Stormwater Project Summary

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Buzzards Bay National Estuary Program

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Buzzards Bay

National Estuary
Program

Overview of Project

Mapping Stormwater Features

Data Results for Local Perspective

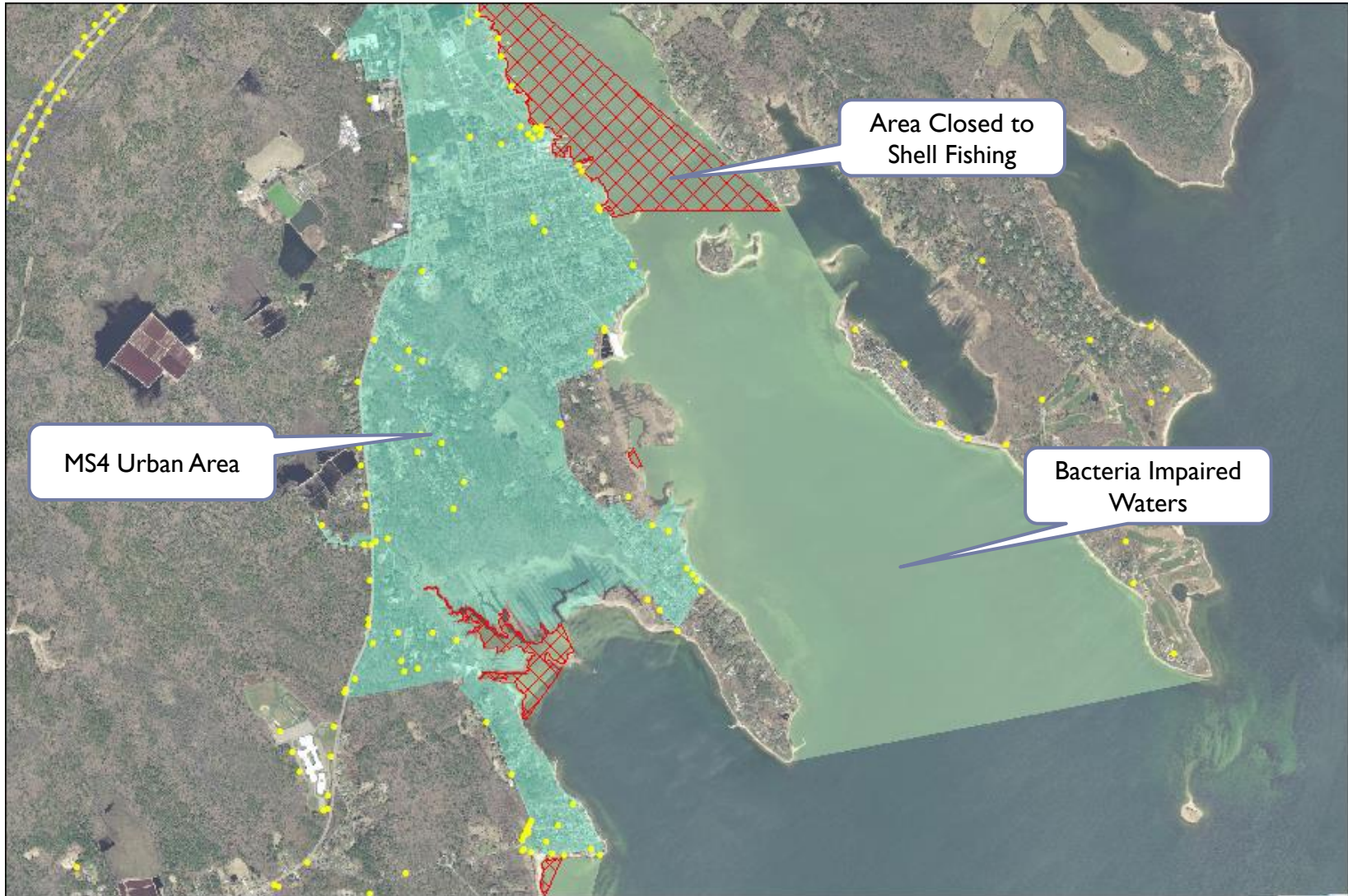Combined Data Analysis

Lessons Learned

Healthy Communities Grant

- ▸ Infrastructure Inventory for GIS -> over 15,000 features GPS updated
- ▸ Two Years of Stormwater Monitoring -> 659 samples, 724 no-flow observations

Selecting Sample Locations

Area Closed to Shell Fishing

MS4 Urban Area

Bacteria Impaired Waters

Sampling Locations

▸ Discharge Points in areas that are within 100 feet of Bacteria Impaired Waters or Shellfish Closures

▸ Both in and out MS4 Urbanized Areas

▸ Includes outfall pipes and roadcuts

▸ Based on the Buzzards Bay NEP 2006 Stormwater Atlas

Municipality	All Discharges	Number of Project Discharges
Acushnet	119	15
Dartmouth	575	47
Fairhaven	354	65
Mattapoisett	557	26
Wareham	930	97

