Are You Facing Large Expenditures For Wet Weather Sewer Improvement?

New Analysis Technology Can Save You Money

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Introduction

- Difficult economic times - what will we do differently?
- Wet weather sewer system projects are often a community's largest capital expenditure
- Examples of new approaches that have proven effective

SSO Policy in Ohio

- The Clean Water Act calls for complete prohibition of SSOs
- Ohio has adopted this policy as their own without further clarification
- Systems in Ohio historically designed to transport peak flow consisting of average flow, based on population, design density, an assumed peaking factor and an infiltration allowance
- Ohio EPA addresses SSOs through enforcement actions

2008 EPA Survey Results

- 86 facilities in Ohio with sewage overflow problems
- Investment of over $6 Billion to fix
- $10 Billion needed for improvements to WWTPs
- Few sources exist to fund these necessary improvements

- How can we minimize these expenditures?

Lesson #1

Common Expectations

"Tried and true" tools combined with engineering judgement can accurately size required facilities

Reality:

Uncertainty leads to use of conservative estimates that may not be obvious to the decision makers

Lesson #2

Common Expectations

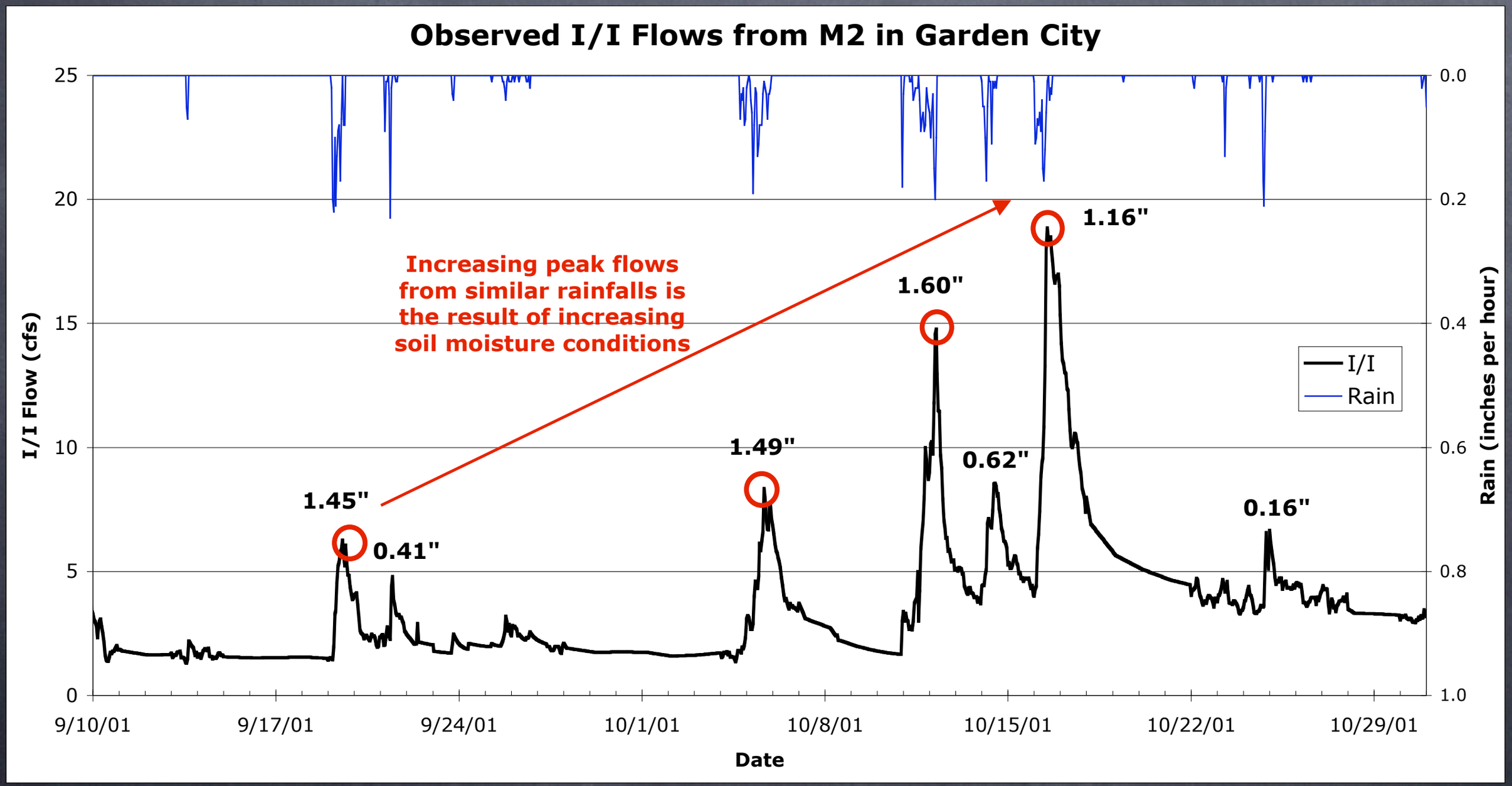
Good engineering will completely solve all problems

Reality:

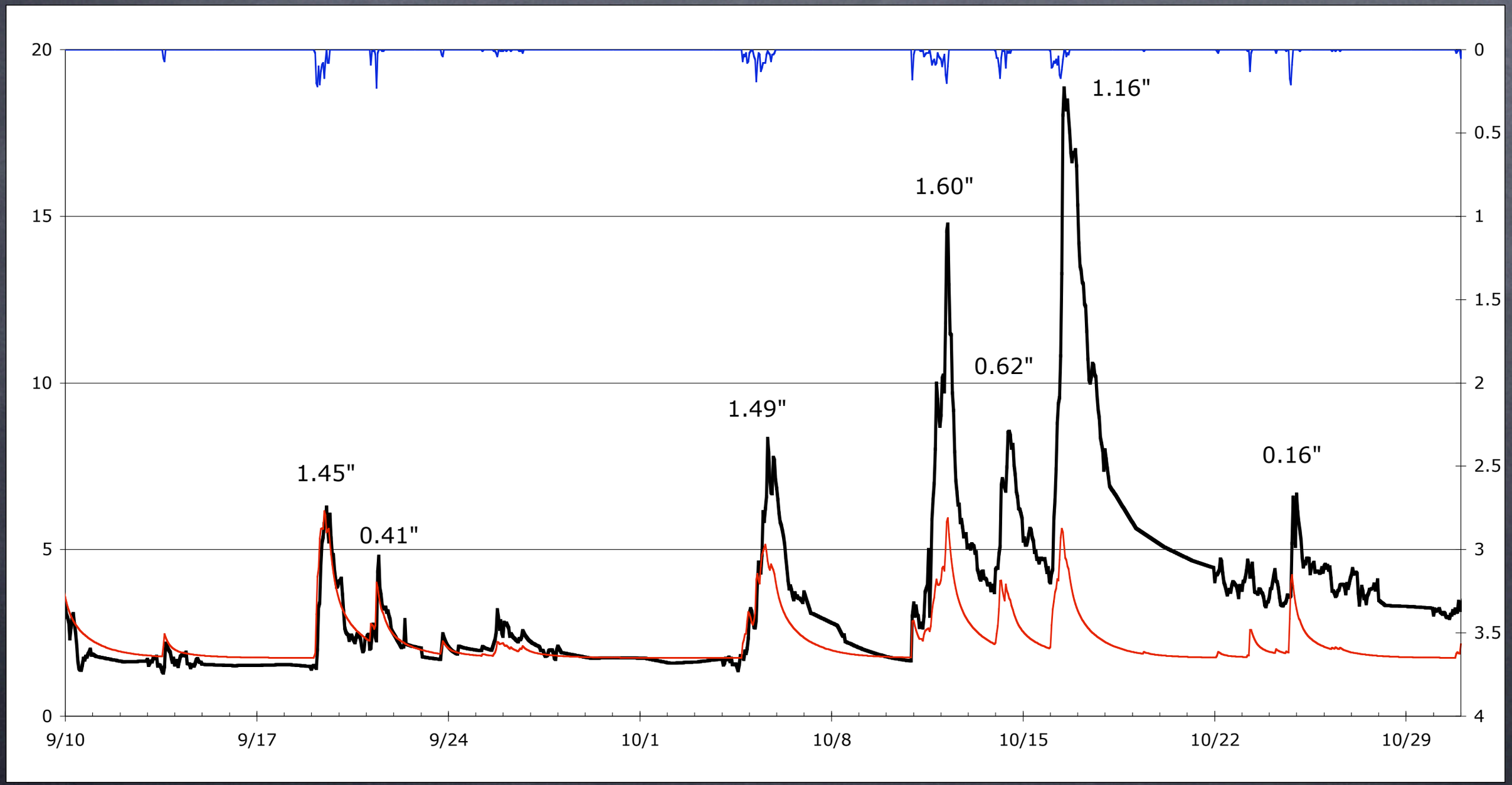
There is always a bigger storm

The Antecedent Moisture Model

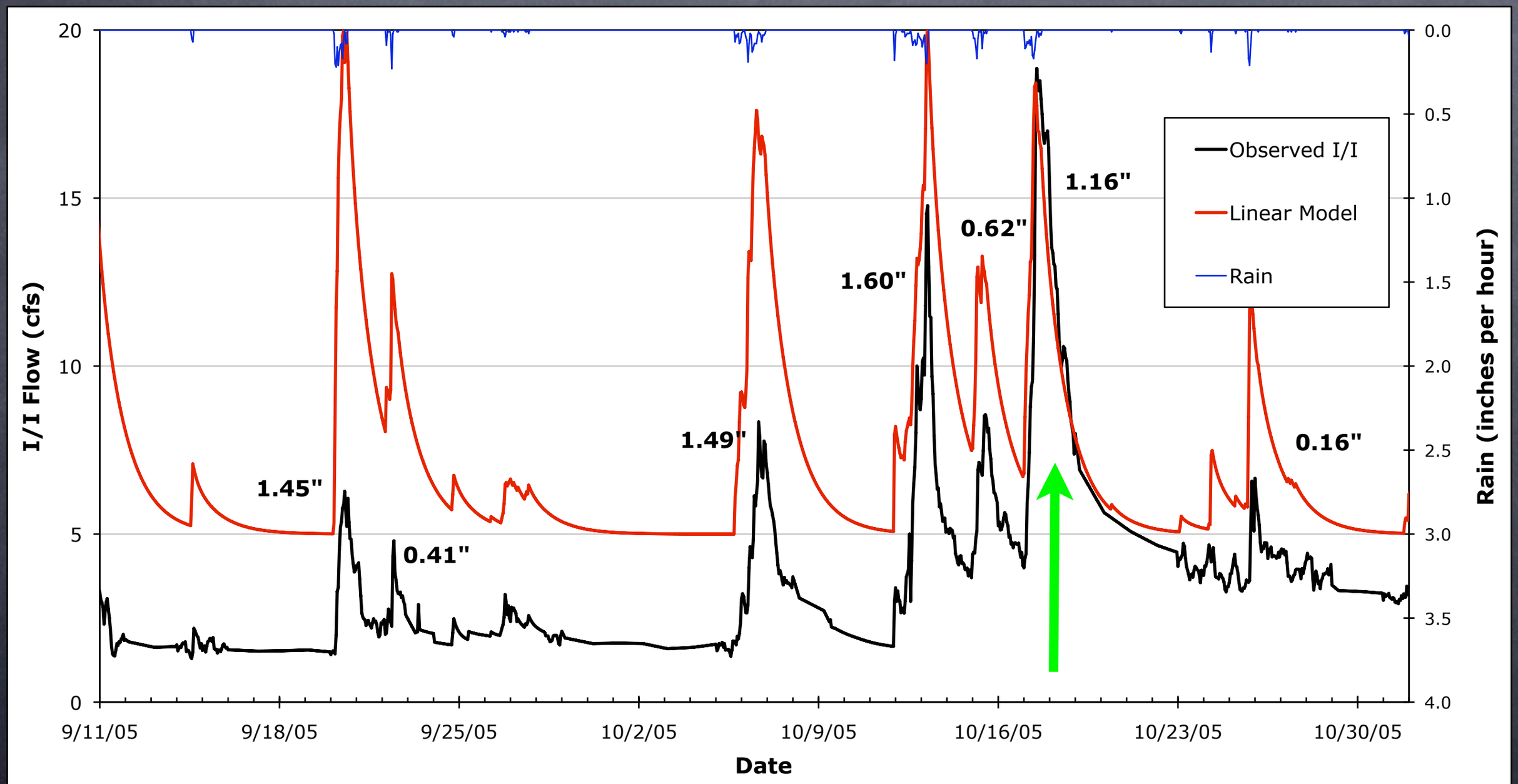
Antecedent Rainfall Effects on Wet Weather Flows



