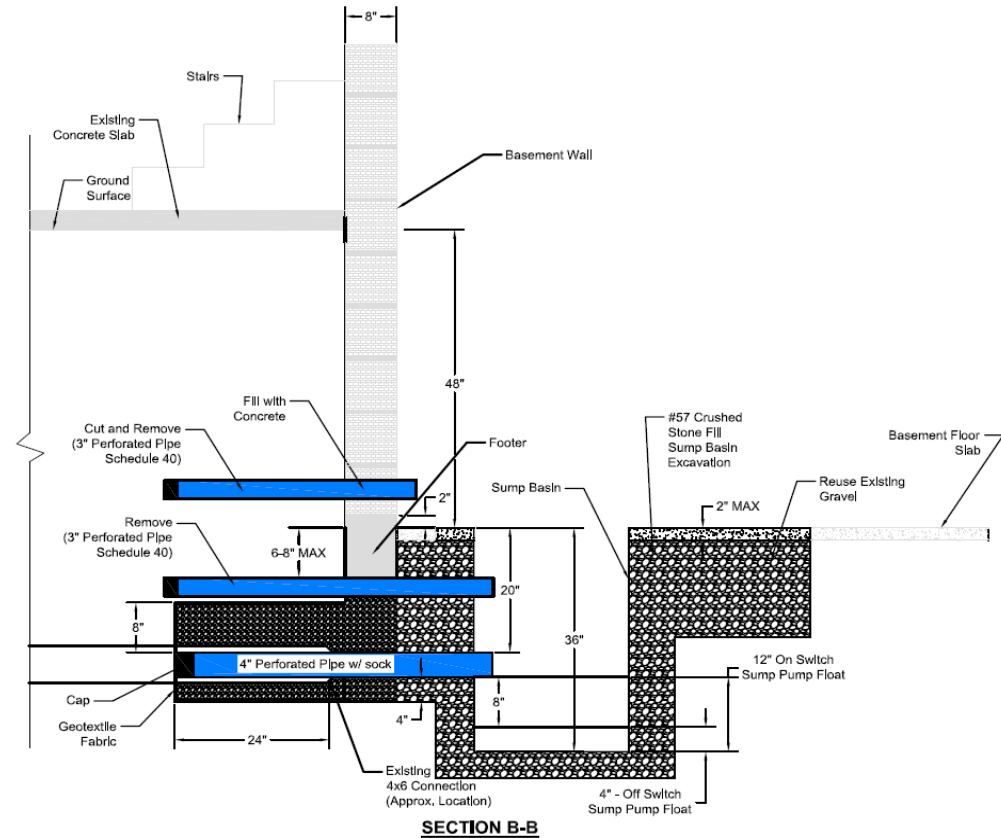
# House 4: 445 Terrace Ave



# House 5: 402 S Richardson Ave – TSP, Modified SP Configuration

## Technologies tested

- Traditional Sump Pump
- TSP with extended pipes above and below foundation
- Tight the 4" x 6" connection
- Deep SP with extended pipe