A total of 250 Outfalls and associated Catchments

Mapping Stormwater Features

Mapping Stormwater Features

RESERVATION ROAD

RAYMOND STREET

BERNESE STREET

◆ 2006 Atlas Discharges

⊗ 2006 Atlas Catchbasins

Mapping Stormwater Features

20 offfset

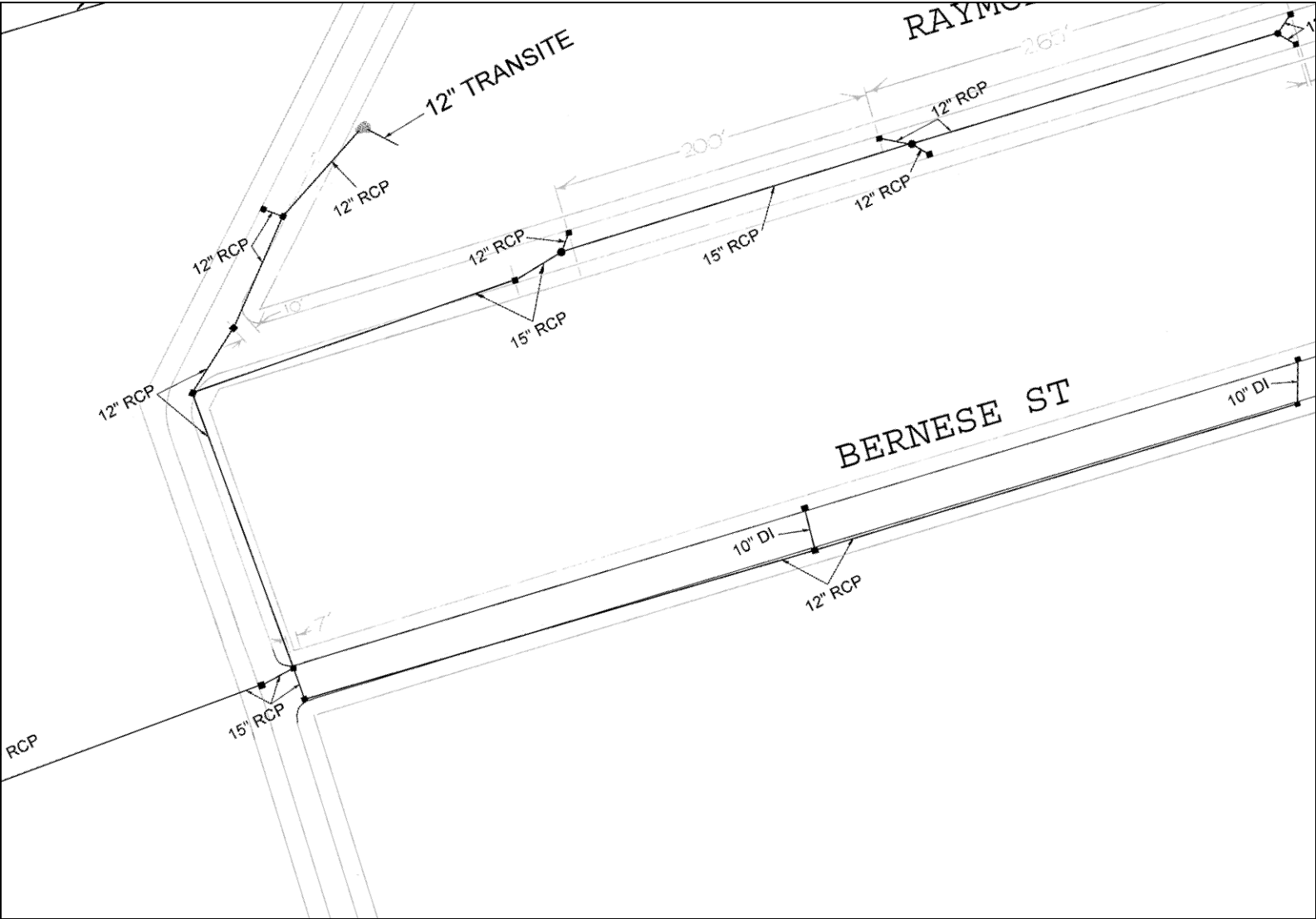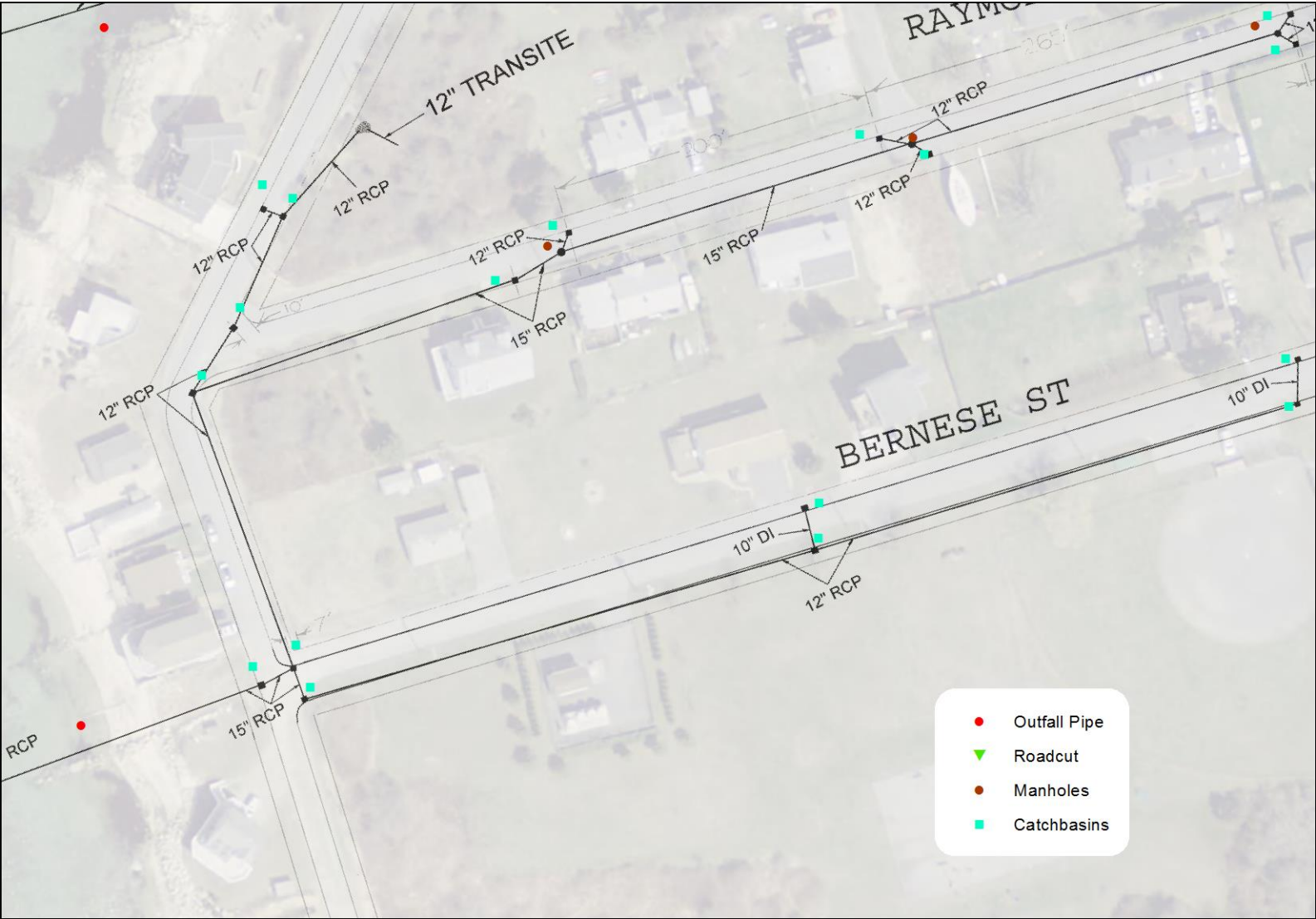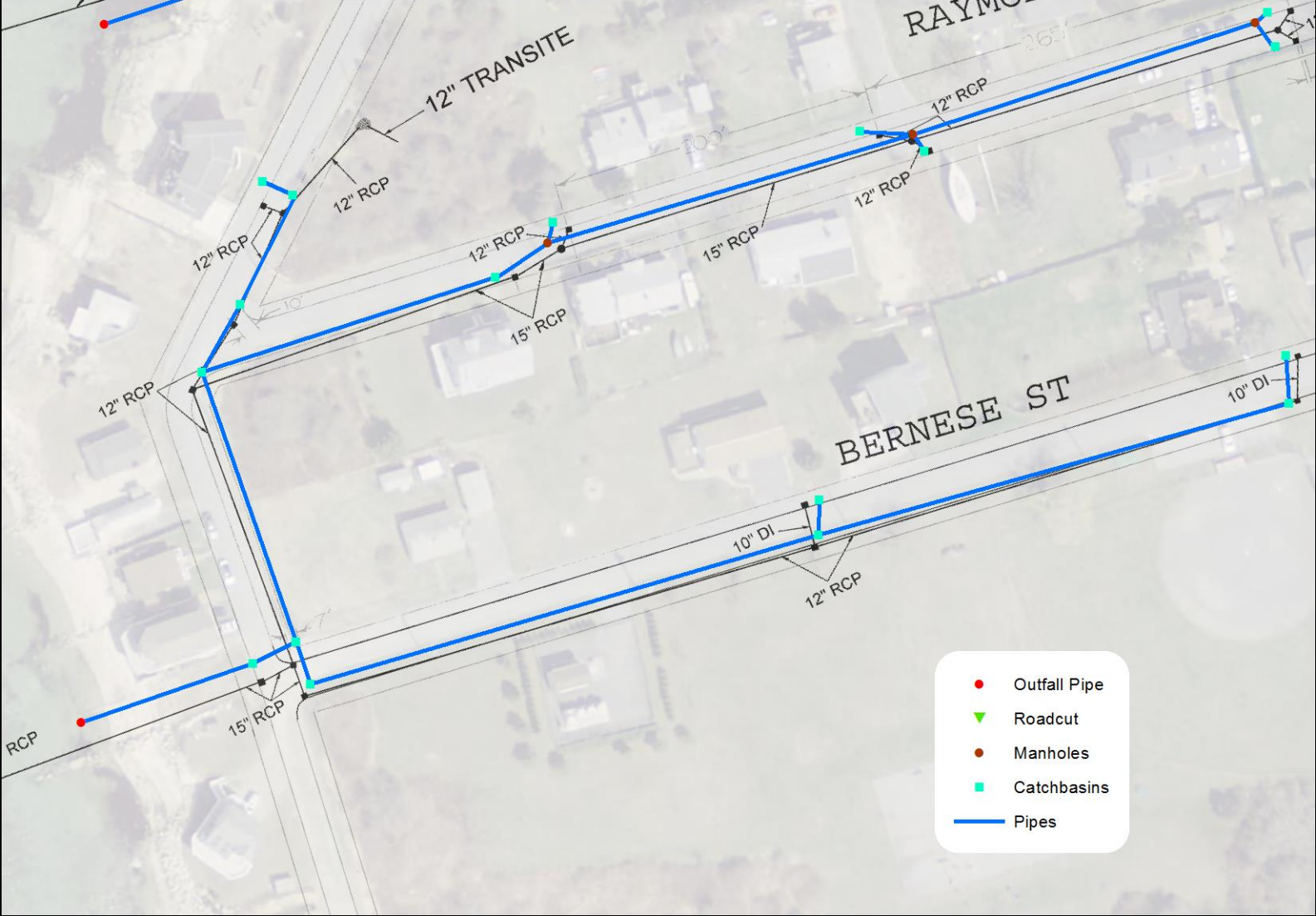|	
🔴 (diamond)	2006 Atlas Discharges
⊗	2006 Atlas Catchbasins
⊙	GPS Catchbasin
●	GPS Manhole
◎	GPS Discharge

