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February 23, 2018: Infrastructure Resilience

Hampton Roads Sea Level Rise/Flooding Adaptation Forum

2-23-2018

Saltwater Inflow & Infiltration Investigation

Ryan Radspinner

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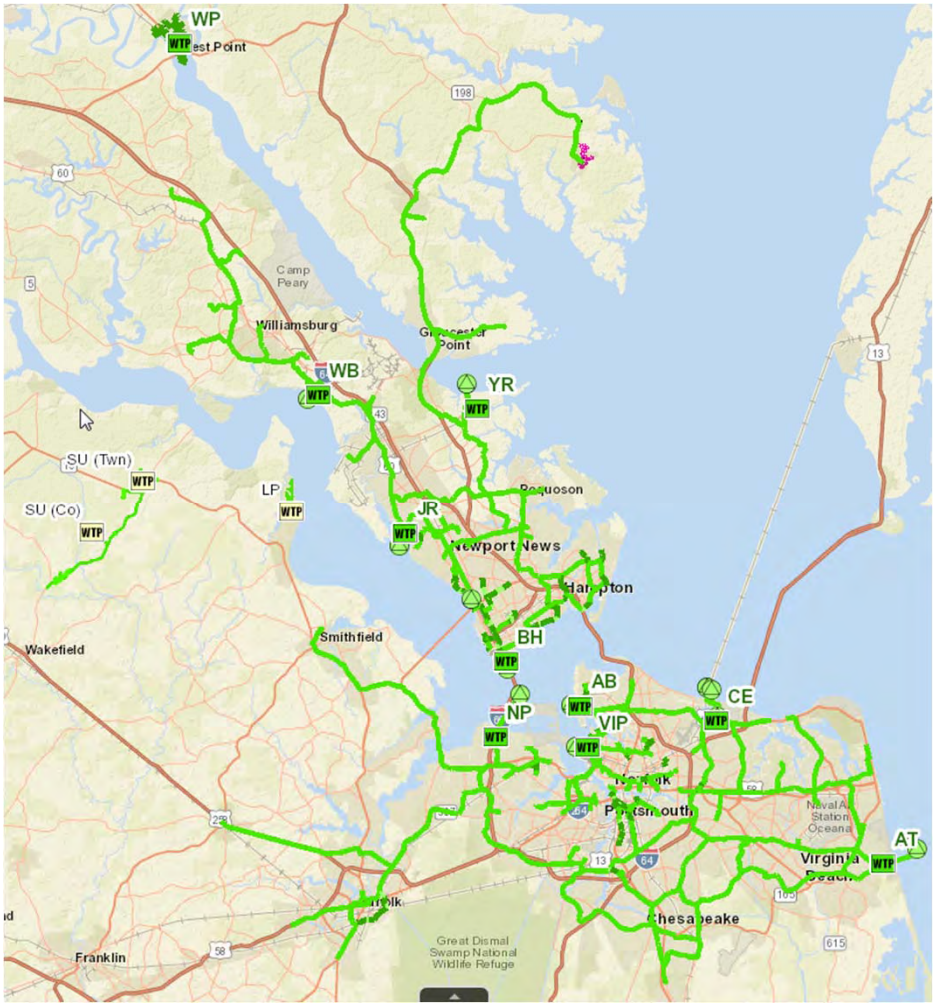
HRSD
Cleaning wastewater every day for a better Bay.

Saltwater Inflow & Infiltration Investigation
February 23rd, 2018

Ryan Radspinner, P.E.

