Somerset Raritan Valley Sewerage Authority

SSO Abatement and Storm Control Treatment Facility

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Collection Systems Specialty Conference

NEWEA

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Presentation Outline

- Collection System Overview
- SSO Problem Definition
- Monitoring and Modeling
- Alternatives Analysis
- Proposed Solution

Somerset Raritan Valley Sewerage Authority System Overview

- 23 MGD Advanced Wastewater Treatment Facility (permitted for 24.3 MGD) in Bridgewater, New Jersey
- Discharges to Raritan River
- Serves 9 municipalities (Population ~ 127,000)
- 4.5 miles of sewer interceptor

SRVSA Service Area and Interceptor

Meter Chamber 4

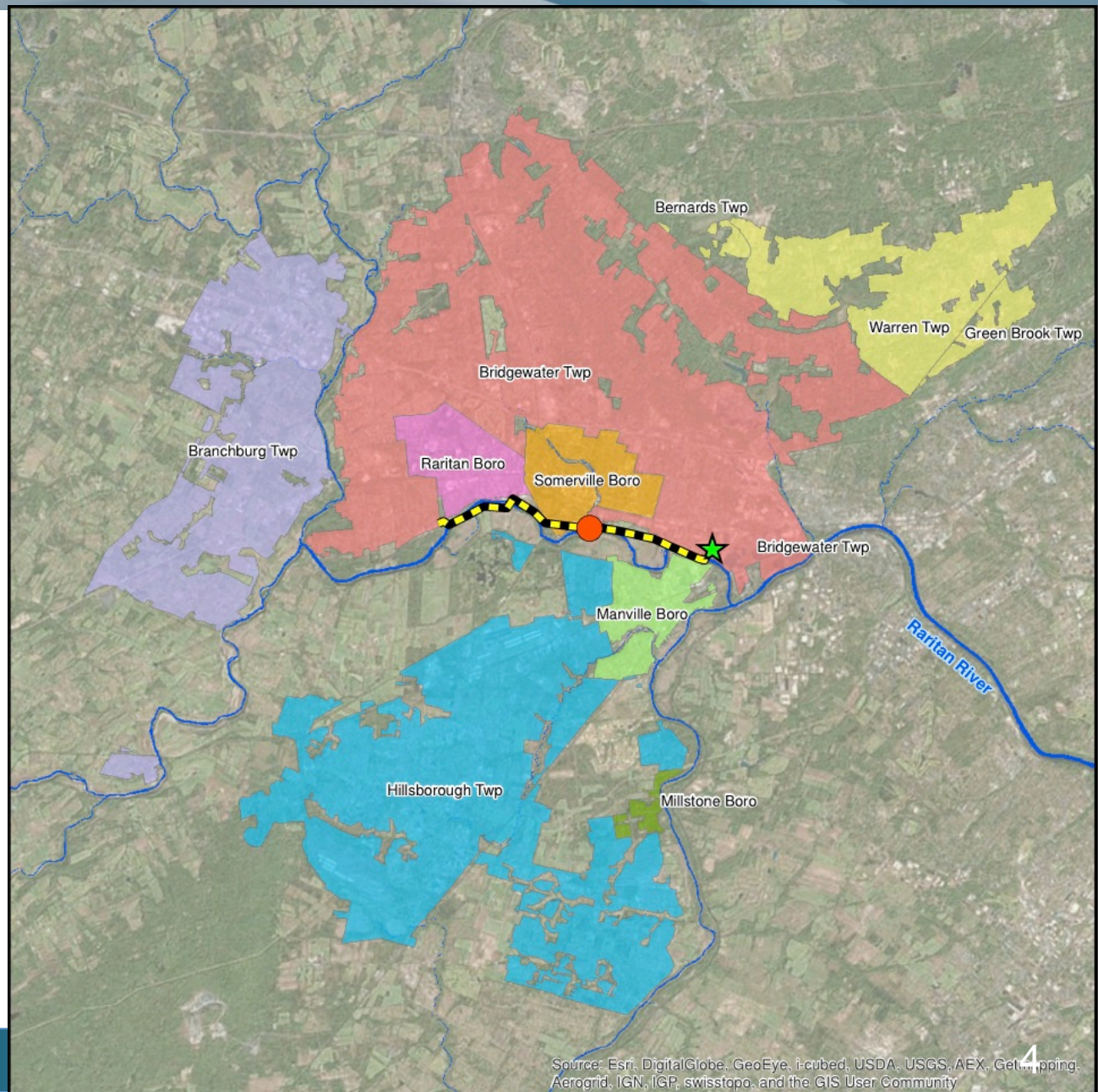
SRVSA Interceptor

SRVSA WWTP

Sewer Service Area

- BRANCHBURG TWP
- BRIDGEWATER TWP
- HILLSBOROUGH TWP
- MANVILLE BORO
- MILLSTONE BORO **
- RARITAN BORO
- SOMERVILLE BORO
- WARREN TWP*

2014 ESRI Roads Basemap
2014 NJDEP Sewer Service Areas



*Includes discharges in Bernards Twp. and Green Brook Twp.

**Millstone Boro added in adopted WMP Sewer Service Area Map but not yet serviced.

Timeline on Interceptor Surcharging

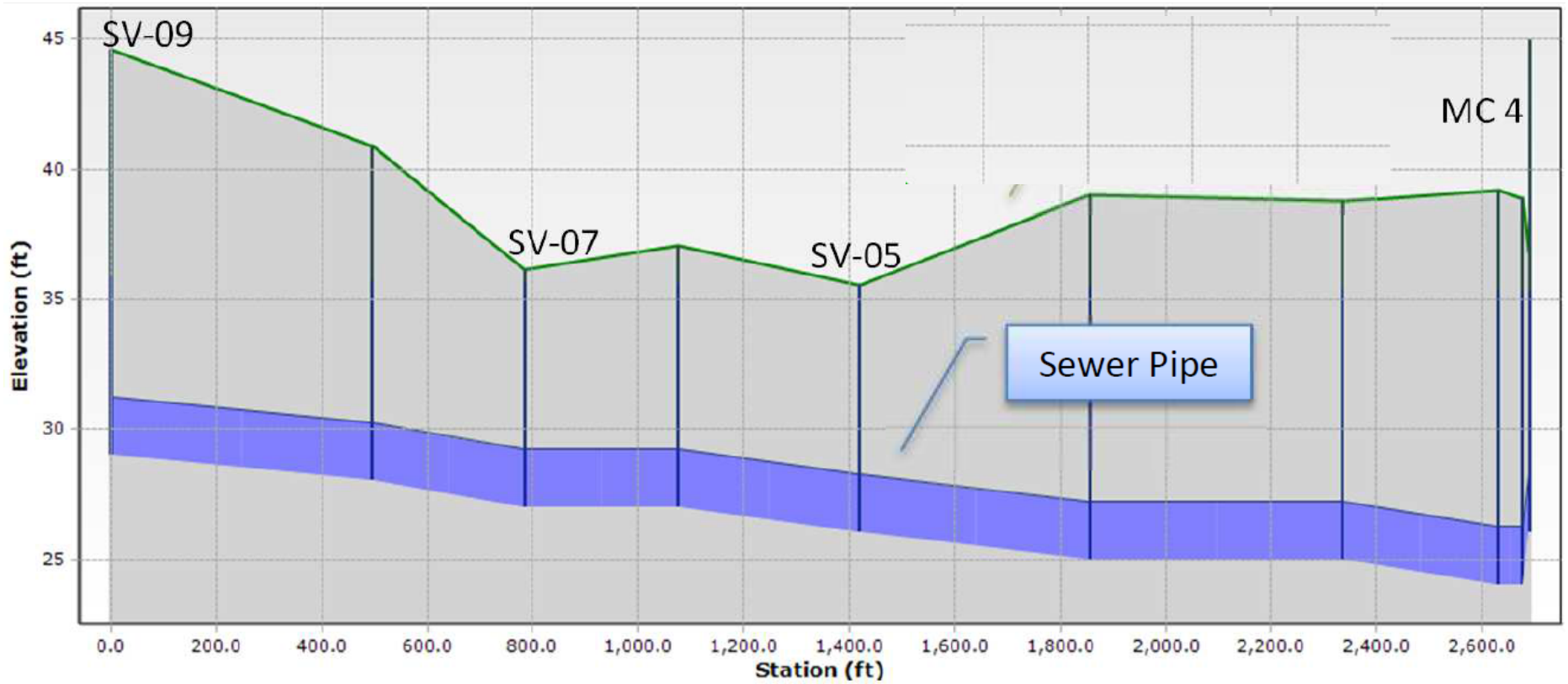
- **1958: SRVSA constructs Interceptor Sewer, including "bypass outlet" at Meter Chamber No. 4 that discharged directly to Raritan River**
- **1965: SRVSA constructs original Storm Control Pumping Station, which pumped flow out of interceptor and through screening/chlorination facility which discharges directly to Raritan River**
- **1970: SRVSA constructs two-mile long forcemain connecting the Storm Control Pumping Station directly to the head of the treatment plant with station capacity of approx. 18 MGD**
- **1988: SRVSA expands Storm Control Pumping Station capacity to approx. 30 MGD and removes bypass.**
- **1998: New metering systems installed that are able to measure under surcharge conditions and reverse flows.**