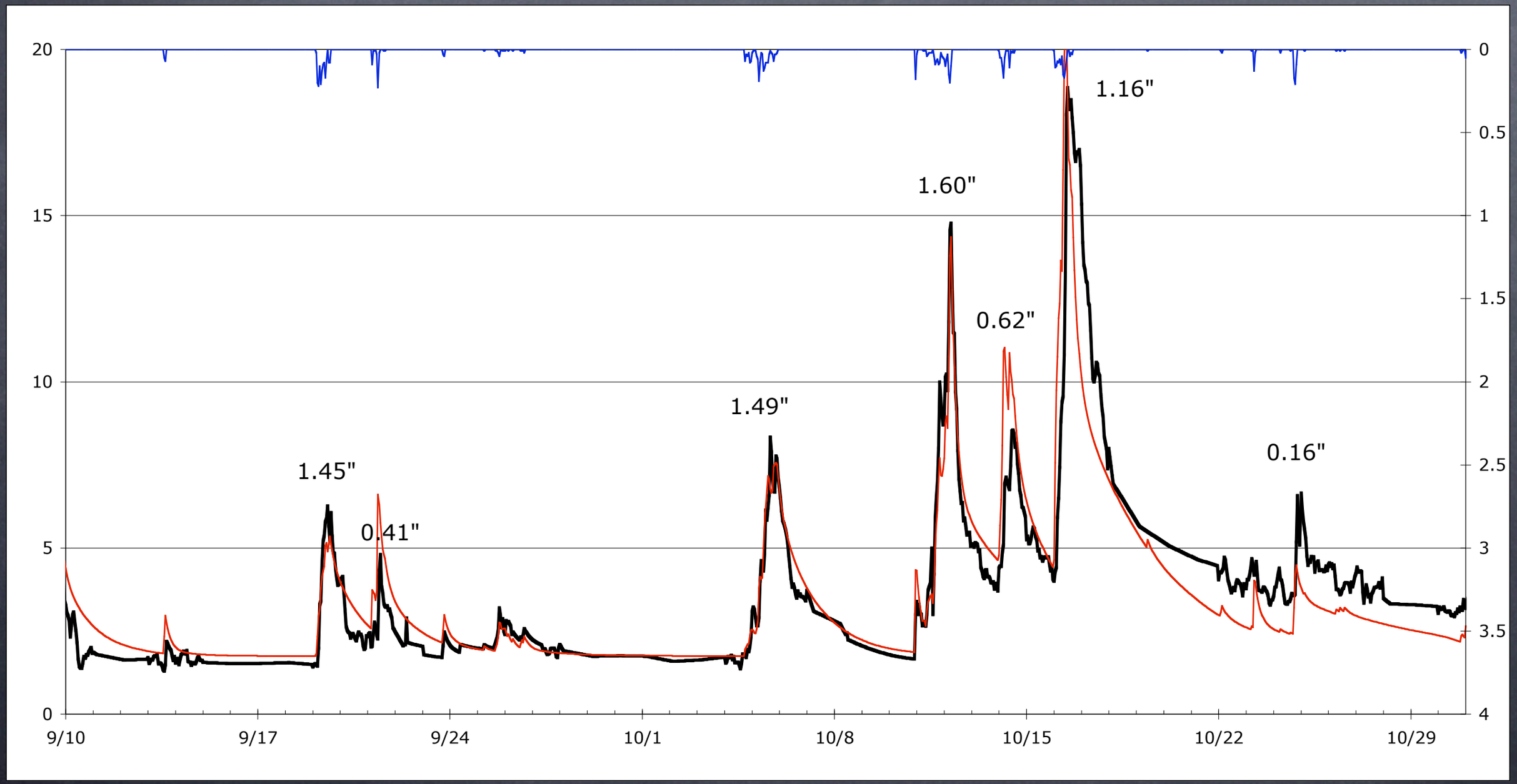
Typical Static Runoff Model Result



Static Model Calibrated to Larger Storm

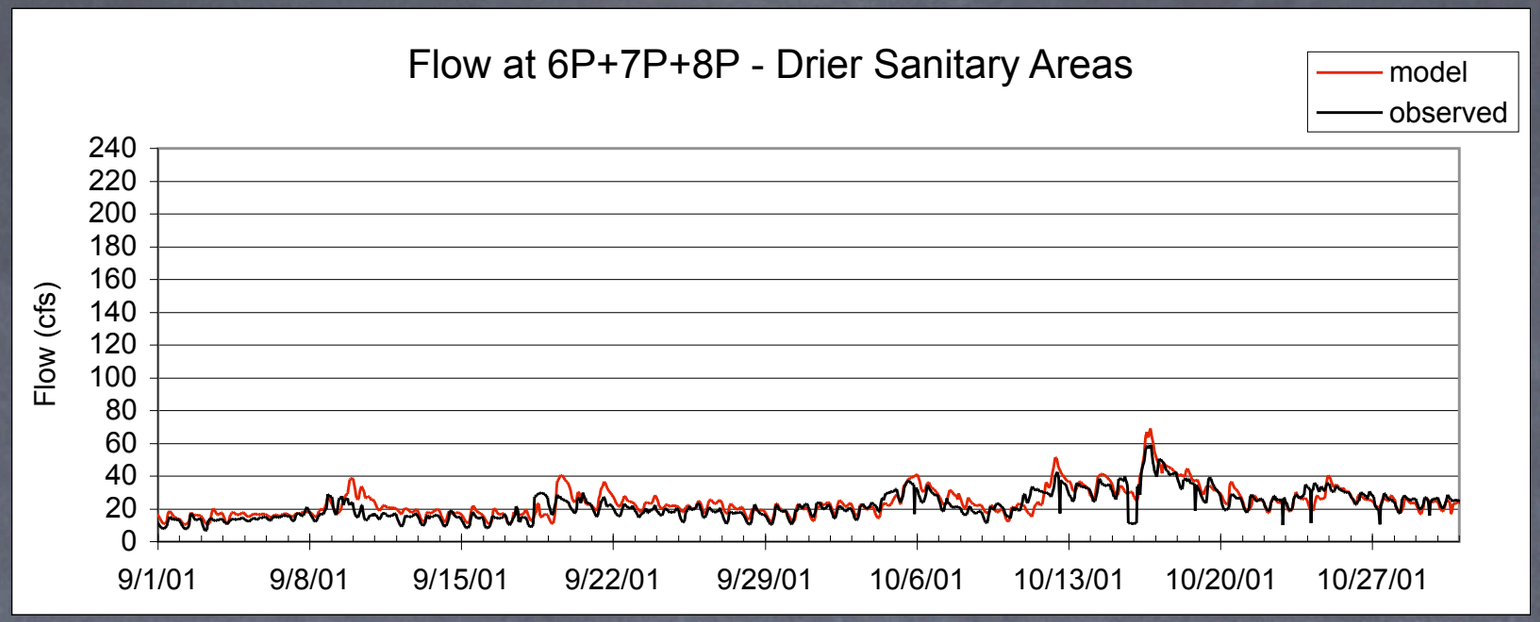


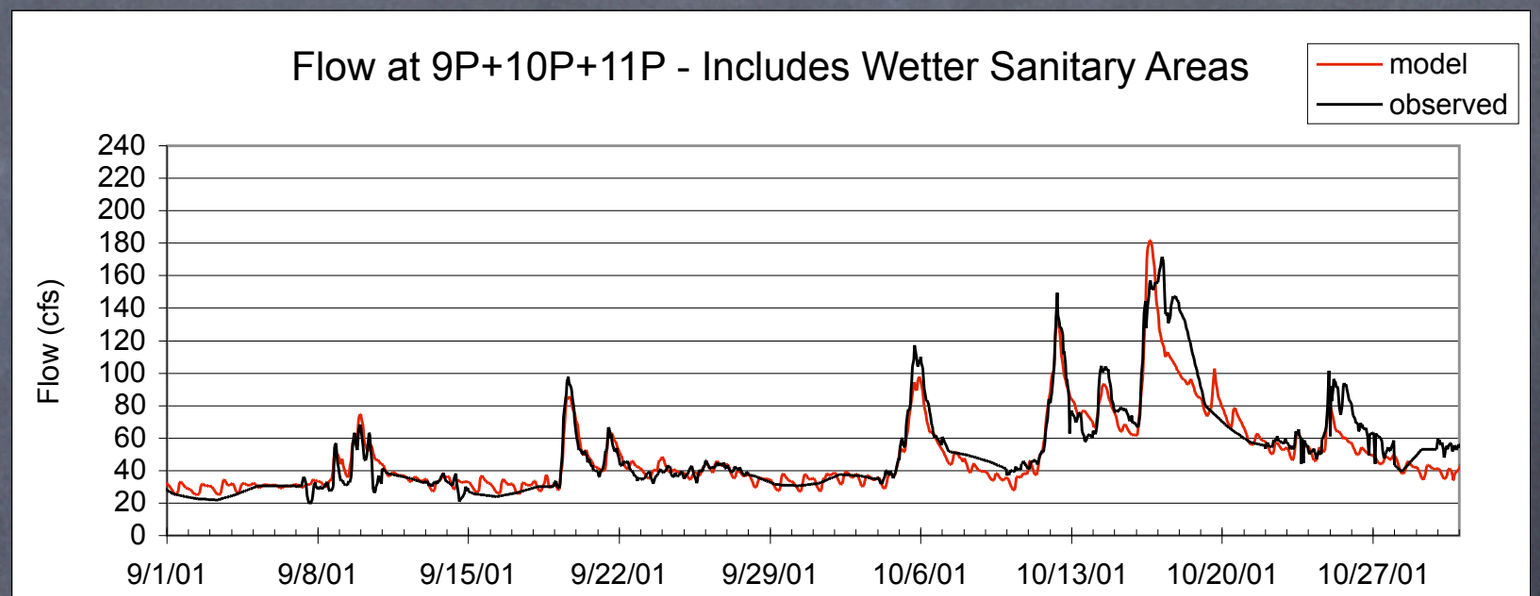
Antecedent Moisture Model Results

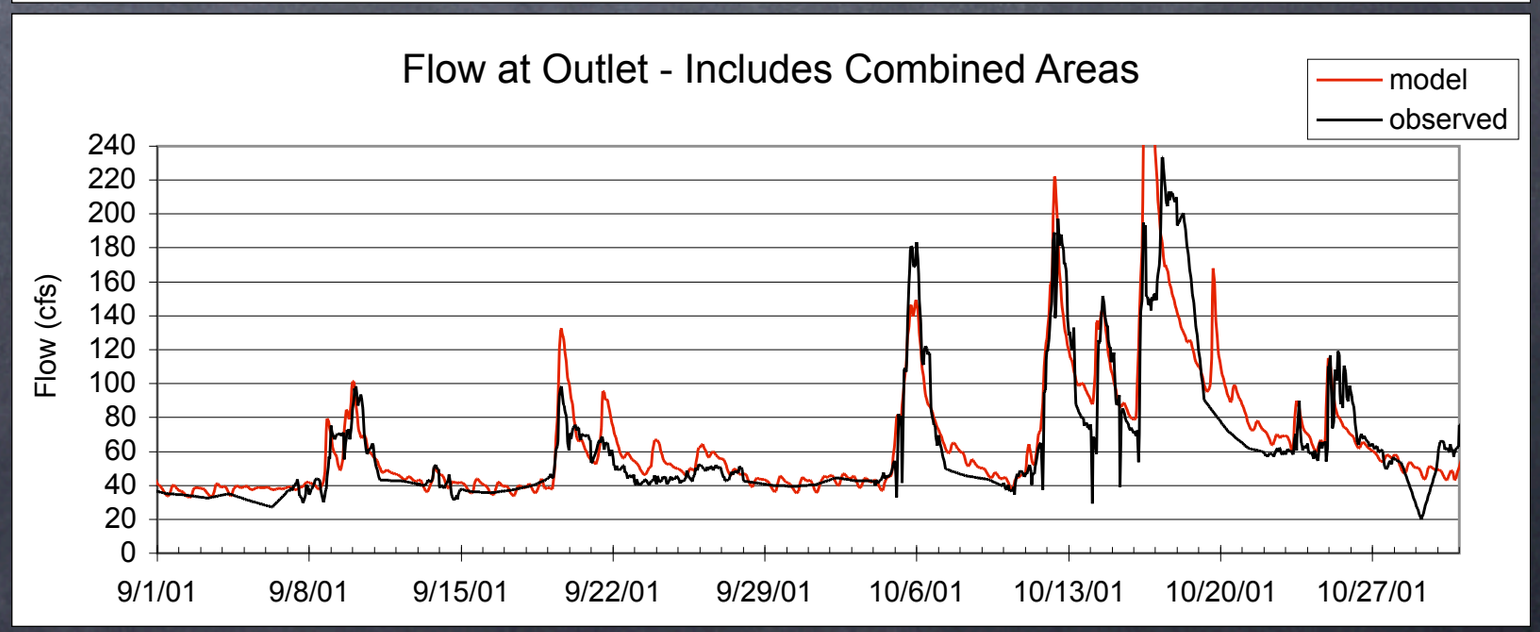


Calibration Results

- Model calibrated to 2000-2001 observations

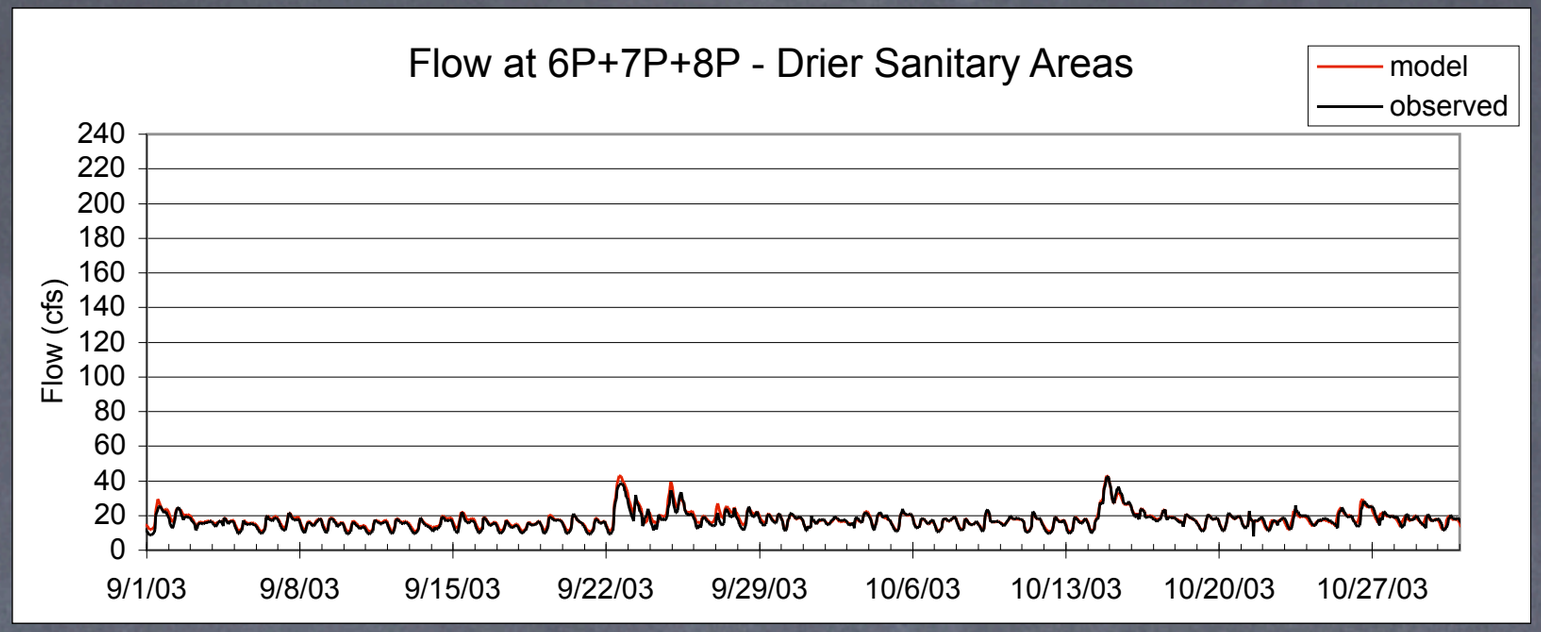


