Supplemental CSO Team - Session #10

Held: January 22, 2019

Senior Citizens Center

Borough of East Newark

Agenda:

- Introductions
- Prior Meeting Recap
- Reducing Combined Sewer Overflows Using a Surface Channel System
  Presented by Stevens Institute of Technology Senior Design Students: Jason Farkas, Ryan Nguyen, Paul Potenza
- PVSC Facilities Inventory and Condition Assessment Analysis Program (Phase V)
  Presented by Kristie Wagner, PE, CDM Smith
- Green Infrastructure Database for the PVSC Service Area
  Presented by Christopher C. Obropta, Ph.D., P.E., Rutgers Cooperative Extension Water Resources Program
- Evaluation of Alternatives Briefing
  Presented by John Dening, PE, Mott MacDonald

CLEAN WATERWAYS

Healthy Neighborhoods

Supplemental CSO Team – Session 10

PVSC Service Area
North Bergen MUA Service Area (Woodcliff Treatment Plant)
Long Term Control Plan

January 22, 2019

CLEAN WATERWAYS
Healthy Neighborhoods

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- Evaluation of Alternatives Briefing
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- Questions
- Adjourn

CLEAN WATERWAYS
Healthy Neighborhoods

Introduction and Recap

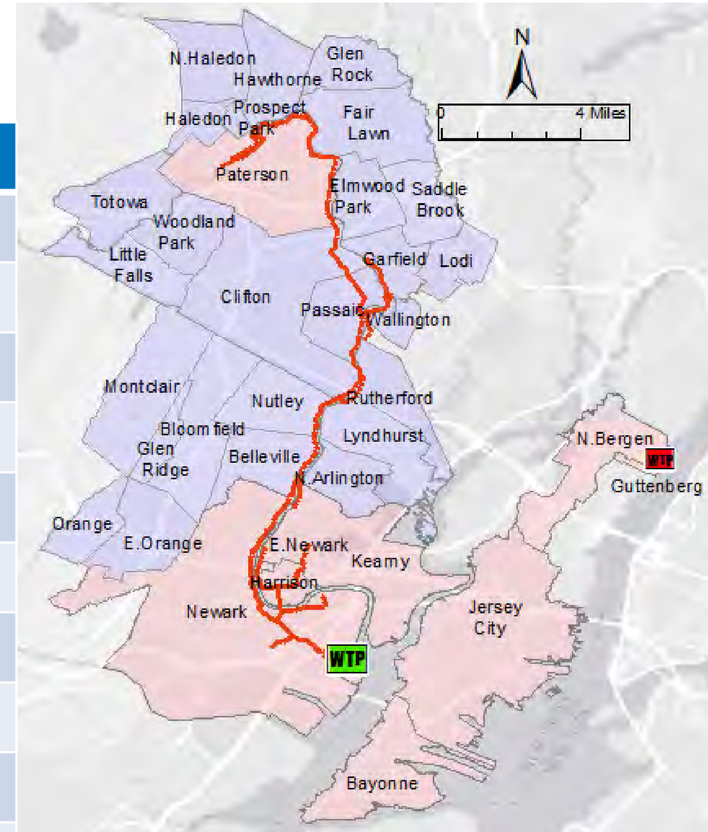
CLEAN WATERWAYS
Healthy Neighborhoods

Supplemental CSO Team Members

Member	Organization		Member	Organization
Dan Smereda	Bayonne Water Guardians		Sue Levine	Paterson Smart
Lisha Smereda	Bayonne Water Guardians		Ruben Gomez	City of Paterson Economic Development
Nicole Miller	Newark DIG		Sheri Ferreira	Greater Paterson Chamber of Commerce
Drew Curtis	Ironbound Community Corporation		Betty Jane Boros	New Jersey Business & Industrial Association
Robin Dougherty	Newark Greater Conservancy/Newark Business Partnership		Vacant	Montclair State University - Passaic River Institute
Jorge Santos	Newark Community Economic Development Corporation		Christopher C. Obropta, Ph.D	Rutgers University - Cooperative Extension Water Resources
Christopher Pianese	Township of North Bergen		Captain Bill Sheehan	Hackensack Riverkeeper
Janet Castro	Hudson Regional Health Commission Town of North Bergen		Harvey Morginstin	Passaic River Boat Club & Passaic River Superfund CAG
Thomas Stampe	North Bergen "Sustainable Jersey" group		Laurie Howard	Passaic River Coalition
Nancy Kontos	Bunker Hill Special Improvement District		Ben Delisle	Passaic River Rowing Association
Alison Cucco	Jersey City Environmental Commission		Patricia Hester-Fearon	Town of Kearny
Michele Langa	NY/NJ Baykeeper		Christopher Vasquez	Town of Kearny

Permittees

Permittee	Municipality	WWTP	CSOs
Bayonne MUA	Bayonne	PVSC	30
Borough of East Newark	East Newark		1
Town of Harrison	Harrison		7
Jersey City MUA	Jersey City		21
Town of Kearny	Kearny		5
City of Newark	Newark		18
North Bergen MUA	North Bergen		7
City of Paterson	Paterson		23
PVSC	-		0
Town of Guttenberg	Guttenberg	Woodcliff	1
North Bergen MUA*	North Bergen		1
	Total		114



* North Bergen MUA conveys flows to both PVSC and Woodcliff WWTPs

CLEAN WATERWAYS
Healthy Neighborhoods

Project Status Update

CLEAN WATERWAYS
Healthy Neighborhoods

59-Month Program Schedule and Milestones

January 1, 2016

- ✓ Coordinates of pumps, regulators, and outfalls
- ✓ System Characterization Work Plan
- ✓ Baseline Compliance Monitoring Program Work Plan

July 1, 2016

- ✓ Map of Combined and Separate Sewer Areas

July 1, 2018

- ✓ System Characterization Report
- ✓ Public Participation Process Report
- ✓ Compliance Monitoring Program Report
- ✓ Consideration of Sensitive Areas Plan

July 1, 2019

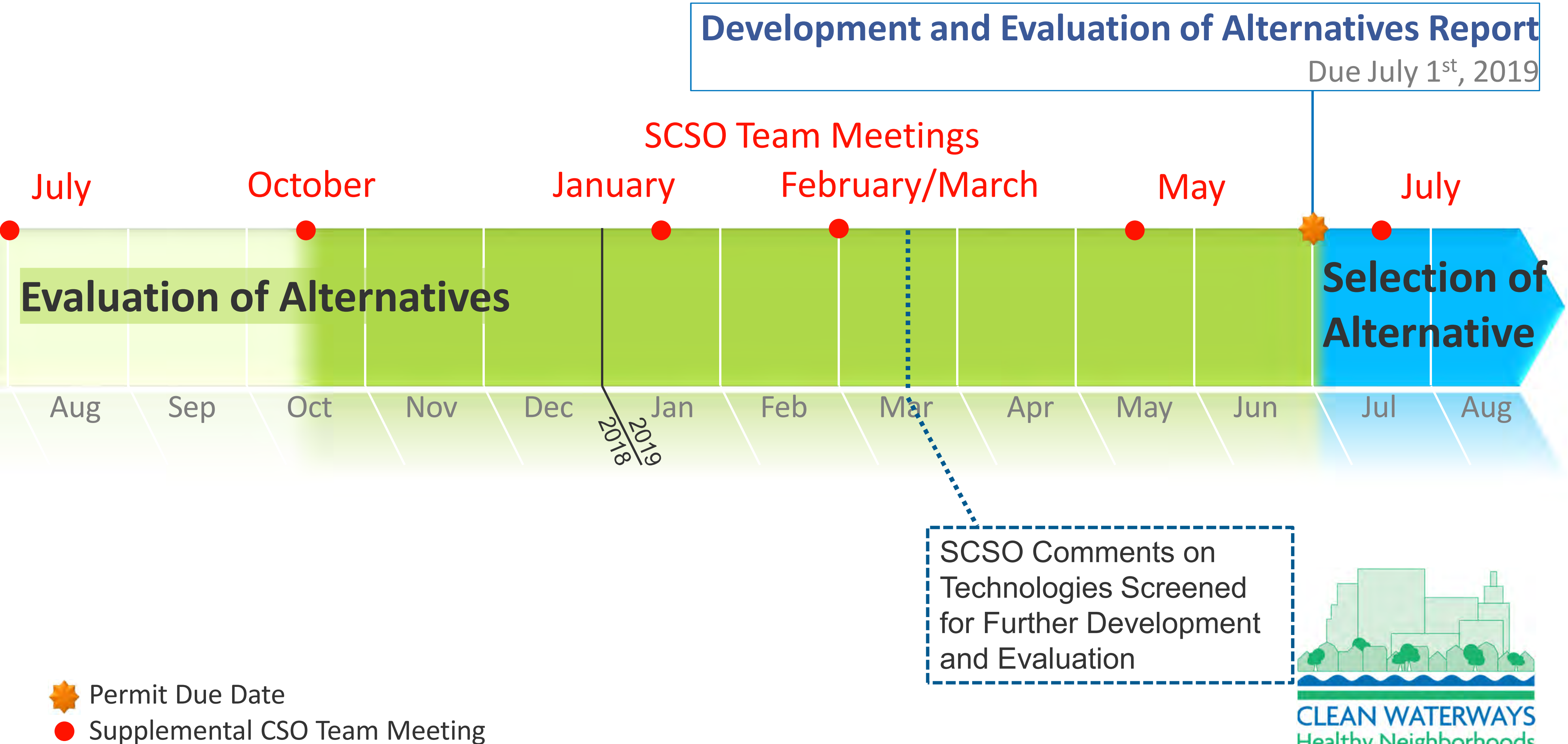
Development and Evaluation of Alternatives Report

June 1, 2020

Selection and Implementation of Alternatives Report in the Final LTCP

Permit Due Date

Timeline for Evaluation of Alternatives



CLEAN WATERWAYS
Healthy Neighborhoods

Supplemental CSO Feedback Summary

- Community benefits should be considered in the rating factor
- Consider ordinances for wet-weather rules, including industrial wet-weather management
- Incentivize water saving measures and use of green infrastructure
- Green infrastructure practices can be designed to achieve HIGH bacteria reductions and increased volumetric reductions.

