Goeke Drive, Hamilton Township Drainage Summary

Rutgers Cooperative Extension
Water Resources Program
www.water.rutgers.edu

October 16, 2014

Christopher C. Obropta, Ph.D., P.E.

Jeremiah Bergstrom, LLA, ASLA

Kyle Gourley, EI

Rutgers Cooperative Extension

Rutgers Cooperative Extension (RCE) helps the diverse population of New Jersey adapt to a rapidly changing society and improves their lives through an educational process that uses science-based knowledge.

Photos: Camden, NJ

Water Resources Program

The Water Resources Program is one of many specialty programs under Rutgers Cooperative Extension.

Our mission is to identify and address community water resources issues using sustainable and practical science-based solutions.

Photos: Newark, NJ

Our Partnership with Hamilton Township

- **Year 1 (2011 – 2012)**
  - **Assessment & Recommendation**

- **Year 2 (2012 – 2013)**
  - **Implementation**

- **Year 3 (2013 – 2014)**
  - **Mitigation**

- **Year 4 (2014 – 2015)**
  - **Integration**

Goeke Drive Drainage Evaluation

- Existing Conditions

- Drainage Concerns

- Preliminary Analysis

- Recommendations

- Next Steps

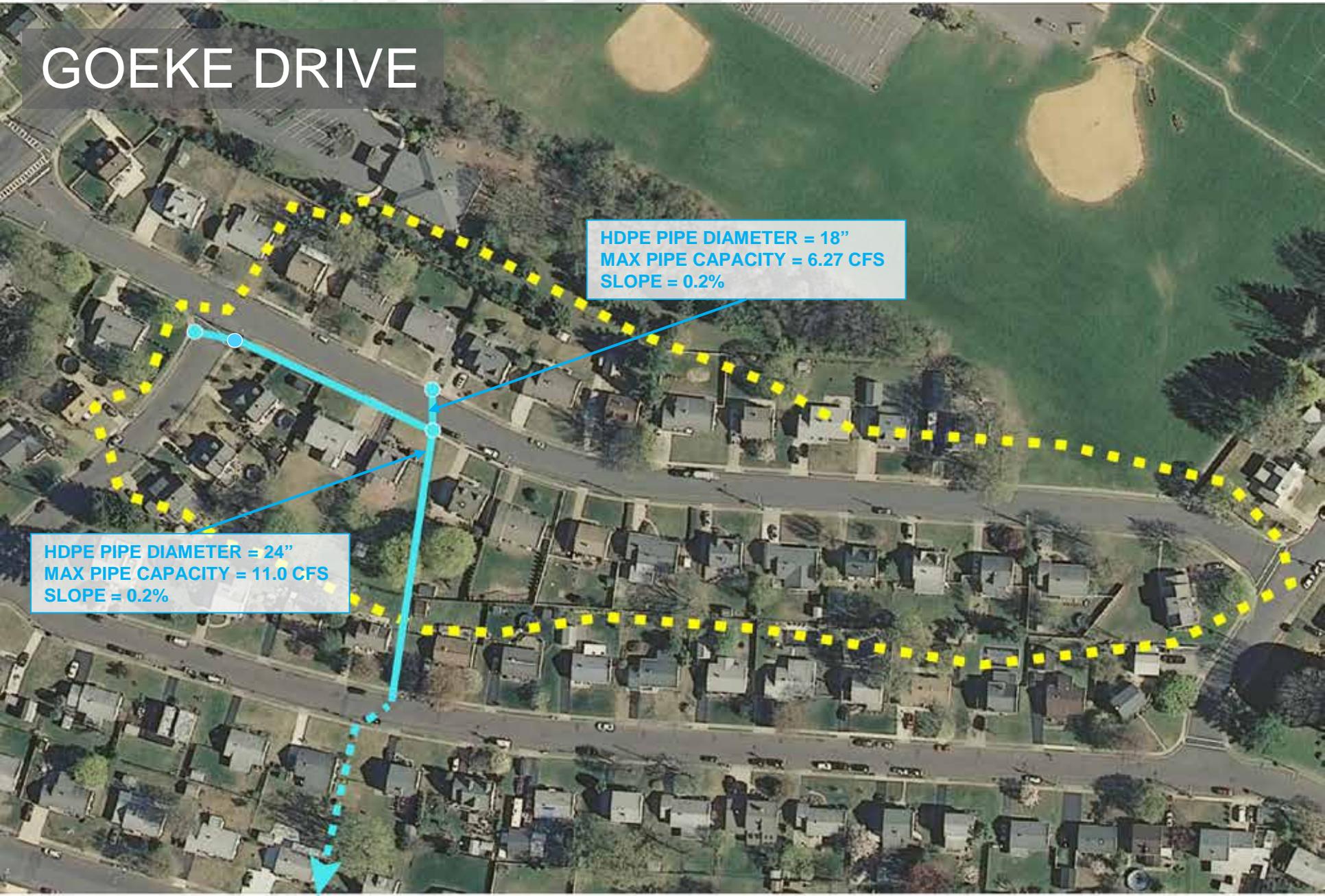# How do we evaluate flooding?

