

Peeling the “1/1 Onion”

John W. Swartzbaugh, PE

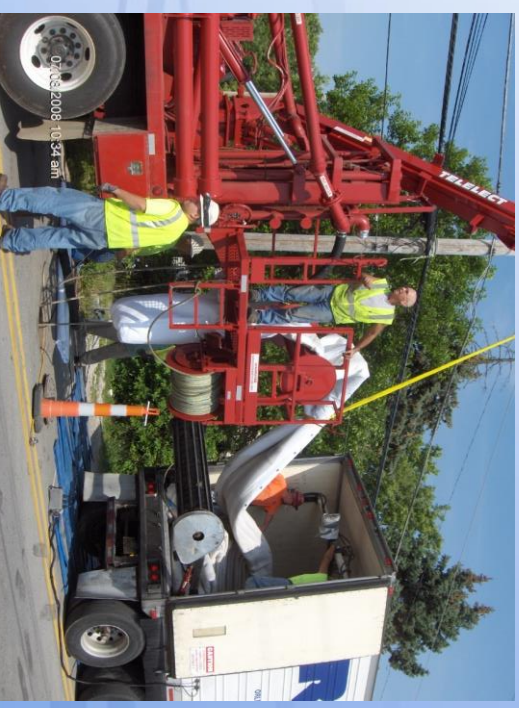


BURGESS & NIPLE

Engineers ■ Architects ■ Planners

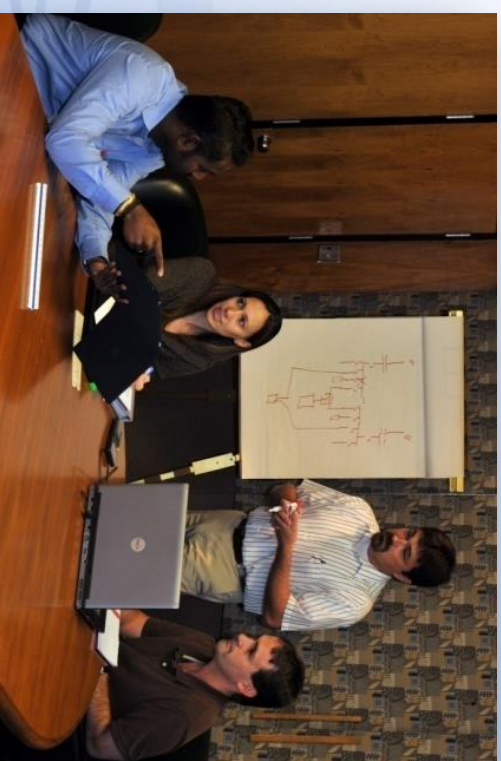
Develop a Plan

- How Many Communities Have I/I Issues?
- How Many Have Performed Rehabilitation?
- How Many Know What the Reduction in I/I was?
- How Many Have a Plan in Place?



Data Gathering

- Gather Available Mapping
- Maintenance Records
- Complaint Records
- Historical Flow Metering and Rainfall Data
- Interview Staff



Public Outreach

Letter and Questionnaire to Residents

Inexpensive way to gain information



City of Frankfort

Frankfort Sewer Department
1200 Kentucky Avenue | Frankfort, KY 40601
502.875.2448 | 502.223.7857
frankfort.ky.gov/sewer-department

FLOODING QUESTIONNAIRE

Please Return By 07/31/2012

The City of Frankfort's Sewer Department is conducting an area-wide evaluation of the sanitary sewer system in the study area to identify and resolve problems. In order for us to better serve you, it is important that we are made aware of stormwater and sanitary sewer problems your property may be experiencing. Please take the time to fill out this survey and return it to us in the self-addressed stamped envelope. Thank you for working with us to address these issues.

Name (optional): _____
PROPERTY ADDRESS: _____
APARTMENT _____

Verify Address: Check one
 Address correct
 Address is wrong (please describe on reverse)

1. How long have you been located at this address? (years)

2. Do you have:

- Basement Split level Crawlspace Sills
- 1/2 yard that slopes away from the building?
- 1/2 yard that slopes toward the building?
- Asparagus trenches or other area in the yard?
- Large catchment area near the building?

3. Do you experience any type of flooding on your property?
(Check all that apply)

- Basement Front Yard Back Yard Street Other None

*Comment: _____

4. If street flooding occurs on your street:

- What is the usual depth of water (inches)? _____
- How long does the water stand (hours)? _____
- Has there standing water in your yard? Yes No
- When? During average rain During heavy rain

5. If basement flooding occurs, what is the usual depth of water?
Inches: _____

6. How does water enter your basement?

- Basement floor/dims
- From drains in window wells
- Through basement walls
- From perimeter of basement floor
- From sump overflowing
- Don't know
- Other: _____

7. How many times have you had water in your basement?
(Last 5 years)

- In the past 5 years: _____
- In the past 2 years: _____
- Never

8. Describe water in basement. (Check all that apply)

- Clear
- Murky
- Milky (gray or black)
- Older
- No odor
- Not applicable

9. If you have experienced flooding, when does it occur?

- During an average rain event
- Only during a heavy rain event
- The water level is at an extent
- There is no water in the basement
- There are no basements
- Cause if other than rain: _____

10. Have you ever used a preventive measure to remove
basement flooding? (Check all that apply)

- Yes No
- How often? _____
- When was the last time (month/year)? _____
- Sanitary Service: Yes No
- If yes: _____
- How often? _____
- When was the last time (month/year)? _____

*Comment: _____

11. What kind of special equipment do you have to take care of or prevent
basement flooding? (Check all that apply)

- Sump pump
- Back up valve / backflow preventer
- Sump pump
- None

CONTINUED ON BACK
*Add additional pages if necessary



City of Frankfort

FLOODING QUESTIONNAIRE

11. What kind of special equipment do you have to take care of or prevent
basement flooding? (Check all that apply)

- Sump pump
- Back up valve / backflow preventer
- Sump pump
- None

12. If a sump pump is used, when and how often does it run?
(Check all that apply)

- Runs periodically during dry weather
- Runs often during dry weather
- Runs as soon as rain begins
- Runs continuously during rain
- Runs continuously after rain stops
- Stops running when rain stops
- Other: _____
- Not applicable

13. Where does the discharge from your sump pump flow?
(Check all that apply)

- To catch basin
- To street
- To sanitary sewer
- Into ground - best practice
- Into ground - best practice
- Other: _____
- Don't know
- Not applicable (Do not have sump pump)

14. List the total number of roof downspouts on your property:

- Number of downspouts that are connected into the ground _____
- To catch basin
- To sanitary sewer
- To catch basin
- Don't know
- Number of downspouts that splash onto ground _____

15. Describe condition of roof gutters:

- Good Clogged
- Missing Section missing

16. Indicate condition of downspouts:

- Good Clogged
- Section missing or disconnected
- Don't know

17. If you option, any yard and street flooding is caused by:
(Check all that apply)

- Street grade problems
- Yard grade problems
- Not enough storm sewers
- Storm sewers too small
- Sanitary sewers too small
- No flooding problem
- Blocked catch basin or catch silt
- Other: _____
- Don't know