Background



- Regional conveyance and treatment agency
- 1.6 million customers
- 18 Jurisdictions
- Low lying and flat
- Surrounded by water

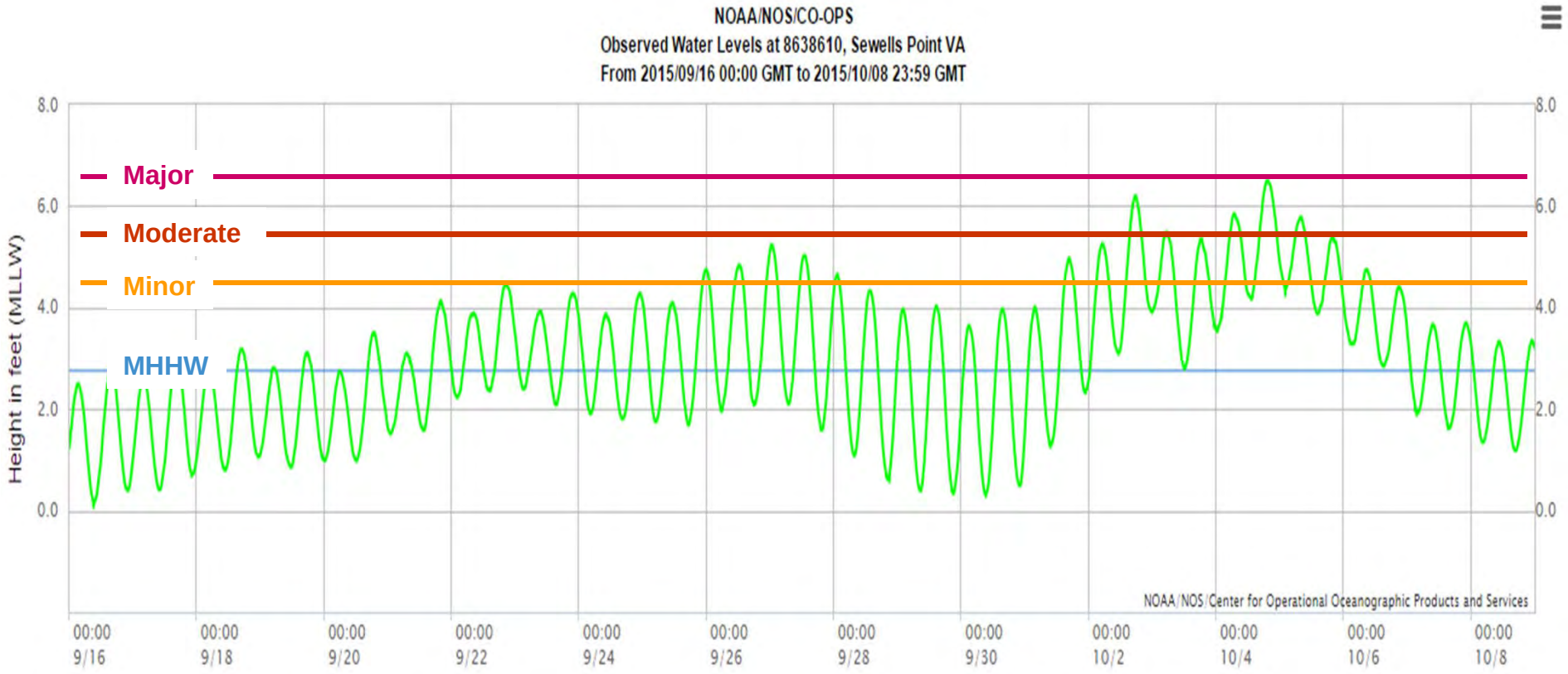
- Separate sewer system
- Consent Decree for SSOs

Tidal Impact

- Non-sewer flow (same as rainfall driven I&I)
- Salinity effect on treatment
- Aquifer recharge