Timeline on Interceptor Surcharging

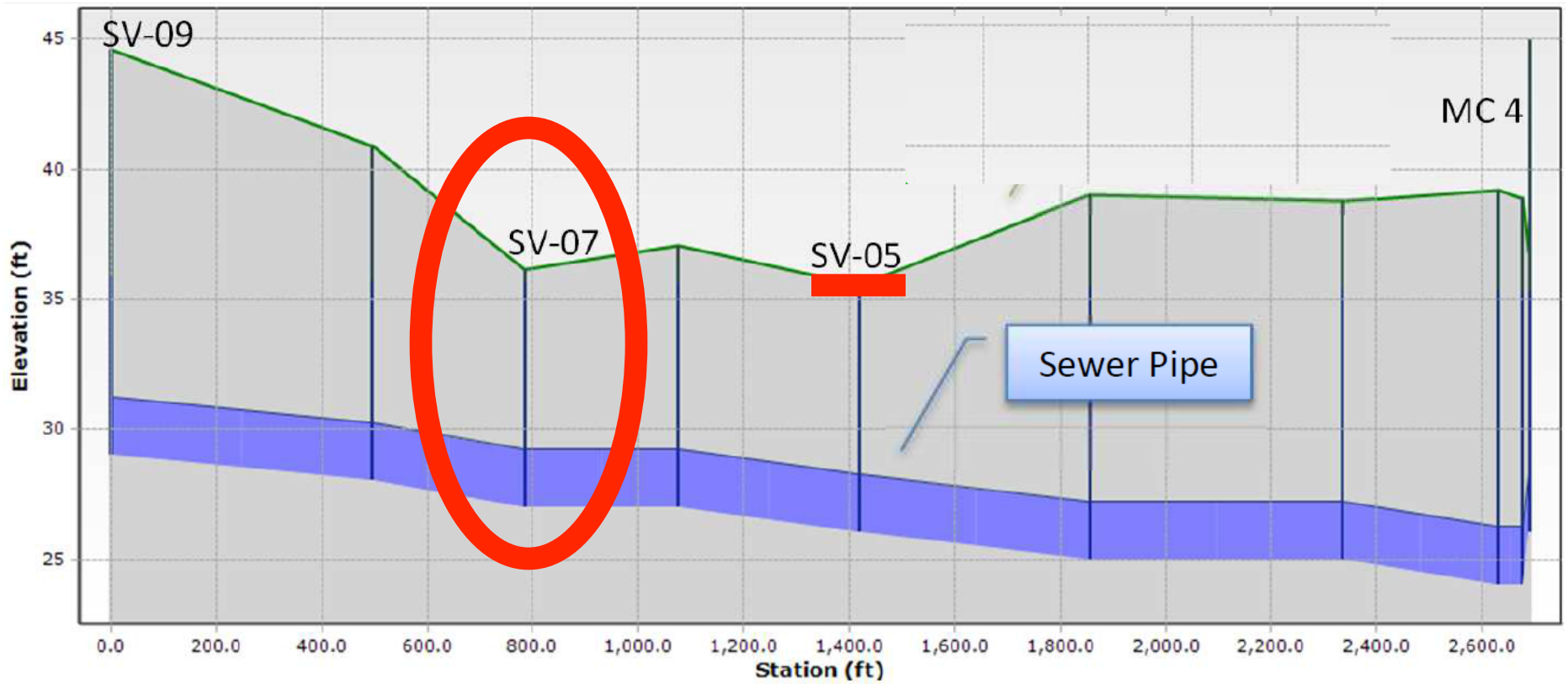
- **1998 – 2012:**
  - **Rehabilitation and modifications to main treatment facility**
  - **Construction of 30” relief interceptor**
- **2009: Somerville secures leaking manhole at Meter Chamber No. 4.**
- **2010: Investigation of flooding of little league field leads to new understanding of extent of problem.**
- **2011: Began preliminary investigation of options to address problem.**

Meter Chamber No. 4 Area

Profile of Somerville 27” Trunk Sewer



Profile of Somerville 27” Trunk Sewer



SSO Problem Definition

During excessive wet weather conditions, wastewater from the Borough of Somerville is escaping the sanitary sewer system upstream of Meter Chamber No. 4.

This occurs because:

- the SRVSA interceptor becomes surcharged due to the excessive I/I from the member municipalities, and
- the low elevation of the Somerville 27” trunk sewer relative to the interceptor.