18. Would you be willing to be contacted for a more detailed discussion
of your drainage issues? YES NO

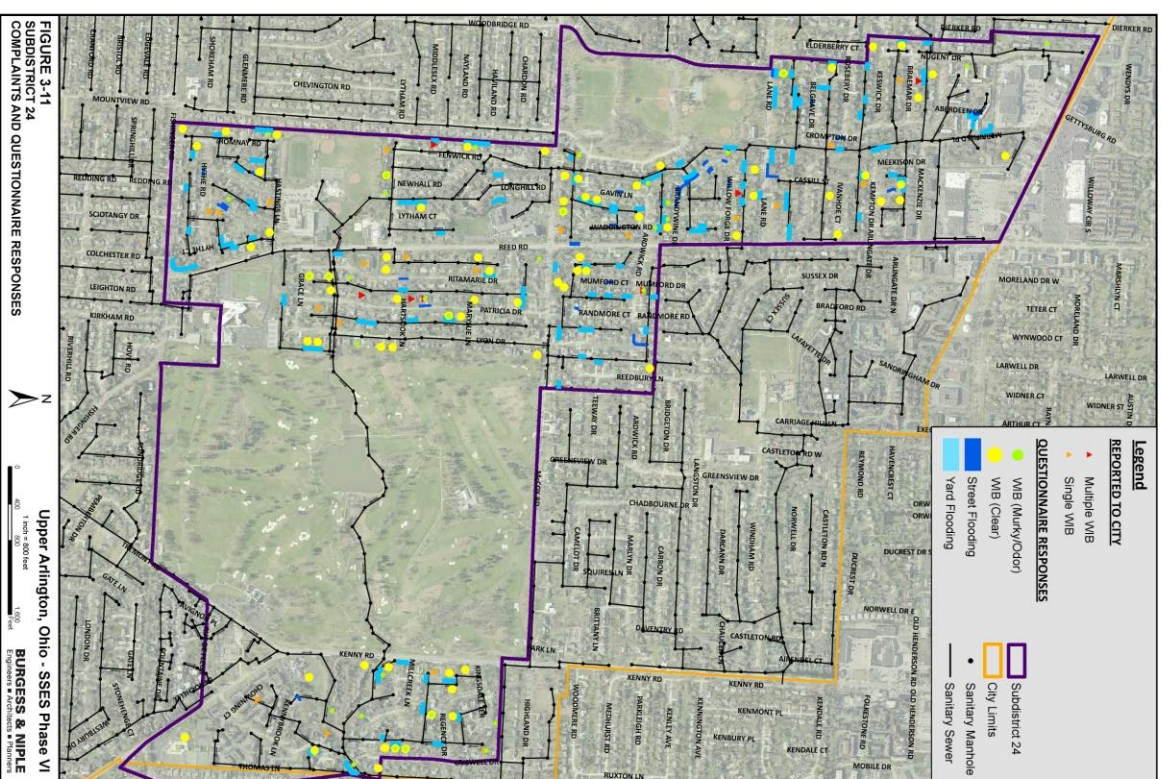
If yes, best time to call: _____
Telephone number: _____

*Comment: _____

Please return your completed questionnaire by 07/31/2012 in the enclosed return envelope.
Thank you for your participation in this survey.
*Add additional pages if necessary

Public Outreach

- Historically 30%-50% Return Rate
- Survey Monkey



Flow Meter & Rain Gauge Duration

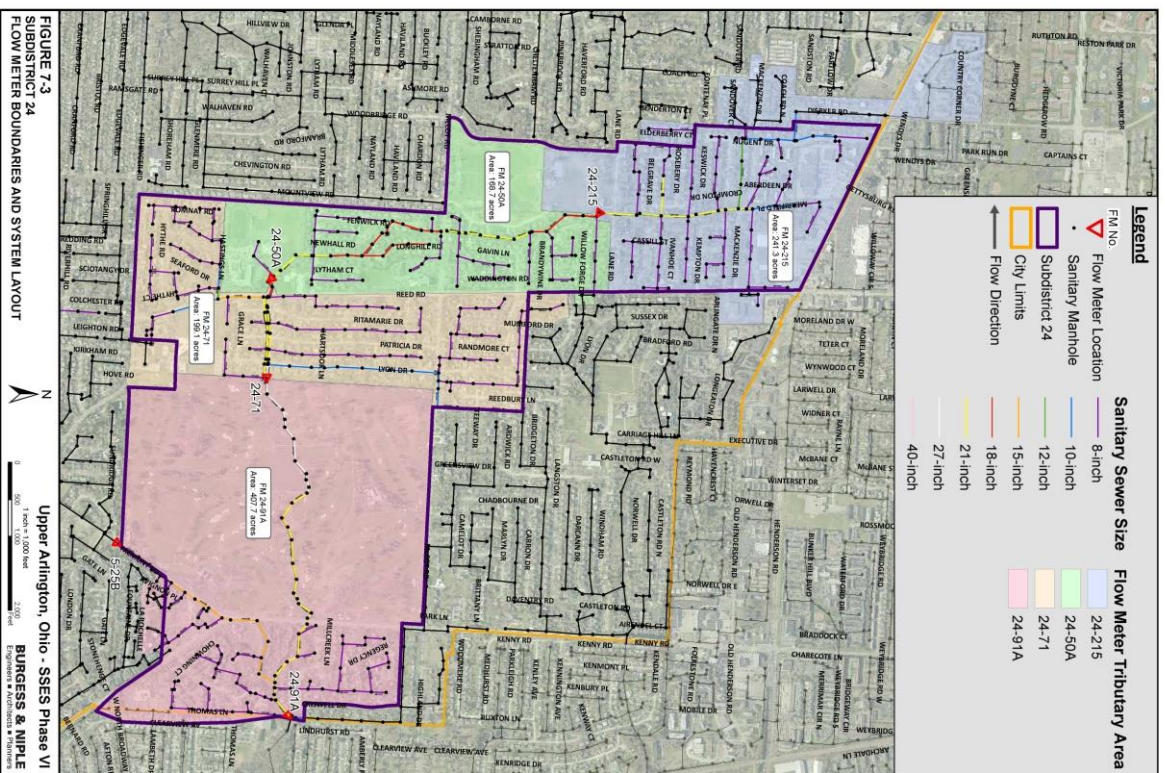
- 3-4 Month Minimum Duration
- 1 Year is optimum for Data Collection
- Minimum of 1 Tipping Bucket Rain Gauge



Flow Meter and Rain Gauge Location Selection

- Select locations with 5,000 to 10,000 feet of Tributary Area
- Use Data Gathering Info to Guide Flow Meter Location Selection
- Install Meters for Baseline Comparison

Flow Meter Tributary Area Map



Detailed Flow Meter Locations Manhole Inspections

- Once Tributary Area Selected
 - Verify Locations
 - Observe Hydraulic Conditions and Debris Levels
 - Confirm Pipe Diameters
 - Inspect Flow Split Locations
- Fill out Inspection Sheets
- Take Pictures!