CLEAN WATERWAYS
Healthy Neighborhoods

Storage and Treatment Technologies									
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Linear Storage	Pipeline	High	High		Can only be implemented if in-line storage potential exists in the system; increased potential for basement flooding if not properly designed…….	No		
	Tunnel	High	High		Requires small area at ground level relative to storage basins; disruptive at shaft locations; increased O&M burden.	No		
Treatment -CSO Facility	Vortex Separators	None	None		Space required; challenging controls for intermittent and highly variable wet weather flows. Vortex separators would remove floatables and ……...	Yes		
	Screens and Trash Racks	None	None		Prone to clogging; requires manual maintenance; requires suitable physical configuration; increased O&M burden. Screens and trash racks ………	Yes		
	Fuzzy Filters	None	None		Relatively low O&M requirements; smaller footprint than traditional filtration methods. This technology primarily focuses on TSS removal, ………	Yes		
Treatment -WRTP	Additional Treatment	High	High		May require additional space; increased O&M burden.	No		
	Wet Weather Blending	Low	High		Requires upgrading the capacity of influent pumping, primary treatment and disinfection processes; increased O&M burden. Wet weather blending does not address bacteria reduction, as it is a secondary treatment bypass for the POTW. Permittee must demonstrate there are no feasible alternatives to the diversion for this to be implemented.	Yes		
Treatment -Industrial	Industrial Pretreatment	Low	Low		Requires cooperation with Industrial User's; more resources devoted to enforcement; depends on IU's to maintain treatment standards. May require Permits.	Yes		

Permit Requirements

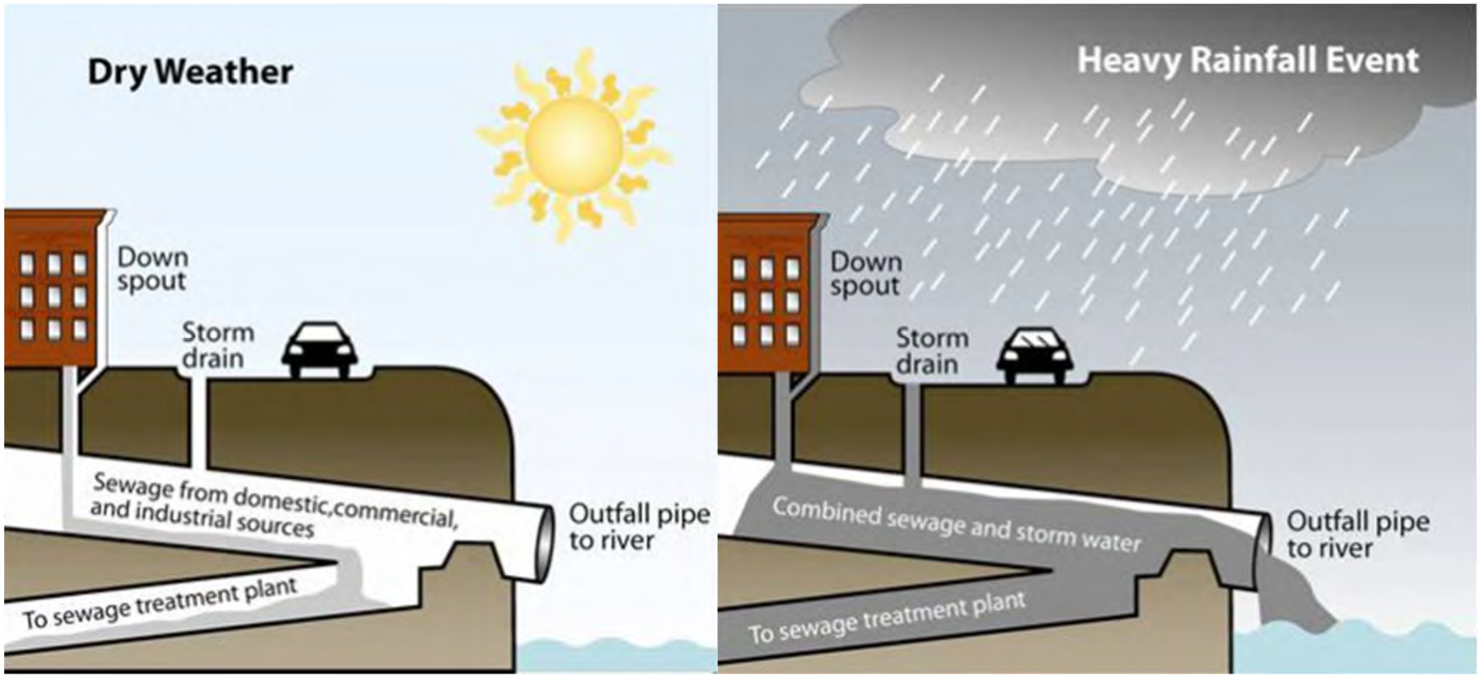
- Evaluate the feasibility of potential control alternatives, including:
  - Green infrastructure
  - Increased storage capacity in the collection system
  - Treatment expansion or storage at PVSC
  - Inflow and Infiltration (I/I) reduction
  - Sewer separation
  - *Treatment of CSO discharge*
  - CSO related bypass of secondary treatment at PVSC

Reducing Combined Sewer Overflows Using a Surface Channel System

Jason Farkas
Ryan Nguyen
Paul Potenza

Advisors
Dr. David A. Vaccari, P.E.
Dr. Leslie Brunell, P.E.
Dr. Valentina Prigiobbe

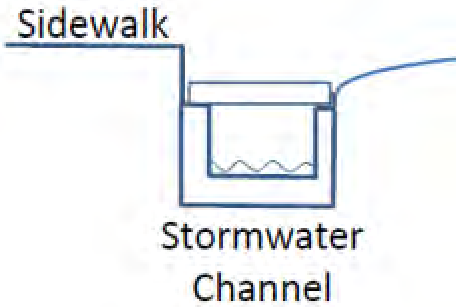
The CSO Problem



Combined Sewer Overflow

Proposed Solution

Roadside Channels



Cross-Section Channels

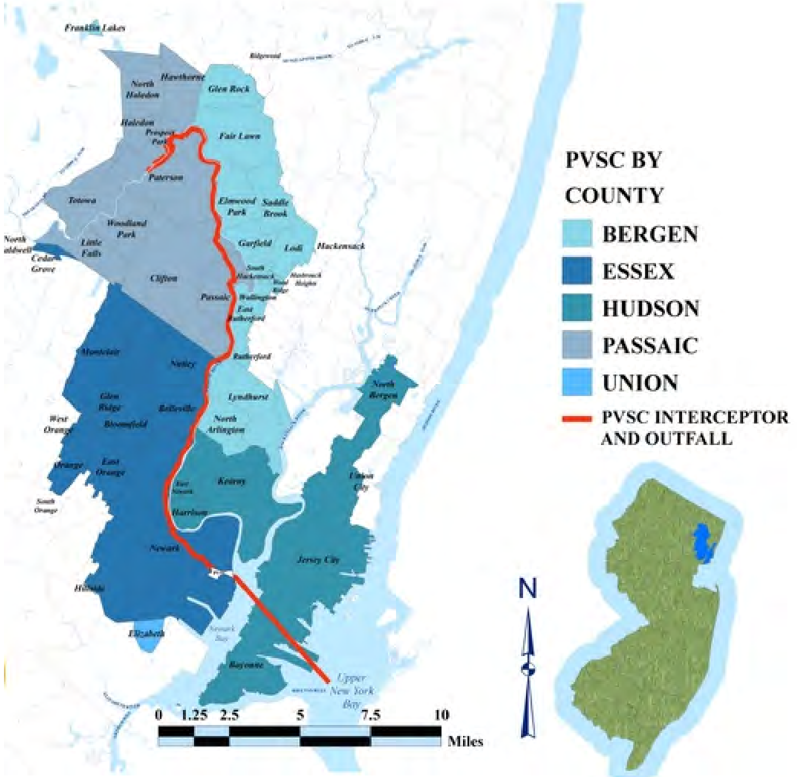
Long Term Control Plan

Passaic Valley Sewerage Commission

- **8 Municipalities**
- **330 Million Gallons Per Day (MGD)**
- **Eliminating or reducing CSO events**