Overview of Sanitary Sewer Overflow

Central Ave on March 30, 2014

Central Ave on March 31, 2014

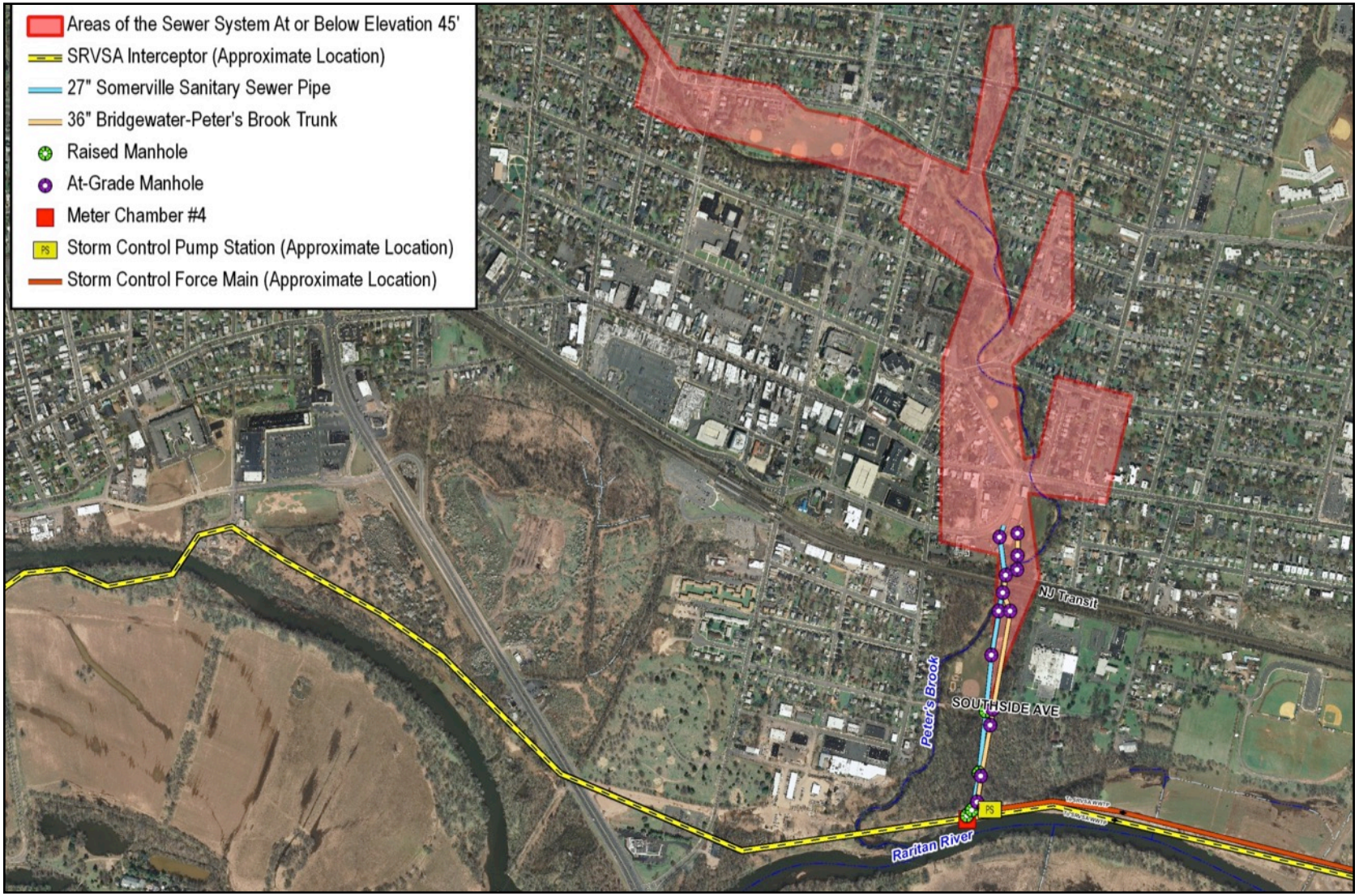
Central Ave. During March 2014 Storm

Largest Overflow Observed – SV07

(March 2014 during SRVSA Plant Upset))

Little League Field from Southside Avenue Showing Ponded Sewage Discharge

Basement Elevations are Key



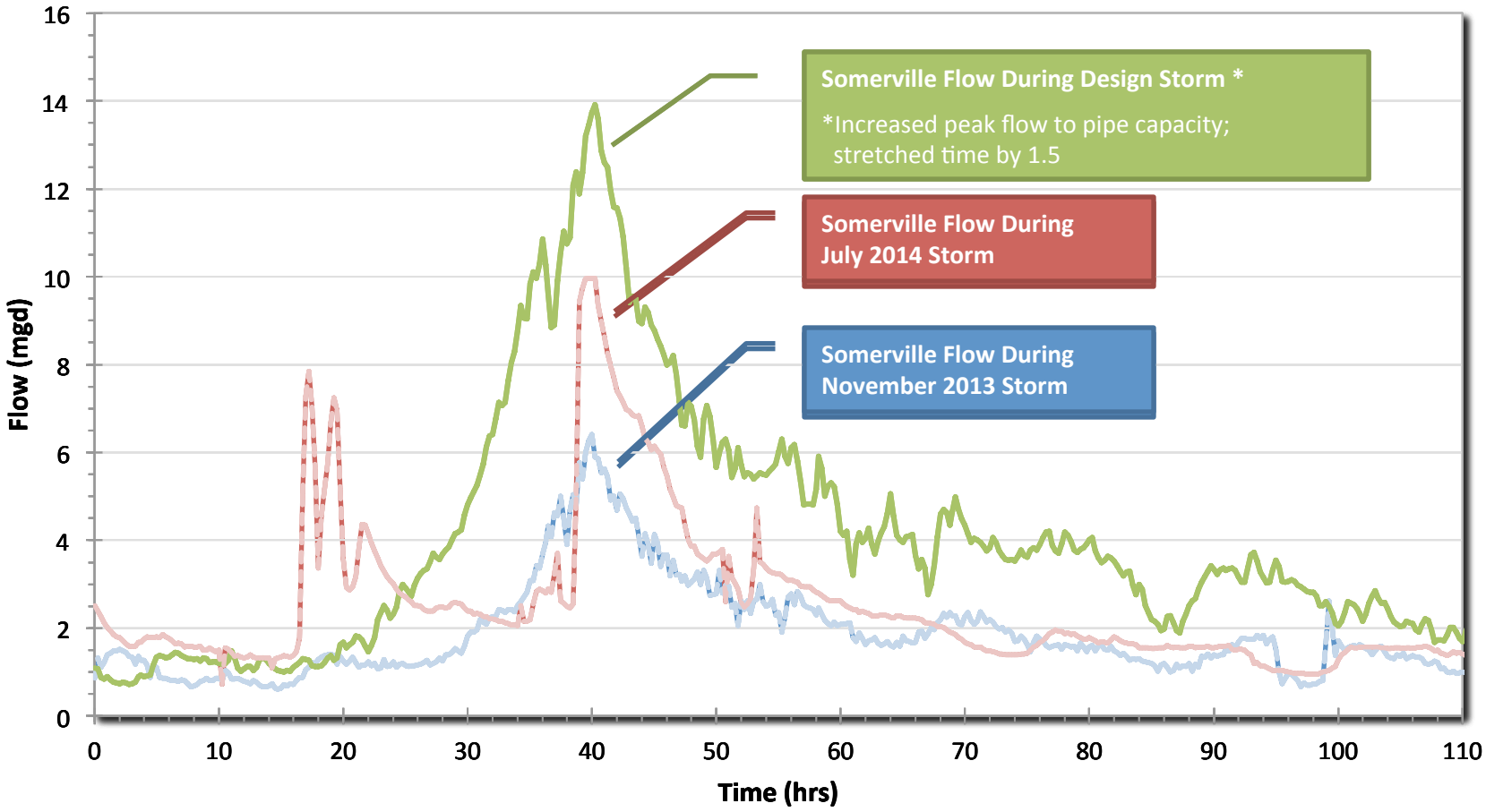
Extensive Monitoring and Modeling Studies

- **Hydraulic Model** of SRVSA interceptor and lower Somerville system
  - Utilized existing SRVSA meter data supplemented with 12 additional meters
  - Used to determine design criteria
- **Wasteload Allocation Study** to predict impact of SSO treatment plant on Raritan River
  - Water quality monitoring during six storms
    - Data collected during overflow conditions from Peter's Brook, Raritan River, and SSO
  - Flow and water quality models developed for Raritan River / Peters Brook
  - Model used demonstrate water quality benefit and establish effluent limits
- **Alternatives Analysis** to evaluate SSO solution alternatives
  - Four alternatives evaluated using three criteria: environmental considerations, feasibility, and costs