Flow Meter /Rain Gauge Installation



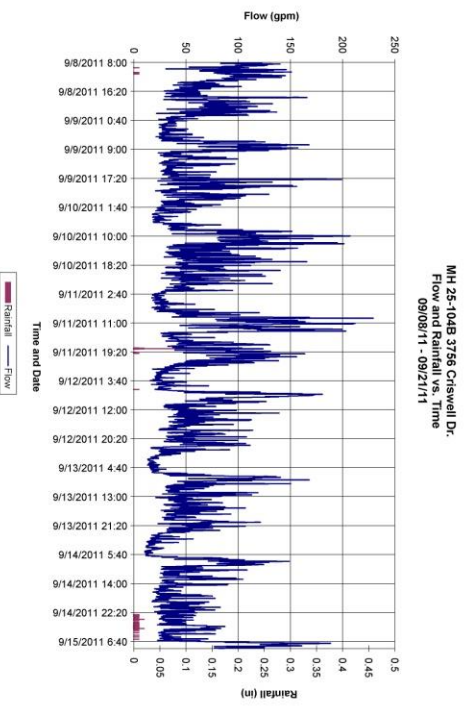
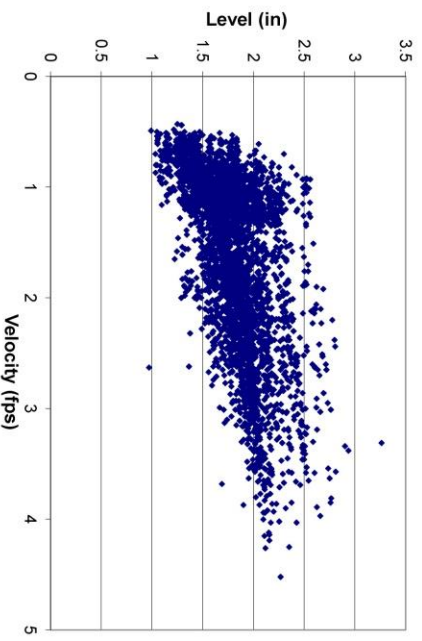
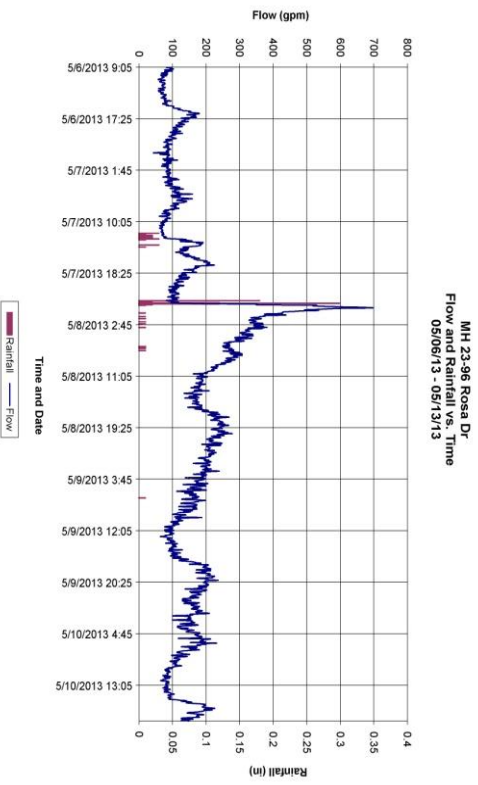
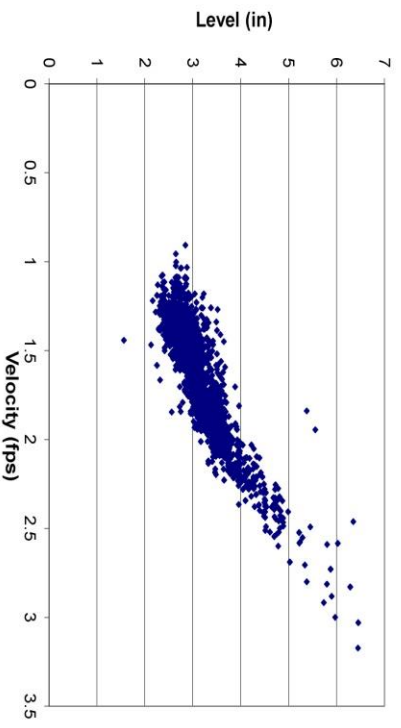
- No Flow Meter is Suited for Every Situation
- Each have their site conditions where they perform at their best.



Flow Meter / Rain Gauge Maintenance

- Weekly Downloads – Check Batteries!
- At a Minimum Monthly Flow Confirmations
 - Level Pressure Transducer Drift
 - Debris partially covering velocity sensor
- Weekly Data Processing and QA/QC
 - Hydrographs of Flow vs. Rainfall
 - Scatter Graph of Velocity vs. Level

Flow Data QA/QC

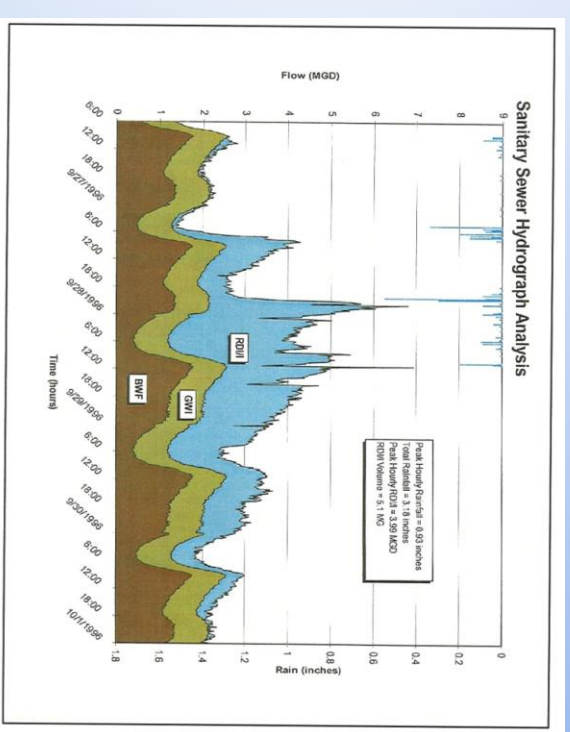


Flow and Rainfall Data Analysis

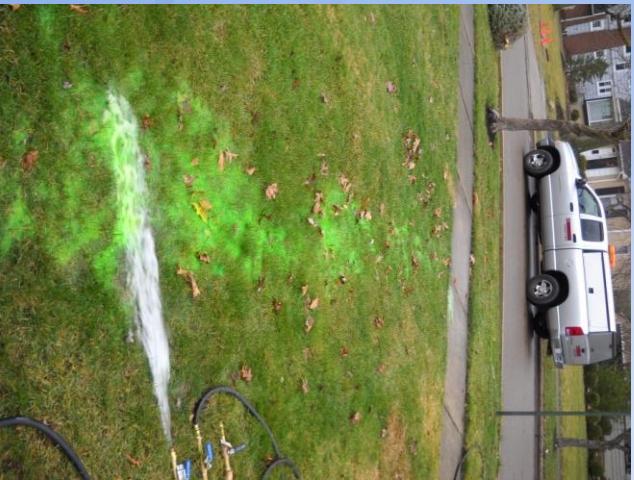
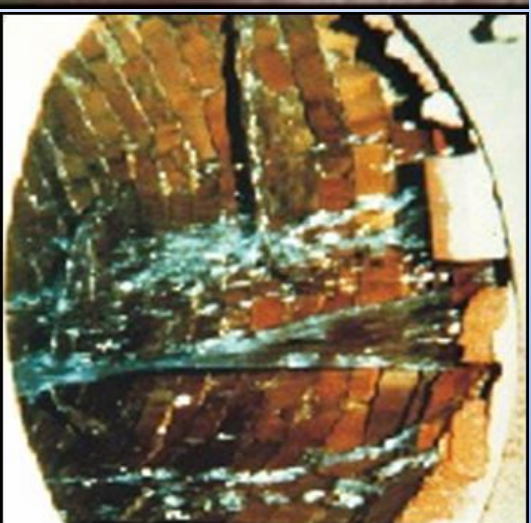
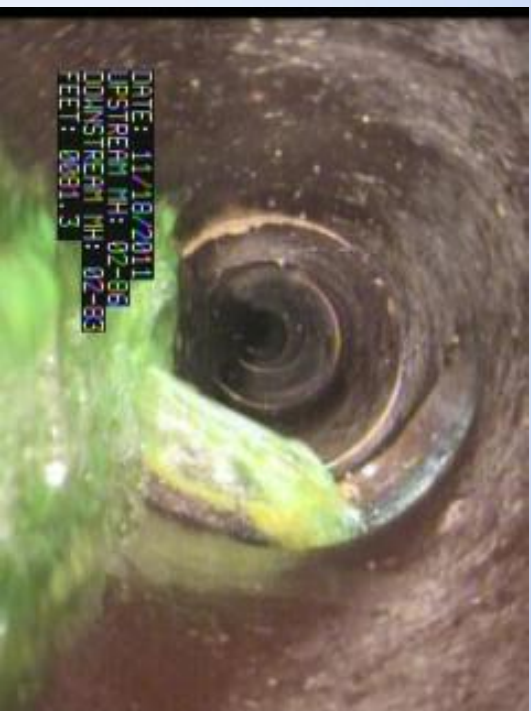
- Capacity Sheets or Hydraulic Model
 - Pros and Cons to each
- Determine Sanitary Sewer Base Flow
 - Water Consumption Records
- Determine Base GWI and Allowable GWI
- Determine the RDII