Mapping Stormwater Features
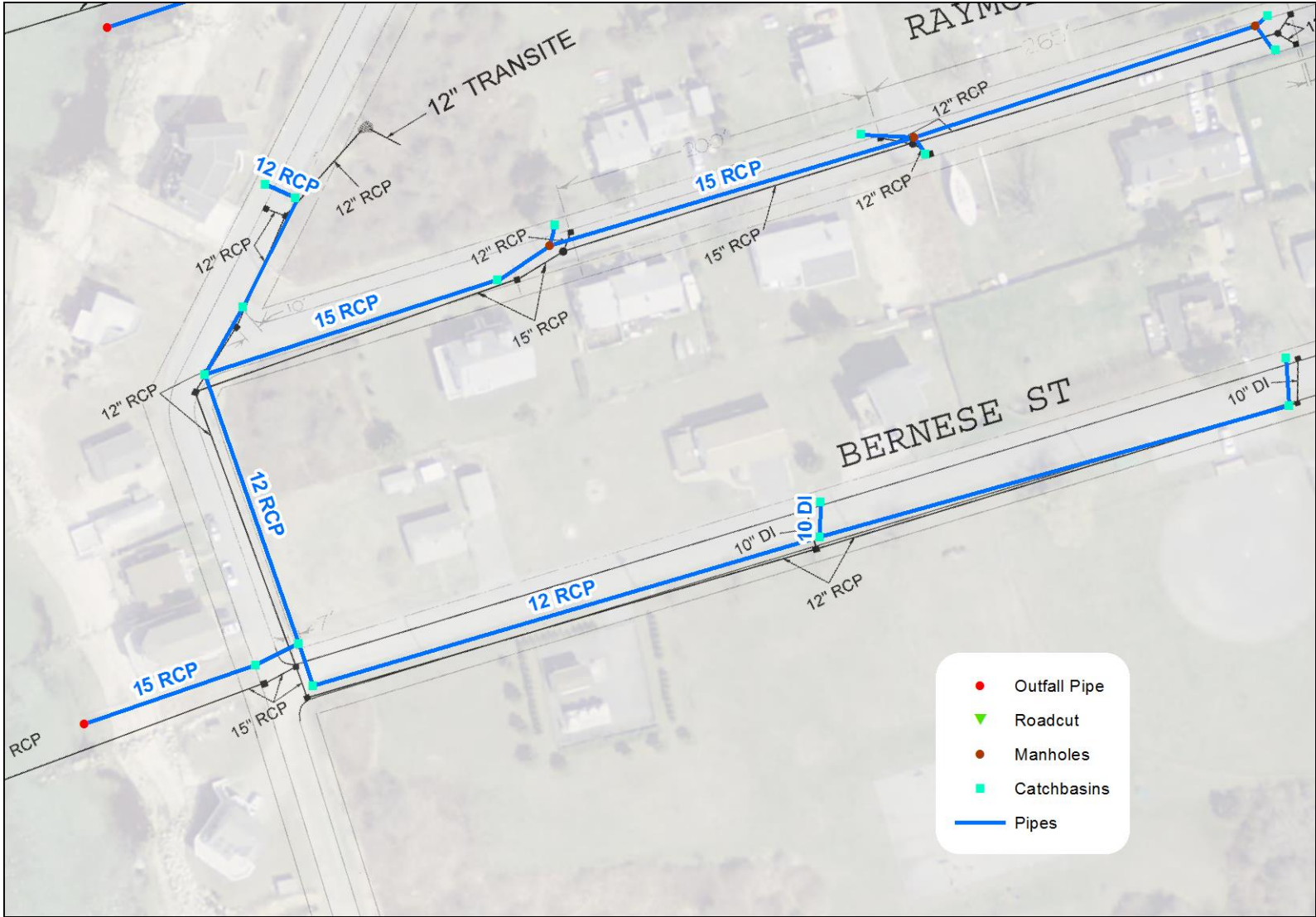
Mapping Stormwater Features