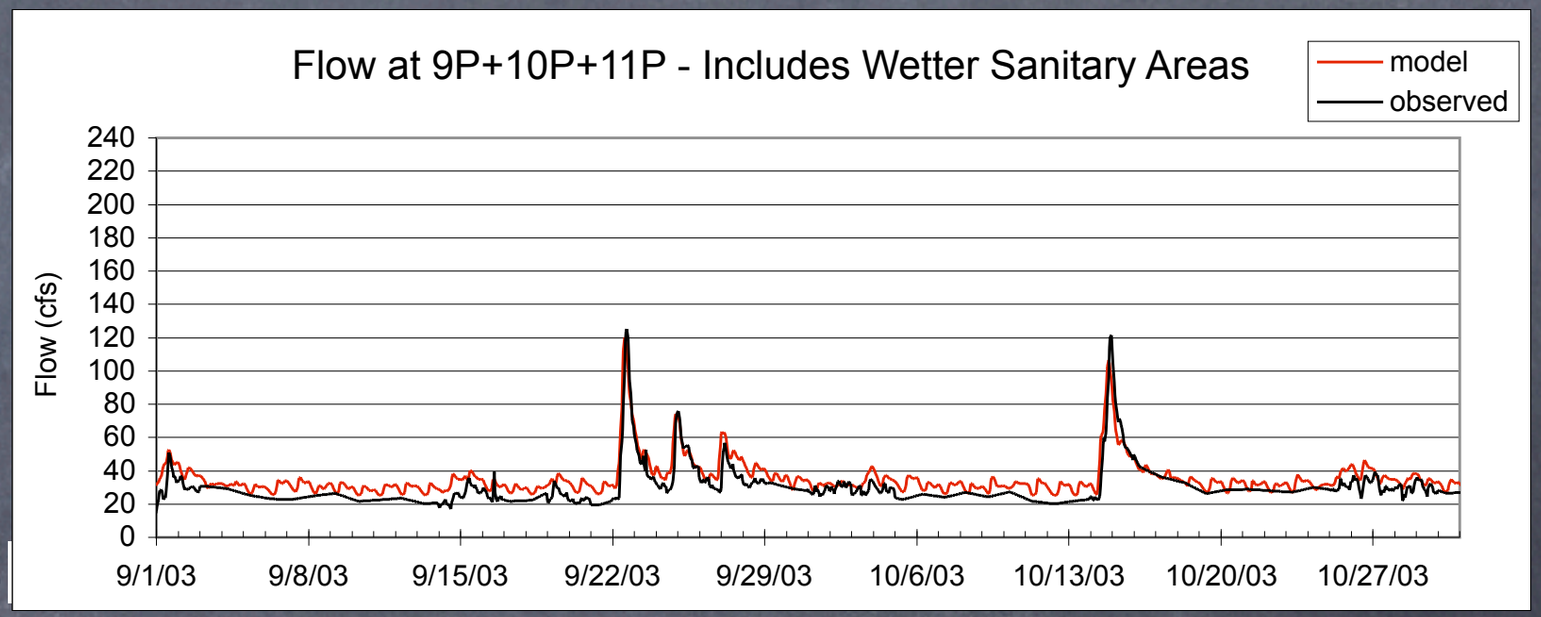


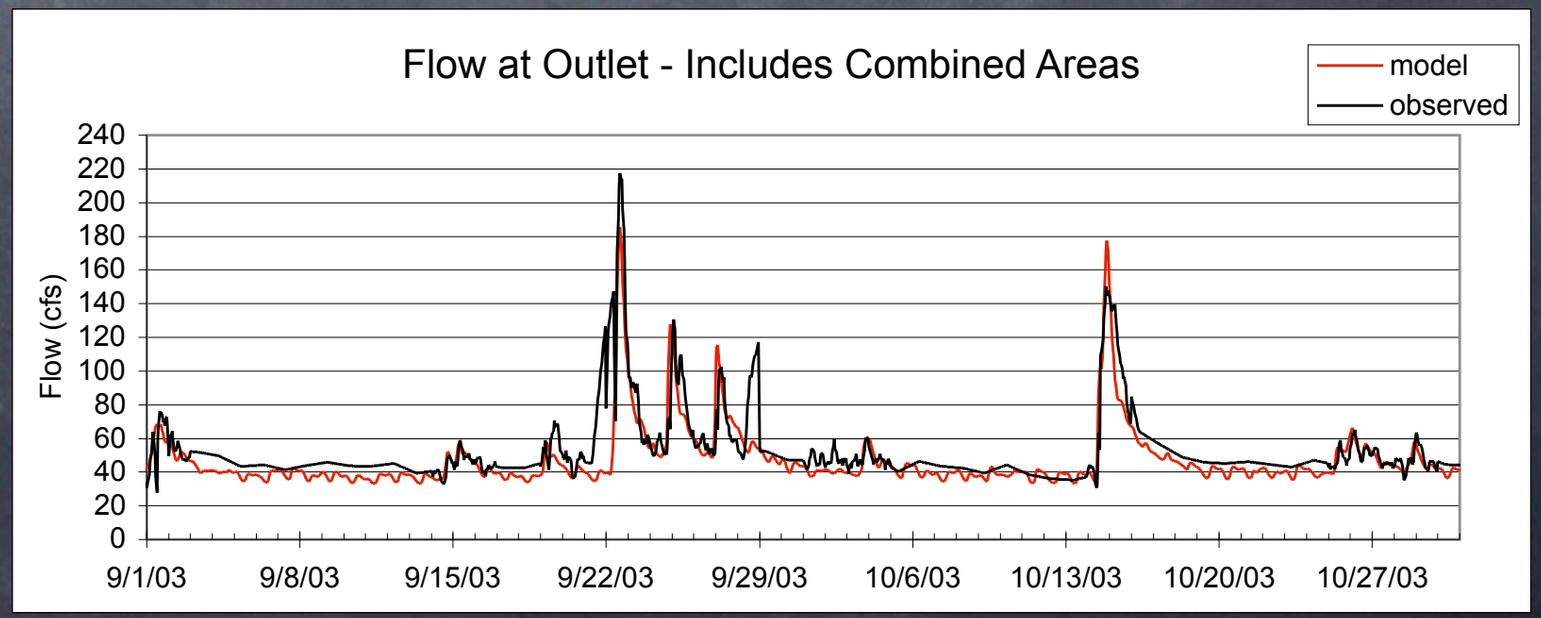


Validation Results

- Model validated to 2002-2003 observations
- Validation done to test model performance
- No changes to the model were made for the validation runs







Lesson #1

Common Expectations

"Tried and true" tools combined with engineering judgement can accurately size required facilities