Further Data Analysis

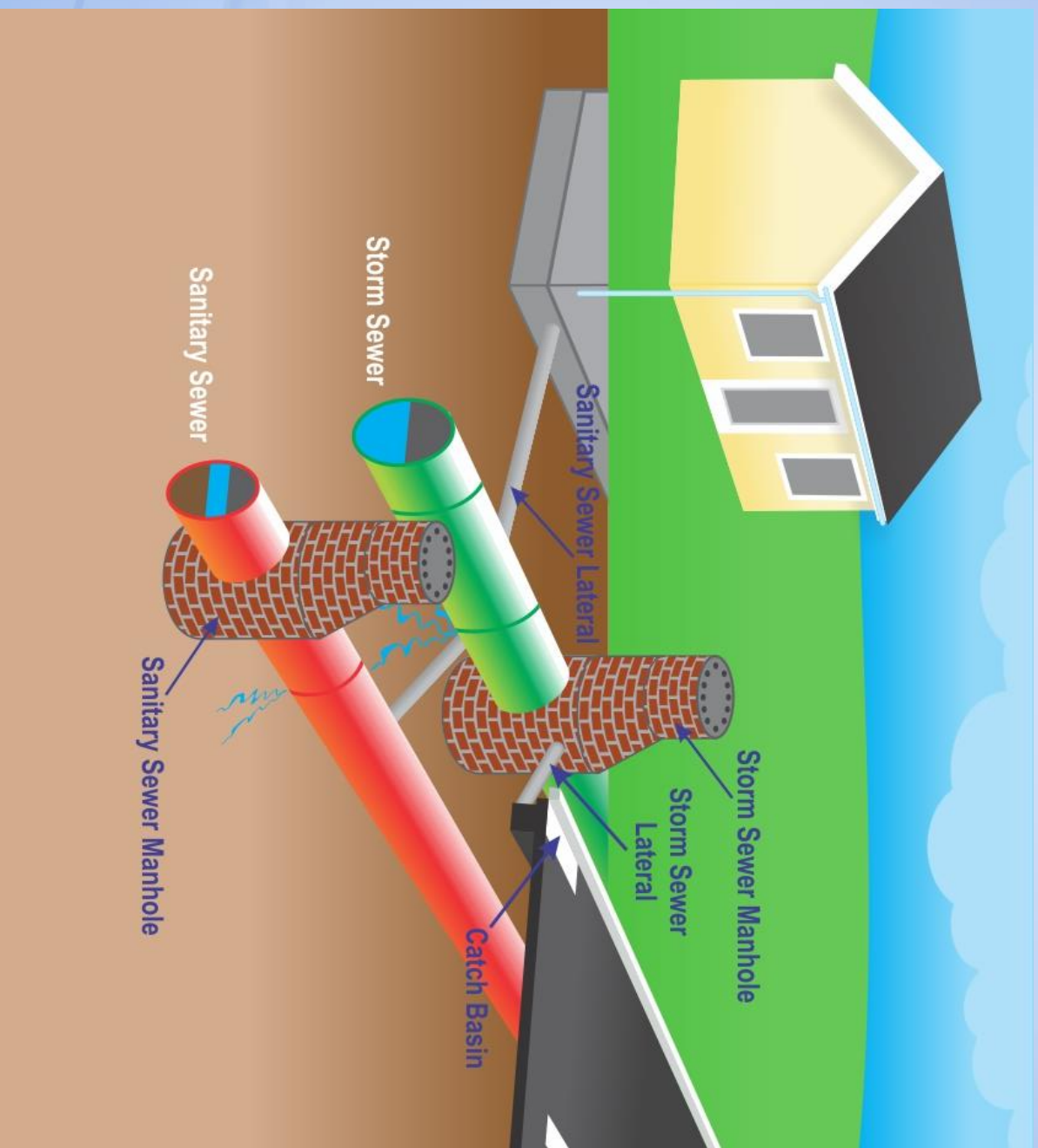
- Correlate Peak Flows to Rain Fall Return Events
- Determine under Capacity Pipe Sections
- Review Tributary Area
- Determine Acceptable Level of I/I
- Prioritize Areas for Further Testing



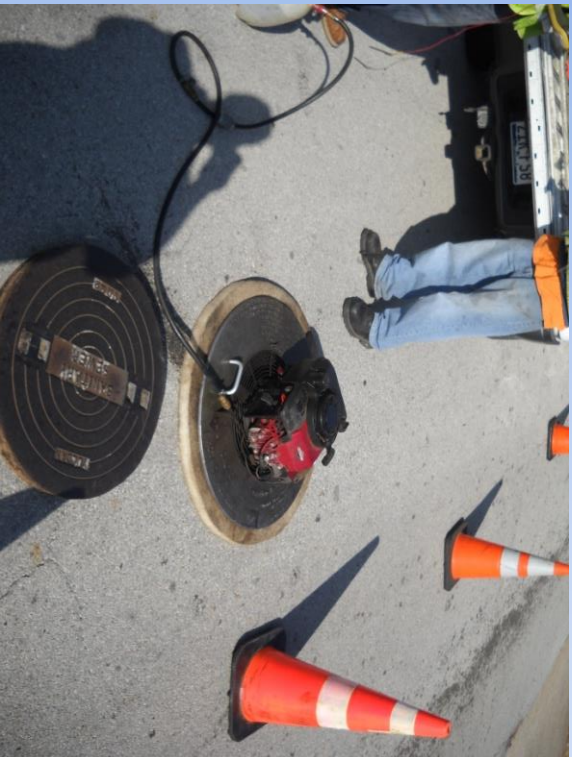
Where is the Water Coming From?!



Typical Separate Sewer Configuration



Smoke Testing



Smoke Testing Data Collection

Smoke Testing Form

Project Name: NEW IBERIA
Client Name: NEW IBERIA
Date: 1/21/2011
Map Grid: 4-5
Technicians: RC, SS