- Characterized drainage area
  - Slope/topography
  - Land cover
  - Soils
- Calculated stormwater runoff volume
- Determined stormwater flow into and through the drainage system

Existing Conditions

GOEKE DRIVE

HDPE PIPE DIAMETER = 18"
MAX PIPE CAPACITY = 6.27 CFS
SLOPE = 0.2%

HDPE PIPE DIAMETER = 24"
MAX PIPE CAPACITY = 11.0 CFS
SLOPE = 0.2%

Goeke Drive Drainage Area

- Total Drainage Area: 7.4 acres

- 27 Homes

- 1,150 feet of roadway

- One pipe ultimately controls the flow on Goeke Drive: a 24" diameter pipe that flows 282 feet to a catch basin on Kerr Drive at a 0.2% slope

IMPERVIOUS COVER MAP

Figure shows impervious <u>ROOFTOPS</u> located within the drainage area

GOEKE DRIVE

12%
of all impervious cover

IMPERVIOUS COVER MAP
Figure shows impervious <u>DRIVEWAYS</u> located within the drainage area

GOEKE DRIVE

5.9%
of all impervious cover

IMPERVIOUS COVER MAP
Figure shows impervious SIDEWALKS located within the drainage area

GOEKE DRIVE

3.2%
of all impervious cover

IMPERVIOUS COVER MAP

Figure shows impervious <u>ROADS</u> located within the drainage area

GOEKE DRIVE

15%
of all impervious cover

IMPERVIOUS COVER MAP
Figure shows all the impervious surface in the drainage area

GOEKE DRIVE

36%
Total impervious cover

Drainage Area Summary

Drainage Type	Area		Percentage
	Square Feet	Acres	
Rooftop	38,653	0.89	12.0%
Driveway	19,089	0.44	5.9%
Sidewalk	10,315	0.24	3.2%
Road and Curb	48,254	1.11	15.0%
Total Impervious	**116,310**	**2.67**	**36.1%**
Lawn	206,265	4.74	63.9%
Total Pervious	**206,265**	**4.74**	**63.9%**
Total Drainage Area	**322,575**	**7.41**	**100.0%**

Preliminary Results (Short/Intense Storm Event)

Rainfall over *TWO HOURS* (inches)	Peak Flow (cfs)	Peak Elevation Above Catch Basins
1.25	6.88	-
2.00	11.57	-
3.00	20.45	93.46'

Preliminary Results (Longer Storm Event)

Rainfall over *24 HOURS* (inches)	Peak Flow (cfs)	Peak Elevation Above Catch Basins
1.25	2.65	-
2.00	4.40	-
3.00	7.51	-