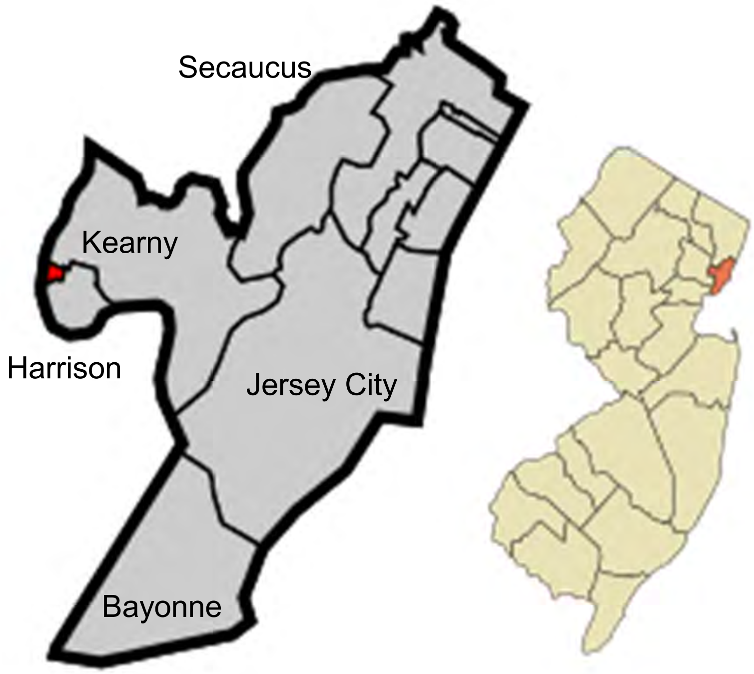
Project Focus

- **Evaluate Alternatives**



PVSC Service Area Map

East Newark



East Newark Location

55 Acres
2700 People
Single CSO Outfall
High Density Residential/Industrial
Along Passaic River
Estimated 22 MG per Year

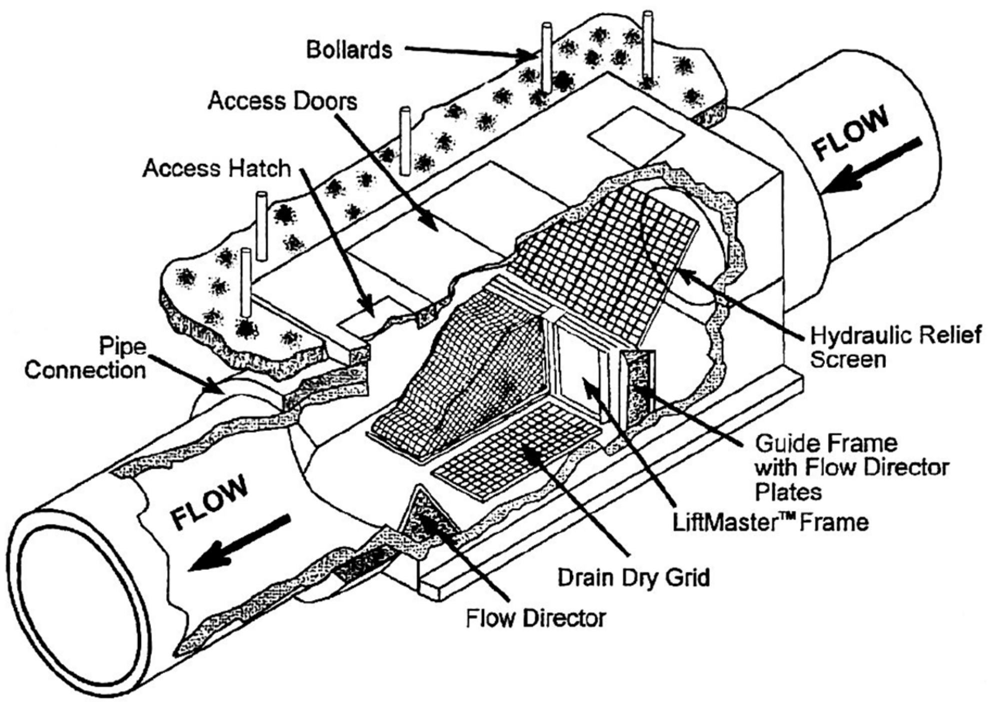
Site Visit

PVSC Line Crew

Site Visit

East Newark Regulator

Site Visit



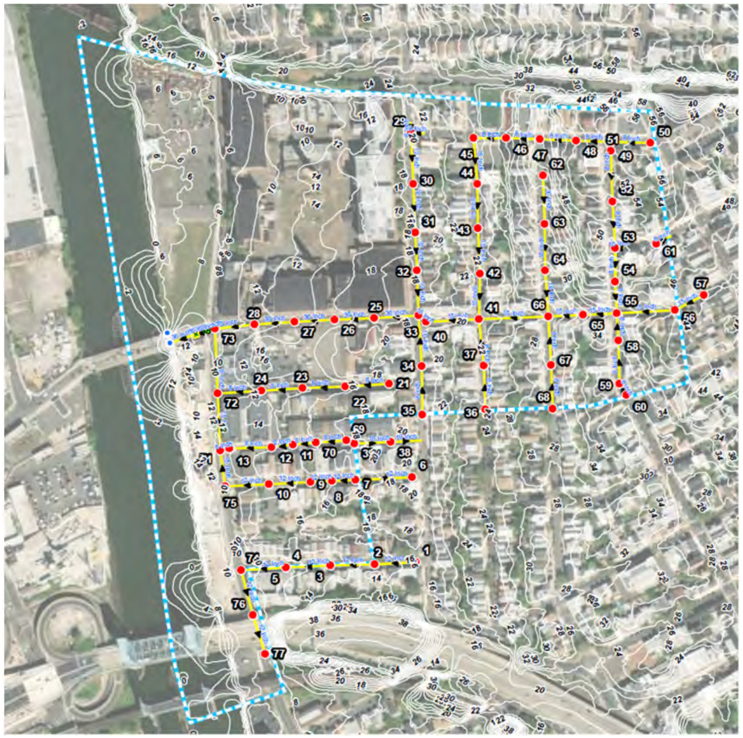
Netting Chamber Schematic

Hydrology

Study of the movement of water

East Newark

- **Small urban watershed**
- **Drainage dictated by roadways**
- **External Downspouts**



East Newark Topographic Map

Alternative Solutions

Sewer Separation

Off-Site Storage

On-Site Treatment

Stormwater Redirection

Roadside Channels

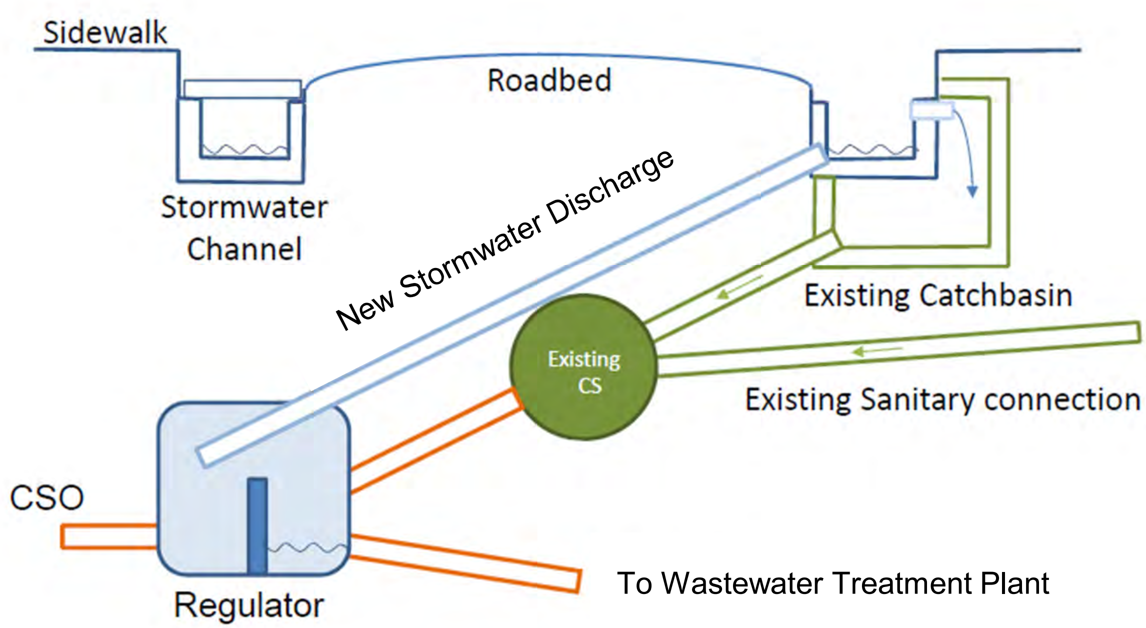
Boswell Cost and Analysis

2007 Report

Cost Estimates

- **Sewer Separation**
  - **$3.6 Million**
- **Off-Site Storage**
  - **$3.6 - 11 Million**
- **Does Not Include Land Acquisition**
- **Treatment and Redirection not analyzed**

Design of Channels



Regulatory Requirements

- Channel load capacities
- CSO Reduction
- Erosion at outfall
- Contaminated Soil

Equations

Rational Equation

- **Determine Runoff**

$$Q = CiA$$

Q = runoff (cfs)
C = runoff coefficient (no units)
i = rainfall intensity (in/hr)
A = watershed area (acres)

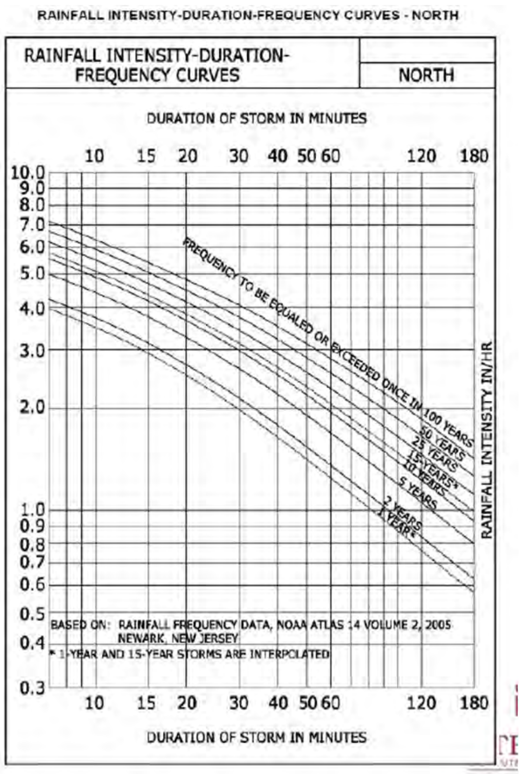
Manning's Equation

- **Size Channels**

$$Q = VA = \left(\frac{1.49}{n}\right) AR^{\frac{2}{3}} \sqrt{S} \quad [U.S.]$$

Q = runoff (cfs)
V = flow velocity (ft/s)
A = cross-sectional area (ft^2)
N = Manning's roughness coefficient (in/in)
R = Hydraulic Radius (ft)
S = bottom slope (ft/ft)