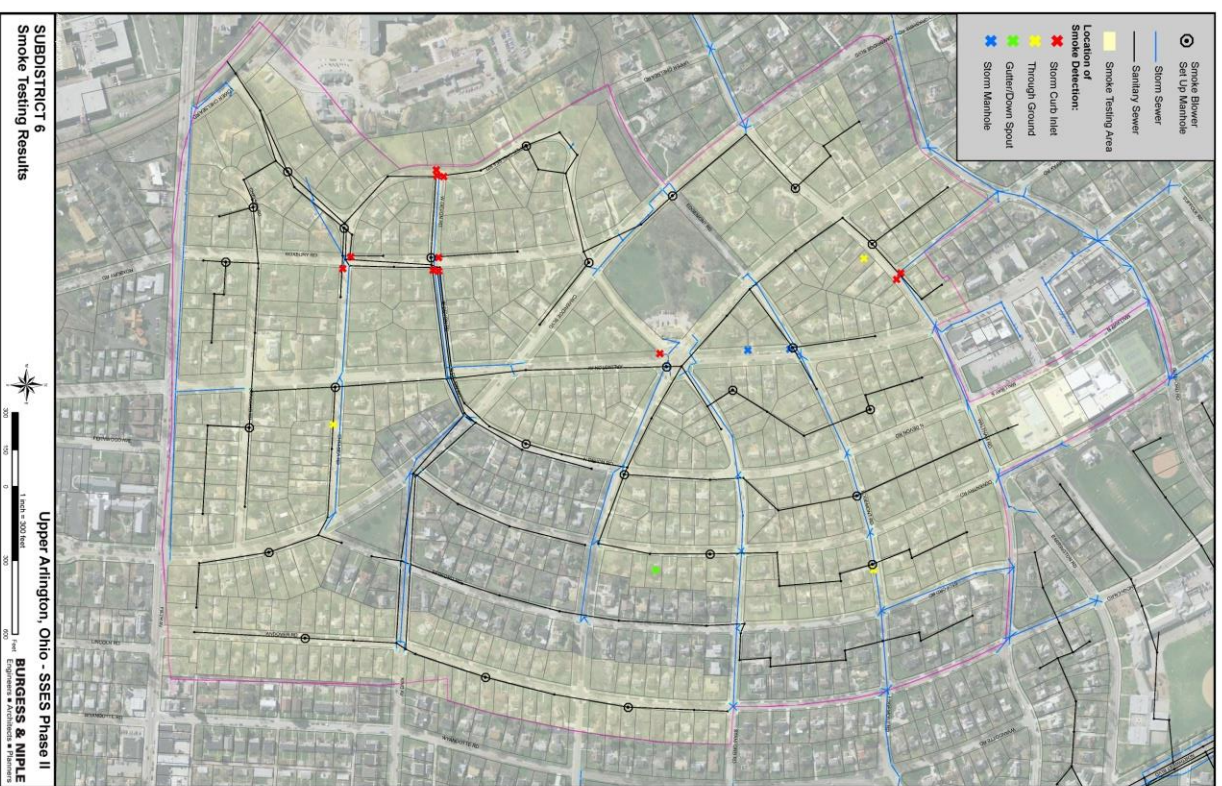
General Information
Address: 5085 Reed Road
Upstream Node Name: 4-23
Downstream Node Name: 4-4
Line ID: 4-23-4-4

Cover Information
USMH Cover Holes?: **USMH Cover Slots?:**
Number of Holes/Slots: **Size of Holes/Slots:**
Ponding?: **Print Correction?:**

Pipe Information
Pipe Length: 185
Pipe Size: 8
Surface Cover: ASPHALT
Smoke_Leak:
Length Smoked: 185
UTSC Code: N/A
Comments: NONE

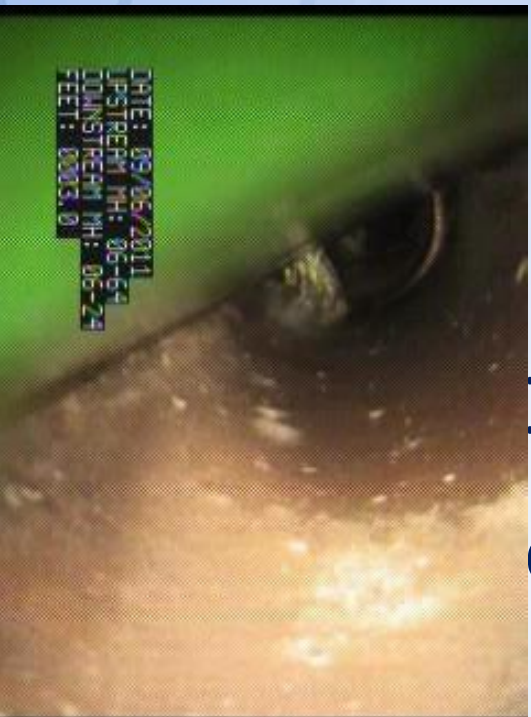
Smoke Defect Information

Line ID	Leak Address	Leak Number	Leak Type
4-23-4-4	5085 Reed Road	1	MAIN LINE



Dye Testing

- Key to Identifying I/I Pathways
- Select Locations Based on Flow Metering, Smoke Testing and Flow Prioritization
- Must be performed in conjunction with CCTV
- Storm Sewer Mapping is very important