Pipe that controls flow has a capacity of 11.0 cfs
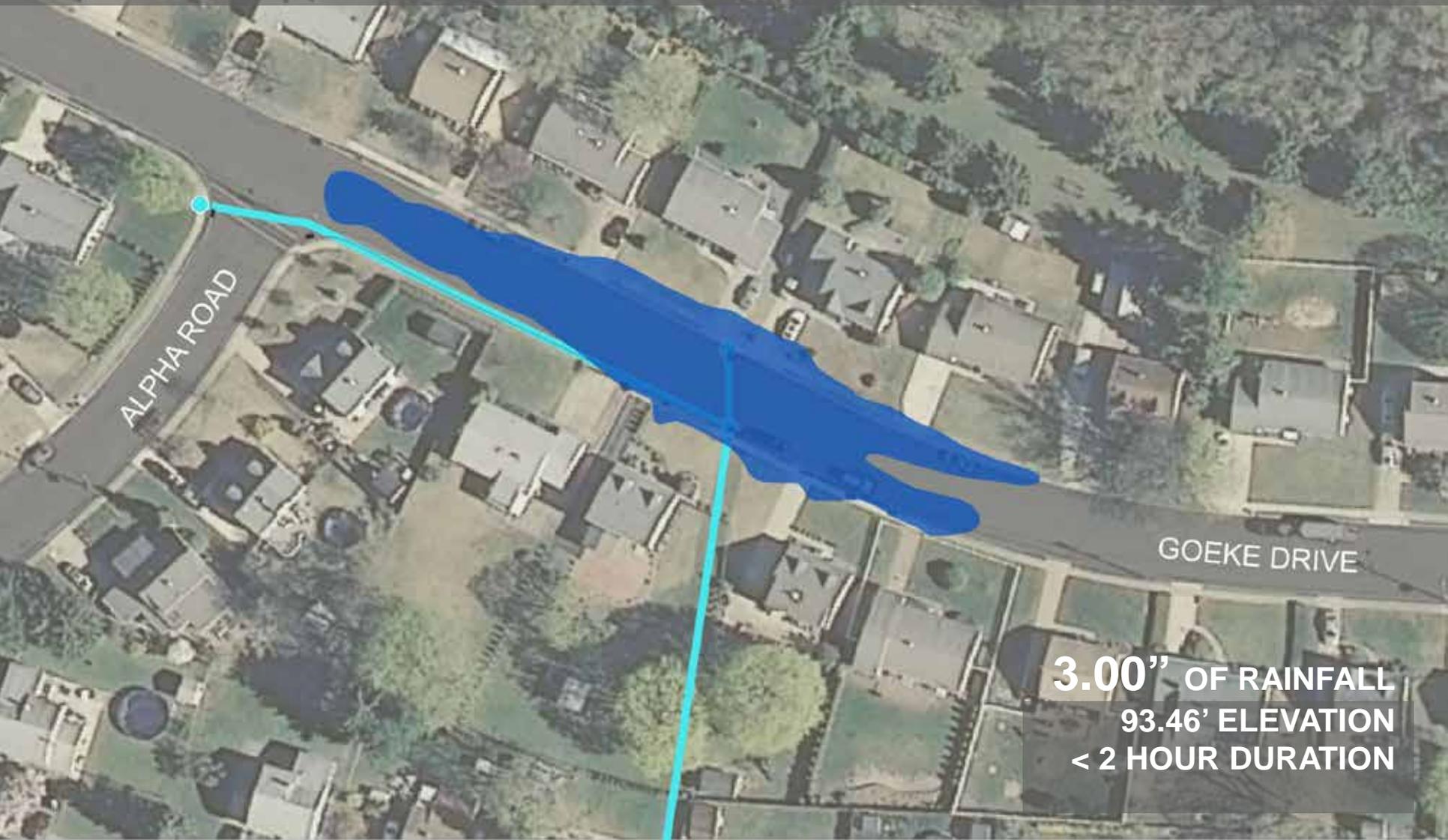
How can we cost-effectively solve this problem?