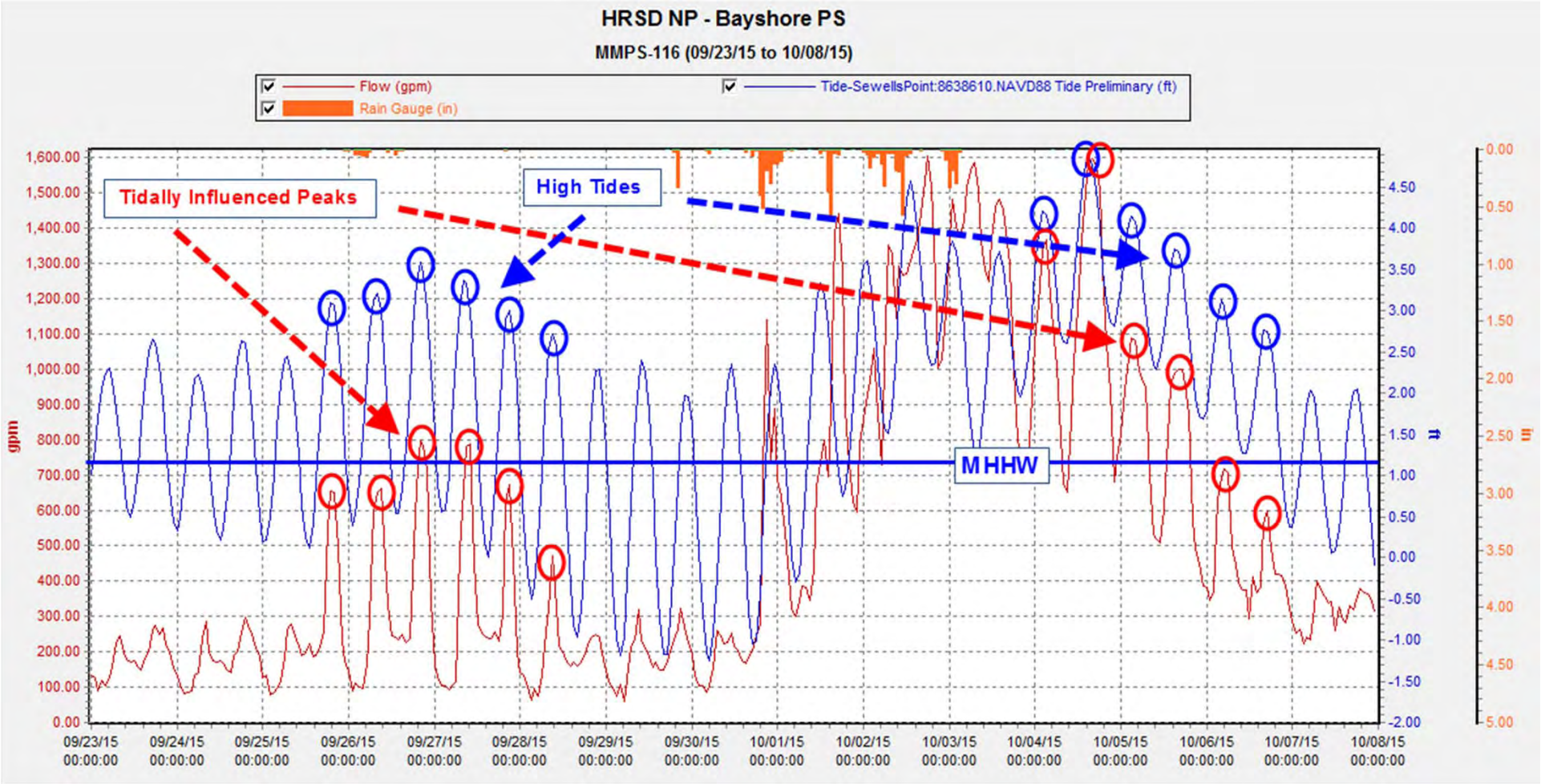
Recent Events

- Nor'easter beginning late September 2015 brought elevated tides to Hampton Roads