DATE: 09/06/2011
UPSTREAM NH: 06-69
DOWNSTREAM NH: 06-24
FEET: 0003.0

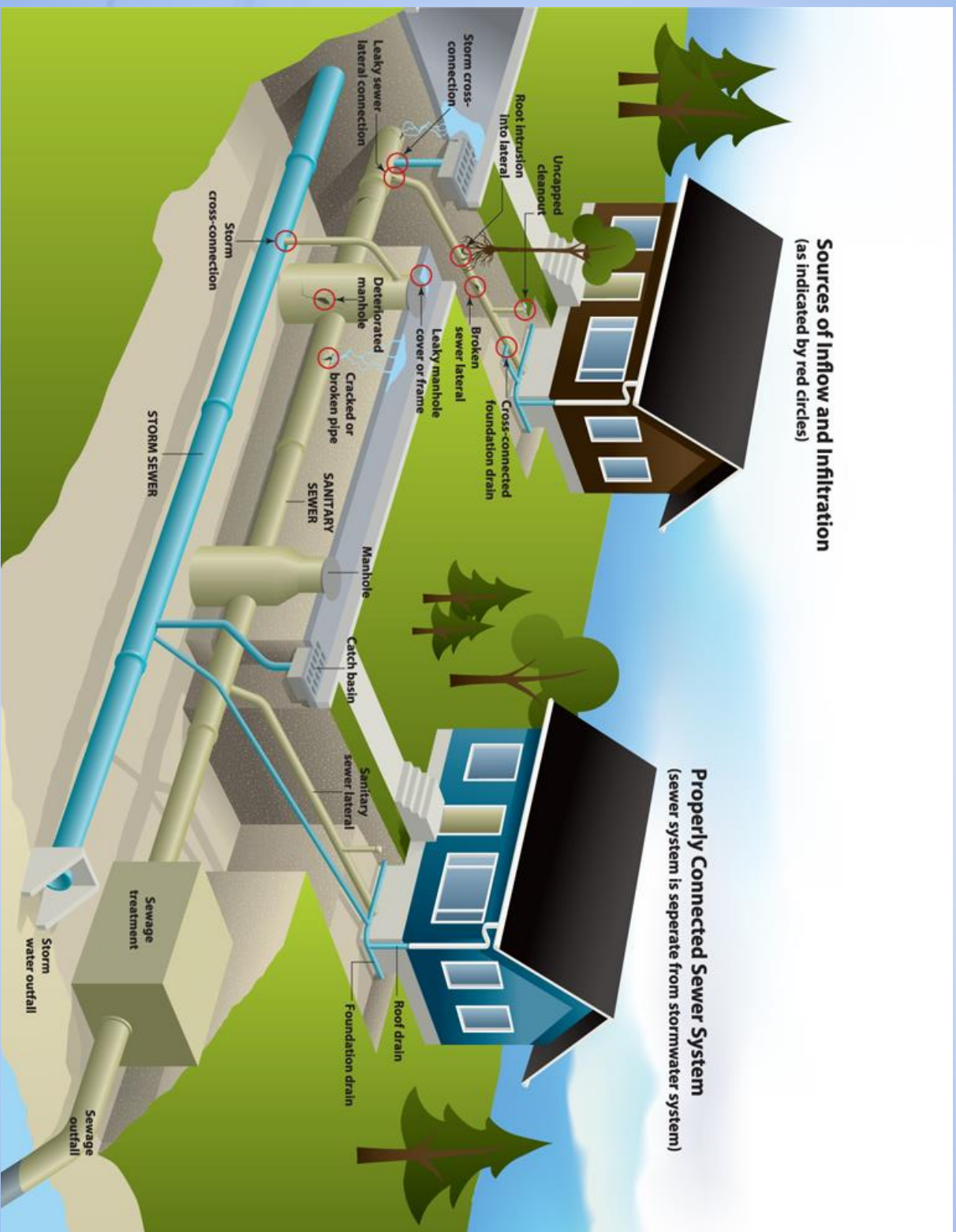


DATE: 09/09/2011
UPSTREAM NH: 06-144
DOWNSTREAM NH: 06-145
FEET: 0052.9

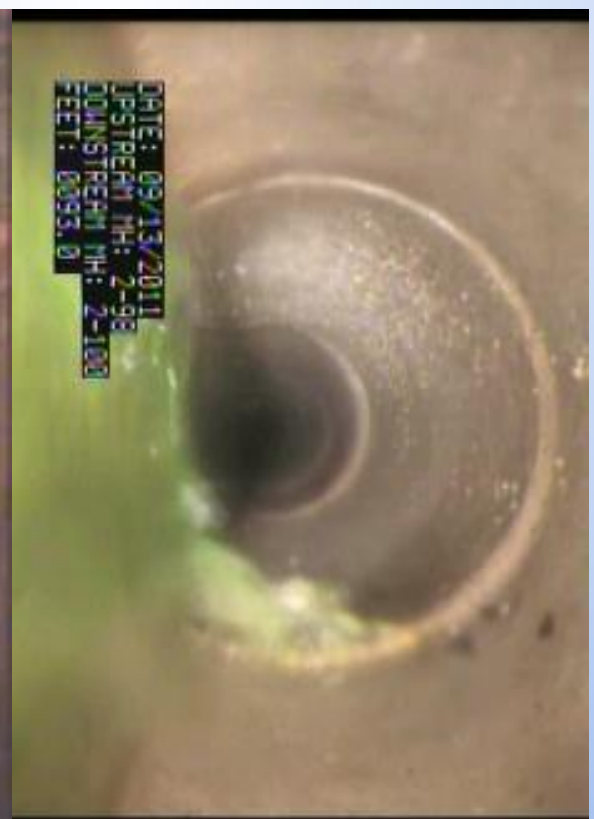
Public Dye Testing

- Determine Storm Sewer Capacity
- Perform Rainfall Simulation to Known Storm Event
- Perform Testing on:
 - Manholes
 - Parallel Storm and Sanitary Lines
 - Perpendicular Storm and Sanitary Lines in close vertical proximity

Identification of I/I Pathways

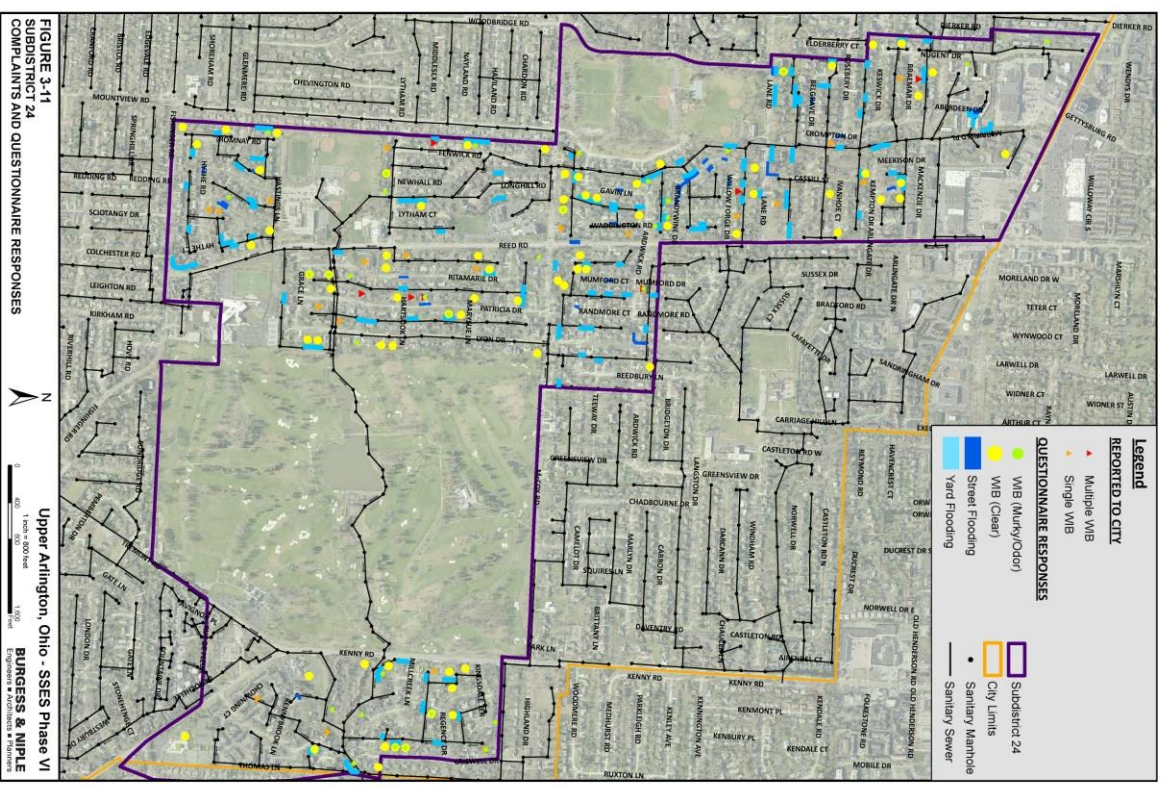


Public Dye Testing Results



Private Dye Testing

- Use Questionnaire Results and WalkABOUTS to determine unique characteristics to the testing area



WalkABOUTS??

WEST FIFTH AVENUE
 I/1 REMEDIATION PROJECT
 PROPERTY OBSERVATION FORM

STREET NAME **ELMWOOD AVE** (1 OF 2) SEWERSHED 22

Address	Business	Yard Ponding	Street Flooding	Lateral in B-F-S	Sag Over Lateral	Gutter Missing	Gutter Clogged	Surface Drains to -----	Downspout Onto Ground	Sump Onto Ground	Downspout Into Ground	Sump Into Ground	Ranch on Slab	Ranch w/ Basement	BI-Level	BI-Level w/ LL Garage	Split Level	2-Story on Slab	2-Story w/ Basement	Garage Trench Drain	LL Back Entrance Drain	Yard Drain	Good Prospect to Flood	Date of Quick Response
1423 1424		X																						
1429		X																						
1432																								
1439																								
1440		X																						
1445		X																						
1448																								
1451																								
1456																								
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1480																								
1483																								
1486																								
1489																								
1492																								
1494																								



Public Interaction and Outreach

- Coordinate with Homeowners time for internal plumbing inspection
- Offer a copy of the lateral inspection CCTV
- Get your Property Access Permission form Completed



TO THE PROPERTY OWNER OR TENANT

We stopped by to see you on ____/____/____ regarding:

Sewer System Evaluation

Dear Resident:
The City of Columbus, Division of Sewerage and Drainage (DOSD) has retained Burgess & Niple, Inc. for the evaluation of the storm and sanitary sewer systems within the West Fifth Avenue Area. Employees from Burgess and Niple, and subcontractors Brown and Caldwell, will be in the area to perform field investigations in relation to the study. We are requesting that you participate in the three upcoming activities listed: 1. Owner/Resident interviews regarding basement and area flooding; 2. Testing of your laterals, downspouts, foundation drains, sump pumps and yard drains (if applicable); 3. Private Sewer system inspections/televising your sewer laterals.

Please contact Mr. Louis McFarland of Burgess & Niple, Inc. at (614) 309-8646 or via email: lmcfarland@bunipb.com to schedule an interview and inspection of your private sewer system which takes approximately 20 minutes. Please note that field personnel may need to enter your home to conduct the interview and inspection. All workers will be wearing City-issued identification badges.

Thank you for your cooperation. If you have any questions please contact Mr. Louis McFarland at (614) 309-8646 or via email: lmcfarland@bunipb.com or Nick Domerick, Columbus Division of Sewerage and Drainage project manager at (614) 645-4693.