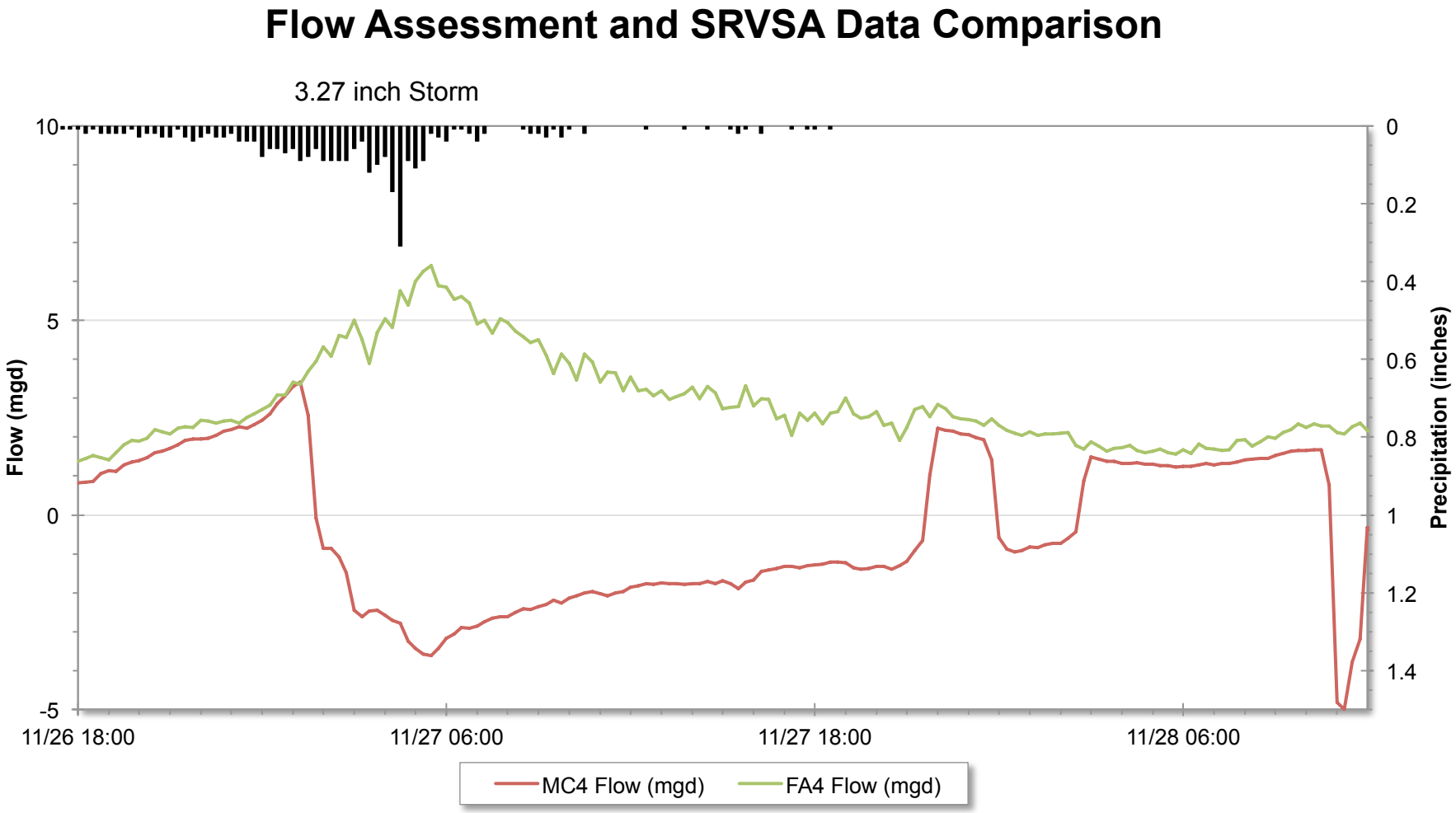
Hydraulic Model

- Developed GIS of interceptor and lower Somerville sewer system (manhole and pipe elevations and locations; pipe lengths; valve locations; pipe materials, etc.) and hyperlinked original plan sets.
- Developed SewerGEMS model of SRVSA Interceptor and lower Somerville sewer system.
- Model simulates flow and hydraulic grade line.
- Meter chamber flow meter data used as input to model.
- Model used to simulate proposed improvements and evaluate best means to stop overflows.