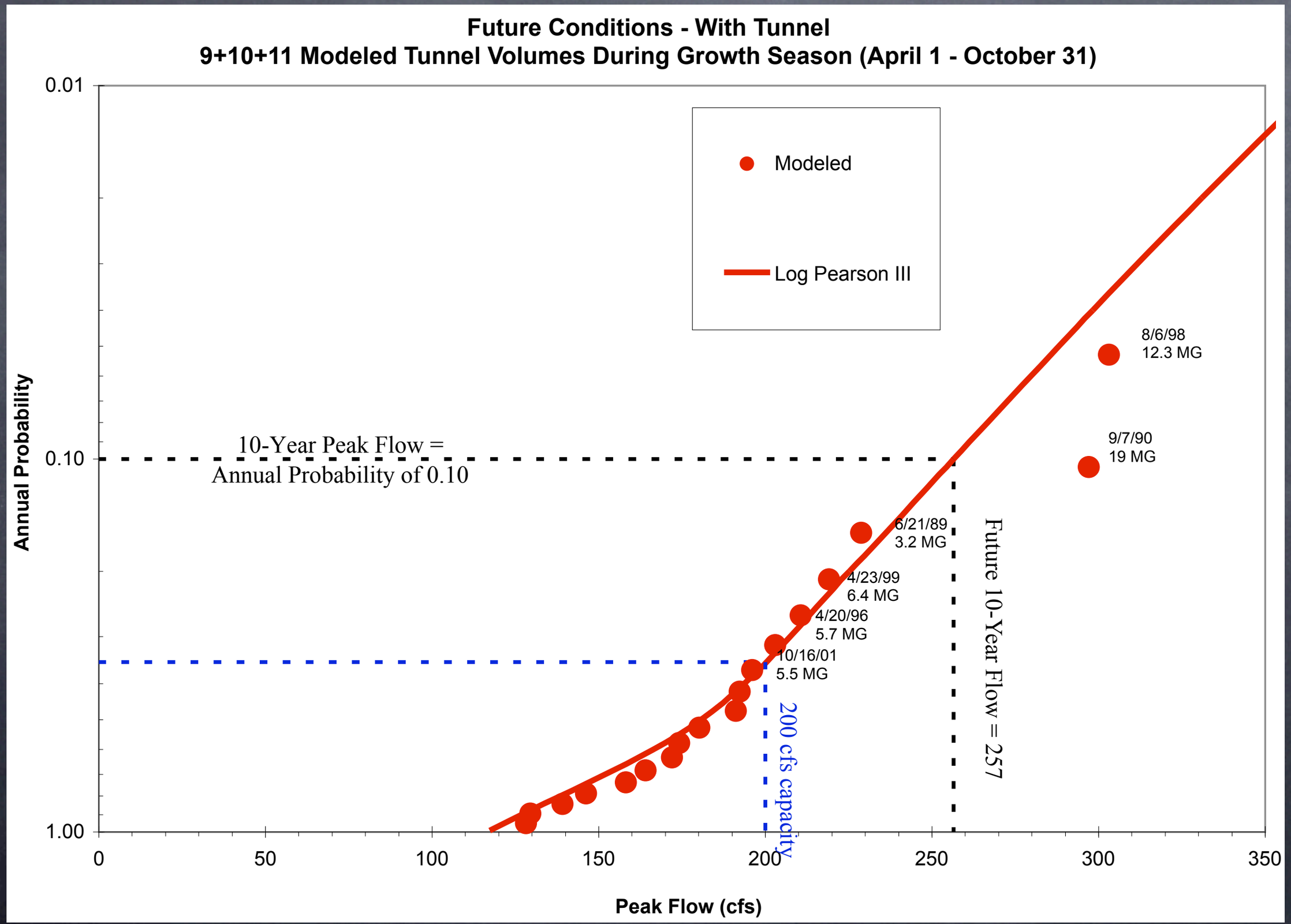
Reality:

Uncertainty leads to use of conservative estimates that may not be obvious to the decision makers

Findings:

Confidence in the model results lead to less conservative estimates

Tunnel Volume Sizing



Lesson #2

Common Expectations

Good engineering will completely solve all problems

Reality:

There is always a bigger storm

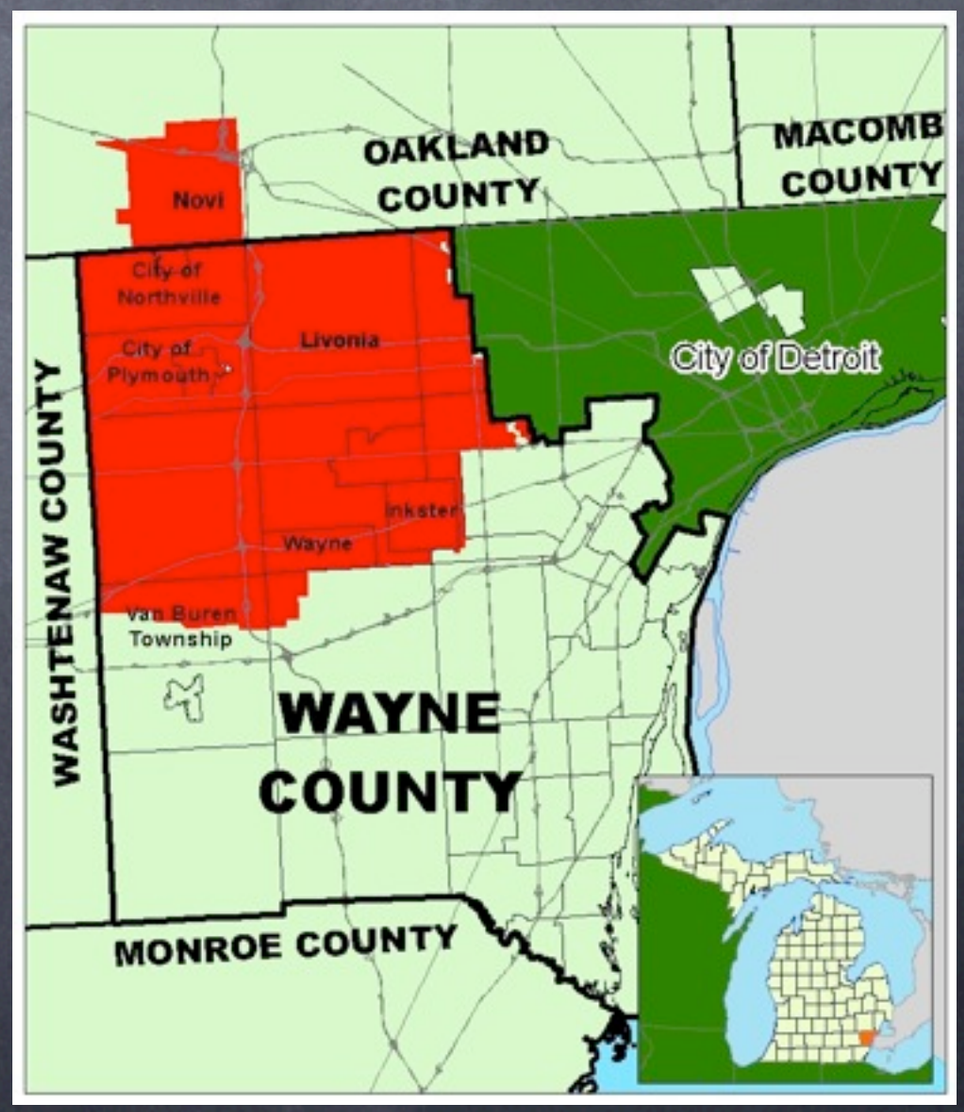
Findings:

Once the risk vs. cost is understood, decision-makers can make reasonable choices