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Mapping Accomplishments

▸ GPS aboveground Features -> over 15,000 features

▸ Scanning Plans

▸ Geo-Referencing Plans

▸ Digitizing Pipes

▸ Attributes

Municipality	Number of Plans Scanned	Percent of Town Covered	Percent of Pipes Digitized
Acushnet	1,172	45%	10%
Dartmouth	~11,000 (by Town)	100%	80%
Fairhaven	160	100%	90%
Mattapoisett	259	50%	25%
Wareham	4,856	Working on it	0%

Working with Monitoring Data

▸ Feature Location versus Sampling Location

▸ Group of Features make up one Location

▸ Good Judgement and detailed notes required

▸ Multiple Locations and Visits

▸ Complex Data Model

FacilityID z

FacilityID y

FacilityID x

Three different Features
One Discharge
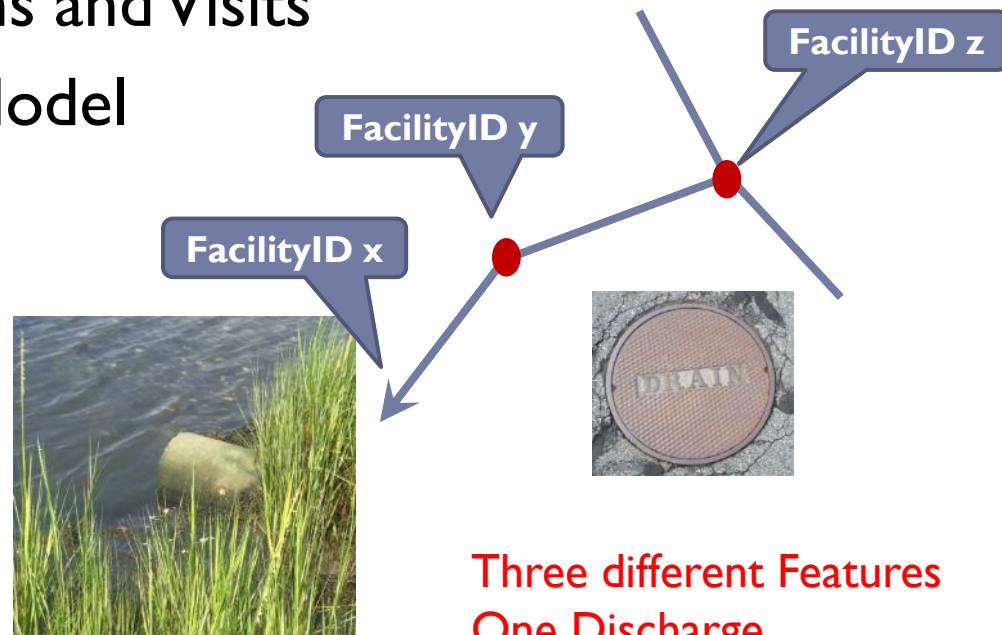
BBAC Stormwater Project Report
Discharge Number   AIH1028PI
in the Town of   Acushnet

Main St near Shady Tree Lane

Water Body: Acushnet River   Qualifier: SFR, CSO

Urbanized: Yes   Sewered: Yes   Class: SB   Category: 5

MS4 Ranking: Medium Priority Outfall

Status: Some Concern Warranted - Continue Monitoring
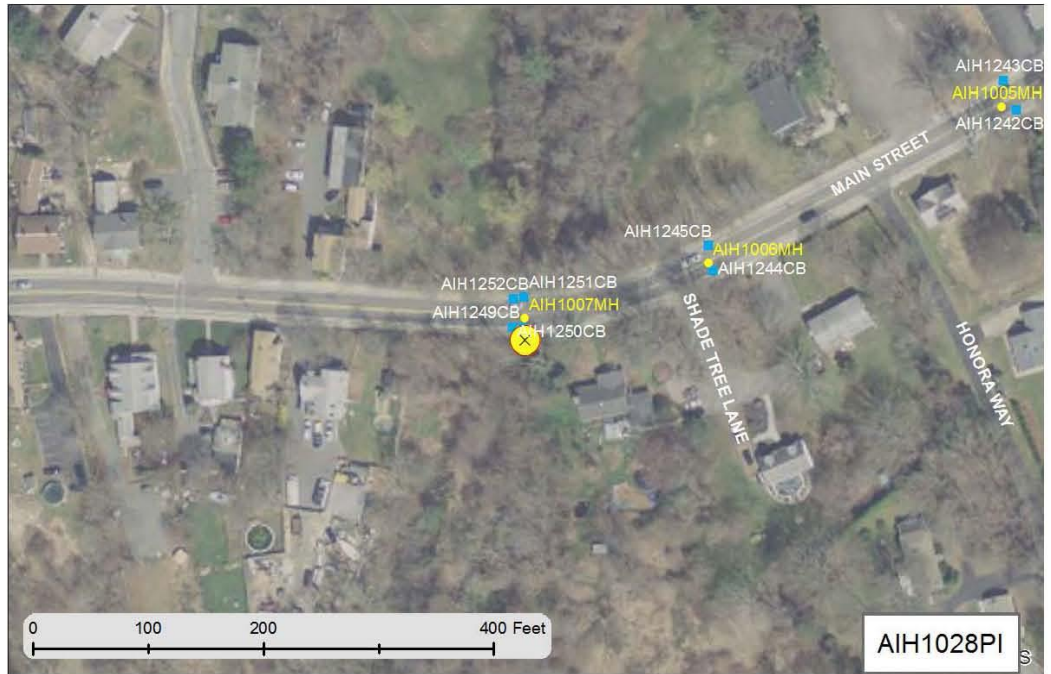
Moderate bact levels and elevated Nitrates in WW. WW rank Bact (1), Nitrates (1), total 2. Low to Moderate levels of Bact, Elevated Ammonia, Surf, and Nitrates in DW. DW Rank: Bact (1), Amm (1), Surf (1), Nitrates(1), Total 4. Continue to monitor DW, collect sample if flowing. Investigate for ID. Trib to impaired water

  2 'No Sample Visits'

AIH1028PI

Ranking, Status, and Recommendation based on the opinion of the BBNEP.   Report Created on: 4/5/2018

FacilityID	SampleDate	SampleID	Sample Type	Water Classification	Last Rain	12 hr. Rain	pH	Temp	Salinity	Ammo	Nitrate	Surfact	Enterococcus	Fecal Coliform
AIH1028PI	6/2/2016	6AC02JUN03-A	pipe	Fresh Water	51 hrs	0 in	6.43	17.9	0.34	0.25	4.40	0.100	3200	5900
AIH1028PI	6/8/2016	6AC08JUN03-A	pipe	Fresh Water	60 hrs	0 in	6.32	19.9	0.32	0.25	4.40	0.000	82	9
AIH1028PI	6/14/2016	6AC14JUN03-A	pipe	Fresh Water	65 hrs	0 in	6.34	20.1	0.25	0.00	4.40	0.000	64	9
AIH1028PI	6/20/2016	6AC20JUN03-S	pipe	Fresh Water	56 hrs	0 in	6.22	21.2	0.24	0.25	4.40	0.100	9	55
AIH1028PI	6/21/2016	6AC21JUN06-A-	pipe	Fresh Water	5 hrs	0.73 in	6.30	21.5	0.21	0.00	3.52	0.200	3400	490
AIH1028PI	6/21/2016	6AC21JUN06-A	pipe	Fresh Water	5 hrs	0.73 in	6.29	20.5	0.21	0.25	4.40	0.200	2800	550
AIH1028PI	7/5/2016	6AC05JUL05-A	pipe	Fresh Water	2 hrs	0.61 in	6.49	22.8	0.06		0.00	0.300	7000	7400
AIH1028PI	6/5/2017	AC05JUN03-A	pipe	Fresh Water	2 hrs	0.41 in	6.30	16.2	0.31	0.25	4.40	0.100	700	
AIH1028PI	7/11/2017	AC11JUL02-A-D	pipe	Fresh Water	0 hrs	0.13 in	7.40	23.4	0.00	1.00	4.40	1.000	7100	
AIH1028PI	7/11/2017	AC11JUL02-A	pipe	Fresh Water	0 hrs	0.13 in	7.90	23.4	0.00	1.00	4.40	1.000	2800	