Department of Public Utilities
Division of Sewerage and Drainage
1250 Fairwood Ave.
Columbus, Ohio 43206
www.sewers.columbus.gov

Property Permission Access Form



BURGESS & NIPLÉ

Phase 1 Dye Testing Form

Recommended for Phase 2: Y/N

Project Manager: Nick Domenick
 Project Name: W. 5th Avenue SAS VI
 Project Job #: 43222
 Testing Crew: FeeCorp
 B&N Field Rep: L.A. McFarland
 Others Present: Brad

Street Address: 978 Chambers Circle
 Arrive Time: WT 2 PM CCTV 2:15 PM
 Depart Time: 3:55 PM
 Testing Date: 6/11/2008
 Sanitary Main Size: 10 Inch
 Downstream MH: 0027S0104
 Upstream MH: 0027S0092
 Lateral Location: 77-FROM MH0104
 Rain in last 24hr

Weather: Dry

Test Type: Residential Commercial Undeveloped
 Color Dye Used: Gutters/Downspouts Area Drains Trench Flooding
 Green: Foundation

Dye Transfer: _____

Time Water Started: 2:45 PM
 Time Water Stopped: 3:35 PM

Time Dye Observed: **NO DYE PRESENT IN SANITARY SEWER.**

Estimate of Water used: 1,000 GAL

Downspouts Tested: RF LF CF CR RR LR

Area Drain Tested: NONE

Dye Observation Location: BASEMENT & SUMP PUMP.

Sump Pump: **DYE DISCHARGED ONTO GROUND.**

Leak Rating: .5 or less 1 to 3gpm 3 to 5 gpm Greater 5 gpm

Leak Rating w/out CCTV: Trace Weak Diluted Direct Conn.

CCTV Equipment used:

CCTV Operator Initials: DD

Additional Equipment Needed: _____



Exhibit 1

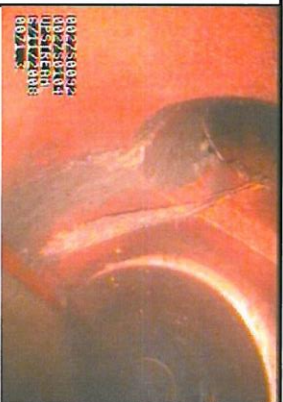


Exhibit 2

Site Comments: DYE LEAKING THROUGH N. BASEMENT WALL, FLOOR DRAIN CAPPED.

BURGESS & NIPLÉ



**CITY OF UPPER
 ARLINGTON**

ENGINEERING DIVISION
 4100 Roberts Road • Columbus, OH • 43228
 Phone: 614.687.5381 • Fax: 614.447.3270 • www.us-ohio.net

**Upper Arlington Sanitary Sewer Evaluation and Survey
 Property Access Permission Form**

Owner's/Resident's Information

Name: _____
 Address: _____
 Phone: (H) _____ (W) _____ (C) _____
 Best Time to Contact: _____

Property Being Investigated (if different from above address):

I, _____ have been informed and understand the tasks necessary to perform the investigations for the Upper Arlington SSES Study. With my signature below, I grant permission to the City of Upper Arlington, Ohio and its agents, Burgess & Niple, Inc. and Flow Line, LLC, to enter my property at the above location for the purpose of performing one or more of the following investigation tasks at a verbally agreed upon time and date.

- Sewer lateral televising
- Sewer lateral cleaning
- Rain water simulation tests on the exterior of the house/structure
- Clear water and/or dye testing inside and/or outside the house/structure as indicated below:

The City's consultants are insured to perform this work and will restore your property to its pre-inspection condition including any plumbing fixtures that may be accessed. My signature also indicates that I am the rightful property owner and/or resident of the property location(s) where the investigation is to occur.

Owner's or Resident's Signature _____

Date _____

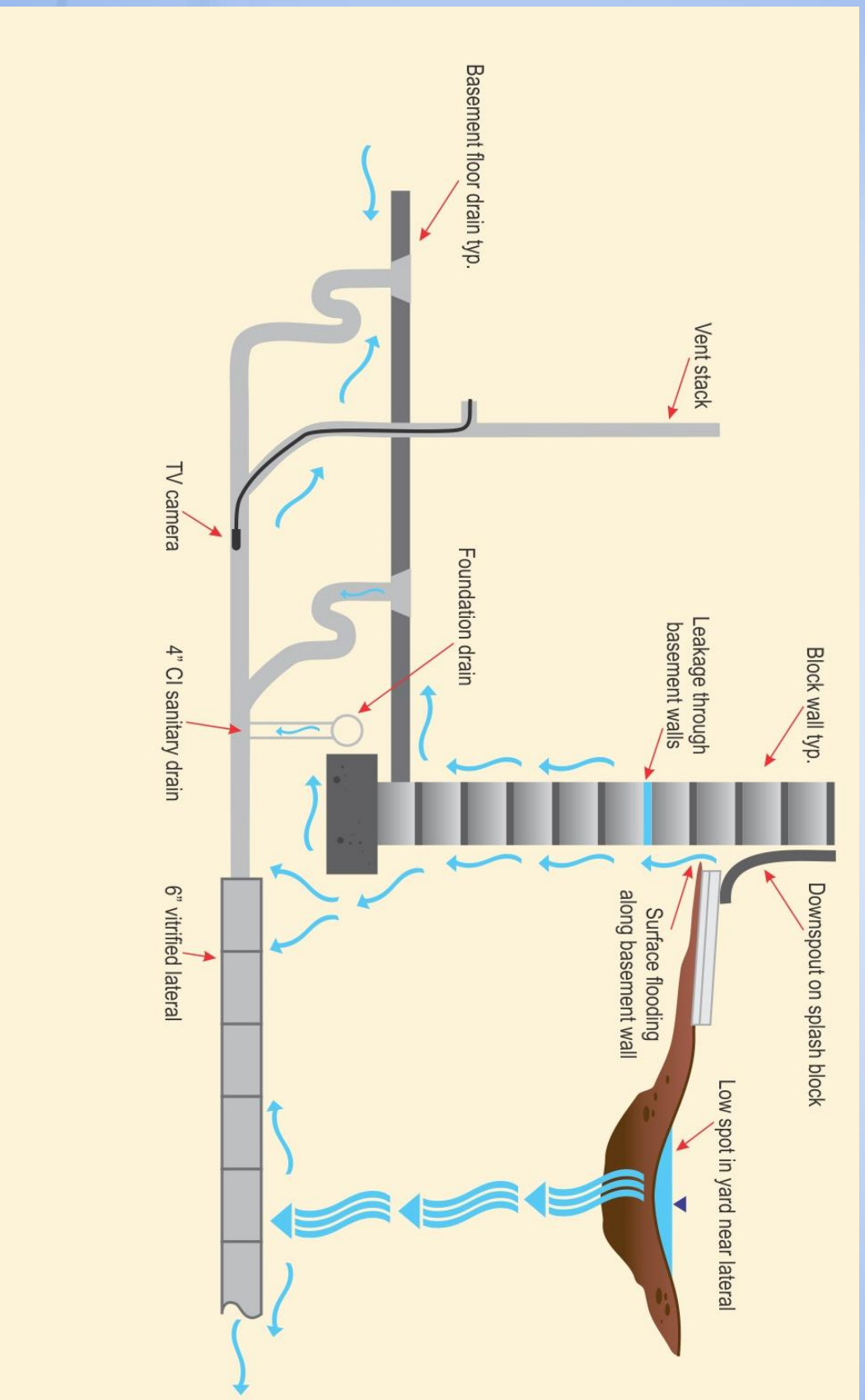
Starting the Private I/I Testing

- Based on County Auditors Mapping determine roof area for homes that are being tested
- Calculate Runoff Rate from Home Roof and Impervious areas
- Divide Runoff Rate by Number of Downspouts
- Calibrate Gutter Hangars Flow