- Store excess water near Goeke Drive

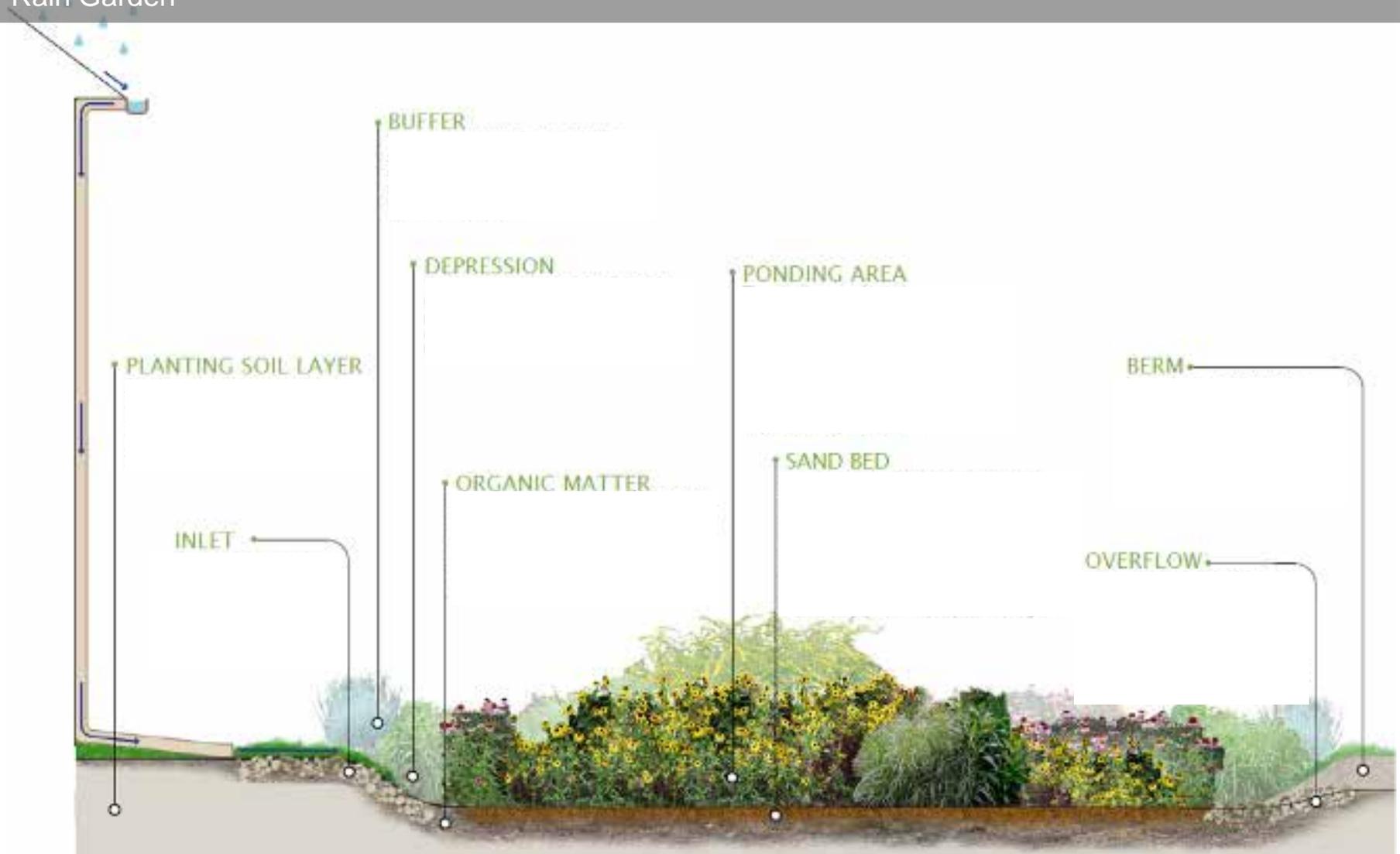- Infiltrate stormwater runoff around Goeke Drive

Green Infrastructure practices we can cost-effectively use to better manage stormwater at Goeke Drive