BBAC Stormwater Project Report
Discharge Number   APB1037PI
in the Town of   Dartmouth

Water St opposite Prospect St

Water Body: Apponagansett Bay   Qualifier: SFO

Urbanized: Yes   Sewered: Yes   Class: SA   Category: 5

MS4 Ranking: High Priority Outfall

Status: Some Concern Warranted - Consider Corrective Action

DW: no issues. WW Mod to high levels of Bact and elevated Nitrates, Amm, and Surf. WW rank Bact (2), Nitrates/Amm/Surf (1 ea), Tot 5. App Bay Impair: Bact and N

2 'No Sample Visits'

Ranking, Status, and Recommendation based on the opinion of the BBNEP.

Report Created on: 4/5/2018

APB1037PI

FacilityID	SampleDate	SampleID	Sample Type	Water Classification	Last Rain	12 hr. Rain	pH	Temp	Salinity	Ammo	Nitrate	Surfact	Enterococcus	Fecal Coliform
APB1309MH	8/8/2016	6DA08AUG04-A	pipe	Fresh Water	38 hrs	0 in	7.66	26.1	0.15	0.00	4.40	0.100	10	10
APB1309MH	8/10/2016	6DA10AUG06-A	pipe	Fresh Water	0 hrs	0.18 in	7.08	23.8	0.05	0.35	4.40	0.750	2800	1600
APB1309MH	8/22/2016	6DA22AUG07-A	pipe	Fresh Water	3 hrs	0.45 in	7.30	26.7	2.75	0.25	2.64	2.000	126000	39000
APB1309MH	9/1/2016	6DA01SEP07-A	pipe	Fresh Water	0 hrs	0.1 in	6.96	23.1	0.03	3.00	2.64	1.000	6800	

BBAC Stormwater Project Report
Discharge Number FIH1123PI
in the Town of Fairhaven

166 Main St

Water Body:	New Bedford Inner Harbor	Qualifier:	SFR, CSO

Urbanized: Yes   Sewered: Yes   Class: SB   Category: 5

MS4 Ranking: High Priority Outfall

Status: Evaluation Not Complete

DW: No flow, No issues. WW: Almost all samples were affected by tidal backwash, recommend moving monitoring site to FIH1401MH. WW rank (one sample): Bact (1), Nitrates (1), Total 2. INBH Impair: Bact, N, HC, DO.

5 'No Sample Visits'

Ranking, Status, and Recommendation based on the opinion of the BBNEP.

FIH1123PI

Report Created on: 4/5/2018

FacilityID	SampleDate	SampleID	Sample Type	Water Classification	Last Rain	12 hr. Rain	pH	Temp	Salinity	Ammo	Nitrate	Surfact	Enterococcus	Fecal Coliform
FIH2214CB	7/7/2016	6FA07JUL04-S	sump	Fresh Water	50 hrs	0 in	6.37	25.9	0.02	0.25	0.00	0.125	10	10
FIH2200CB	7/7/2016	6FA07JUL05-S-D	sump	Brackish or Sea Water	50 hrs	0 in	7.06	25.1	10.00	0.00	0.44	2.500	540	2600
FIH2200CB	7/7/2016	6FA07JUL05-S	sump	Brackish or Sea Water	50 hrs	0 in	7.02	24.9	10.00	0.00	0.44	2.500	590	1400
FIH2214CB	7/13/2016	6FA13JUL05-S	sump	Fresh Water	48 hrs	0 in	6.55	24.1	0.02	0.50			10	10
FIH2200CB	7/13/2016	6FA13JUL06-S-D	sump	Fresh Water	49 hrs	0 in	7.03	22.9	2.72	0.25			240	20
FIH2200CB	7/13/2016	6FA13JUL06-S	sump	Fresh Water	49 hrs	0 in	7.02	23.1	2.69	0.25			70	110
FIH1544MH	7/18/2016	6FA18JUL02-S	sump	Brackish or Sea Water	92 hrs	0 in	7.20	28.5	9.79	0.25			950	720
FIH1544MH	7/19/2016	6FA19JUL02-S	sump	Brackish or Sea Water	115 hrs	0 in	7.05	25.7	10.00	0.25	0.00	2.500	610	570
FIH1544MH	7/20/2016	6FA20JUL02-S	sump	Brackish or Sea Water	139 hrs	0 in	7.19	24.3	10.00	0.50	0.88	2.000	190	180
FIH1123PI	7/29/2016	6FA29JUL10-A	pipe	Fresh Water	0 hrs	0.19 in	6.85	23.9	1.06	1.00	1.76	0.500	3800	900