Design Storm



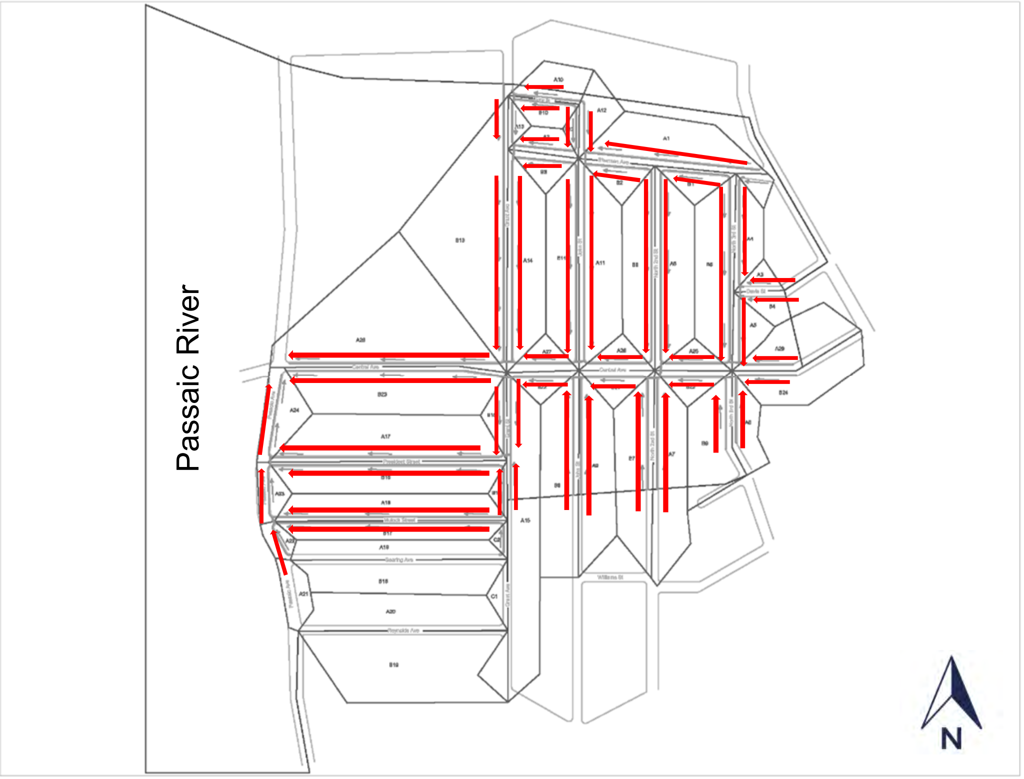
Largest storm in 2004 EWR Rainfall Year

- **25 yr, 2 hr event**
- **1.5 in/hr**

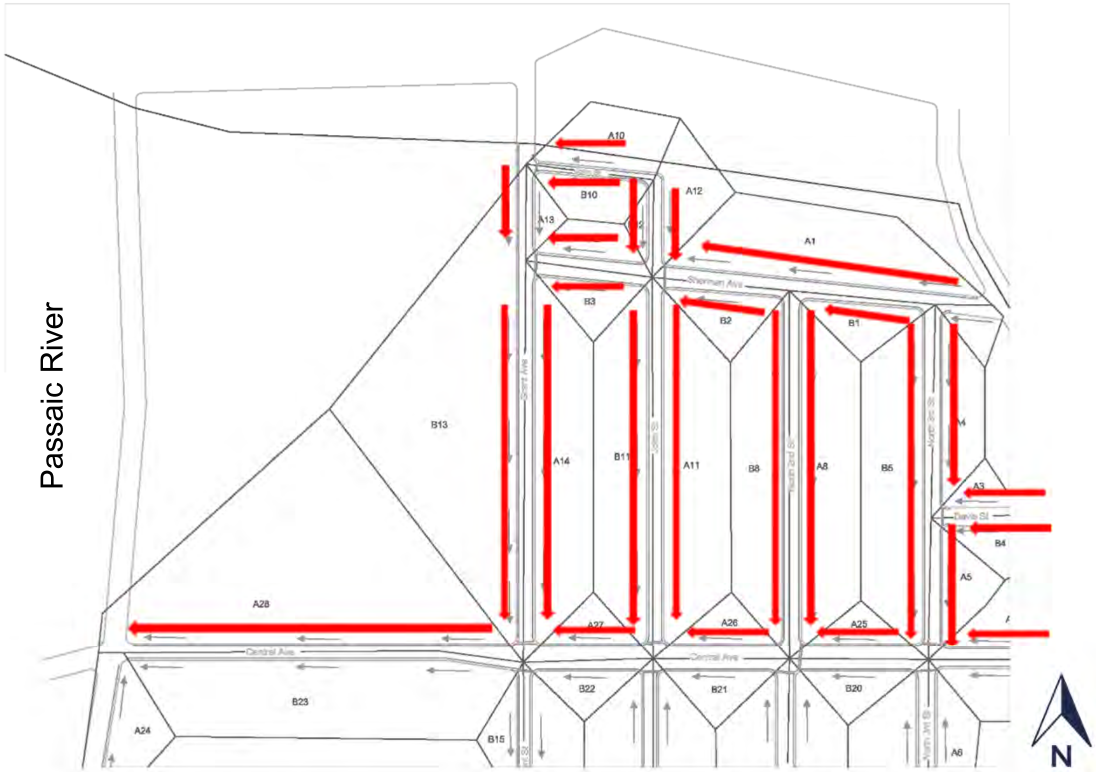
Slopes

Street	Start	End	Length (ft)	S Elev (ft)	E Elev (ft)	Difference (ft)	Slope (ft/ft)
Sherman	North 3rd	North 2nd	270	56	44	12	.044
	North 2nd	John	250	44	26	18	.072
	John	Grant	240	26	20	6	.025

System Layout



Central Ave North Channel Network



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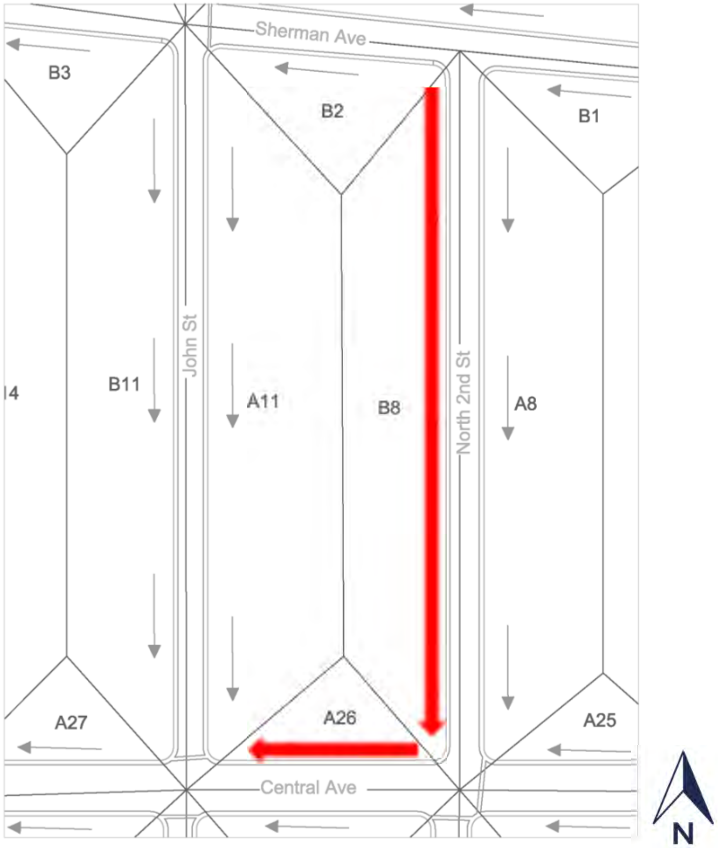
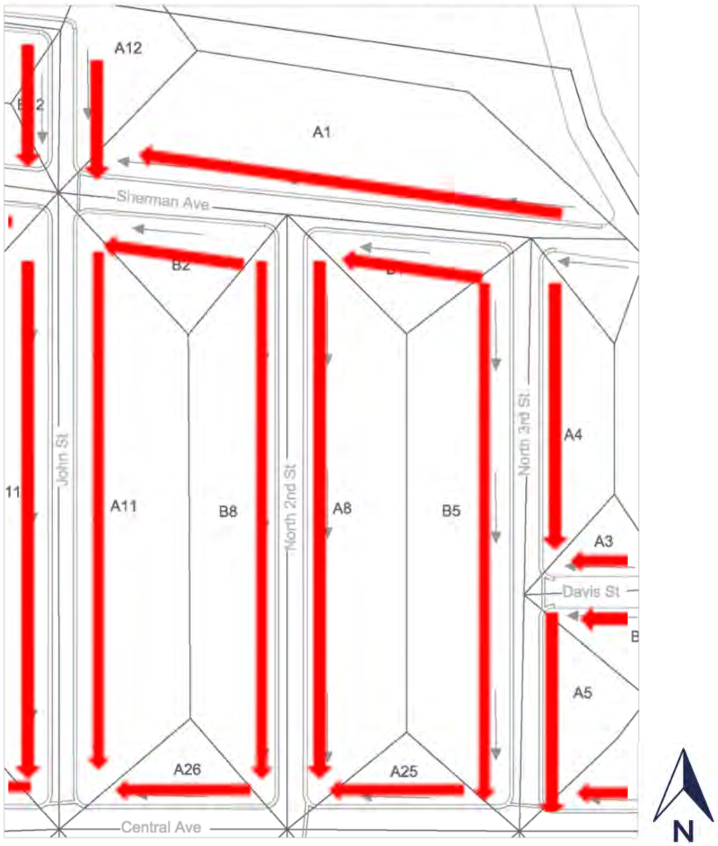


Central Ave (North) System	Area (ft²)	Area (acres)	C Total (ft²)	Cumulative Rainfall Runoff (cfs)	Slope of Roadway	Channel Size (in)	Design Capacity (cfs)
B8	52253.1	1.2	52253.10	1.81	0.027	8”x8”	3.33
A26	14008.59	0.3	66261.69	2.30	0.019	8”x8”	2.79

Central Ave North Channel Network



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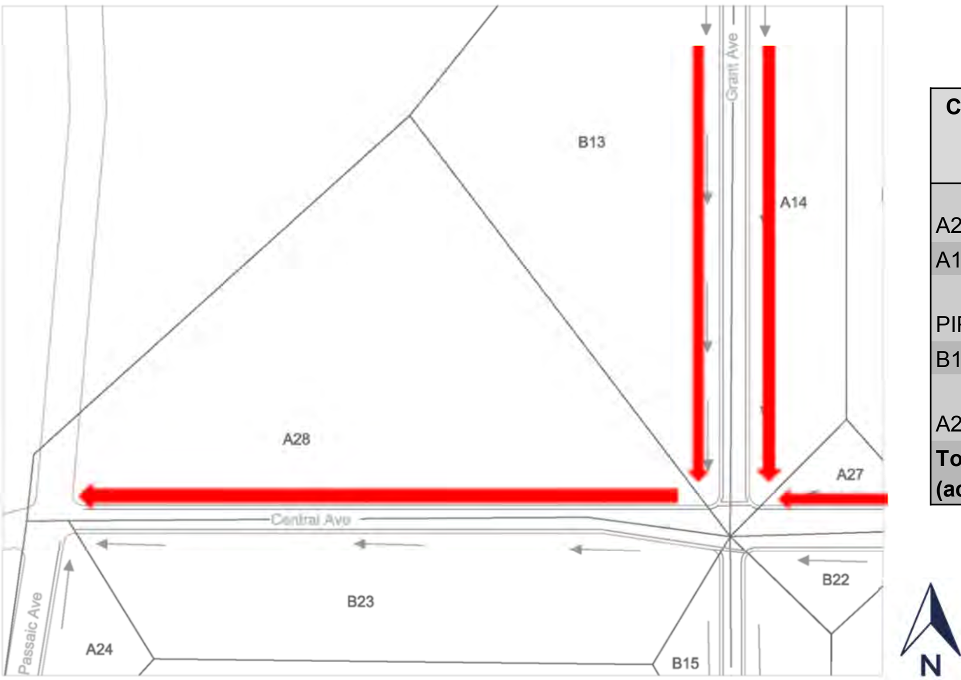
A26	14008.59	0.3	66261.69	2.30	0.019	8"x8"	2.79
B2	15844.5	0.4	15844.50	0.55	0.072	6"x6"	2.52
A1	66559.5	1.5	66559.50	2.31	0.058	8"x8"	4.88
A12	19905.3	0.5	19905.30	0.69	0.005	8"x8"	1.43
PIPE 1			86464.80	3.00	0.005	15" diameter	4.96
A11	71310.6	1.6	173619.90	6.03	0.007	14"x14"	7.53
PIPE 2			239881.59	8.33	0.005	21"diameter	12.17