- Rain Gardens

- Rainwater Harvesting

- Infiltration Trench Systems

- Pervious Concrete

- Porous Asphalt

- Stormwater Curb Bump Outs

GREEN INFRASTRUCTURE EXAMPLES
Rain Garden

GREEN INFRASTRUCTURE EXAMPLES
Trench drain and Rain Garden

GREEN INFRASTRUCTURE EXAMPLES
Rain water harvesting – Rain Barrel system

- Collect rainwater from roof with existing downspouts into a rain barrel

- Rain barrel acts as storage that can be used at a later time

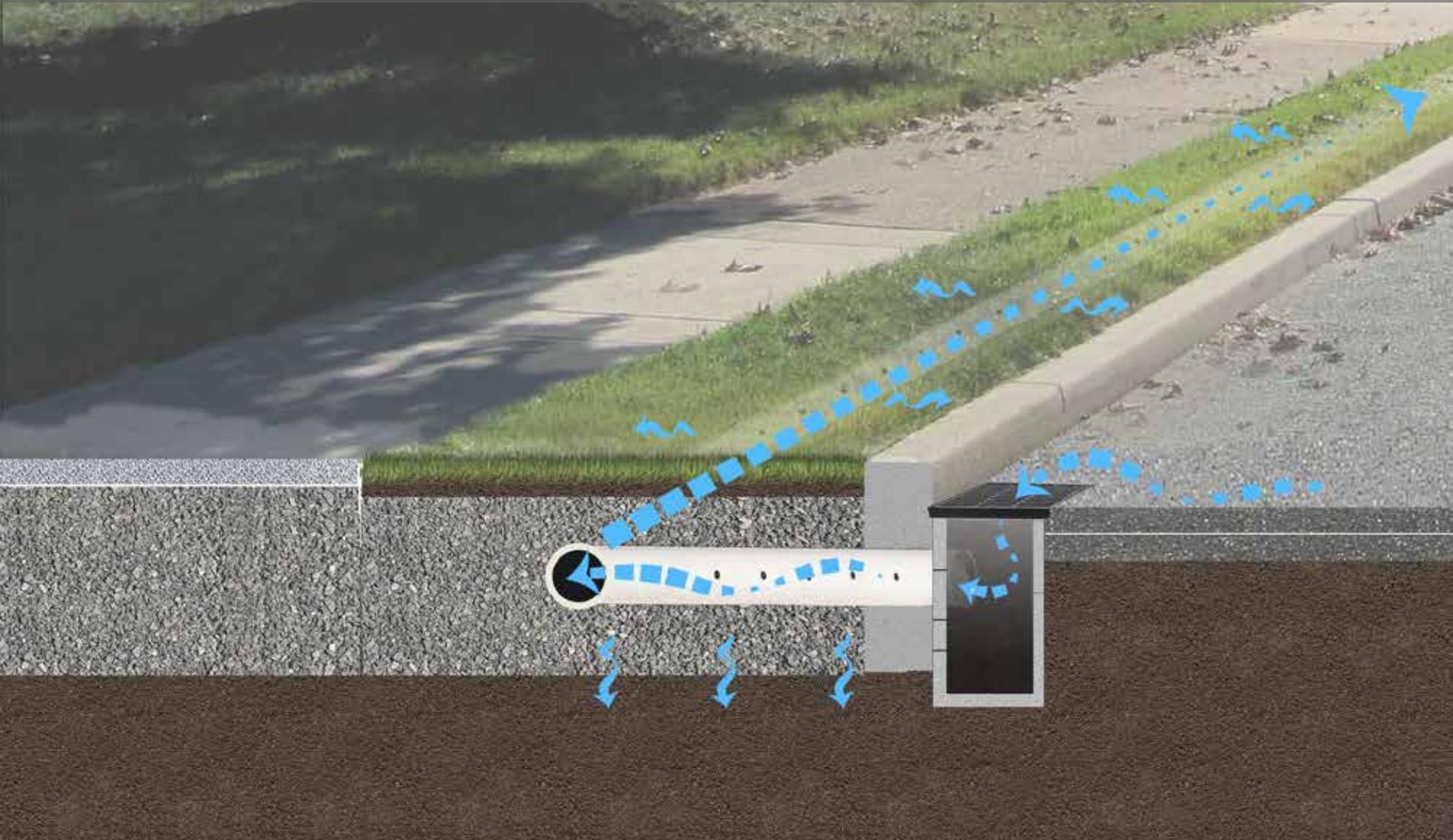GREEN INFRASTRUCTURE EXAMPLES

Rain garden and rain harvesting system

BEFORE

AFTER

GREEN INFRASTRUCTURE EXAMPLES
Infiltration Trench System

GREEN INFRASTRUCTURE EXAMPLES
Pervious Concrete Apron

RUTGERS

GREEN INFRASTRUCTURE EXAMPLES
Pervious Asphalt

Stone   Existing asphalt

3 ft wide porous asphalt
bottom of curb

RUTGERS

GREEN INFRASTRUCTURE EXAMPLES
Curb Bump out

How much water do we need to manage?