~ Manhole Locations
Tide Line

Bayshore PS


HRSD NP - Bayshore PS
MMPS-116 (09/23/15 to 10/08/15)
Flow (gpm)
Rain Gauge (in)
Tide-SewellsPoint:8638610.NAVD88 Tide Preliminary (ft)
Tidally Influenced Peaks
High Tides
MHHW
gpm
ft
1,600.00
1,500.00
1,400.00
1,300.00
1,200.00
1,100.00
1,000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
4.50
4.00
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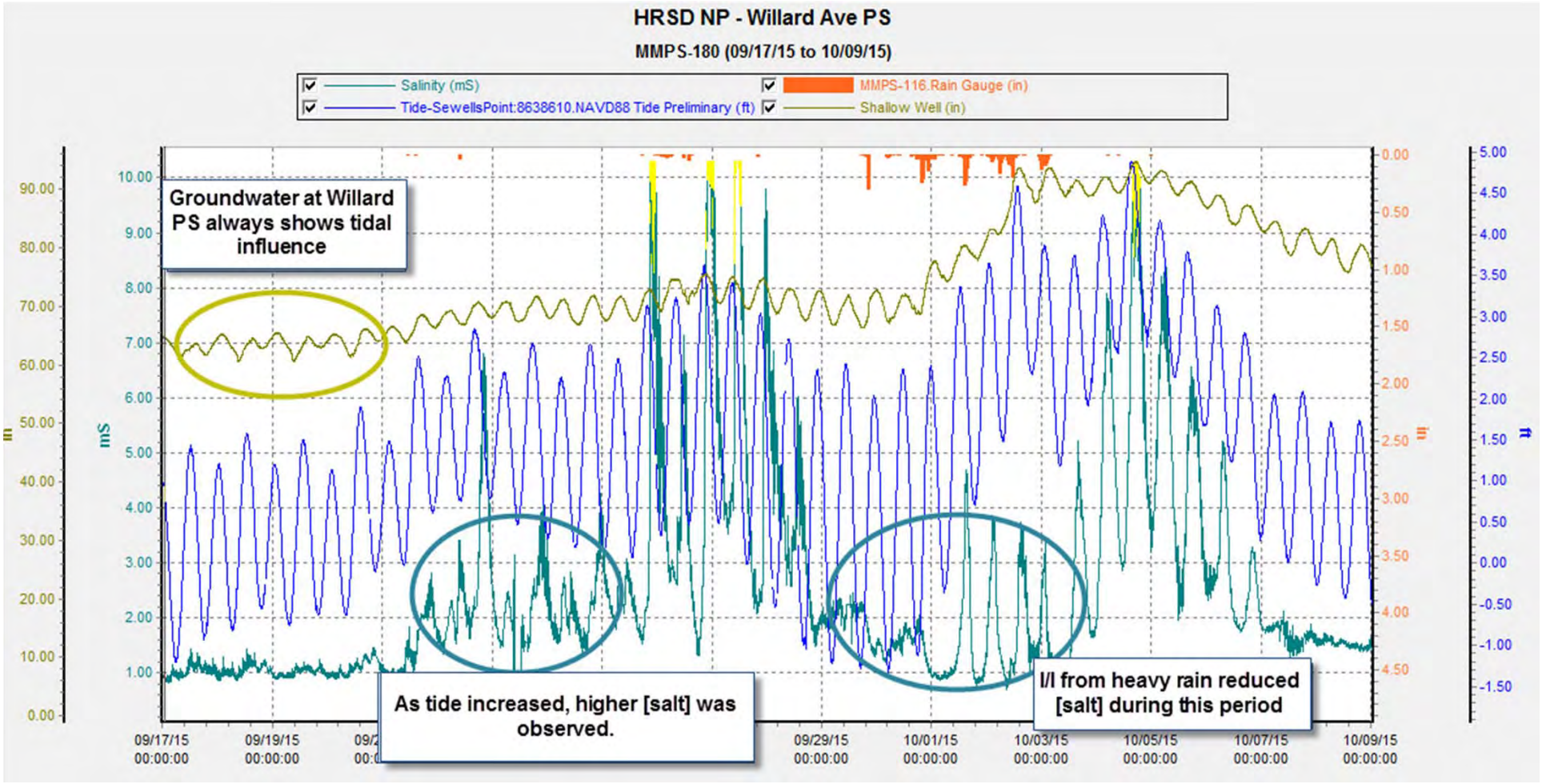
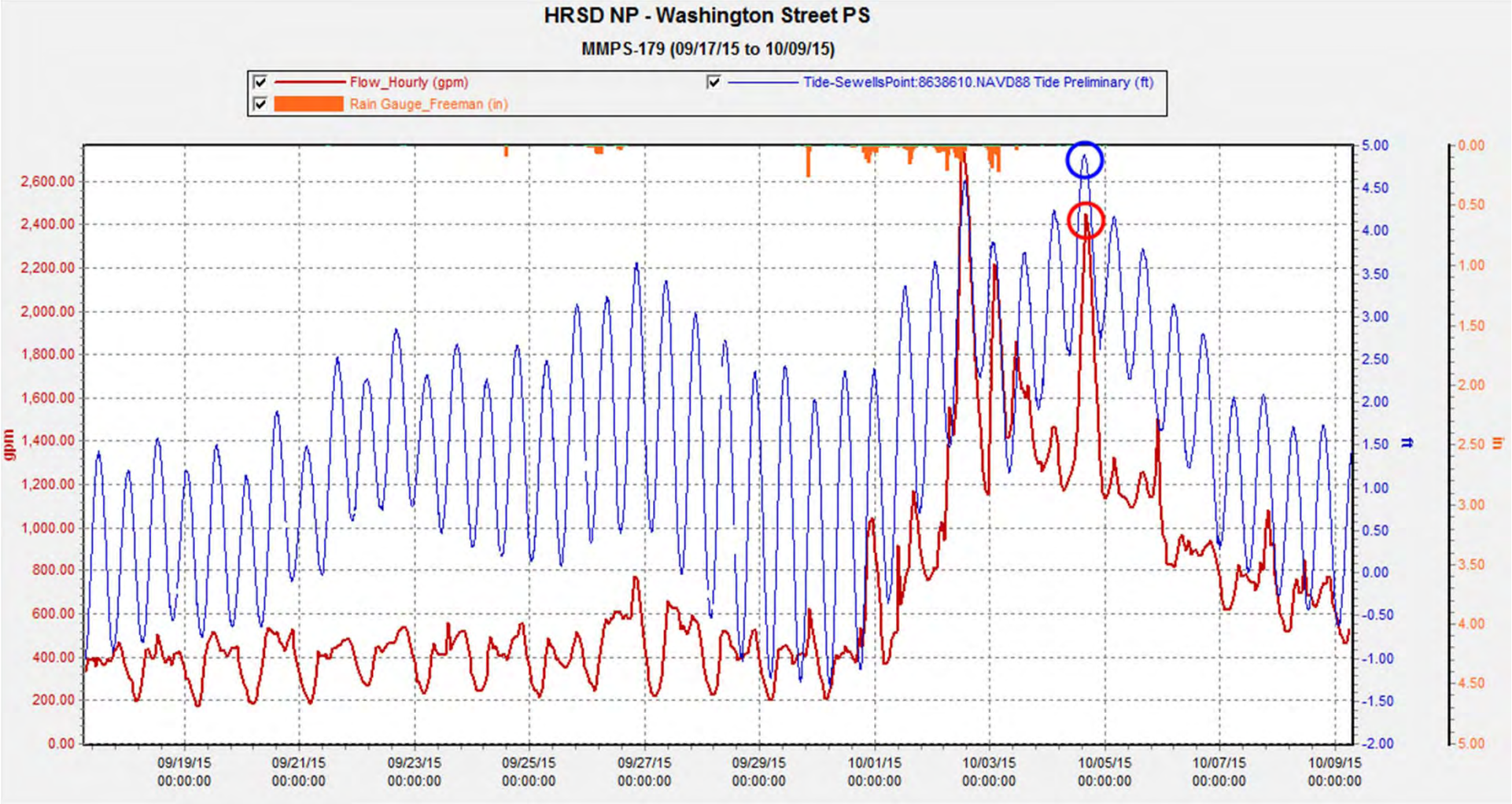
10/08/15 00:00:00