Central Ave North Channel Network



Central Ave (North) System	Area (ft²)	C Total (ft²)	Cumulative Area (acres)	Cumulative Rainfall Runoff (cfs)	Slope of Roadway (ft/ft)	Channel Size (in)	Design Capacity (cfs)
A27	13741.68	309610.47	7.1	10.75	0.008	16"x16"	11.50
A14	67239	147411.00	3.4	5.12	0.005	14"x14"	6.37
PIPE 5		457021.47	10.5	15.87	0.005	24" diameter	17.38
B13	148727.2	148727.20	3.4	5.16	0.0135	12"x12"	6.94
A28	168315.84	774064.51	17.8	26.88	0.014	20"x20"	27.58
Total Area (acres)			**17.8**				

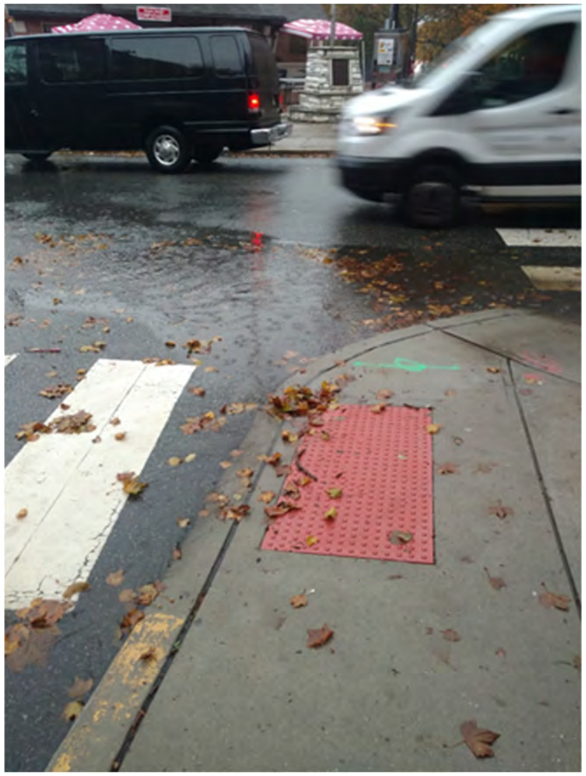
Future Progress

- Channel Material
- Channel Coverings
- Regulator Entry
- Cost Estimation

Channel Covers

Benefits to the Community

- Minimum Disruption
- Public Awareness
- Clean Waterways
- Improved Drainage
- Lower Costs



Flooded Pedestrian Area

Benefits Beyond East Newark

- **Reduced bacterial pollution**
- **Reduced nutrient pollution**

Stormwater Outfall

Progress to Date

Preparation

Site Visit
- Regulator ✓
- Catchbasins ✓
- Downspouts ✓

Gather Information ✓
- Elevations ✓
- Sewage Maps ✓
- Rainfall Data ✓
- Pollution Data ✓
- Cost Estimates

October 15th

Design

Calculations ✓
- Runoff/Land Use ✓
- Areas and Slopes ✓
- Channel Size ✓
- Reduction in CSO

Design ✓
- System Layout
- Channel Coverings
- Catchbasin Modifications ✓
- Regulator and Weir Entry ✓

December 1st

Special Thanks to

Dr. Leslie Brunell
Dr. David A. Vaccari
Dr. Valentina Prigiobbe
Mayor Joseph Smith

Mike Hope
Sheldon Lipke
Bridget McKenna
Marques Eley
Lisa Oberreiter
Brigite Goncalves

Frank Rossi
Nicki Louloudis
Frank Pestana
Giselle Diaz

References

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Facilities Inventory and Condition Assessment Analysis Program (Phase V)

PASSAIC VALLEY SEWERAGE COMMISSION

Kristie Wagner, PE, BCEE
CDM Smith

January 22, 2019

CDM Smith

PASSAIC VALLEY SEWERAGE COMMISSION
EST. 1902

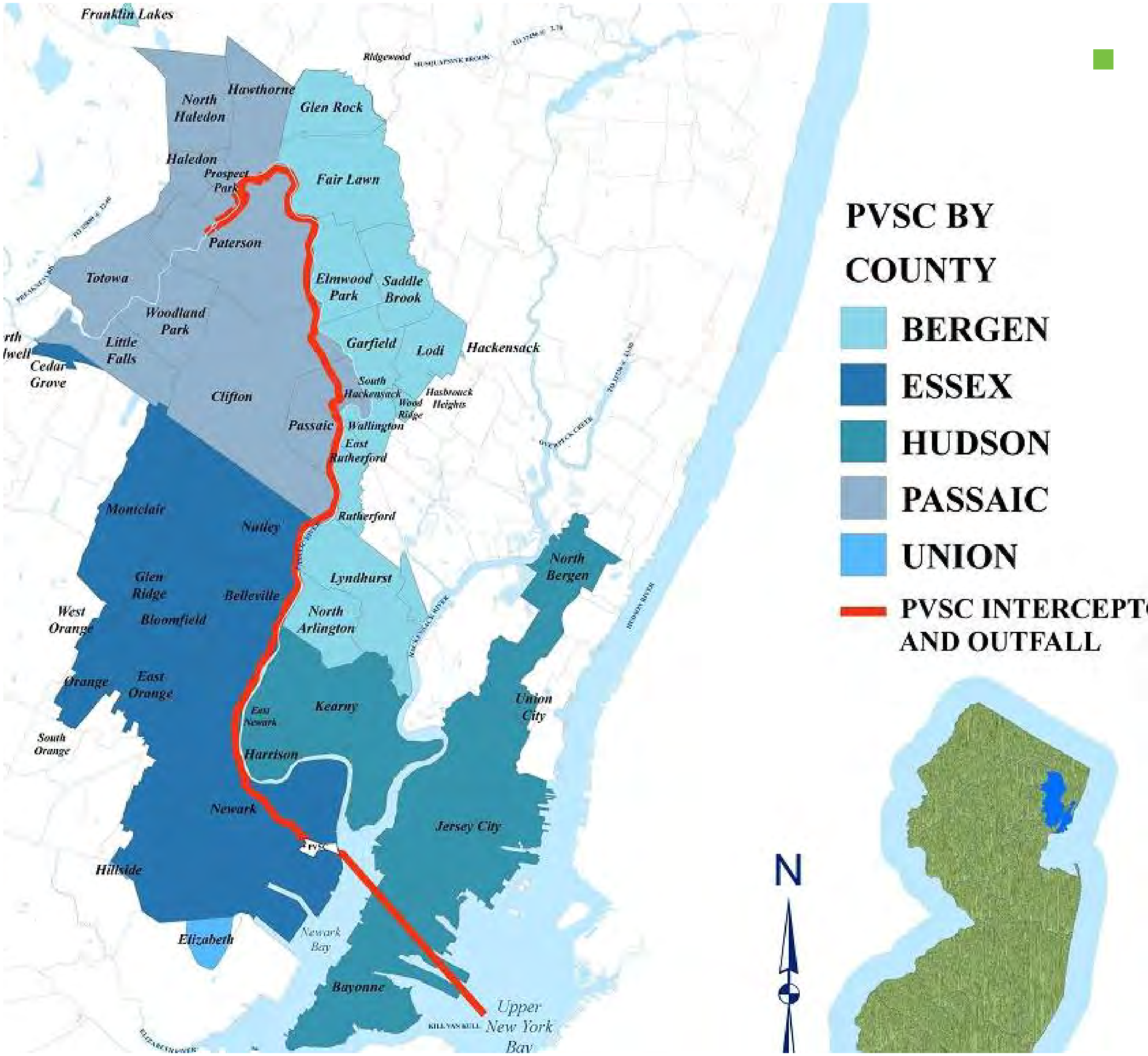
Presentation Overview

- Project Scope – Age and Extent of PVSC Sewer Assets
- Purpose – Proactive Inventory and Condition Assessment Analysis Program
- Assessment Phase Work and Rehabilitation Recommendations
- Planned Construction Projects
- Public Outreach and Mitigation of Impacts

PVSC Sewer Assets

- Over 41 miles of pipe, original construction 1910s & 1920s
  - Main Interceptor: 21 miles, 45” to 153” diameter
  - Branch Interceptors, Laterals and Local Sewers: 15 miles, 8” to 64” diameter
  - 11 River Crossings
  - Primary Outfall Tunnel to NY Harbor >5 miles long
- Largely non-reinforced cast-in-place concrete

PVSC Sewer Assets – Where are they?



- Service Area:
  - 48 Municipalities
  - 5 Counties

PVSC Sewer Assets – Where are they?

- Numerous Critical Locations, High Impact of Failure

90” Diameter Main Interceptor
State Street, Passaic

141” Main Interceptor -
Beneath Panasonic Building, Newark

PVSC Sewer Assets – Where are they?

- Critical Locations (Highways Route 21 and Route 20)

72" Main Interceptor
Within Route 20, Paterson

72" Main Interceptor -
Within Route 20, Paterson

Why have a proactive program?

- Stay ahead of failures
  - Sinkholes, road collapses, disruption in service
  - Environmental Impacts
- Avoid costly and disruptive Emergency Repairs
  - Planned projects are more economical than emergency repairs
  - 4 Emergency Repair projects since 2012

Why have a proactive program?