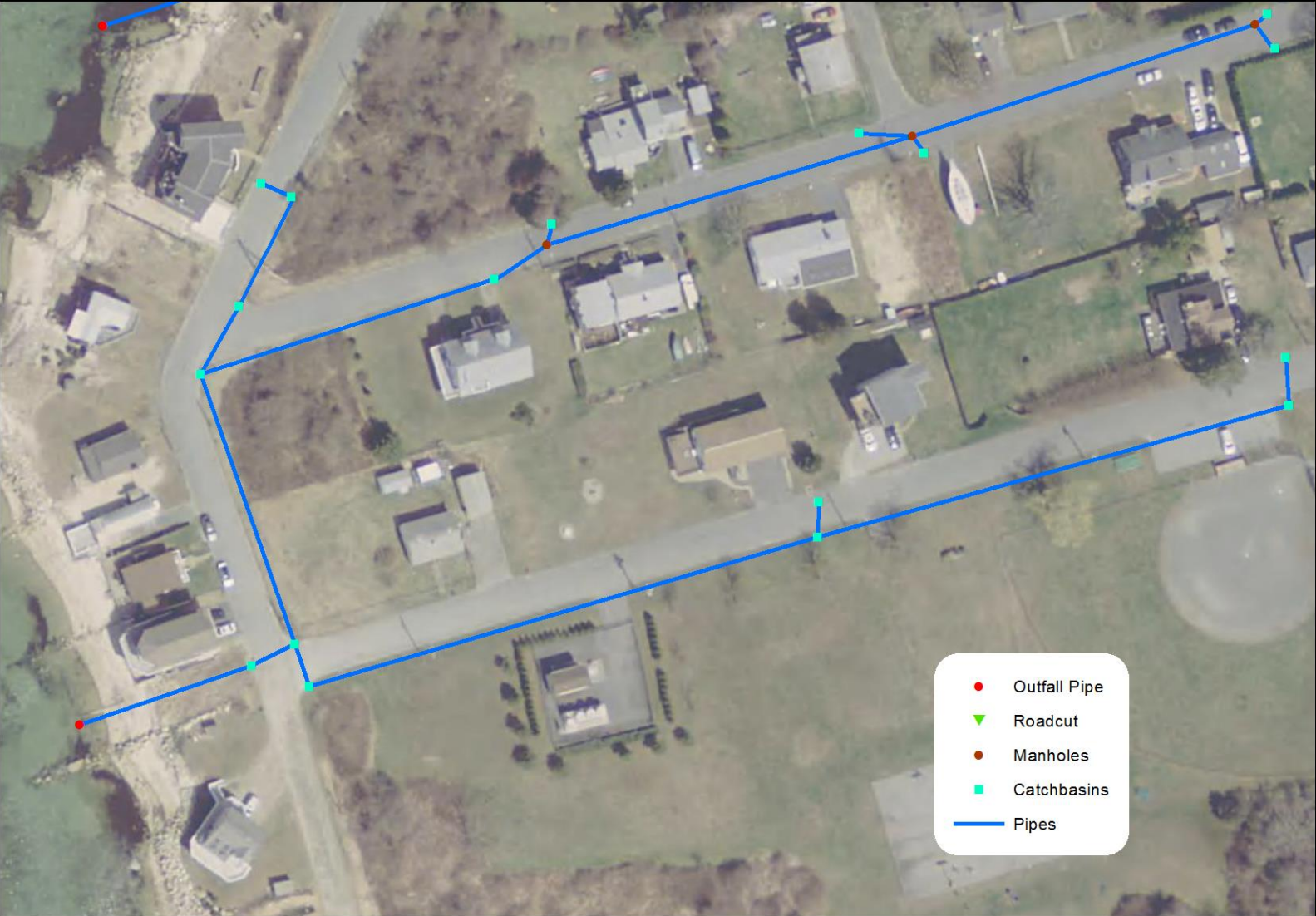# Water Quality Parameters

Parameter	Indication of:
Surfactants	Washing machine or sewer connection
Ammonia as Nitrogen	Sewer connection
Temperature	Impact to aquatic life
Conductivity	Saline conditions, impacts on surfactant tests
Nitrates as Nitrogen	Sewer connection
Enterococci	Swimming beach contamination
Fecal Coliform	Pathogen contamination in shellfish areas
Chlorine (optional)	Connection to swimming pools

**Information on how to interpret local results will be detailed in the final report.**

Combined Results

Sample Type	Salt Water	Rain	Entero Count	Entero Median
bay	Brackish or Sea Water	Dry	6	100
bay	Brackish or Sea Water	Wet	4	4500
pipe	Fresh Water	Dry	75	160
pipe	Fresh Water	Wet	131	5200
pipe	Brackish or Sea Water	Dry	6	215
pipe	Brackish or Sea Water	Wet	10	1350
stream	Fresh Water	Dry	12	410
stream	Fresh Water	Wet	7	700
sump	Fresh Water	Dry	152	490
sump	Fresh Water	Wet	66	8200
sump	Brackish or Sea Water	Dry	125	230
sump	Brackish or Sea Water	Wet	16	300
surface	Fresh Water	Dry	5	100
surface	Fresh Water	Wet	25	4500

