This presentation premiered at WaterSmart Innovations

watersmartinnovations.com

Proof that Porous Asphalt Can Succeed In a Midwestern Climate

(Kicking Asphalt – the truth about porous pavement!)

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Nature's Voice Our Choice
Wednesday, October 5th, 2011

Presentation Outline

1. Project Overview
2. NVOC Involvement
3. Importance of Monitoring
4. Observations & Findings
5. Conclusions
6. Next Steps

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THE INDUSTRY TALK

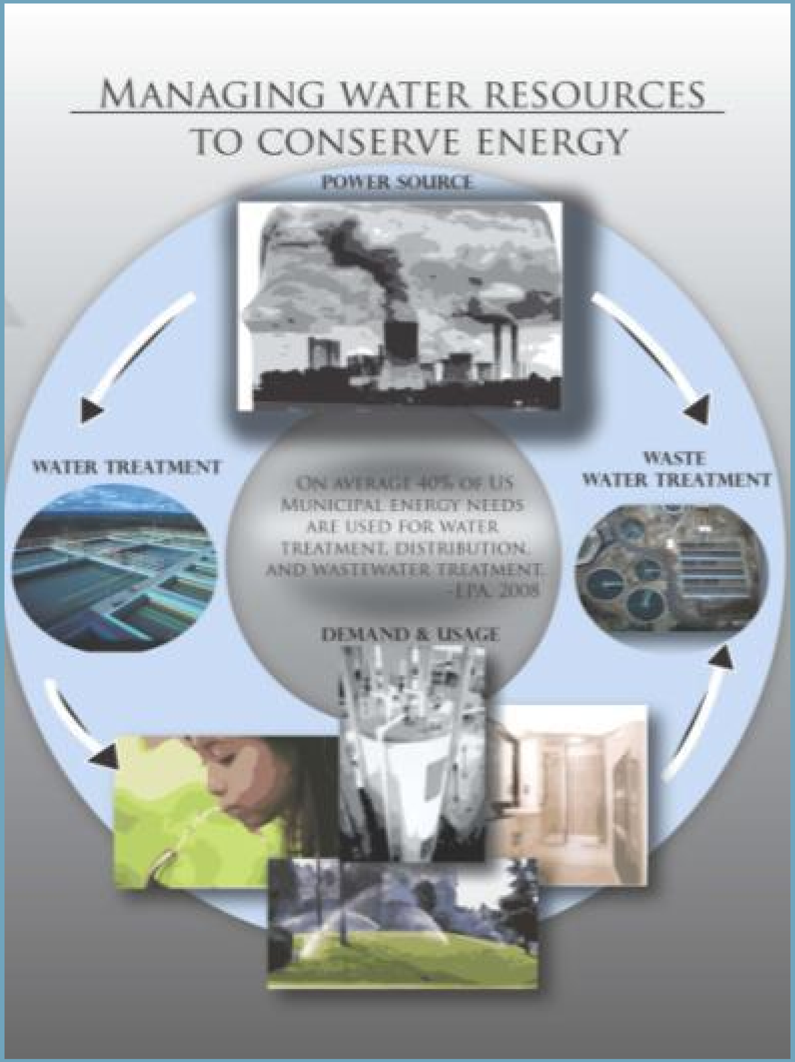
The Hypothesized Benefits:

- Decreased flooding from sheeting runoff
- Increased friction when icy
- Less salting required
- Increased infiltration and groundwater recharge
- Improved water quality
- Minimized and/or elimination of storm sewer pipe
- Reduced carbon emissions
- Ideal for use with bio-infiltration

WHY SYLVAN AVE?

- **The WRMEC program mission is to bring public service to the engineering field.**
- **In light of a rapidly changing climate there are two opposing forces to adaption and mitigation:**

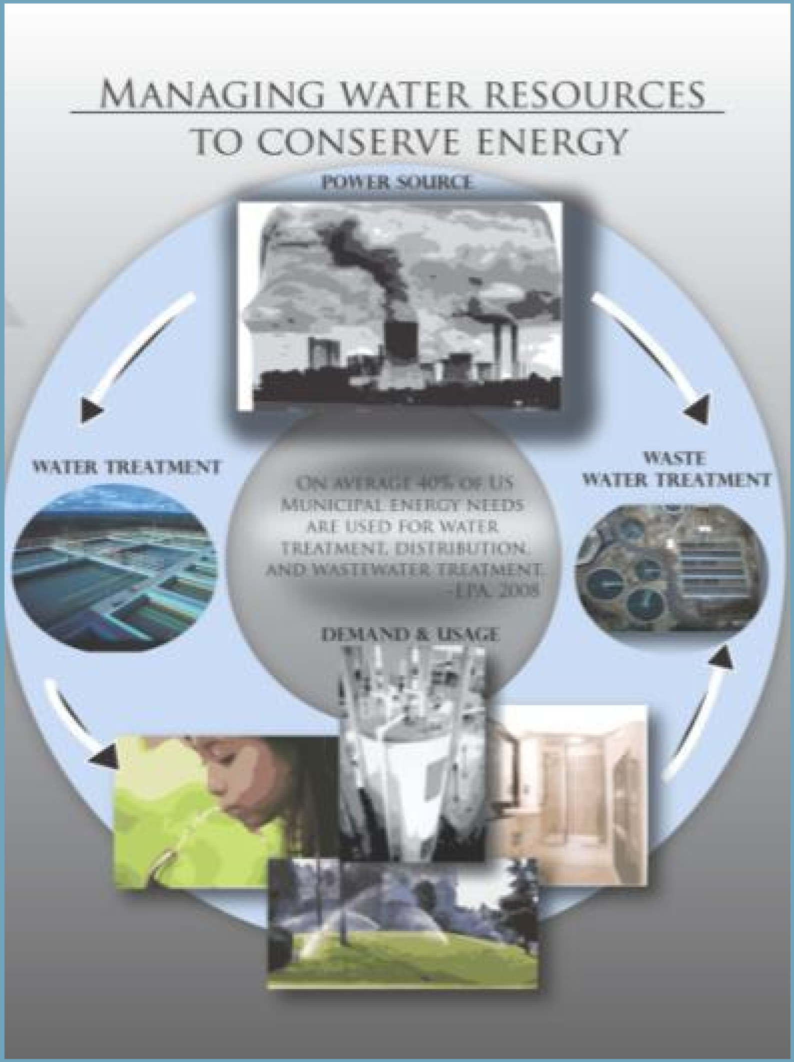
1. *A need to see tangible projects that can support theoretical solution and*
2. *A nation with roughly 19,000 municipal governments for which extreme budget and closely held purse strings preclude many pilot (risky) projects.*



WHY SYLVAN AVE?