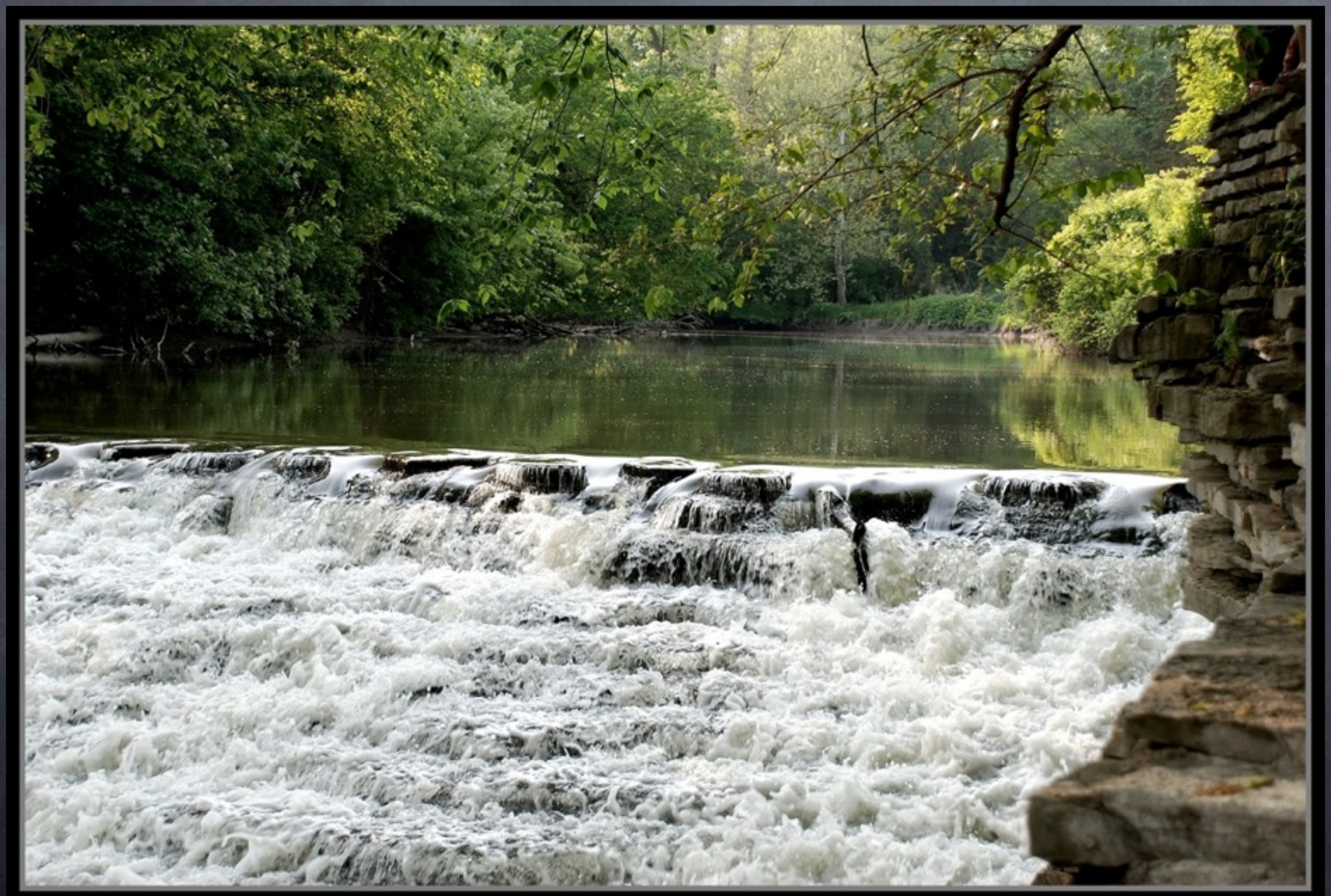
Case Study Example - Wayne County, Michigan

SSO Policy Impacts on Wayne County

- The NHVRV System collects sewage from 15 communities with a population over 500,000 for delivery to the Detroit WWTP
- In the late 80's the system was upgraded to control SSOs for the 10-year, 1-hour storm (3 communities unable to meet certification)
- Since the upgrades, SSOs occur about once every 2-4 years
- MDEQ is requiring improvements to meet the new SSO Policy
- The Communities are very concerned about escalating requirements and the cost of the improvements



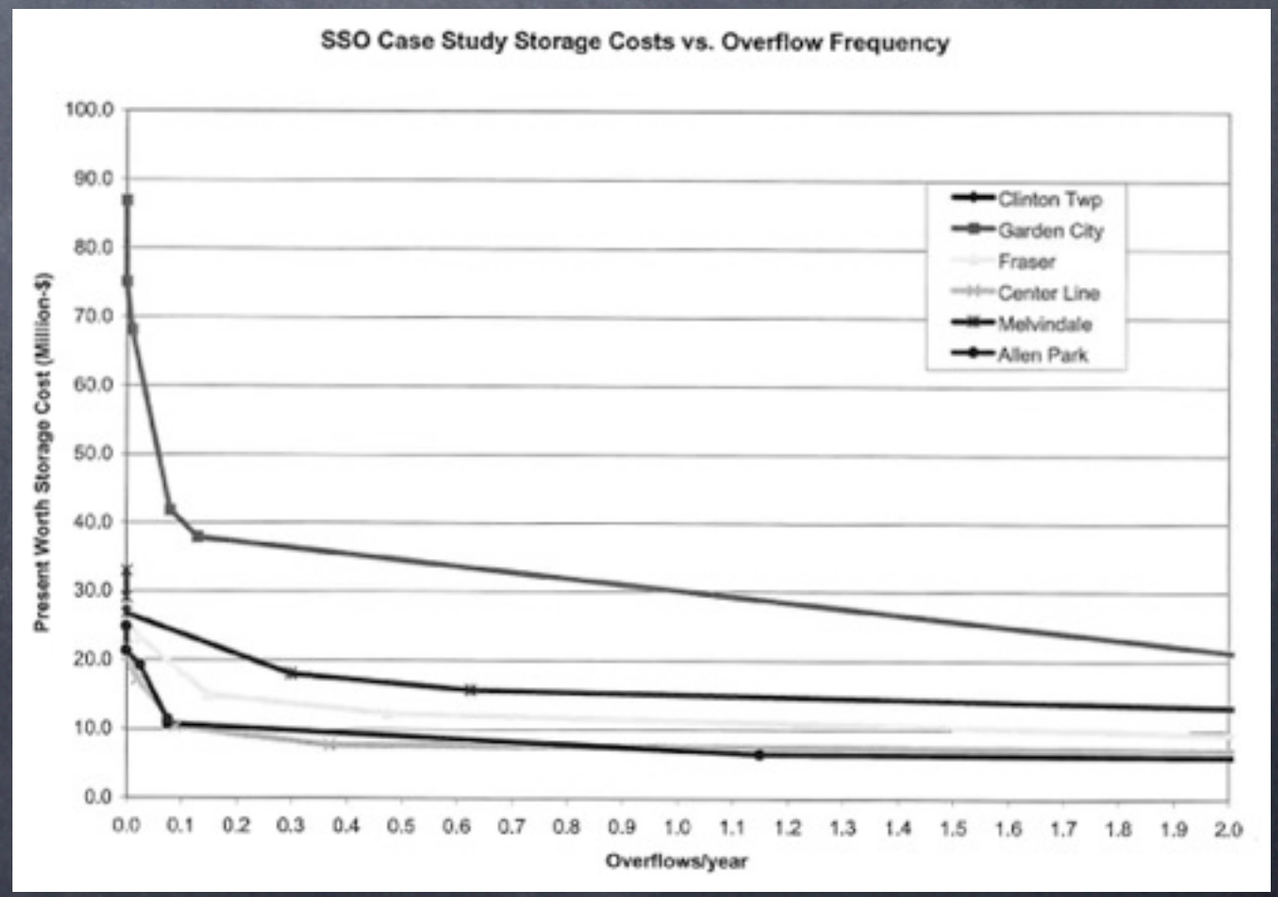
Rouge River



Sanitary Sewer Overflow (SSO)

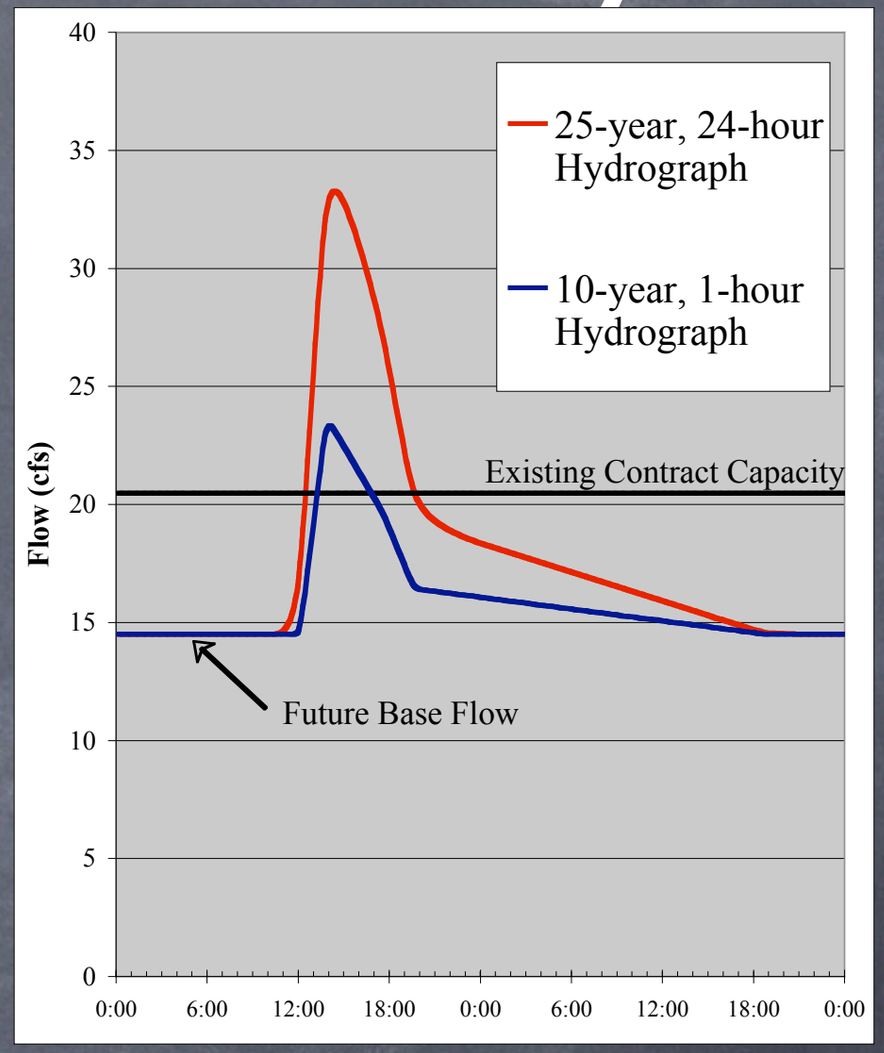
State of Michigan SSO Policy

- The Clean Water Act calls for a complete prohibition of SSOs
- MDEQ desired to formalize a policy as SSOs became a national priority
- Systems in Southeast Michigan were historically designed to transport a 10-year, 1-hour storm (1.8-inches)
- Advisory committee formed in 2001 to assist in developing a new policy
- MDEQ has acknowledged that zero SSOs is not feasible - they will use enforcement discretion