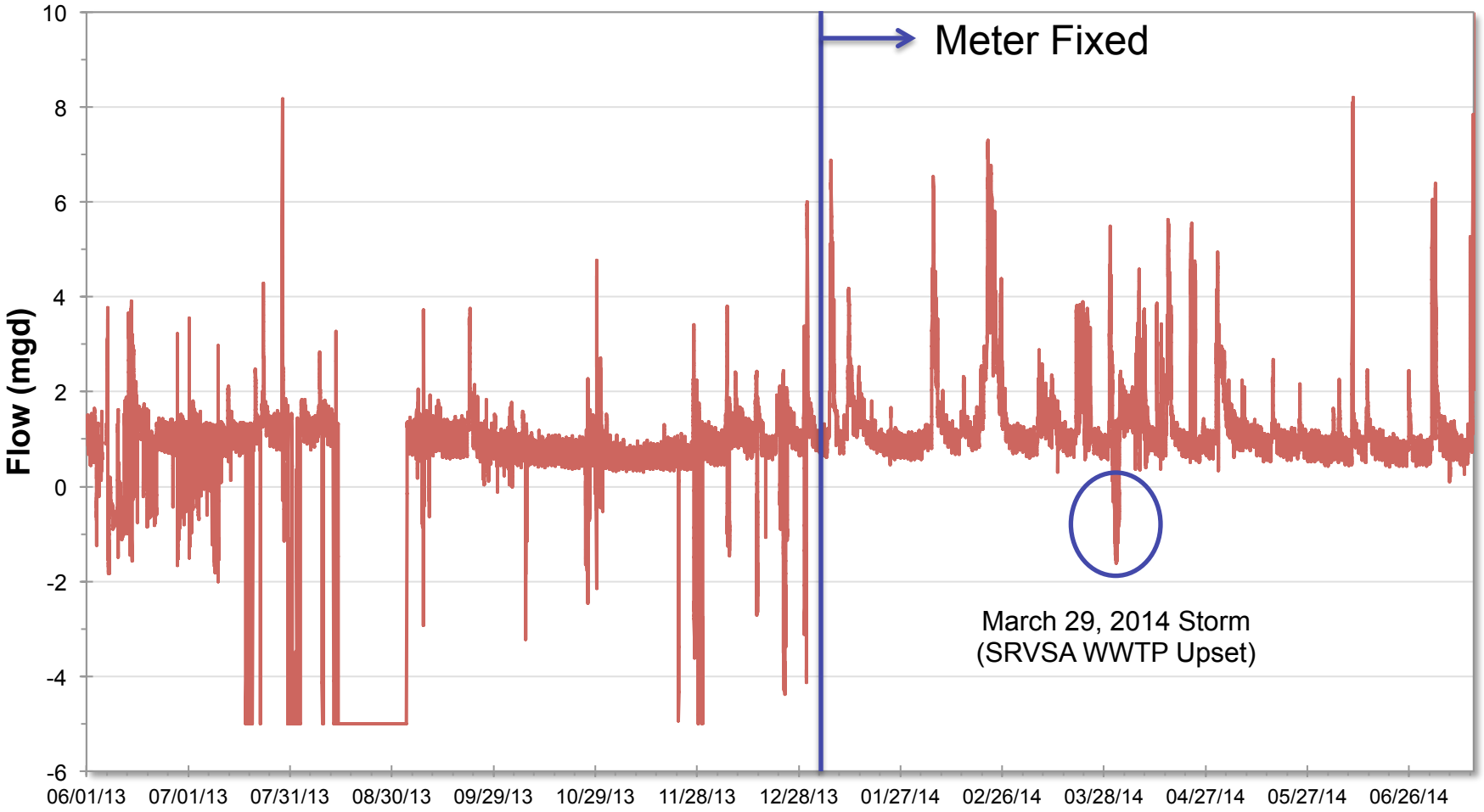
Hydraulic Model



MC4 Results – November 2013 Storm



Meter Chamber #4 Issue

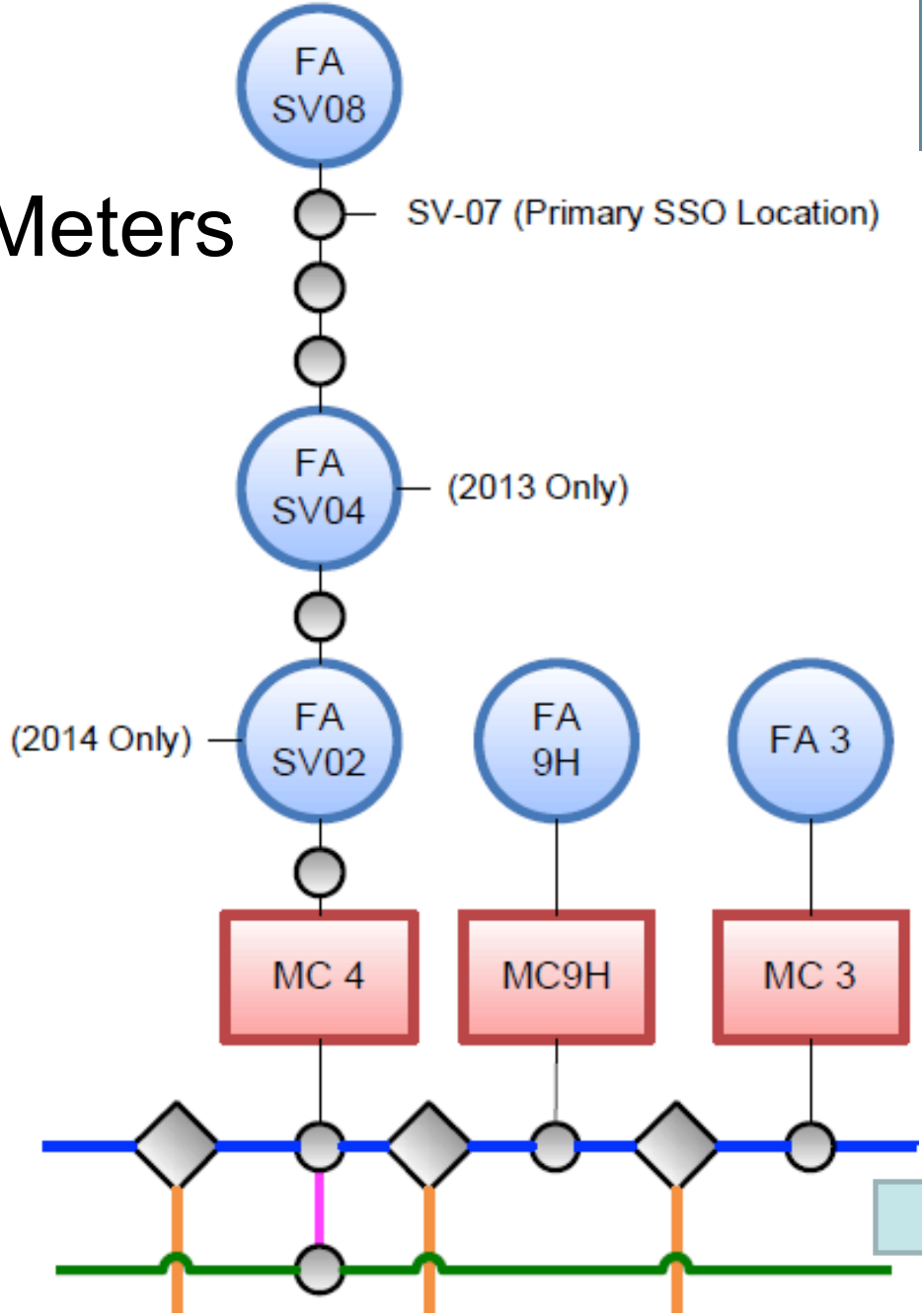


Metering/Sampling Program Summary

- Temporary Flow Metering Program
  - 15 meter chambers at municipal connections to interceptor
  - June 2013 – July 2014
  - 4 storms with overflows:
    - June 7-8, 2013 – 4.2 inches rain (substantial, but unmeasured overflow volume)
    - November 26-27, 2013 – 3.3 inches rain (10,000 gallon overflow)
    - March 29-30, 2014 – 3.0 inches rain (9,000,000 gallon overflow)*
    - April 29-30, 2014 – 4.6 inches rain (750,000 gallon overflow + upstream)
- Water Quality Sampling Program
  - 7 storm events; 5 stream locations and 1 sewer system location
  - Parameters: BOD_5, TSS, TKN, NH_3-N, NO_3-N, TP, metals, and E. Coli
- Interceptor I/I Investigation

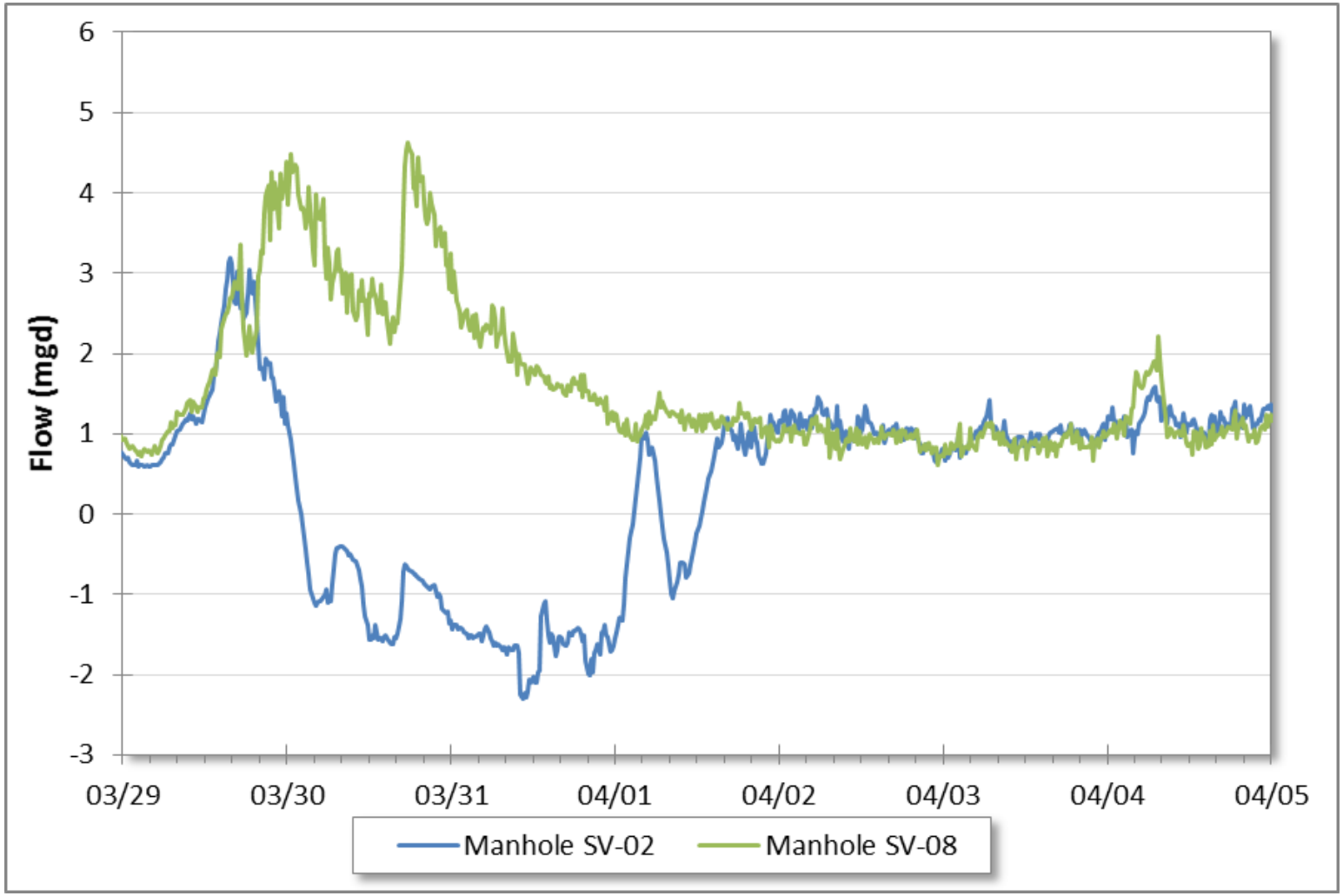
*Overflow exaggerated due to plant upset.