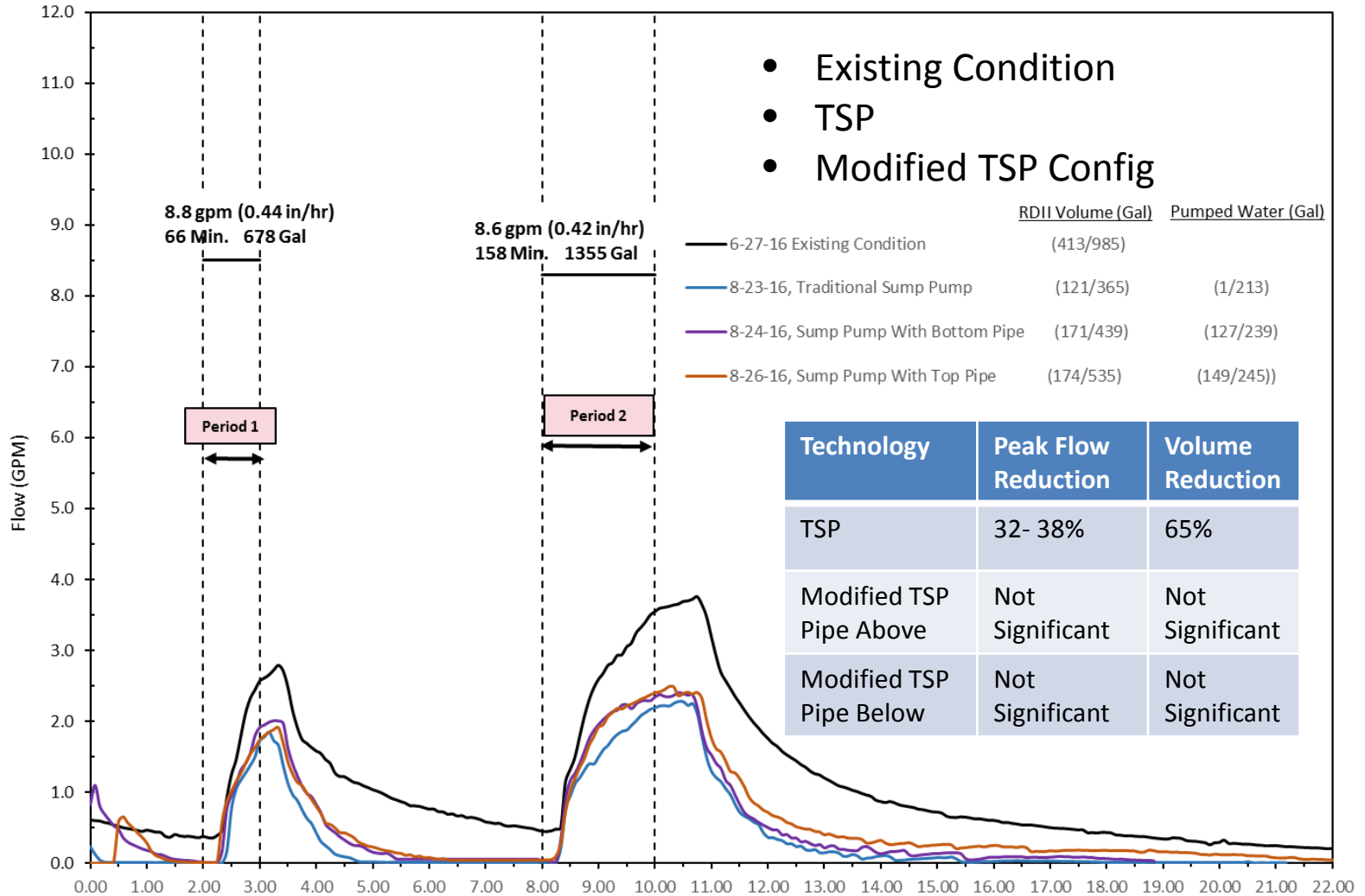
# House 5: 402 S Richardson Ave Modified SP Configuration