NVOC's interest in flow monitoring on Sylvan Ave:

1. Lack of information and long-term results for performance, benefits, and economics.
2. The project is in our own backyard – so why not!



Sylvan Ave, Ann Arbor, MI

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Sylvan Ave ~ Ann Arbor, MI

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December 9, 2009

Monitoring Objective

One Big Question:

What are the positive residential and environmental impacts of a porous pavement street?

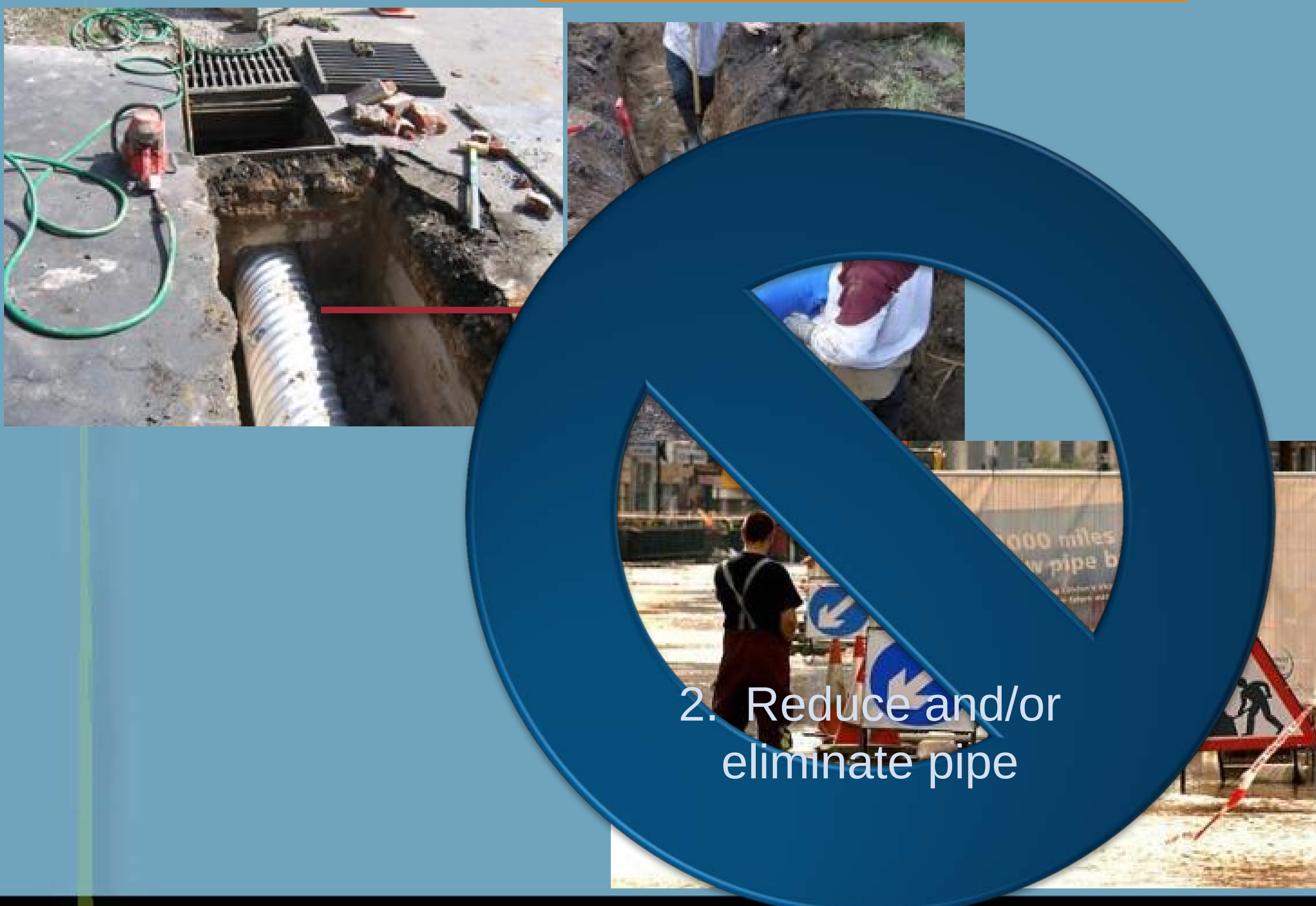
Porous Street Design

3 - Ideal Outcomes

1. Decrease Flooding
&
Increase Infiltration

Porous Street Design

3 Ideal Outcomes



2. Reduce and/or eliminate pipe

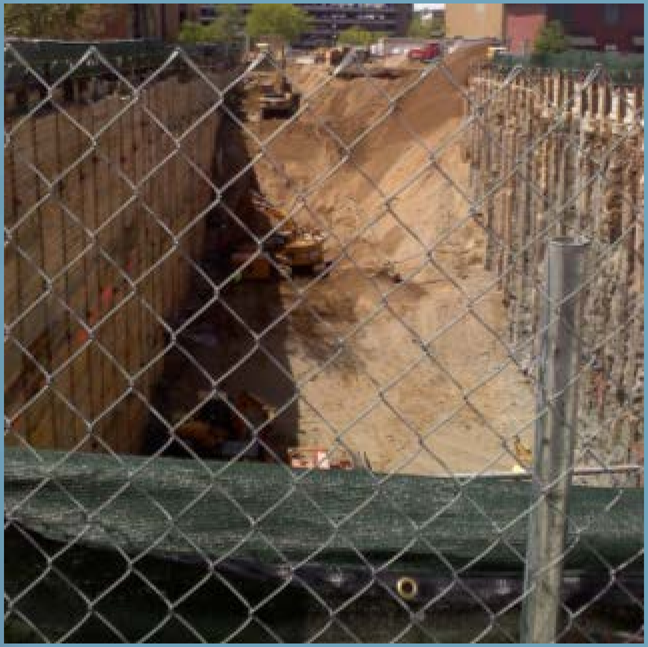
Porous Street Design

3 - Ideal Outcomes

3. Increased water quality

Porous Street Design

Ideal Conditions



Sandy A and B type Soils