- Similar Assessment Performed in 1990s
  - >20 years ago; Not all assets able to be located and assessed
- Phases I through III (1999 through 2001)
  - ± 23,000 linear feet rehabilitated- open-cut, CIPP, sliplining, and spray-applied coatings
- Phase IV (2012-2016)
  - ± 7800 linear feet rehabilitated- CIPP and sliplining
- Recent Emergency Repairs (2012-2017)
  - ± 5300 linear feet rehabilitated- CIPP

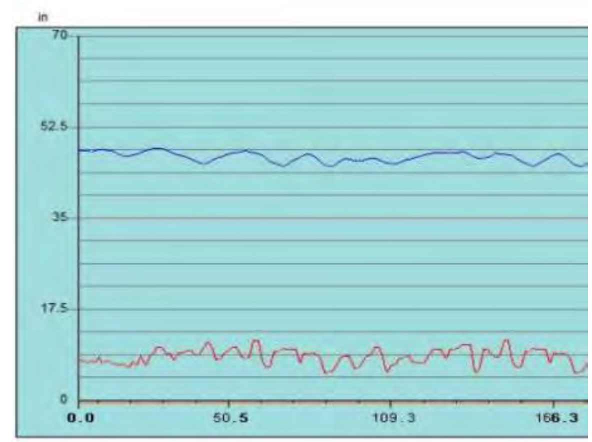
6-7 miles of 41 miles have been rehabilitated

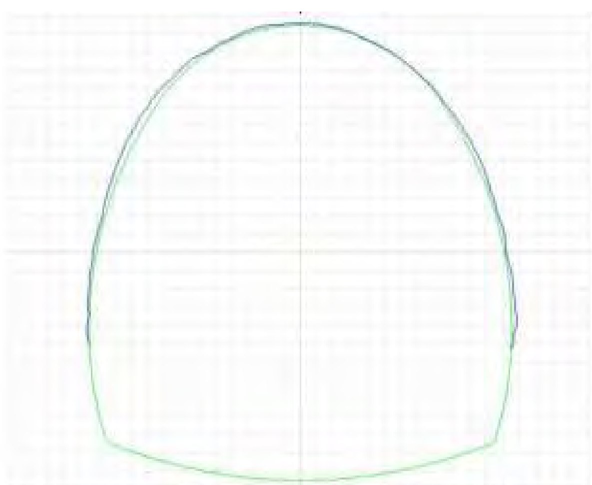
How long will the Program Last?

- Multi-year Program
- Planning and Condition Assessments
- Repair Prioritization and Design
- Bidding and Construction

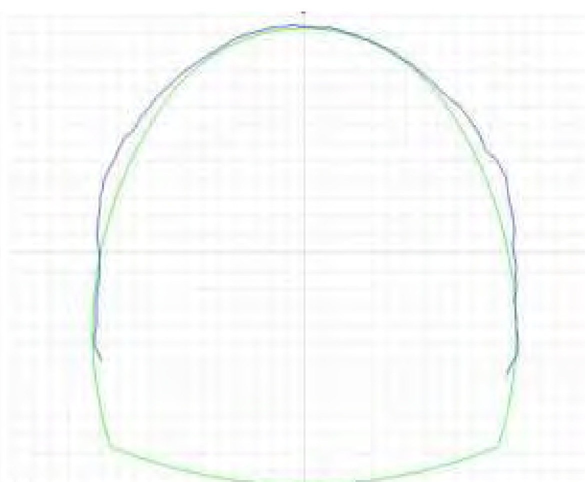
Assessment Phase

- Use the most advanced tools
  - Pipeline Inspection Tools: Televising, 3-D Laser Scanning, Sonar
  - Identify Deterioration, Deformation, Debris and Sediment
  - Sonar and Acoustic Tools for Outfall Tunnel and Diffuser Field in NY Harbor



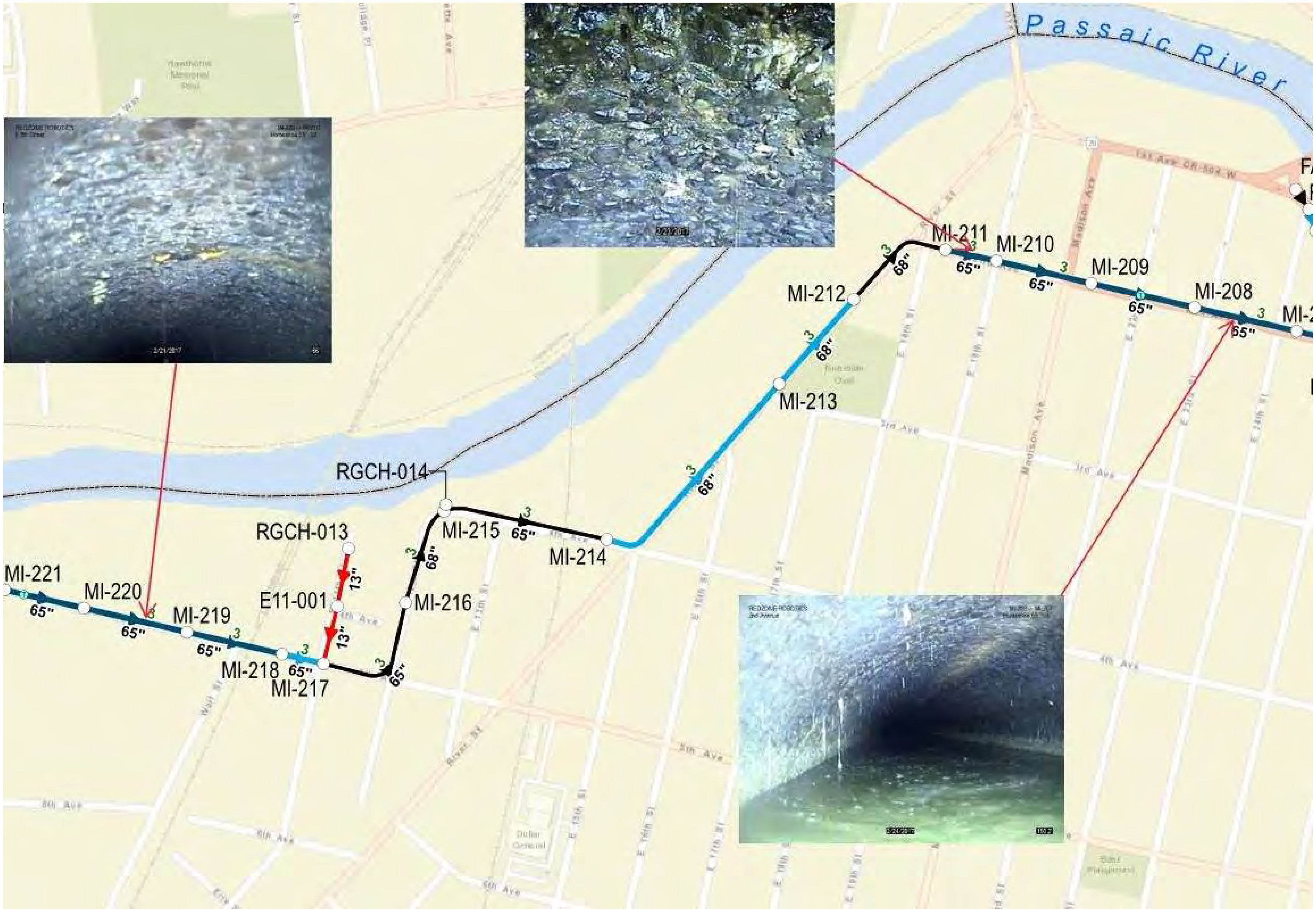


220.1ft General Observation - Measurement outside reference to 2.4"



257.1ft Maximum Measurement Outside Reference - To 5.9"

Prioritization of Rehabilitation Work



Planned Construction

- Heavy Cleaning Contracts
  - 2019-2020
- Rehabilitation Contracts
  - 2020-2023
  - Various possible rehabilitation methods – majority trenchless

How Do We Mitigate Impacts?

- Up-front coordination with municipalities, counties, businesses, residents
- Evaluation Phase:
  - Roving lane closures; night work when appropriate
- Design Phase:
  - Identify impacted businesses and residents
- Construction Phase:
  - Lane closures, Road Closures/Detours
  - Notifications to residents and businesses
  - Minimize construction duration and interruption of sewer service

Extensive Public Outreach Efforts

- Varied formats and languages
- Interactive Website
- Informational Meetings
- Construction Notices
- Primary Goals:
  - Notify the Public of potential impacts
  - Educate the Public on purpose of program
  - Smooth coordination with municipal and county officials
  - Provide easy access to information


PASSAIC VALLEY SEWERAGE COMMISSION
Facilities Inventory and Condition Assessment Analysis

OVERVIEW (/OVERVIEW/)
WORK SITES
SCHUYLER AVE (/SCHUYLER-AVE/)
CENTURY DRIVE (/CENTURY-DRIVE/)
MAPS (/MAPS/)
UPDATES (/UPDATES/)
RESOURCES
PHOTOS (/PHOTOS/)
DOCUMENTS (/DOCUMENTS/)
CALENDAR (/CALENDAR/)
PASSAIC VALLEY SEWERAGE COMMISSION (HTTP://WWW.NJ.GOV/PVSC/)
CONTACT US (/CONTACT/)

Project Overview

Phase V
Facilities Inventory and Condition Assessment Analysis (FICAA)
Main and Branch Interceptor Sewers, Laterals/Local Sewer Connections, and Outfall Tunnels

The Passaic Valley Sewerage Commission has retained a team of qualified consultants to perform an inspection and evaluation of its main and branch interceptor sewers, river crossings, outfalls, manholes, chambers and appurtenant items, and to develop recommendations and designs for observed deficiencies. Inspection techniques will vary, but much of the work will be completed using robotic television and multi-sensor inspection (including laser and sonar imagery) within the existing pipelines. This work will be partly visible to the public, with trucks parked at access manholes and chambers, and inspection equipment being taken in and out of manholes. In total, over 35 miles of sewer and 5 miles of outfall tunnel will be inspected as part of this project.

Following completion of the evaluation phase of work, recommendations for repairs will be made. Ultimately, as part of this program, PVSC anticipates up to 9 construction contracts including cleaning and debris removal, structural rehabilitation of existing pipelines and structures, and rehabilitation of specialty flow metering equipment. The PVSC system service area includes, and inspection work will be performed in, XX towns over 5 counties.

ENVIRONMENTAL VALUE

- Prevent deterioration and failure of collection system and structural failures
- Reduce disruption in conveyance and treatment of wastewater
- Limit discharge of raw (untreated) wastewater to the environment

interactive website
www.pvscsewers.com

Conclusion

- Majority of conveyance system is sound, but over 100 years old
- Areas of degradation, infiltration, and heavy debris

- Anticipated 14+ miles cleaning, 2019-2020
- Anticipated 3+ miles rehabilitation, 2020-2023
- Phased proactive rehabilitation beyond 2023

Thank you! Questions?