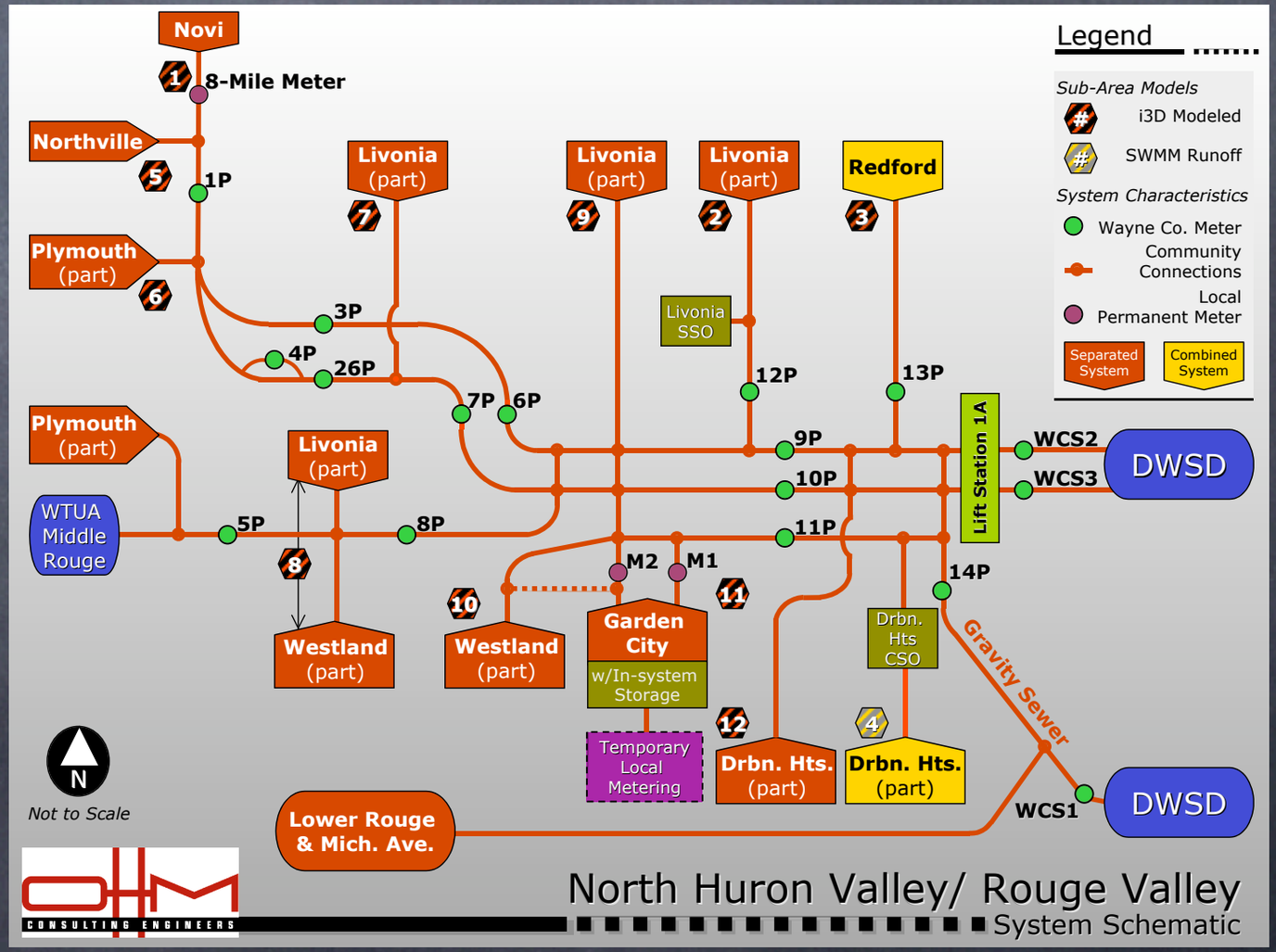
State of Michigan SSO Policy

- Technical research and policy discussions occurred during a 2-year period
- Available data indicated that a 10-yr, 1-hour design storm would be exceeded every 2-3 years
- MDEQ felt that this was too frequent and desired less than one SSO in 10 years
- A 25-year, 24-hour storm (3.9-inches) on average growth season soil moisture was selected
- Less than one SSO every 10 years is also acceptable



SSO Policy Impacts on Wayne County

- Initial development of alternatives based on event modeling was divisive. The frequency discussion showed some promise.
- A frequency analysis was tried with an event model
- Confidence in the analysis was not as high as desired for the level of capital investment required
- A new approach called Antecedent Moisture Modeling was used to perform the frequency analysis



Rouge overflow compromise saves $175M

By Christine Ferretti
The Detroit News

Wayne County officials on Wednesday announced a cost-saving compromise with the state Department of Environmental Quality to alleviate Rouge River sewage backups.

County and state environmental officials over the past four years have worked to revise a $270 million plan to combat Rouge overflow county officials viewed as financially unrealistic for the 13 impacted Wayne communities.

The new $95 million plan is expected to save communities $175 million.

The project, to be done by 2020, will include Rouge overflow studies and probably the construction of a regional relief tunnel, said Kurt Heise, the county's environment director.

Wayne County

"This is a really big deal for us. It shows our determination and hard work has paid off," he said. "This resolves one of the last remaining pollution issues in the Rouge watershed."

Officials of suburbs including Garden City, Westland, Inkster and Livonia — with sewer systems dating back to the 1940s or '50s — will bear the greatest financial burden. Communities with newer systems such as Plymouth, Northville and Canton Township won't be hit as hard.

Garden City officials were relieved to hear of the revised plan, City Manager David Harvey said. He said the city is looking at a "big price tag," but tweaking the local sewage system will reduce the presumably hefty impact.

"We don't know the final cost (to Garden City), but we are confident we can do some things to get the price tag down," he said.

Suzanne Todd of Dearborn Heights hopes the project will combat sewage overflow, but said she's skeptical.

"Sanitary sewers dump into that river, and I don't know how building a flood retention basin in that area would help," she said.

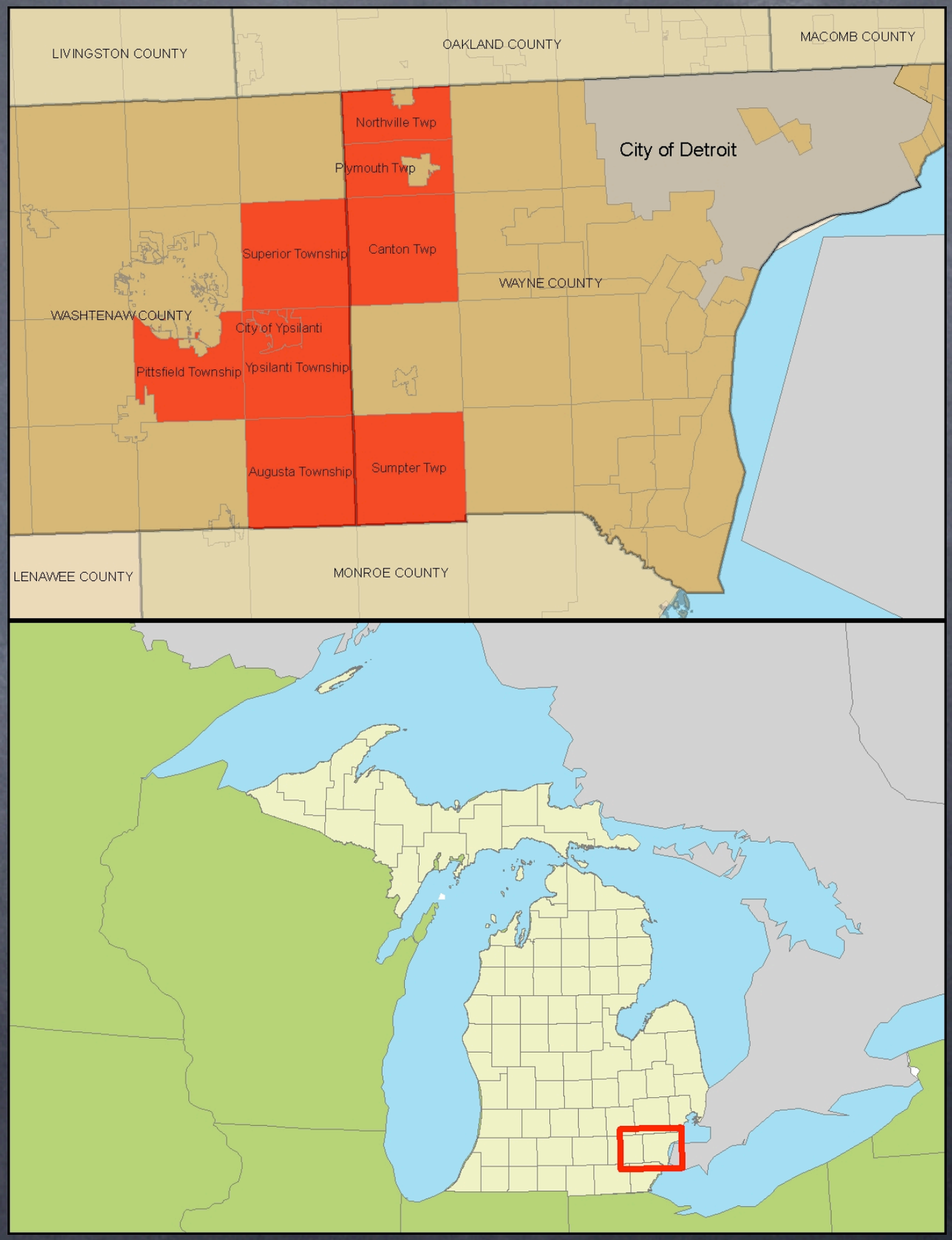
Wayne County and Downriver communities have spent more than $300 million improving sewers under a 1994 federal court order.