Photo from: http://www.flickr.com/photos/wentzelepsy/4607131640/

Sylvan Conditions

Sandy - Clay

Porous Street Design

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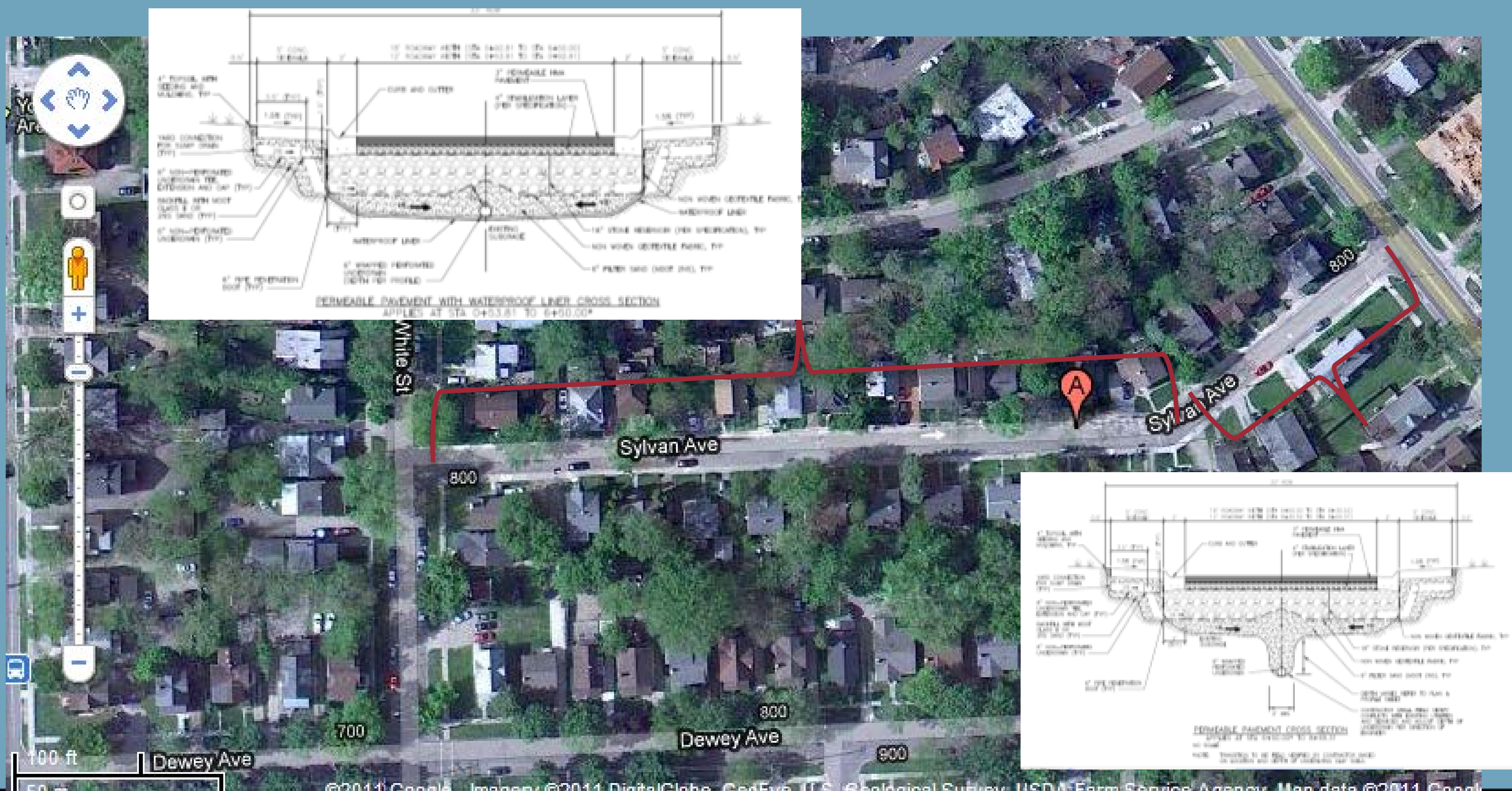
Sylvan Ave Design



Porous Street Design

Ideal Design

Infiltrate run-off, attenuate peak discharge, and retain onsite. Often used in combination with vegetated area.

Sylvan Ave Design

Infiltrates runoff, attenuates peak discharge, but no retention onsite. It has an under drain that directs the runoff to the storm sewer.

PROJECT TIMELINE – COMPLETED TO DATE

Before Construction


White
STOP


STOP

During Construction


STOP
ABC PAVING COMPANY

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Ribbon Cutting Ceremony

POST CONSTRUCTION

FIRST WINTER - 2011

Is The Street Less Icy/Snowy?

Photos Take January 20th, 2011 – a cold and icy day that was preceded by a couple days of warming and thaw.