RUTGERS
THE STATE UNIVERSITY
OF NEW JERSEY

Green Infrastructure Database

For the PVSC Service Area

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

obropta@envsci.rutgers.edu

January 22, 2019

www.water.rutgers.edu

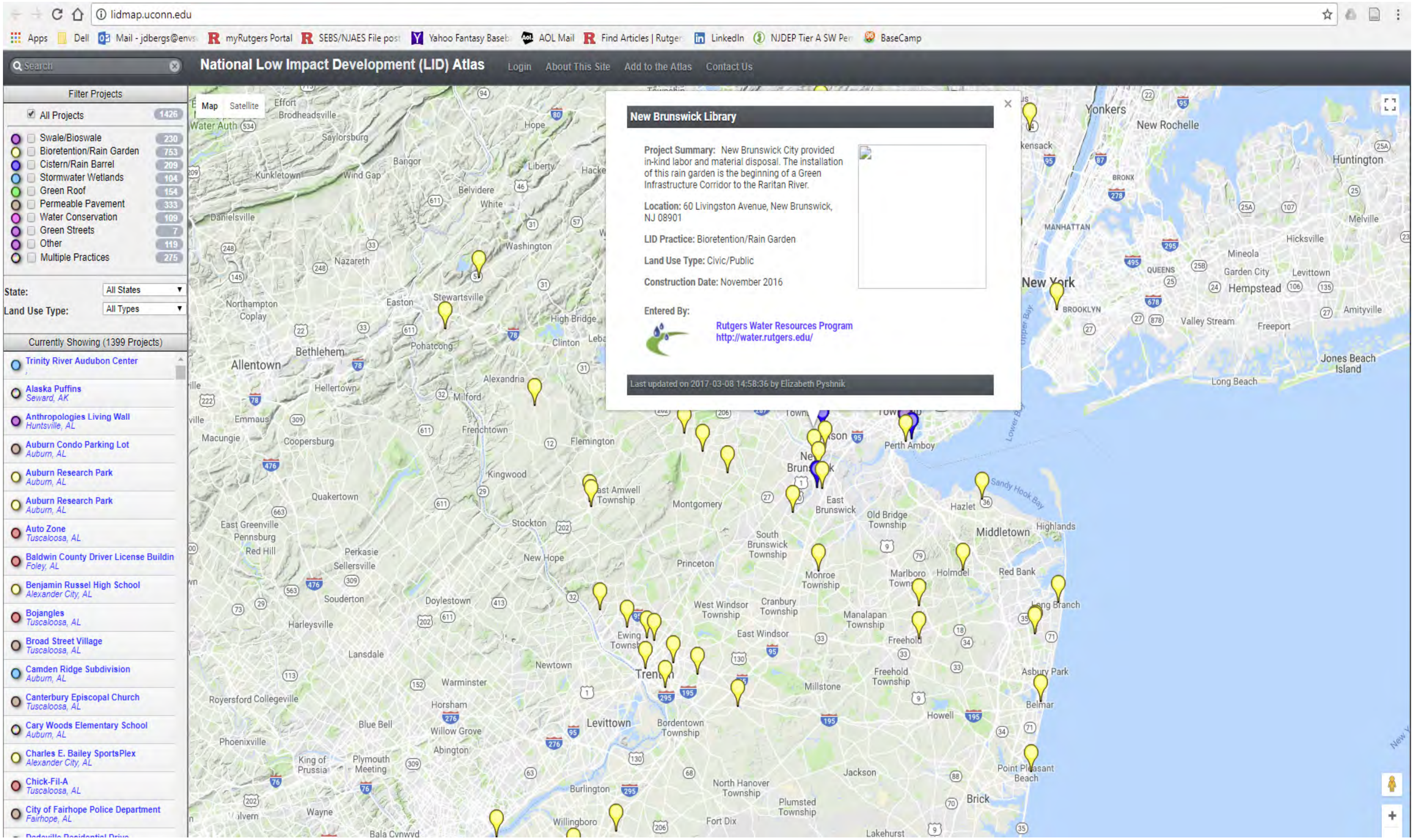
Need for a Green Infrastructure Database

- Identify location and type of completed green infrastructure practices
- Identify owner/responsible party of green infrastructure practices
- Track impervious drainage area managed by green infrastructure practices
- Track volume of stormwater runoff managed by green infrastructure practices

What information is necessary?

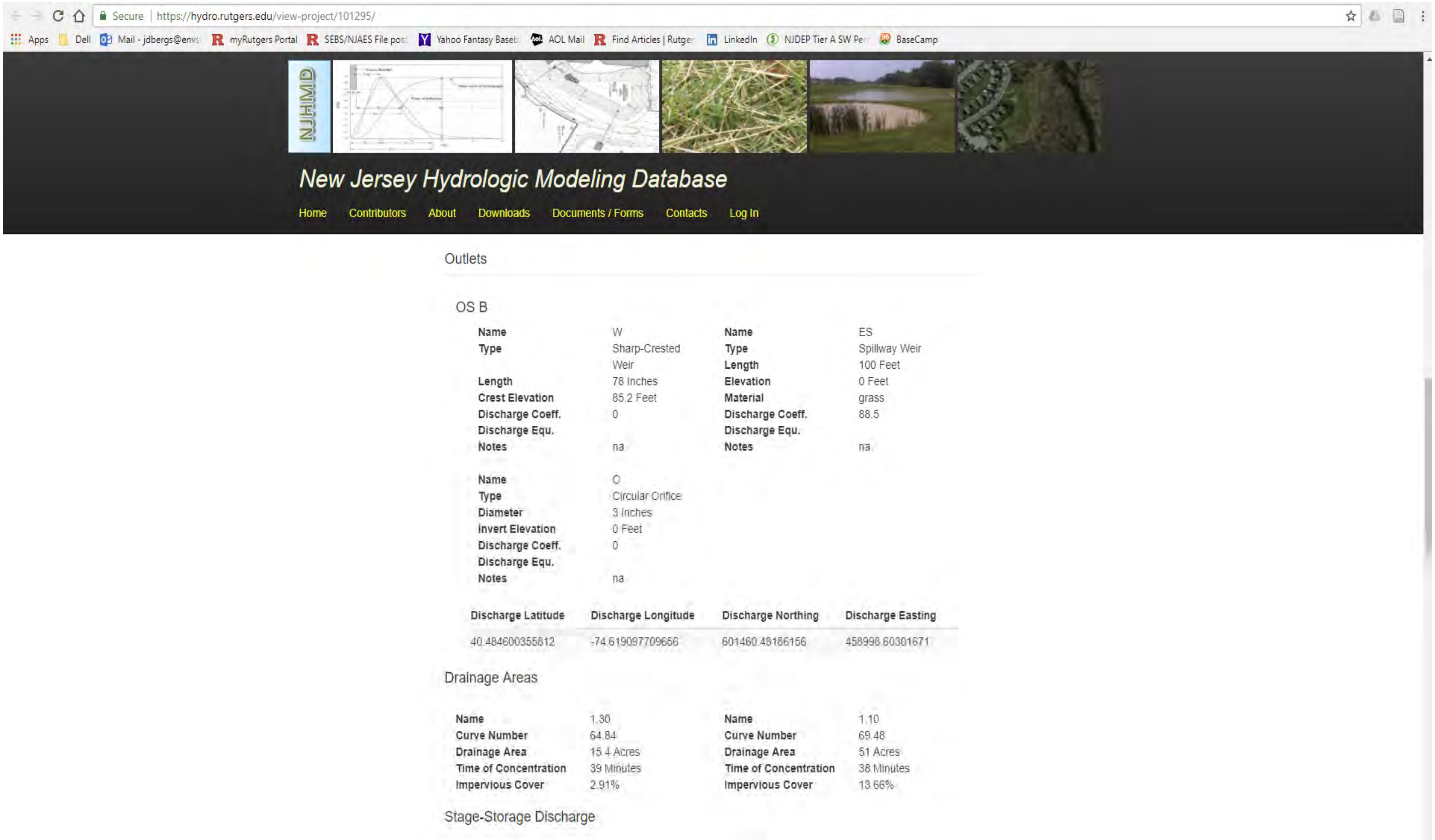
- Location information
- Brief project description
- Green infrastructure type
- Green infrastructure size
- Contributing drainage area
- Volume of stormwater managed (gal/year)
- Responsible party
- Maintenance plan