Temporary Flow Meters

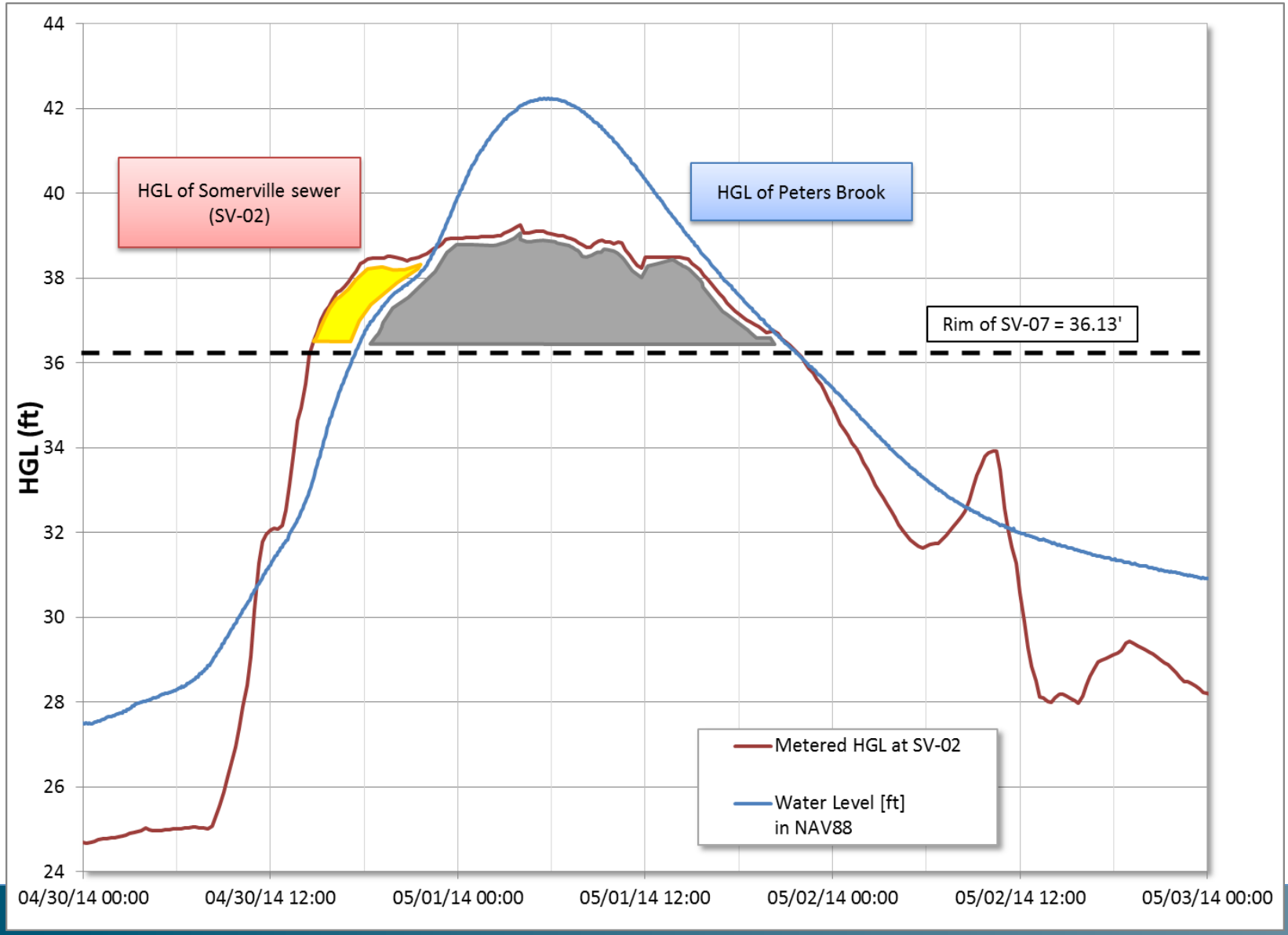


SRVSA
Interceptors

Quantifying Sewer Overflows



Flood influence on Sewer Overflows



Solution Alternatives

- No Action
- Pump Station, Force Main, & SRVSA WWTP Expansion
- I&I Reduction
- Storage
- Auxiliary Treatment Facility (named “Storm Control Treatment Facility”)

Solution Alternatives

1. Reduce Infiltration/Inflow
   - Impractical
   - Cost Prohibitive
   - Results not guaranteed
   - Multiple decade implementation timeframe
2. Pump, Convey, and Treat at SRVSA WWTP
   - Land Use permitting issues
   - Availability of land for SRVSA WWTP expansion
   - Inefficiency in designing expanded plant for few large storms
   - Cost prohibitive
3. Storage
   - Huge volume required
   - What happens when tank full?
4. Construct plant for SSO treatment
   - Eliminates discharge of untreated overflow
   - Relieves flow sent to SRVSA during wet weather
   - Cost effective

No Action

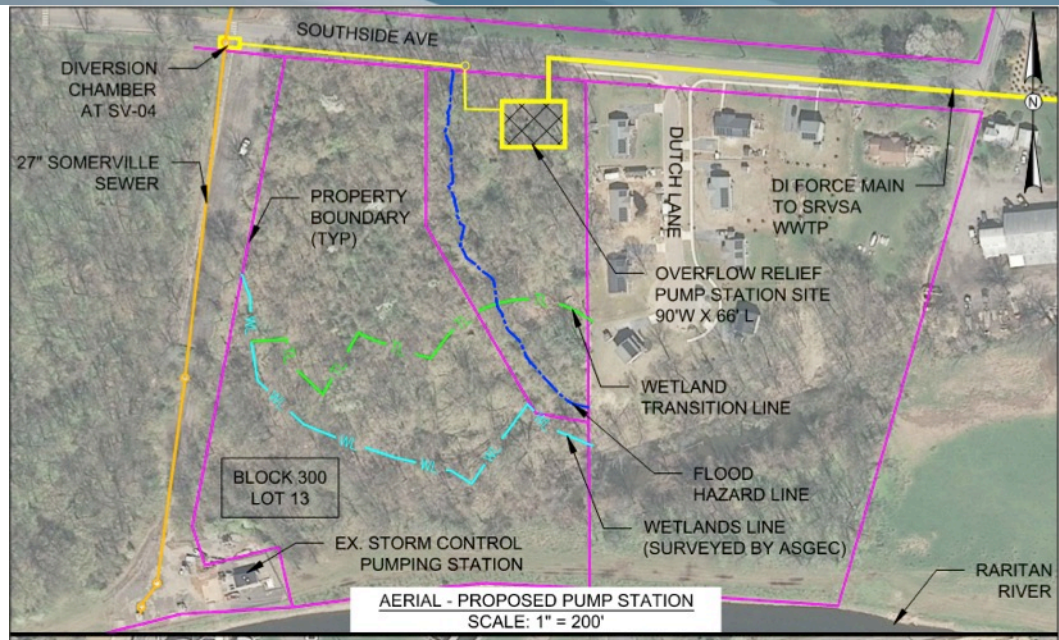
- Positive Attributes
  - No Costs Incurred
- Negative Attributes
  - Overflows will continue during large storm events
  - Water quality will continue to be degraded
  - Continued public health risk