To reduce flooding, 5,456 cubic feet or 40,810 gallons need to be captured and slowly released to the drainage system
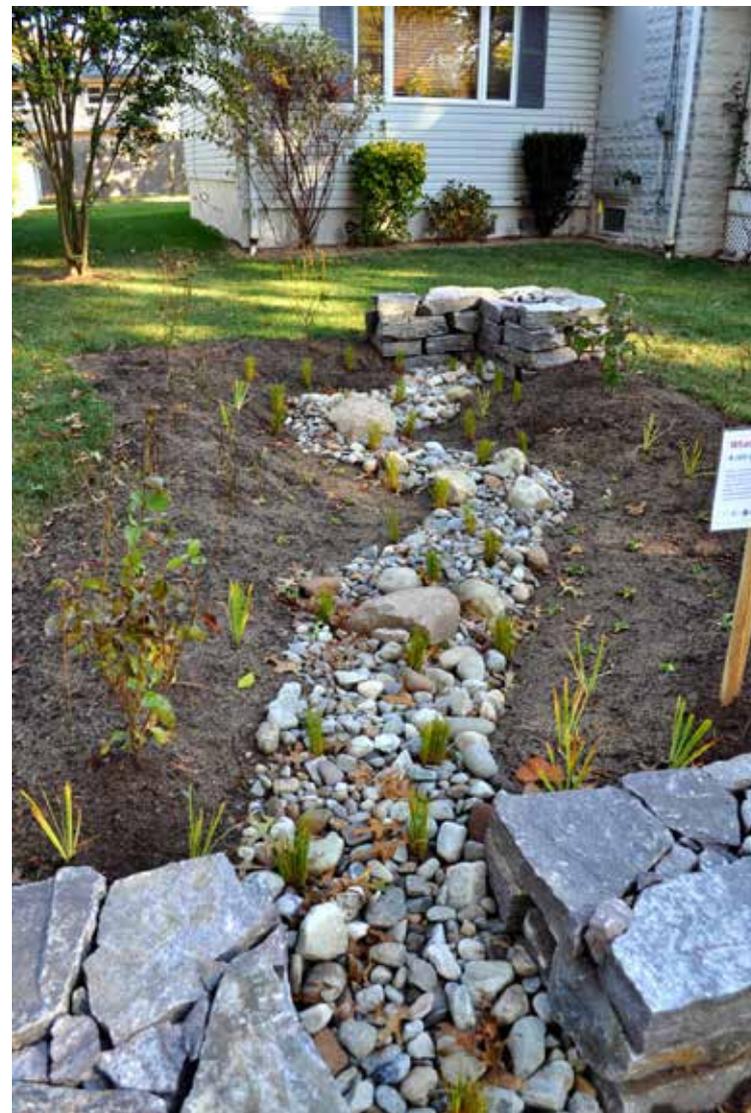
HOW CAN WE ACHIEVE THIS?

Disconnect 25% of Rooftops

– Rain Barrels

– Rain Gardens

Disconnect 25% of Driveways

- Rain Gardens

- Pervious Concrete Driveway Aprons

Disconnect 20% of Roadway

- – Porous Asphalt
- – Infiltration Trench Systems
- – Curb Bump Outs

How can we reduce flooding on Goeke Drive?