Mapping Stormwater Features

Discharge and Catchment

Catchment Line determined by Infrastructure and Topography

Catch Basins and Pipes
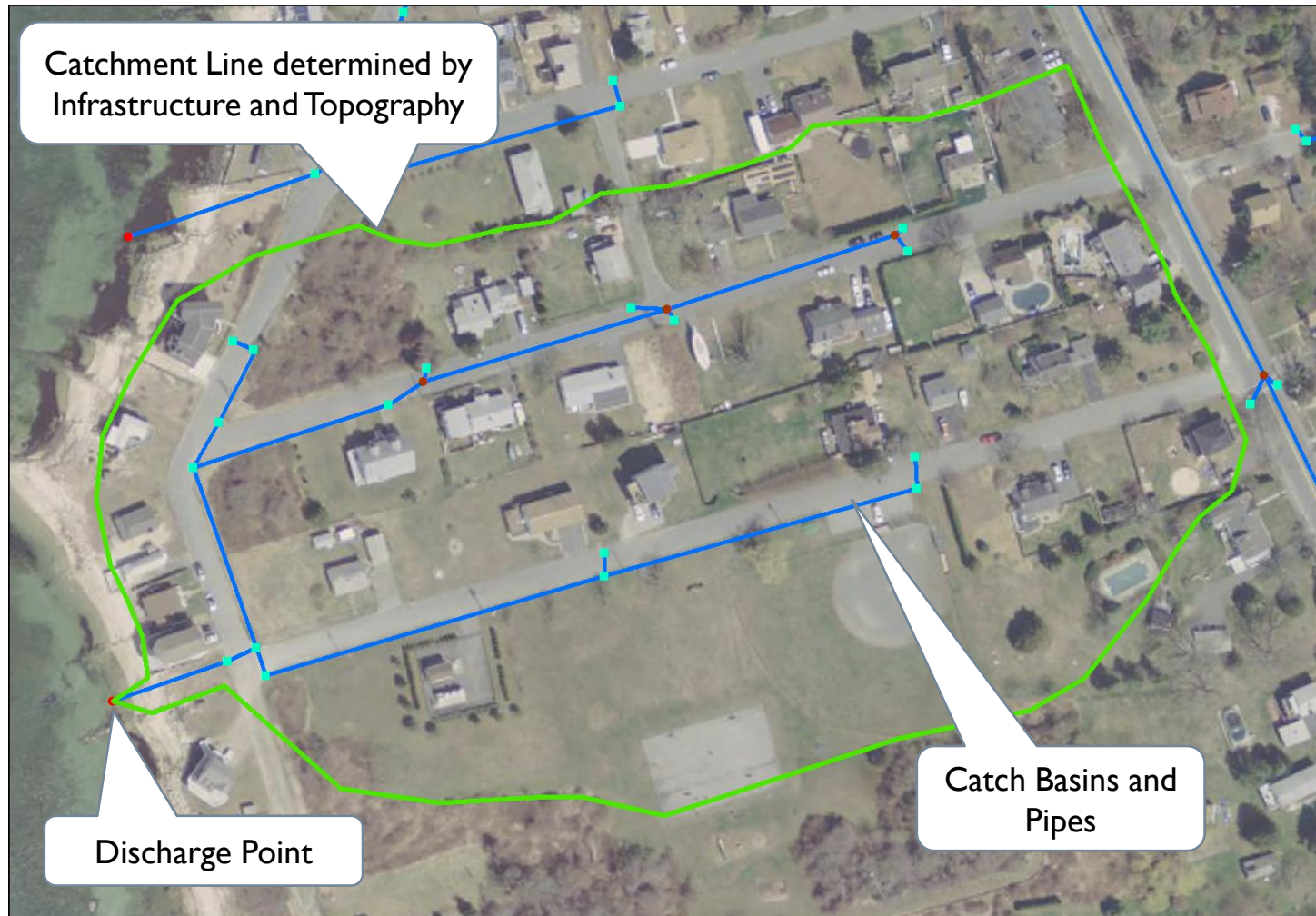
Discharge Point

12 acres of roads, houses, fields, and yards contribute to a single discharge point.

Combined Data Analysis

Catchment Relationship to Water Quality at Discharge

▸ Area of Catchment

▸ Number of Catch Basins

▸ Length of Stormwater Pipe

▸ Type of Stormwater Pipe

▸ Average Slope of Landscape

▸ Dominant Soils

▸ Percent Impervious Area

▸ Population per Acre

▸ Number and Location of Registered Dogs

▸ Vintage of Septic Systems (Title V versus Earlier)

Combined Data Analysis

t-Test: Two-Sample Assuming Unequal Variances		
Enterococcus Samples from Pipes during Dry Weather		
	Sewer	*No Sewer*
Mean	891.6	1190.9
Variance	7419082.1	3233509.1
Observations	58	11
Hypothesized Mean Difference	0	
df	20	
t Stat	-0.46087	
P(T<=t) one-tail	0.32493	
t Critical one-tail	1.72472	
P(T<=t) two-tail	0.64987	
t Critical two-tail	2.08596	
Median	100	400
Range	9 to 20000	10 to 5200
Geometric Mean	175.5	193.4

Lessons Learned
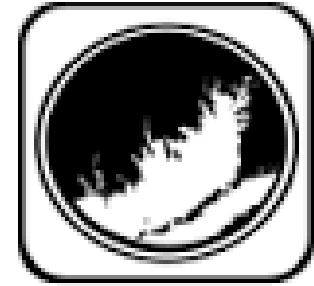
Mapping:

▸ Map before Monitoring – Timing of Grants

▸ Detailed Field Notes for Outfalls – **Start Now**

▸ Understand Connectivity before Sampling

▸ Some Pipes need to be Cleared or Serviced before Sampling

Sampling:

▸ Sampling Strategies – Plan Route

▸ Use Simple and Durable Equipment in Field

▸ Coordination and Scheduling with Laboratories and DPWs

▸ Town DPWs are often Not Available during Big Storms

▸ Use different Form for 'no-flow' Observations

▸ Paper Forms versus Digital Forms

No single raindrop believes it is to blame for the flood.

<u>STORMWATER</u>
- ✓ Road Network
- ✓ Flood Control
- ✓ Safety
- ✓ Maintenance
- ✓ Infrastructure
- ✓ Asset Management
- ✓ Erosion Prevention
- ✓ Property Protection
- ✓ Fisheries
- ✓ Wildlife
- ✓ Water Quality
- ✓ Pollution
- ✓ Regulation