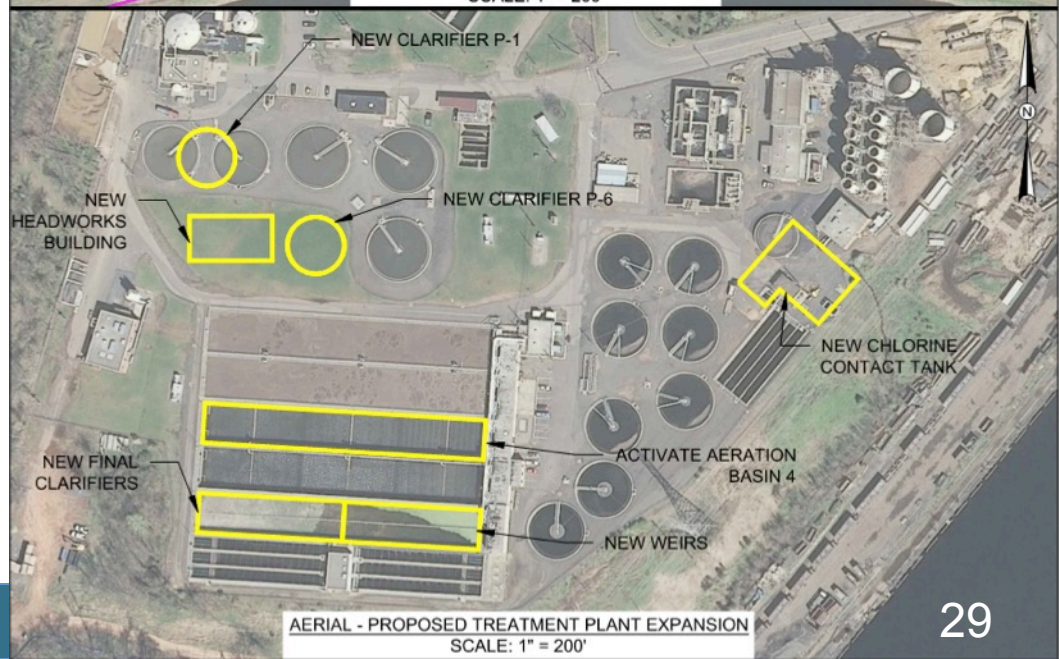
Pump Station, Force Main, & WWTP Expansion

- 14 mgd peak flow pump station, 2 mile long 24-inch force main, and WWTP expansion to handle additional 14 mgd peak wet weather flow
- Positive Attributes
  - All treatment occurs in one place
  - Would address future expansion requirements
- Negative Attributes
  - Secondary impacts along pipeline to WWTP
  - Expanded capacity will sit unused most of the time
  - Operational challenge to keep biology alive
  - Requires land acquisition
  - Provides additional capacity for unplanned development
  - Requires WMP amendment
  - Cost estimated at $49 million

Pump Station
and
Force Main

Treatment
Plant
Expansion





Inflow and Infiltration Reduction

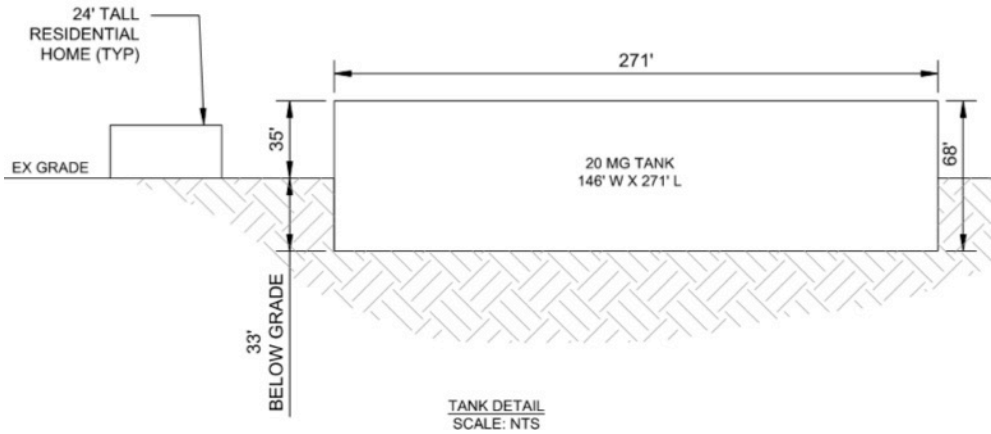
- To stop SSO in Somerville, would need to remove 11 mgd (27% reduction) in peak flow from municipal systems
- Positive Attributes
  - Direct solution to problem
  - No treatment system required
  - Would not require land acquisition
- Negative Attributes
  - Municipal systems not within SRVSA's jurisdiction
  - Overflows will continue over the decades required to implement
  - Not guaranteed to remove sufficient I&I
  - Not guaranteed to eliminate SSOs
  - Cost estimated at $54 million

Storage

- Need 20 million gallon tank to safely store 2 days of Somerville flow.
- Positive Attributes
  - Only minor treatment needed
- Negative Attributes
  - Extended storms may exceed tank capacity and cause SSOs
  - Size of Tank (300’ x 170’ x 53’)
    - eyesore to community
    - large surface area: large odor control volume
  - Cost estimated at $64 million
  - Will require additional land acquisition
  - Remote facility to operate and maintain

Storage Alternative

AERIAL
SCALE: 1" = 200'