- Extended pipe above foundation

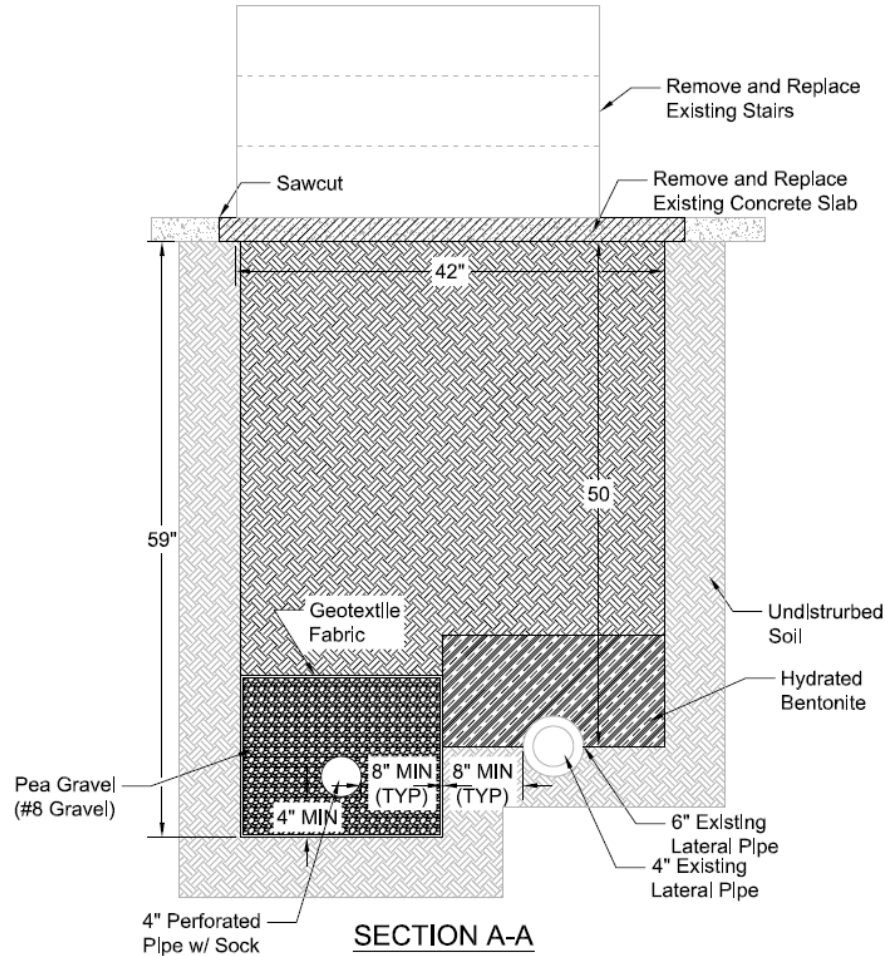




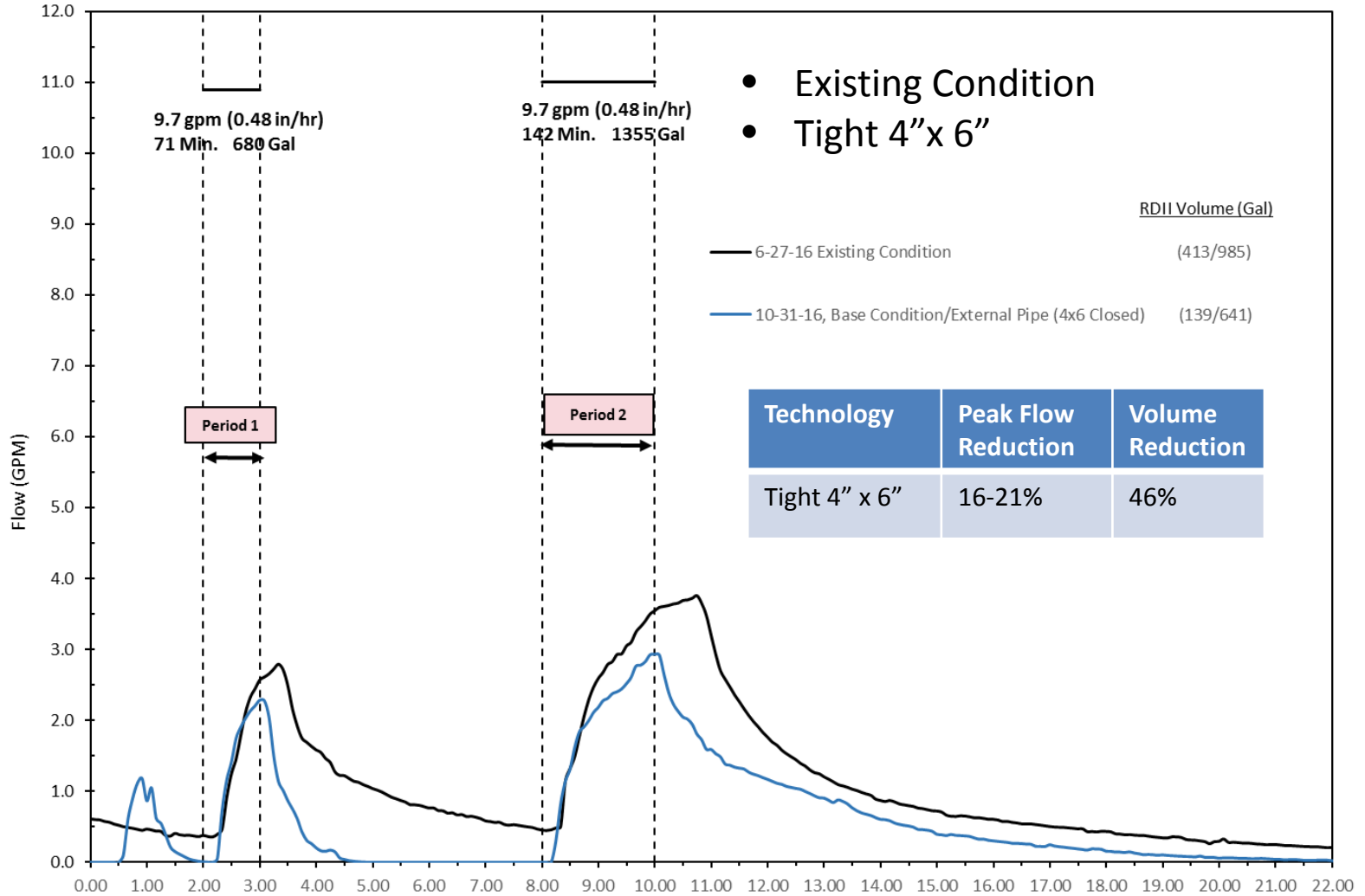
# House 5: 402 S Richardson Ave



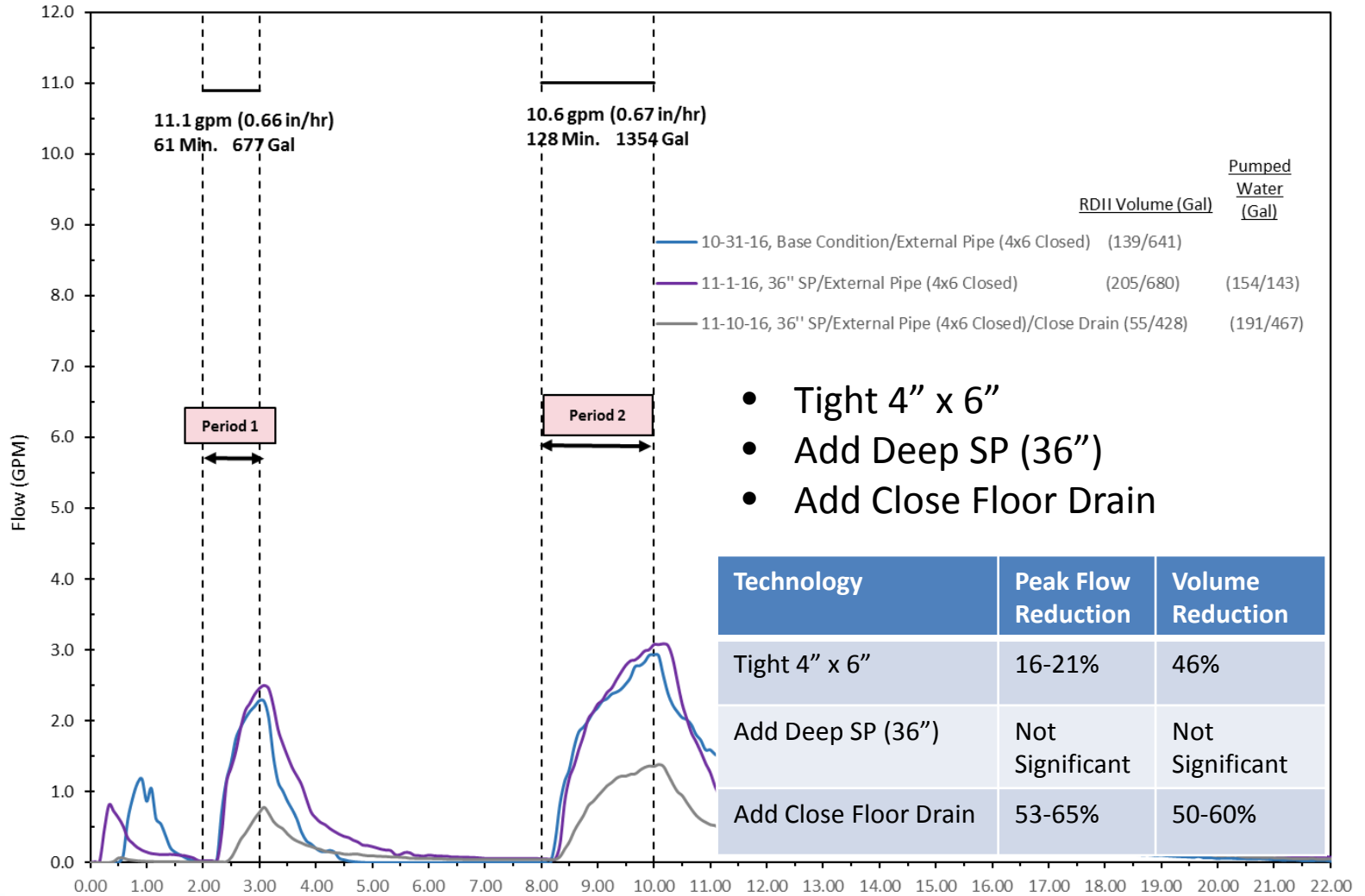
# 36" Sump Pump with External Pipe



# House 5: 402 S Richardson Ave



# House 5: 402 S Richardson Ave



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# Challenges and Opportunities

- Challenges
  - A combination of RDII reduction technologies are required to achieve the target LOS
  - Lateral lining could cause groundwater to build up around house perimeter
  - Traditional sump pumps is least effectiveness in RDII reduction
- Opportunities
  - Highest level of RDII reduction is expected in houses with foundation drains that could be connected directly into storm sump pump
  - Roof drainage redirection is highly effective (assuming gutters are in good shape to avoid splashing around the house)
  - Deep (no-traditional) sump pump increase the effectiveness of the sump pump reduction technologies with additional cost

# Thank You

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