Database Example – UConn LID Atlas

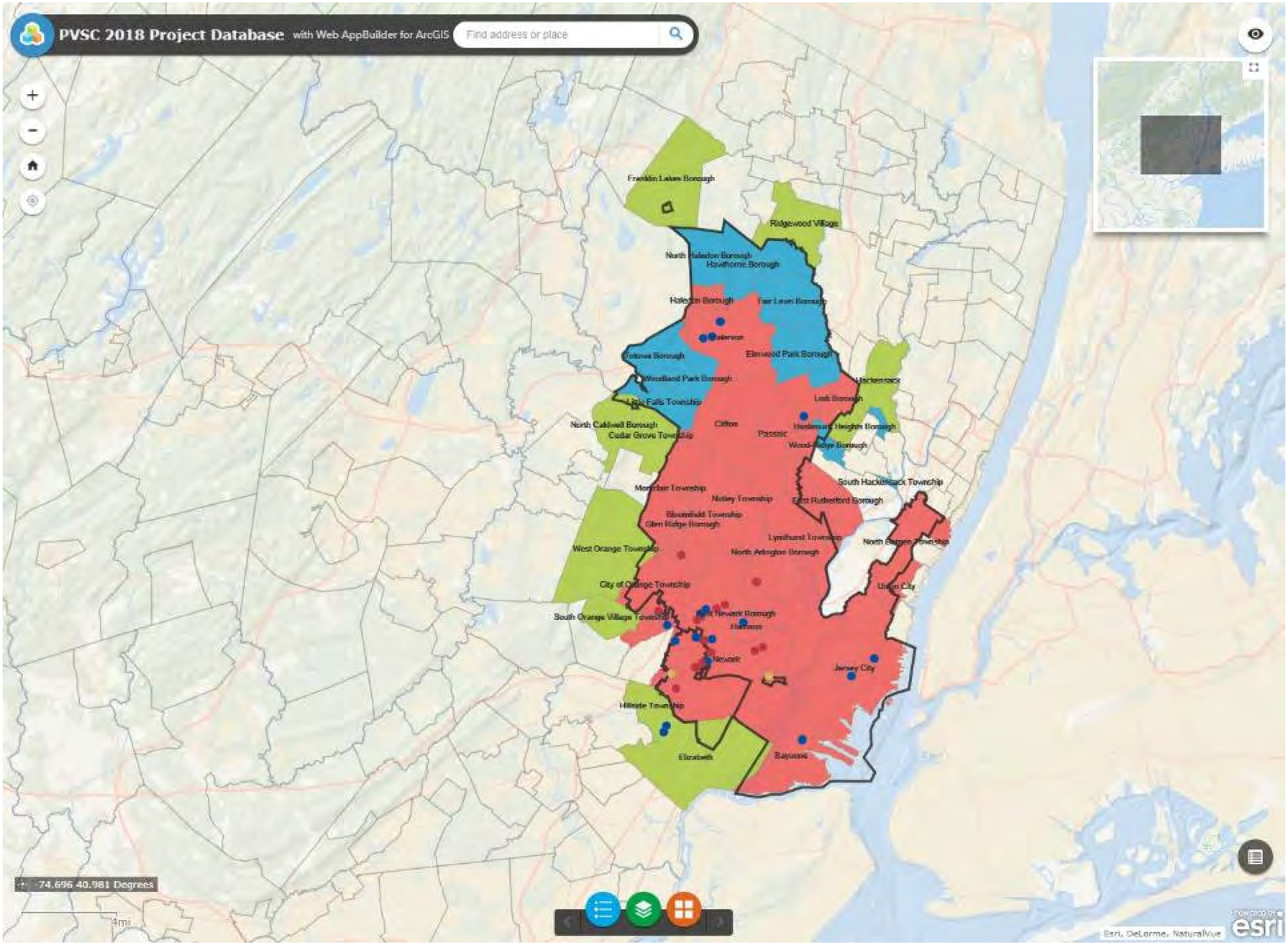


lidmap.uconn.edu

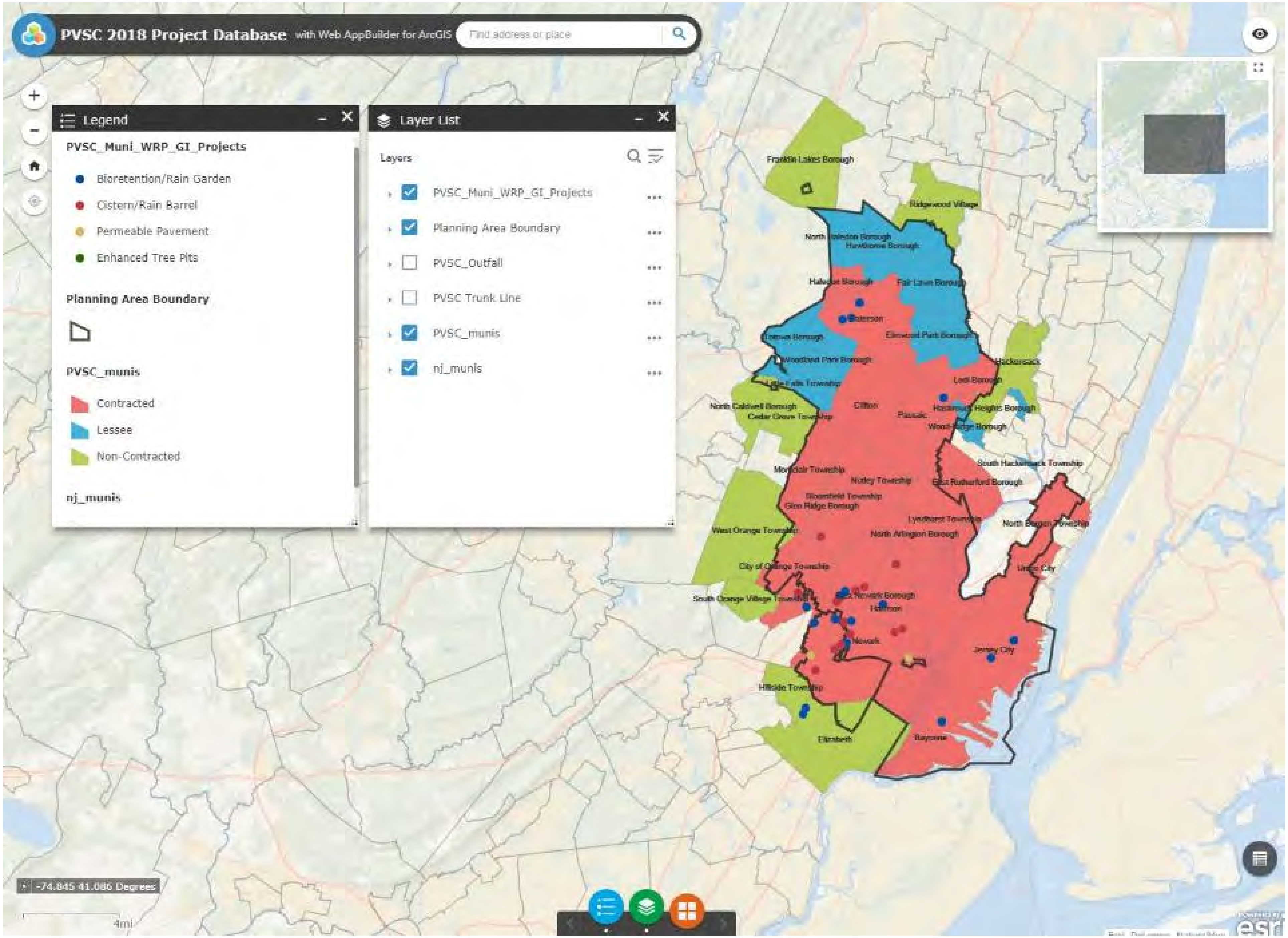
Database Examples – NJ Hydro Map

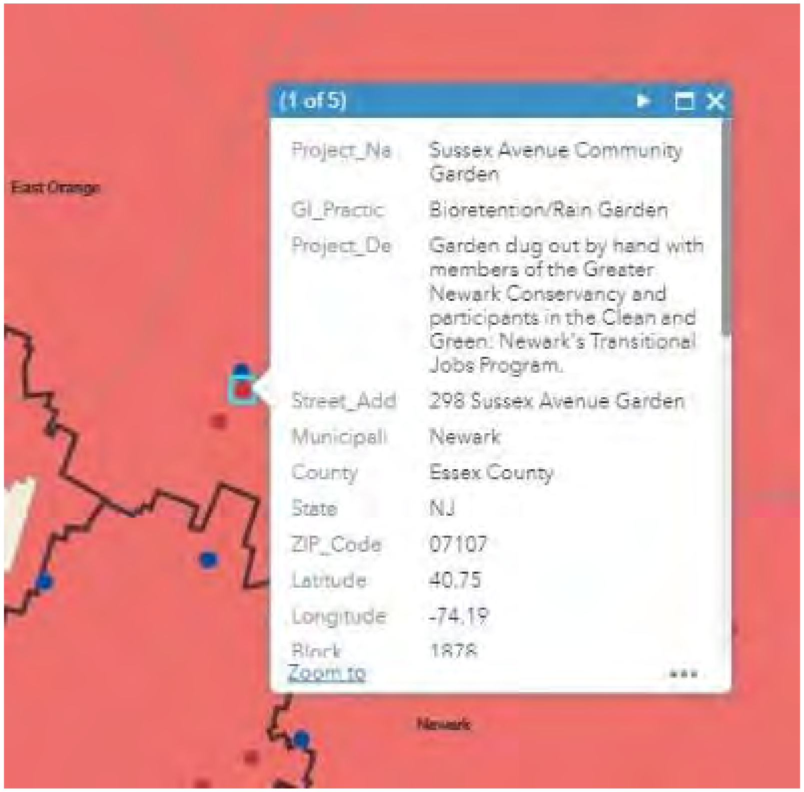


hydro.rutgers.edu



PVSC 2018 Project Database
with Web AppBuilder for ArcGIS
Find address or place
Franklin Lakes Borough
Ridgewood Village
Hawthorne Borough
Totowa Borough
Woodland Park Borough
North Caldwell Borough
Clifton
Passaic
South Hackensack Township
Notley Township
Bloomfield Township
Glen Ridge Borough
Lyndhurst Township
West Orange Township
North Arlington Borough
City of Orange Township
South Orange Village Township
Newark
Jersey City
Union City
Hillside Township
Elizabeth
Bayonne
-74.696 40.981 Degrees
4mi
Esri, DeLorme, NaturalVue
esri


PVSC 2018 Project Database
with Web AppBuilder for ArcGIS
Find address or place
Legend
PVSC_Muni_WRP_GI_Projects
Bioretention/Rain Garden
Cistern/Rain Barrel
Permeable Pavement
Enhanced Tree Pits
Planning Area Boundary
PVSC_munis
Contracted
Lessee
Non-Contracted
nj_munis
Layer List
Layers
PVSC_Muni_WRP_GI_Projects
Planning Area Boundary
PVSC_Outfall
PVSC Trunk Line
PVSC_munis
nj_munis
Franklin Lakes Borough
Ridgewood Village
Hawthorne Borough
Fair Lawn Borough
Paterson
Elmwood Park Borough
Woodland Park Borough
Hackensack
Lodi Borough
North Caldwell Borough
Cedar Grove Township
Clifton
Passaic
Hasbrouck Heights Borough
Wood-Ridge Borough
South Hackensack Township
Montclair Township
Nutley Township
East Rutherford Borough
Bloomfield Township
Glen Ridge Borough
Lyndhurst Township
West Orange Township
North Arlington Borough
North Bergen Township
City of Orange Township
Union City
South Orange Village Township
East Newark Borough
Harrison
Newark
Jersey City
Hillside Township
Elizabeth
Bayonne
-74.845 41.086 Degrees
4mi



https://tinyurl.com/pvsc-gi

Who can use and enter information?

- Database to be hosted and managed by Rutgers Cooperative Extension Water Resources Program
- General project information can be submitted to RCE WRP using a standardized form
- Agencies and individual municipal authorities have access to database to track projects and calculate impact
- Agencies and authorities have access to hold owner/responsible party accountable for operations and maintenance

Questions or Comments?

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Questions and Final Discussion

CLEAN WATERWAYS
Healthy Neighborhoods