You can reach Christine Ferretti at (734) 462-2289 or cferretti@detnews.com.

Case Study Example - YCUA

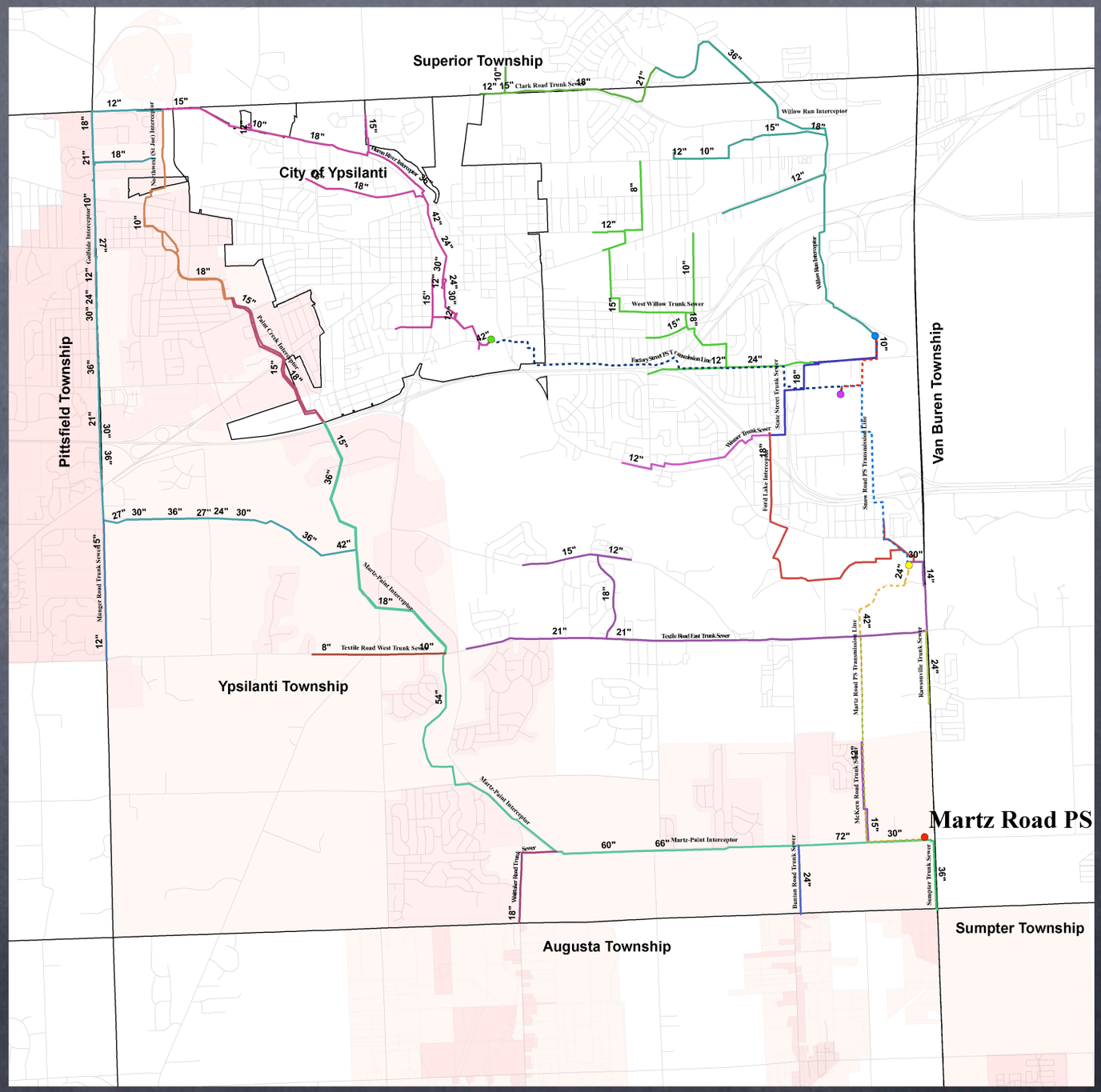
The YCUA System

- Located 35 miles west of Detroit
- Serves 9 communities
- Serves an equivalent population of 230,000
- YCUA owns and operates 4 main pump stations which convey flow to the YCUA treatment plant
- Among those pump stations is the Martz Road Station, which is the focus of this case study
- The Martz Road Pump Station conveys flows from 5 communities with a capacity of 14.5 Million Gallons per Day (MGD)



SSO Policy Impacts on the Martz Road Pump Station Capacity Assessment

- In 1999 YCUA prepared a capacity assessment of the Martz Road Pump Station
- The capacity assessment of the pump station indicated that future peak flows to the station were 44.6 MGD.
- No known overflows from the sanitary collection system as a result of capacity issues.
- Collection system operators have never observed a capacity problem at this pump station even though a rainfall close to the remedial design event.
- YCUA was not comfortable with the findings and in 2006 decided to revisit the master plan....



Lesson #3

<u>Common Expectations</u>

Technical analyses provide a single, correct answer

<u>Reality:</u>

Different assumptions can significantly alter the results of the analyses

Summary of Existing and Future Design Peak Flows

Design Peak Flow Computations (flows in MGD)

Description	Existing Calculations in 1999 YCUA Master Plan	Revised Calculations Based on New Analysis
Existing Base Flow	4.4	2.6
Future Base Flow	14.0	5.7
Projected Design Wet Weather Flow	26.2	14.1
Future Design Peak Flow	**44.6**	**22.4**

Existing capacity = 14.5 MGD

Technical Overview of the 1999 and 2006 Capacity Assessments of the Martz Road Pump Station – Future Base Flows

- Future base flows were estimated using population growth projections
- The 1999 study utilized the observed wet weather peaking factors
- The 2006 study used dry weather peaking factors

Modeling Approach	Estimated Population Growth	Additional Average Dry Weather Flow at 100 gpcd, MGD	Calculated Additional Future Peak Flow, MGD
1999 Study - Traditional Approach	45,800	4.6	14.0
2006 Study - Frequency Based Approach	45,800	4.6	5.7

Aggressive Flow Management

The less conservative modeling approach used for the analysis coupled with the less conservative assumptions used to estimate future peak flows revealed the need for an aggressive flow management program recommendation.

Aggressive flow management to include the following:

1. Continuous flow monitoring of the Martz Road Pump Station to verify that the future base flows do not exceed the ones assumed in the analysis.
2. Continuous inspections of the collection system upstream of the Martz Road Pump Station to identify sources of I/I.
3. Continuous I/I Source Removal
4. Advanced tracking tools to compare measured flows to modeled flows to track I/I flows

Summary of Revised YCUA Recommendation

- The update analysis of the Martz Road Pump Station revealed overly conservative estimates of peak flows to the station.
- The more reasonable peak design flow estimate of 22.4 MGD reduced the amount of capital expenditures required for the Martz Road Pump Station upgrade from $9,700,000 to $600,000 with an estimated savings of $9,100,000.
- Aggressive Flow Management

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Common Expectations

Technical analyses provide a single, correct answer

Reality:

Different assumptions can significantly alter the results of the analyses

Findings:

If your common sense tells you to question the results, explore the assumptions

Summary

Difficult economic times require a closer look at expensive projects. Some tips to consider:

#1 - There's always a bigger storm - a risk-based approach may suggest better solutions

#2 - Conservative analyses can result in a more expensive project - rigorous testing (calibration and validation) can provide confidence in the project sizing

#3 - If a project doesn't seem to match your "common sense" intuition, explore the assumptions or seek a second opinion.

Questions?