Impervious Drainage Type	% to be disconnected	Total Area Disconnected (square feet)	Volumed Captured (cf)
Rooftops	25%	9,664	2,229
Driveway	25%	4,772	1,101
Roadway	20%	9,704	2,239

To eliminate the flooding during intense storms of 1.5 inches over one hour, the 5,456 cubic feet of runoff needs to be captured and released slowly to the drainage system. Disconnecting the impervious surfaces as suggested above will accomplish this.
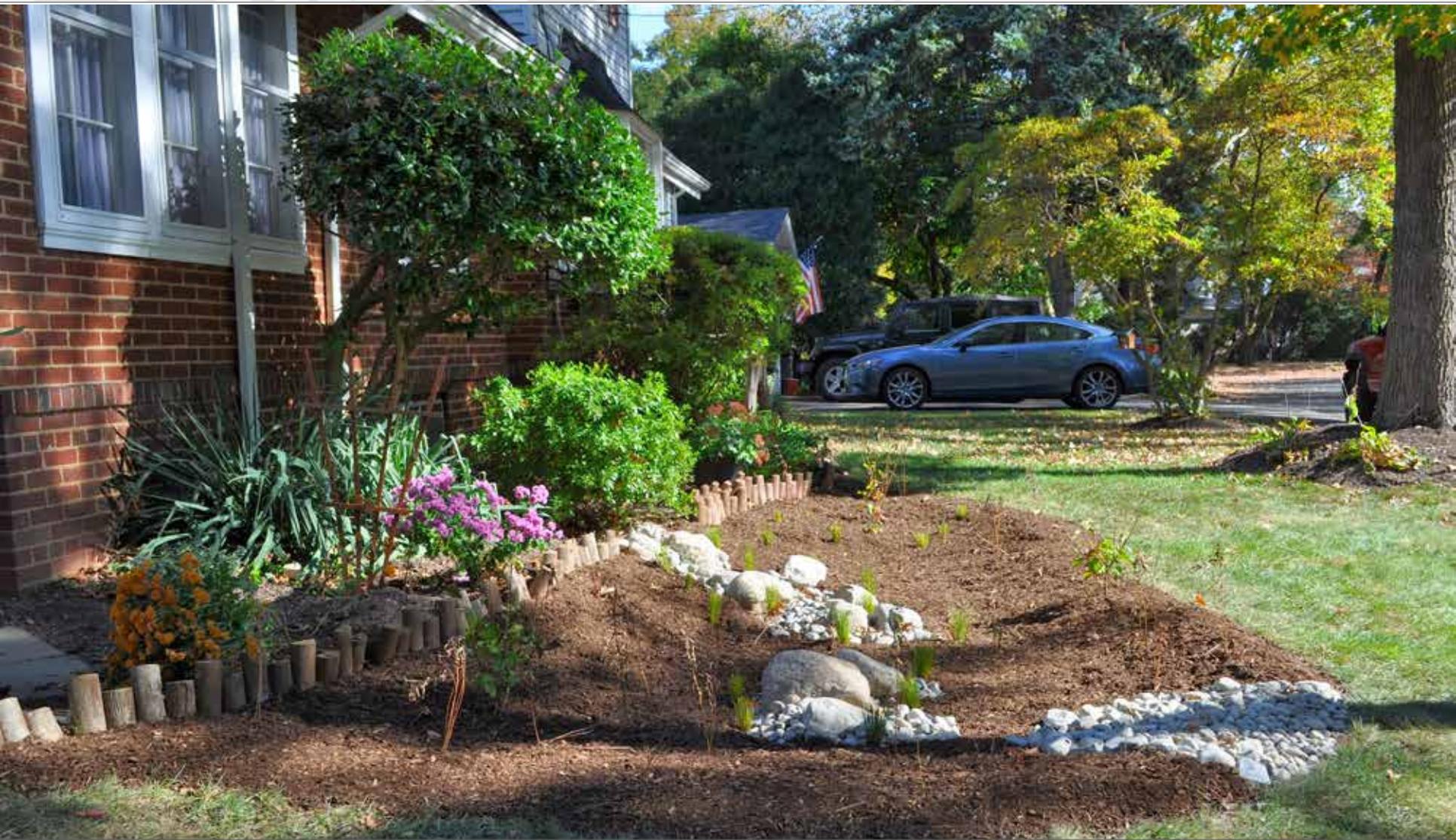
DISCUSSION & QUESTIONS

Rutgers Cooperative Extension Water Resources Program

www.water.rutgers.edu

Christopher C. Obropta, Ph.D., P.E.

obropta@envsci.rutgers.edu

848.932.5711

Jeremiah D. Bergstrom, LLA, ASLA

jbergstrom@envsci.rutgers.edu

848.932.5708