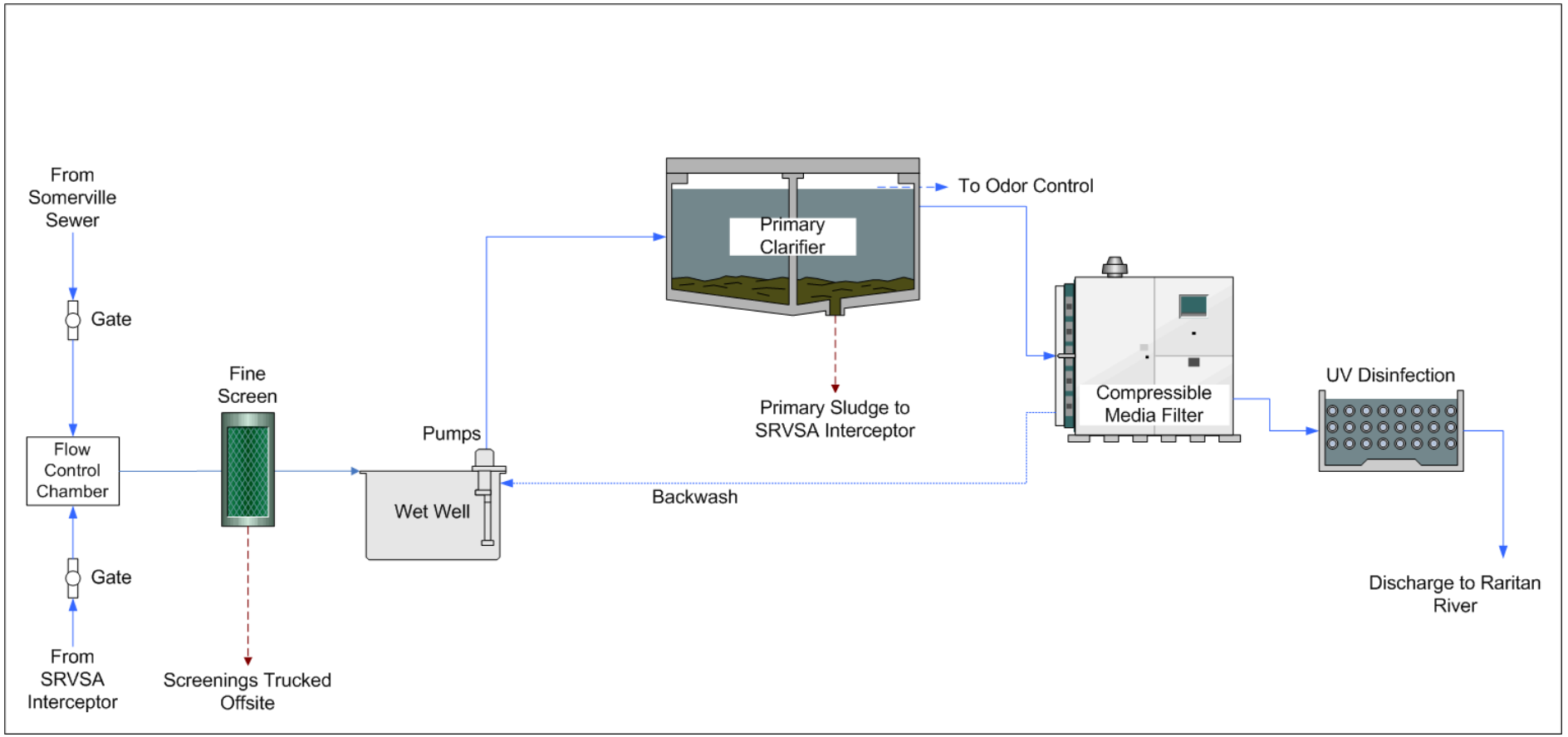


TANK DETAIL
SCALE: NTS

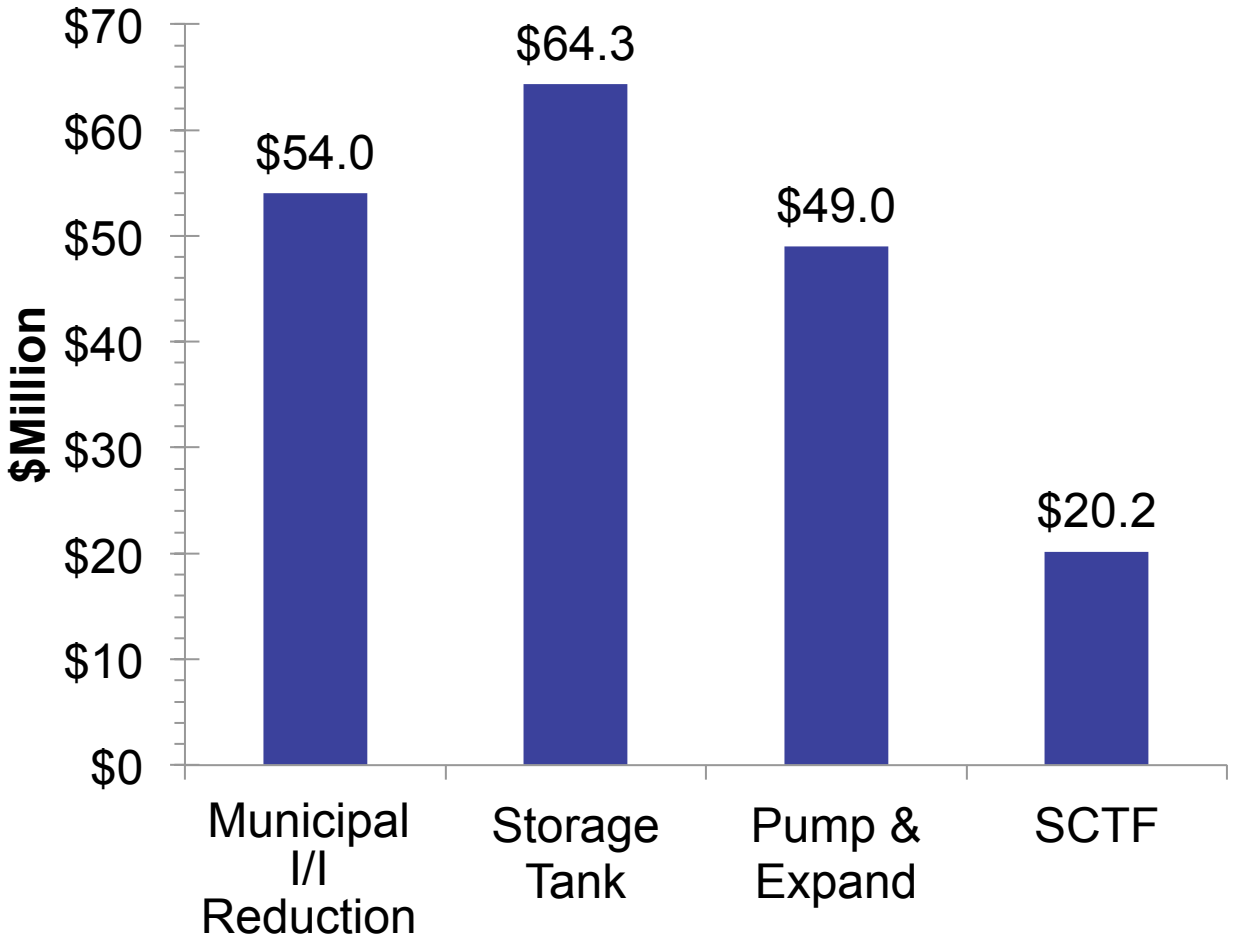
Storm Control Treatment Facility (SCTF)

- Auxiliary treatment facility with 14 mgd peak flow and 9 mgd average flow treatment capacity
- Positive Attributes
  - Maximizes ability to remove SSOs caused by interceptor surcharge
  - Takes pressure off existing WWTP during high flows
  - Minimum cost of alternatives - $18 million
- Negative Attributes
  - Requires auxiliary treatment facility and discharge
    - Remote treatment facility to operate and maintain
    - Land acquisition required

Storm Control Treatment Facility Process Schematic



Estimated Costs for Each Alternative (Includes Capital and O&M Costs)



Alternative Rating Results*

Evaluation Criterion	I&I Reduction	Storage Tank	Pump & Expand	SCTF
Cost	1.0	1.0	1.0	2.0
Feasibility	1.0	2.0	2.0	3.0
Environmental Impact	0.0	1.0	1.0	2.0
Total (w/o weighting)	2.0	4.0	4.0	7.0

* 0 = worst; 3 = best

Project Status

- NJDEP has approved the SCTF alternative
- NJDEP has issued draft NJPDES discharge permit for SCTF
- Engineering design is 60% complete
- Working on Land Use permits and Land Acquisition
- Anticipated Schedule (subject to change based on approvals):
  - Submit Final Design to NJEIT – September 2016
  - Receive All Required Permits and Approvals – April 2017
  - Construction Start – June 2017
  - SCTF In Operation – January 2019

Questions?

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