Icing Comparison – Pre & Post Construction

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Pre-construction
February 2010

Post-construction
February 2011

First spring - 2011

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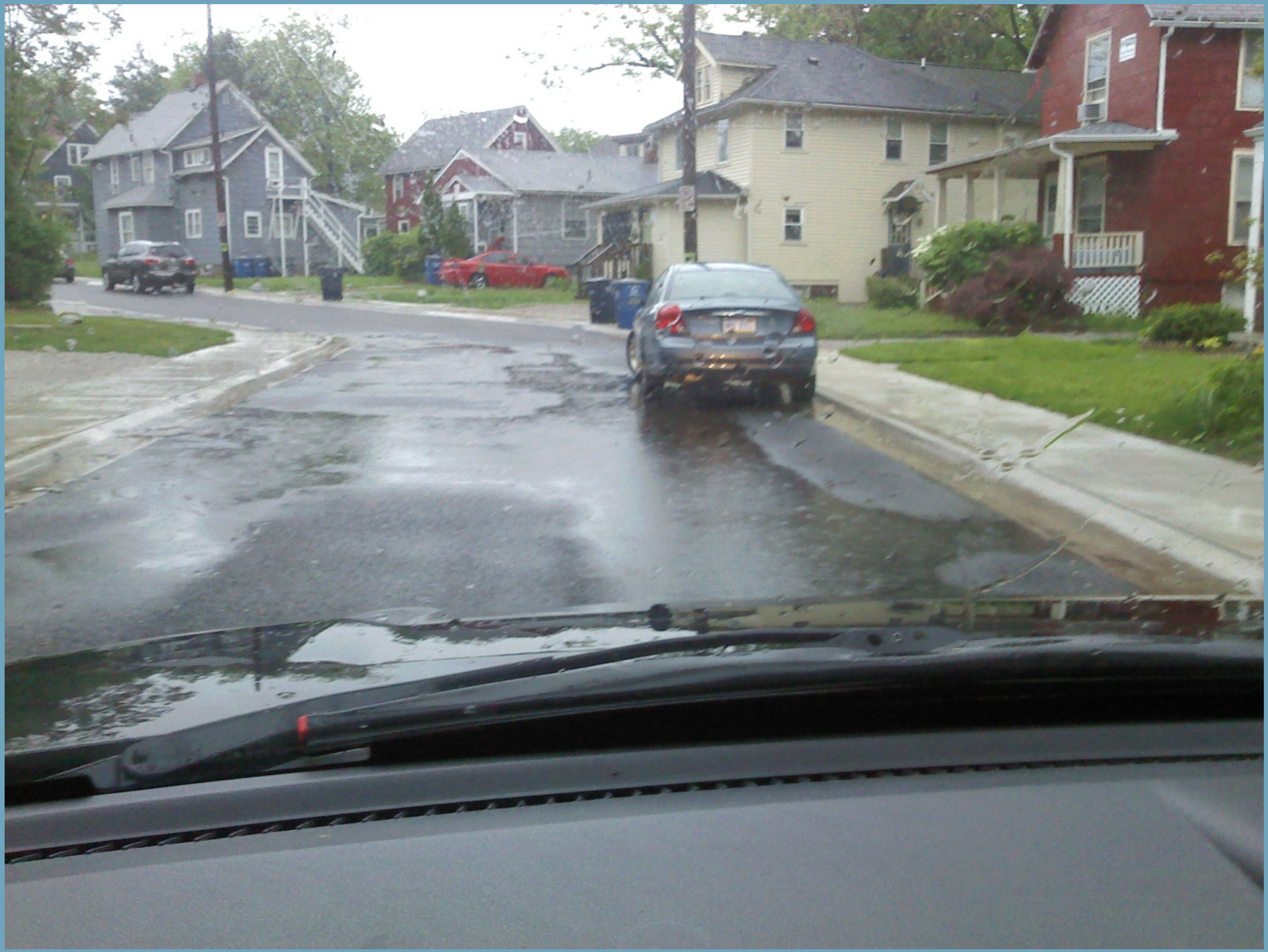
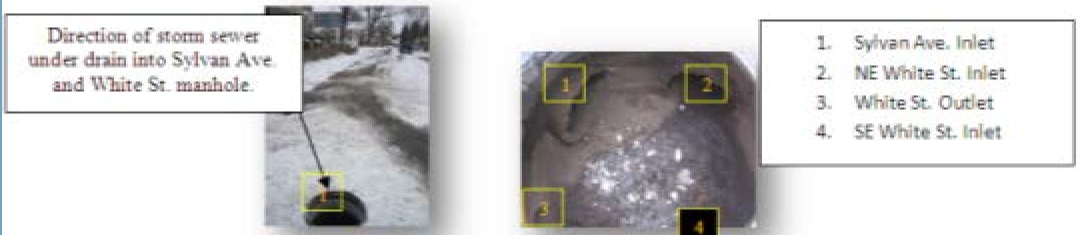


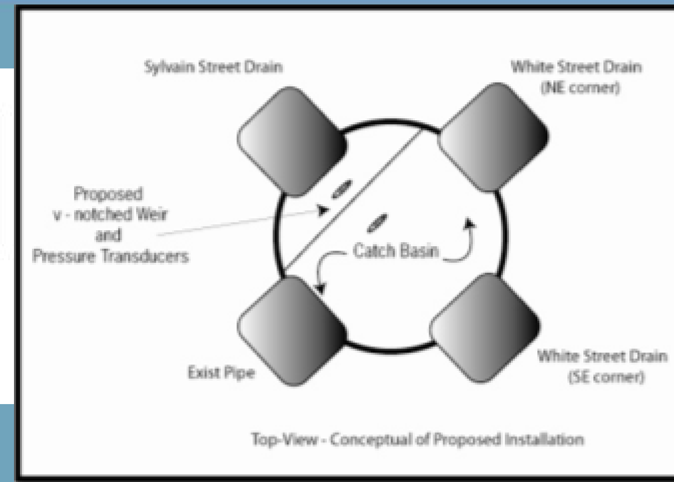
Data Collection – what we need to answer the Big Question

1. How do the run-off volumes change before and after installation of the porous asphalt?
   a) Is there less runoff and more infiltration? If so how much?
   b) How do the runoff and infiltrated volumes compare to the total impervious drainage area?
   c) How does the hydrograph curve change before and after installing the porous pavement?
2. If installing this application in conjunction with a bio-retention facility, how big would it need to be, and what event sizes could it handle before overflowing?
3. Do the residents see a decrease in runoff or standing water?
4. Do the residents see a decrease in flooding or sump pump usage?