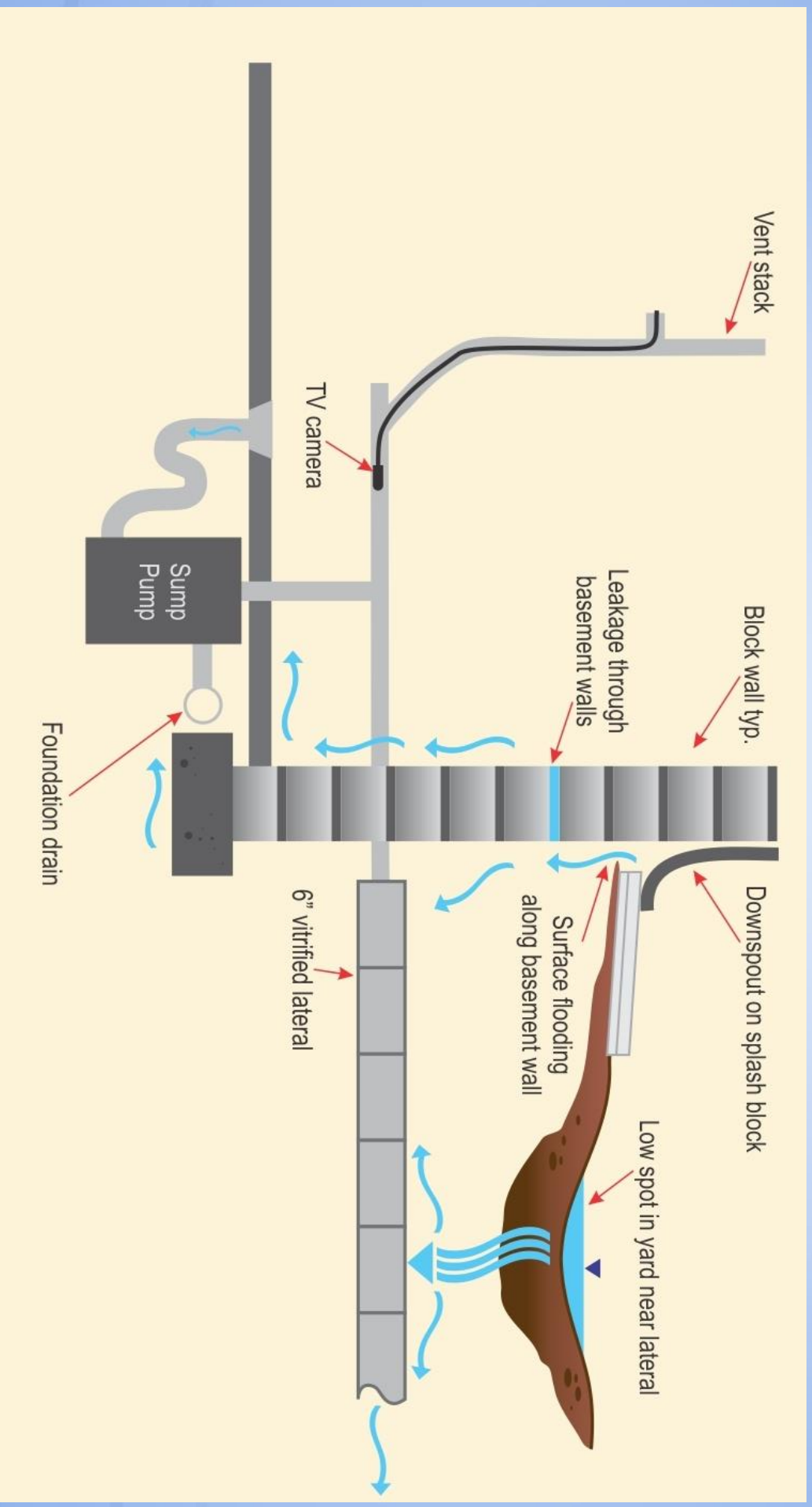
Water Usage Table									
	30-Minute			1-Hour			2-Hour		
	Rainfall (in)	Flow Rate (gpm)	Volume (gal)	Rainfall (in)	Flow Rate (gpm)	Volume (gal)	Rainfall (in)	Flow Rate (gpm)	Volume (gal)
2-Year Storm	1	21	623	1.27	13	792	1.57	8	979
5-Year Storm	1.24	26	773	1.57	16	979	1.94	10	1,209
10-Year Storm	1.43	30	891	1.81	19	1,128	2.24	12	1,396
25-Year Storm	1.72	36	1,072	2.18	23	1,359	2.69	14	1,677

NOTES:
1. The flow rate in gpm assumes a roof with a 1,000 square foot surface area.

Private I/I Pathways without Sump Pump



Private I/I Pathways with Sump Pump



Private Lateral Cleaning Photos

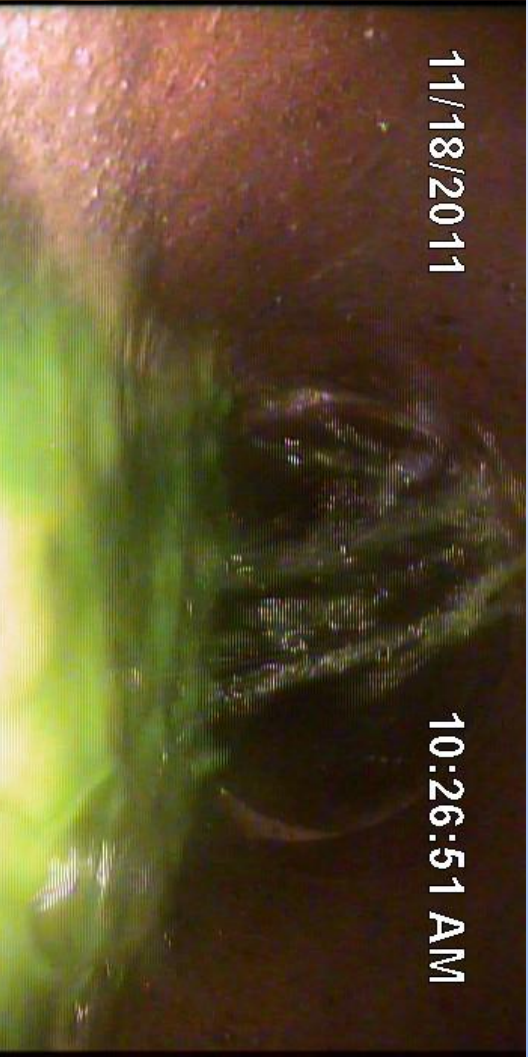


Rain Fall Simulation Locations

- Downspouts
- House Foundations
- Yard / Driveway Drains
- Lateral Locations
- Low Spots or Sunken Sidewalks
- Lower Entry Steps and Driveways



Private Dye Testing



11/18/2011

10:26:51 AM



BURGESS & NIPLE



Innovative ways Homeowners Deal with I/I



Develop Prioritization of Locations, Pilot Projects

- Based on Public and Private Dye Testing
Results and Extrapolation – Develop
Prioritization of Locations for Pilot Projects

Follow Up Flow Metering

- Quantify Impact of Improvements
 - Reduction of RDII flows 380 GPM - remediated 76 homes
 - Columbus Still Waiting on Results from Clintonville Lateral Rehabilitation Pilot Project

Questions??

Ogres are like onions. Ogres have layers. Onions have layers. You get it? We both have layers.



Shrek (2001)
www.the-poisoned-apple.com

Contact Information

John Swartzbaugh, PE

John.Swartzbaugh@burgessniple.com

Office- (614) 459-2050

Mobile – (614) 989-7759