Monitoring Design – Proposed



Photos 3 and 4: Photos taken of Sylvan Avenue and manhole, taken 2/12/2010.



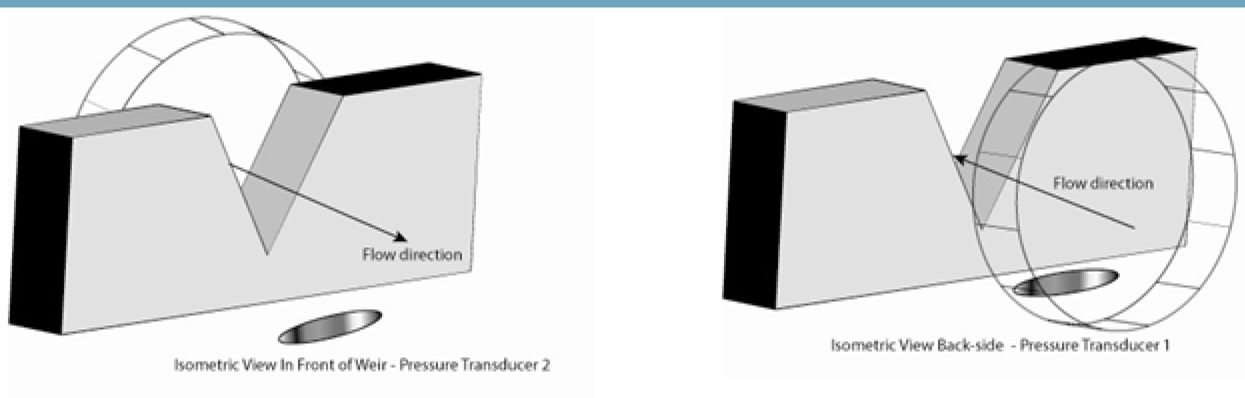


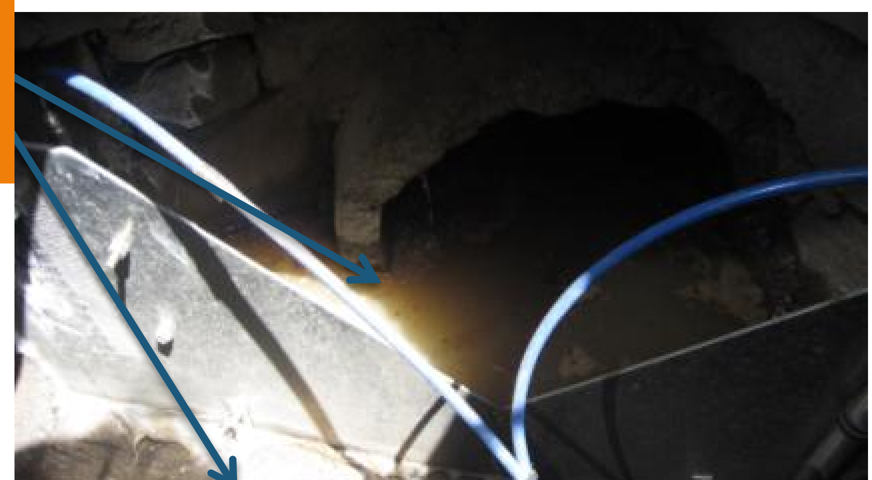
Figure 2 and 3. Isometric view of weir plat and pressure transducer - **Note – the figure is not drawn to scale, and the weir plate is actually much thinner.*

Weir Dimensions:

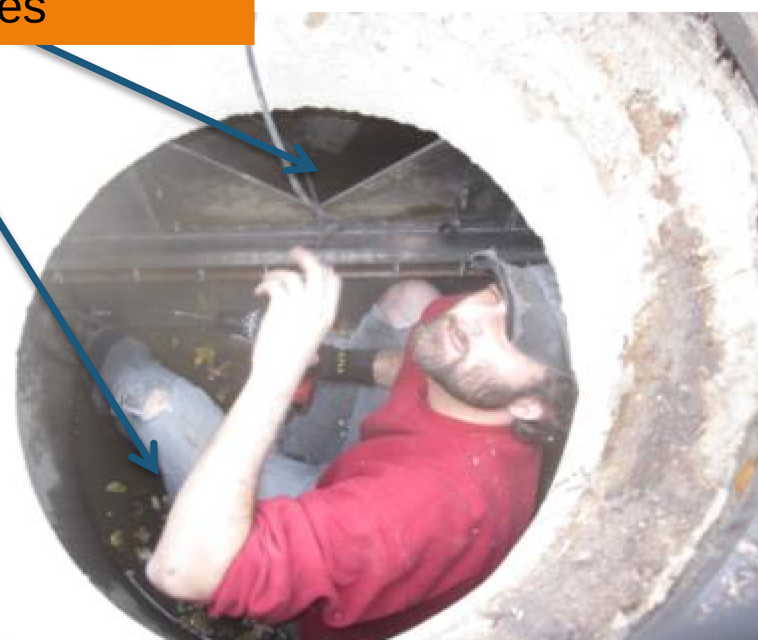
Photo Taken – 5/4/2010

Often standing water behind, And dry in front

Photo Taken – 5/26/2010

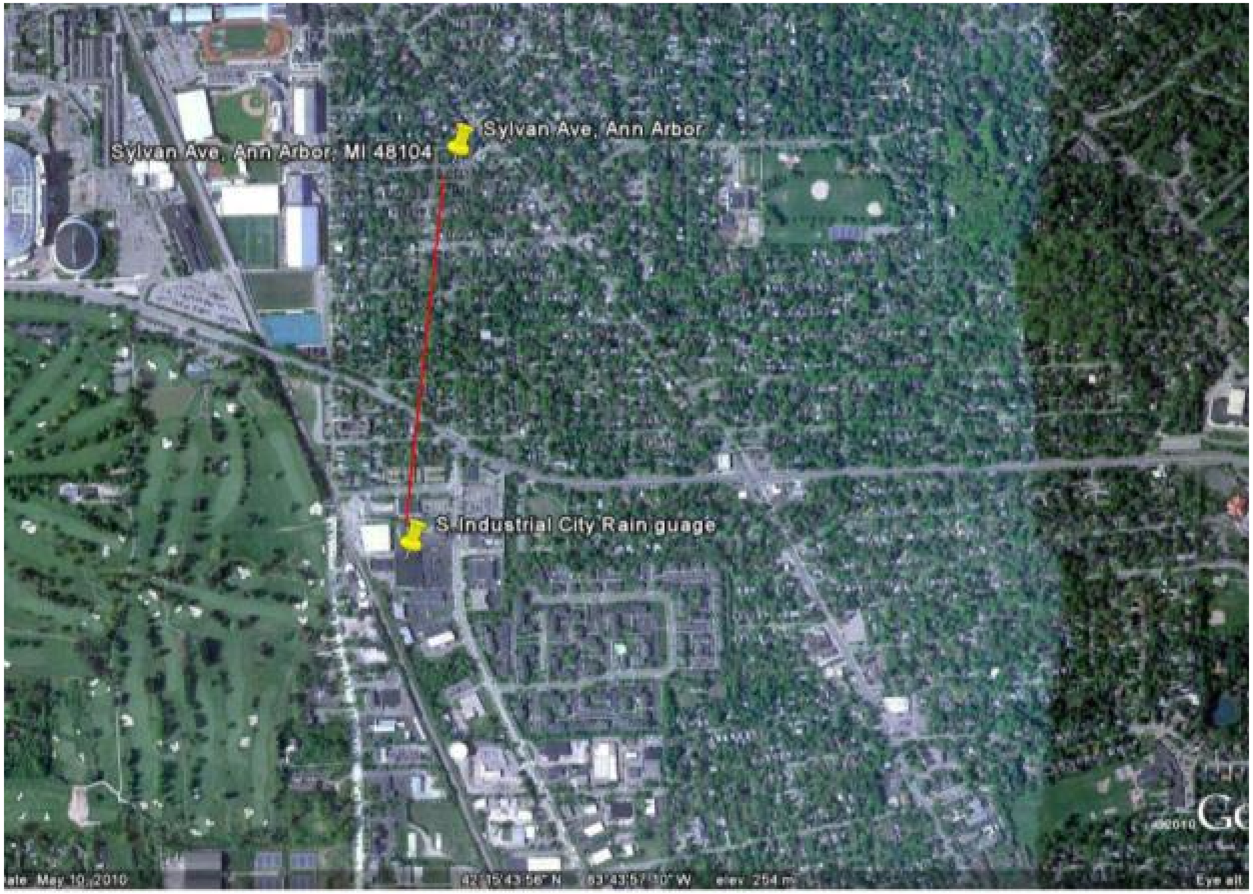


2 - foot sump, so always standing water on both sides



Input Parameters:

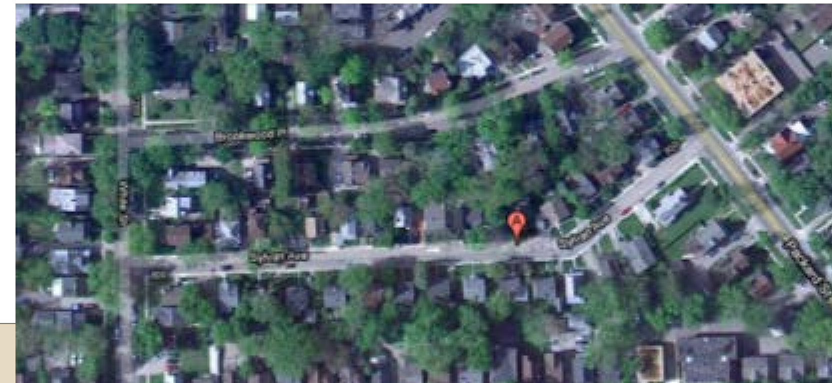
- Rainfall by event size
- Total Directly Connected Impervious Surface Area (DCIA)
- Pressure Head/Flow into catch basin from Sylvan Ave

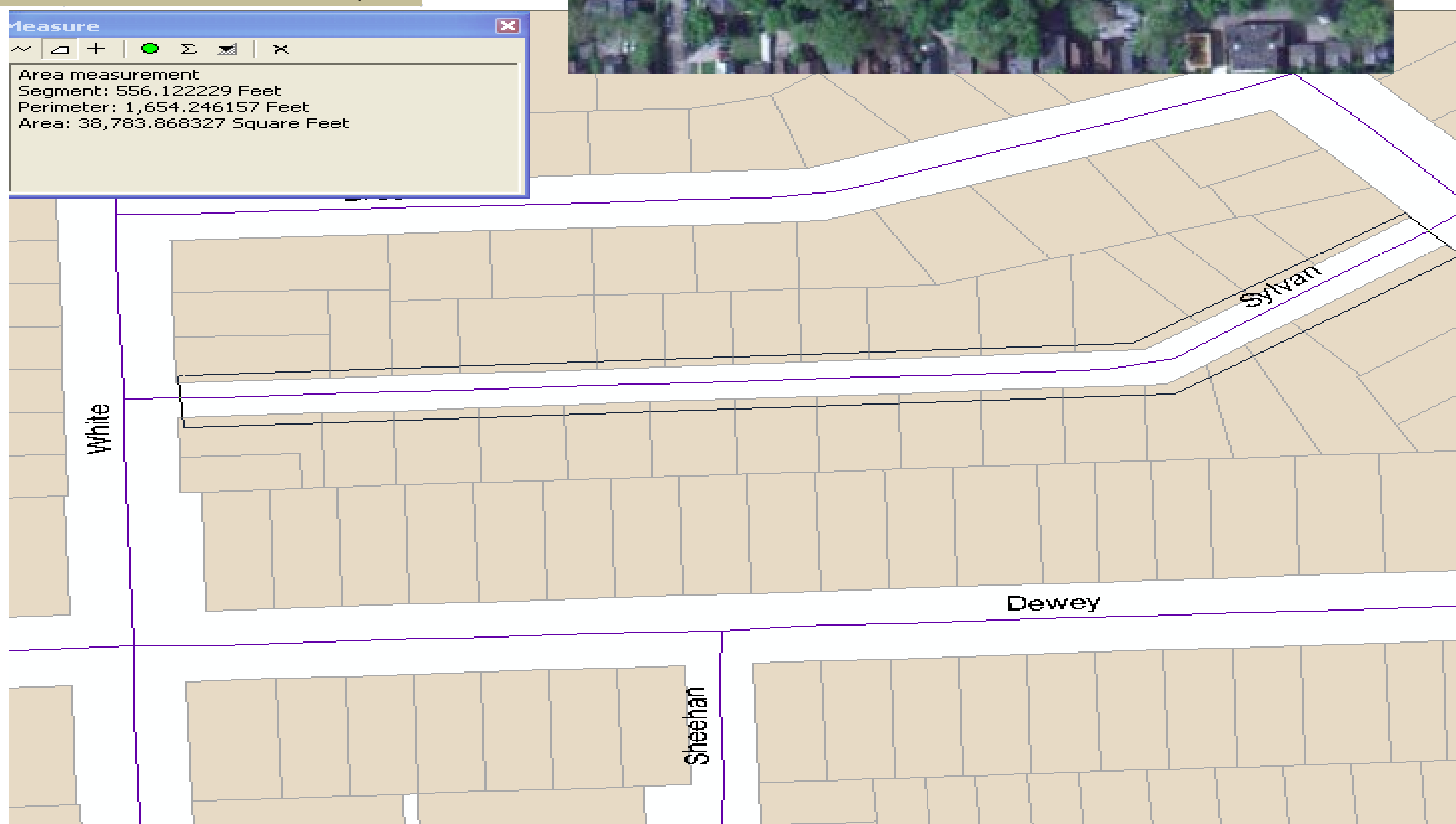


City of AA S. Industrial Rain Gauge

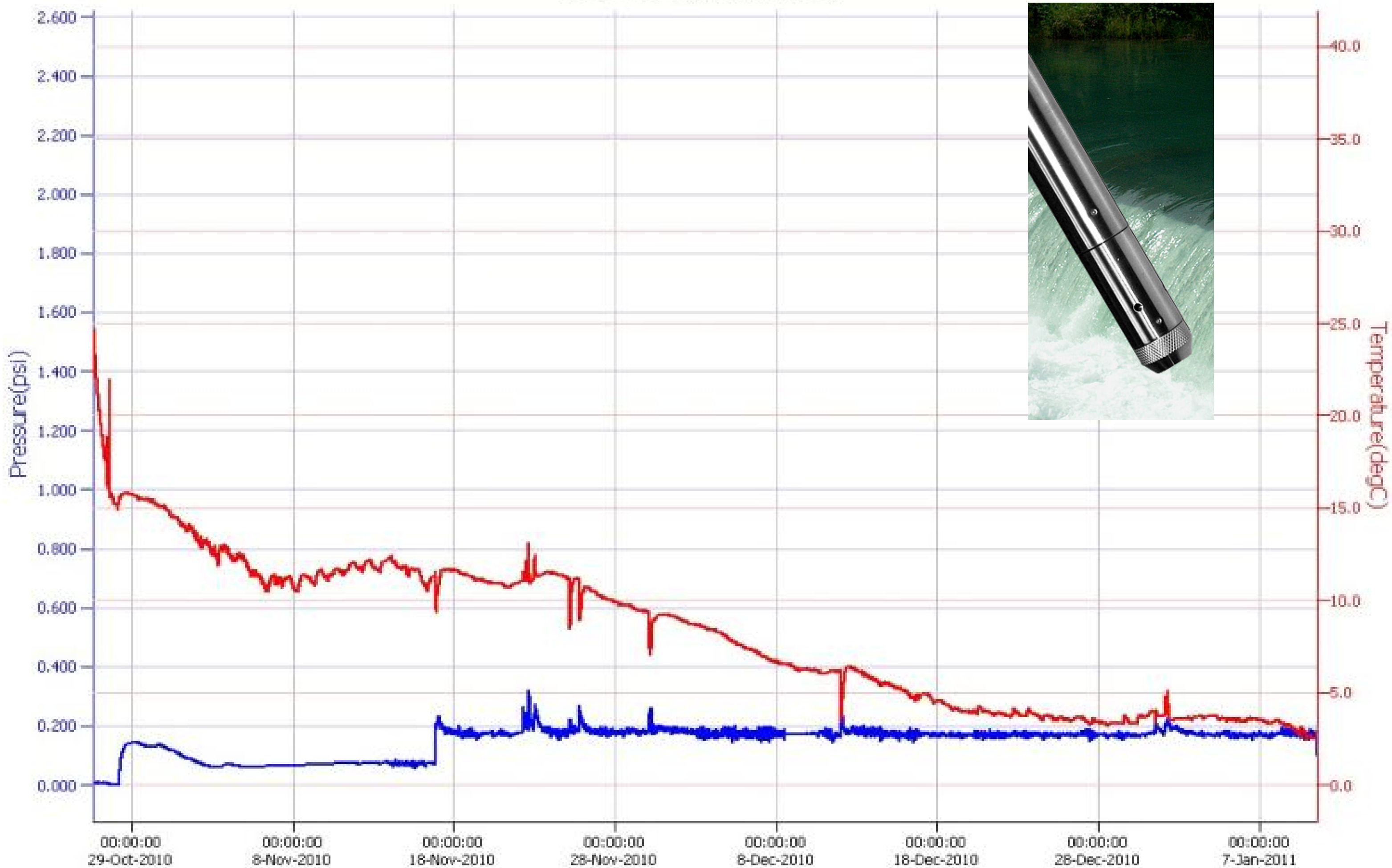
Approximately 0.45 miles apart

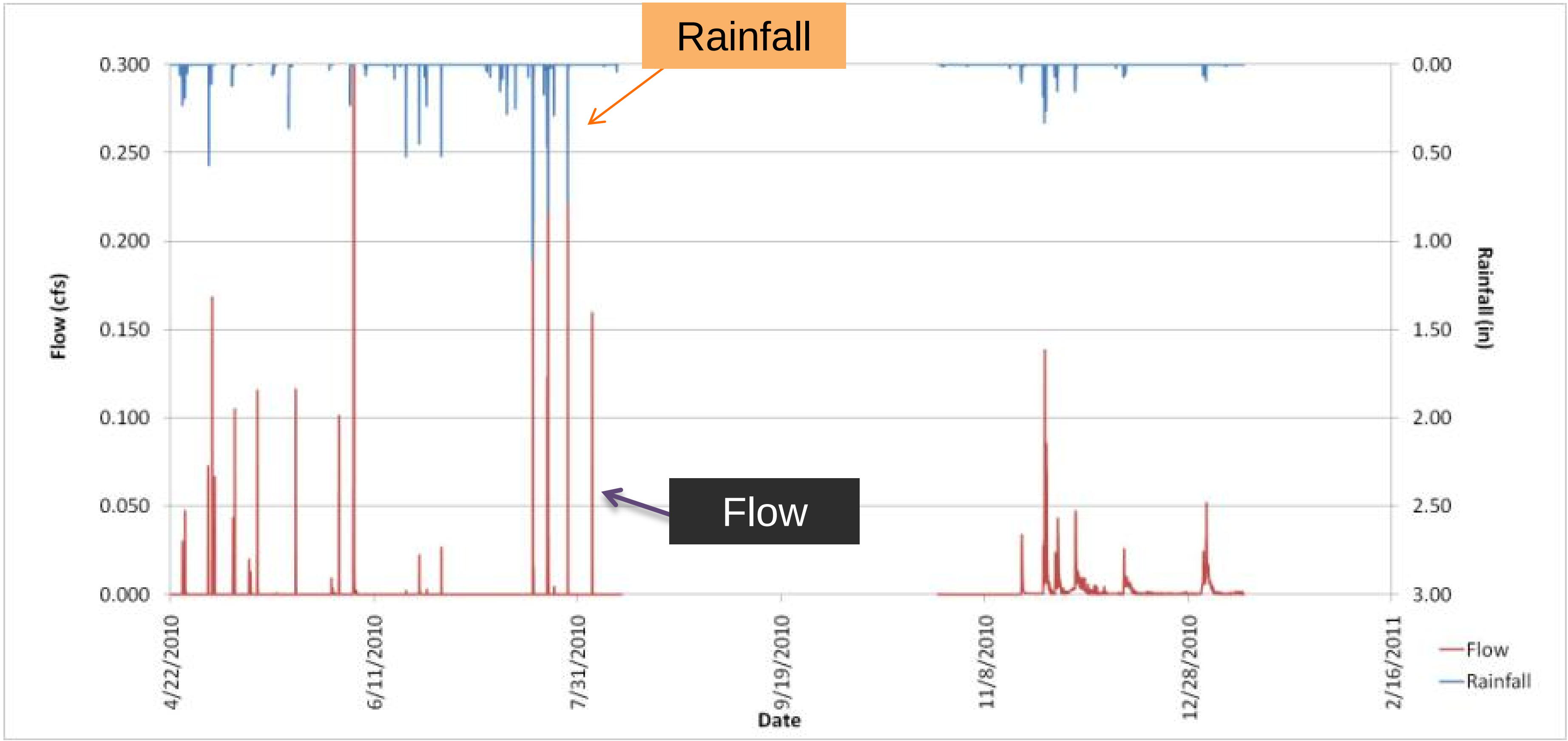
Estimated drainage Area (sq ft)	
Total Block	**107,139**
Street and Sidewalk	38,794
Roof runoff (assuming 1500sqft)	43,500
Total DCIA	**87,000**





102610_Slyvan Ave_f




Rainfall
Flow
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Flow (cfs)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
Rainfall (in)
4/22/2010
6/11/2010
7/31/2010
9/19/2010
11/8/2010
12/28/2010
2/16/2011
Date
Flow
Rainfall

Pre-construction:

All the runoff comes in all at once, and exits all at once.

Post-construction:

Runoff comes in more slowly, but there is more of it.

Pre-construction:

All the runoff comes in all at once, and exits all at once.

Post-construction:

Runoff comes in more slowly, but there is more of it.

Pre-construction:

All the runoff comes in all at once, and exits all at once.

Post-construction:

Runoff comes in more slowly, but there is more of it.

Total Volumetric Comparison	Estimated Total Runoff (ft^3)	Measured Total Runoff (ft^3)	Measured Total Runoff (gal)	Estimated maximum capacity per event* of a bioretention facility of 1,000 ft^2 (gal)
April Sum	4,106	**1,564**	**11,700**	**36,000**
Nov Sum	4,364	**3,863**	**28,897**	

- The system is collecting more runoff after installation then before.
- Although there is more runoff entering the system it is doing so more slowly than before installation.
- The material does not roll-out flat – an idea that is counter to field technician & engineering comfort
- If the system were to be installed in another location, the under drain could be directed to a bio-retention facility of 1,000 sq ft, and it would likely have capacity for most event sizes up to 2 inches.

- Are the residents seeing a reduction in standing water on the street?
- Have the residents noticed a difference in their basement flooding and/or sump pump usage?
- Has the street been less icy then other surrounding (equally trafficked) streets?
- Has the maintenance crew seen a difference in the level of effort needed to maintain the street?

- Survey – Develop Questionnaire With City Input
- Economic Analysis:
  - Capital and O&M comparison for this location vs. another
- Continued Monitoring And Analysis

THANK YOU!
QUESTIONS/FEEDBACK???

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