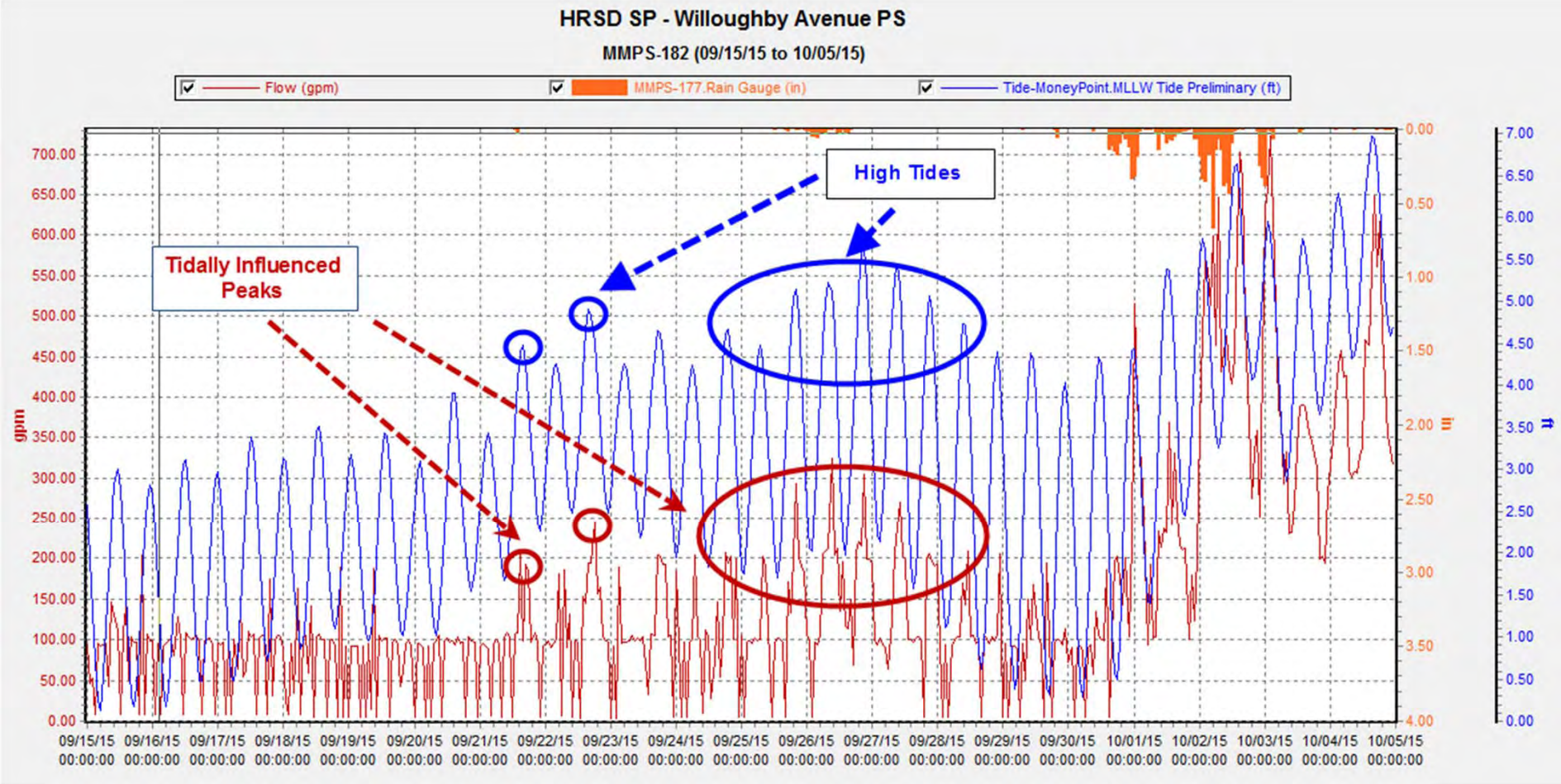
Willard Ave PS



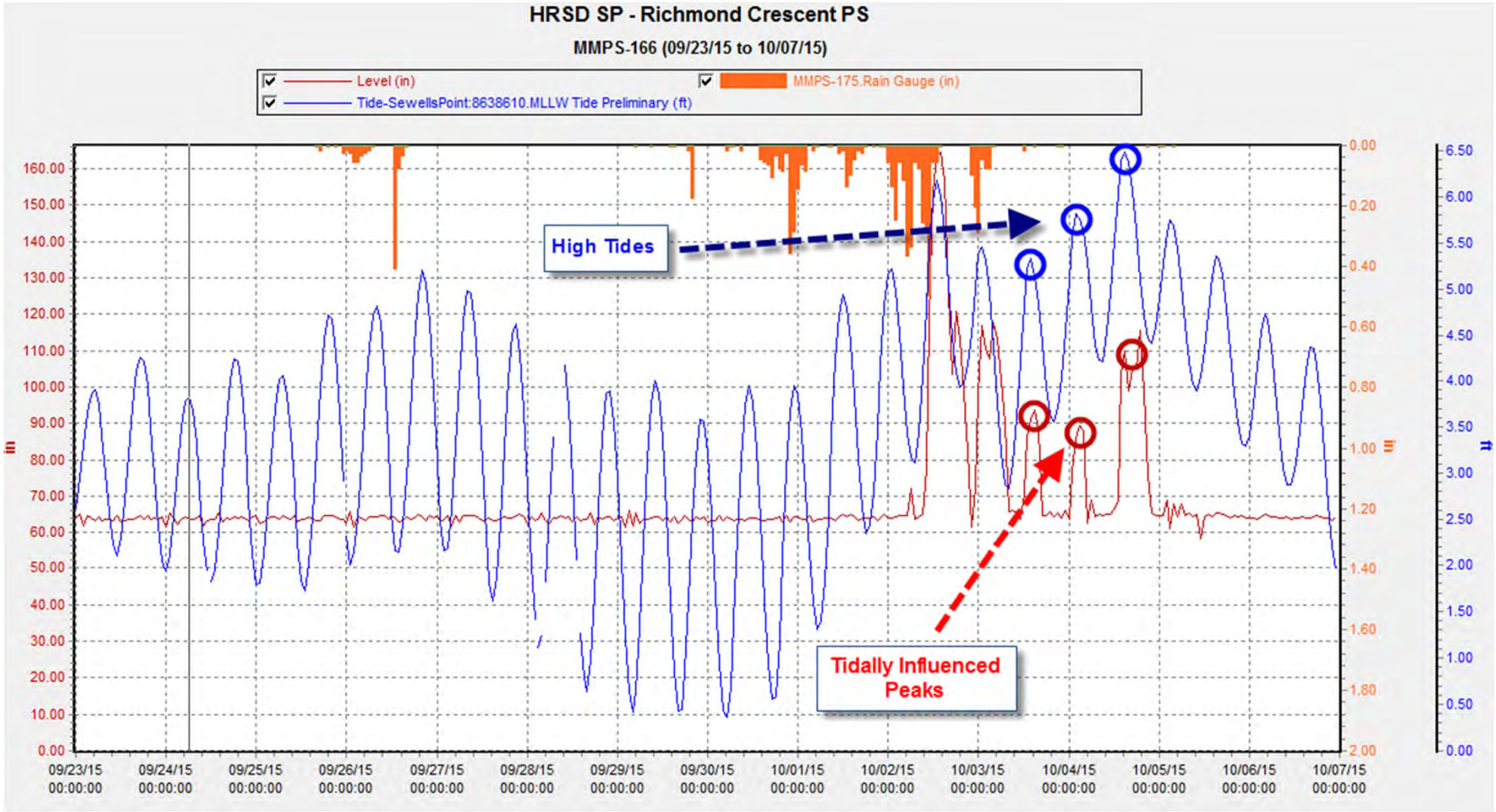
Washington Street PS



Willoughby Ave PS



Richmond Crescent PS

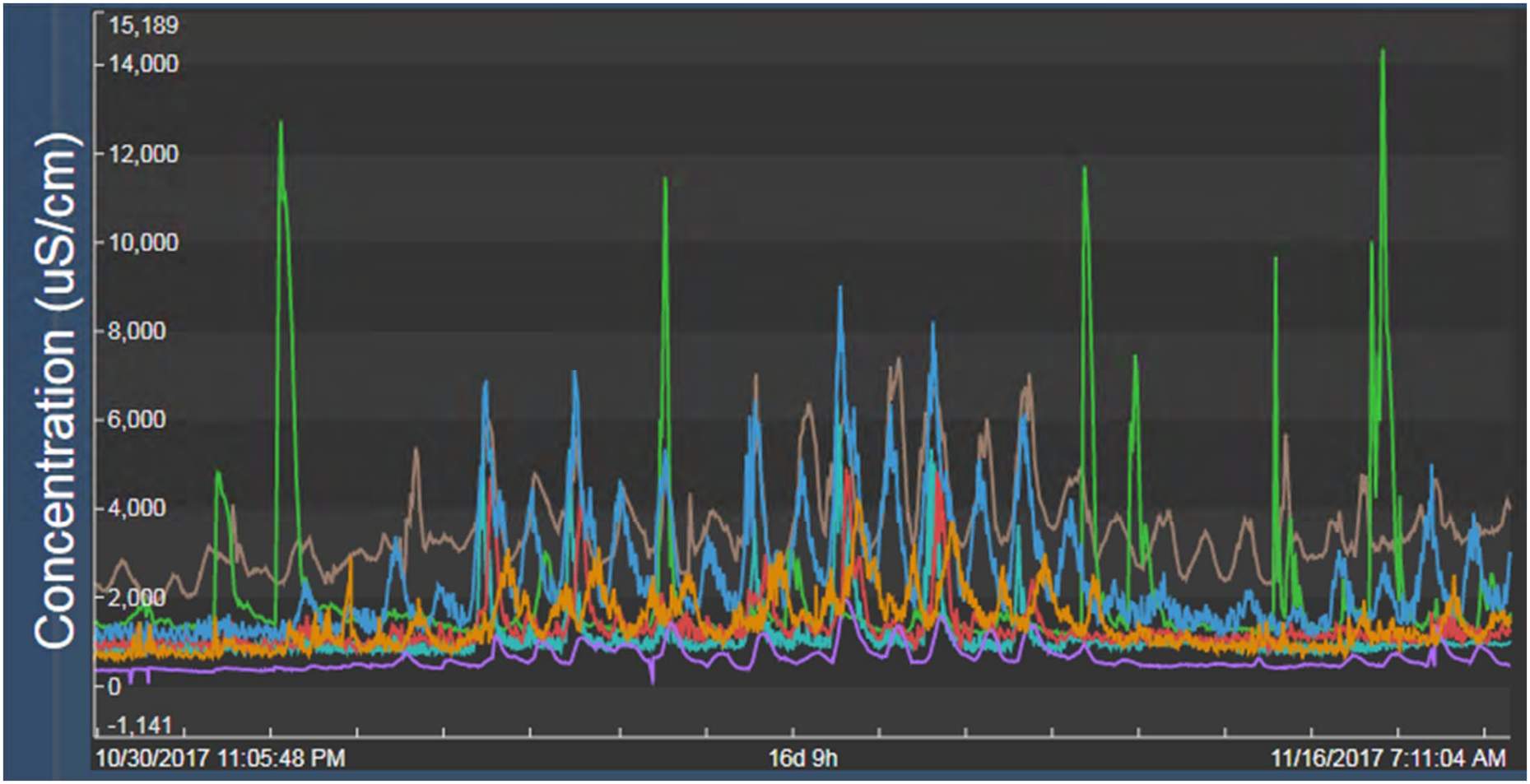


Step 1 - Team Formation

- Engineering
  - Hydraulics and Capacity, Data Analysis, GIS
- Operations
  - Interceptors, Treatment
- Water Quality
  - P3 (Industry), Technical Services

- Partner Jurisdictions

Step 2 – Collect Data



Conductivity 101

- Conductivity is more readily measured than Total Dissolved Solids (TDS)

• Drinking water	500 µS/cm
• Typical wastewater	700 µS/cm
• Bay water	30,000 µS/cm
• Ocean water	40,000 µS/cm

- Impact to treatment process ~3,000 µS/cm

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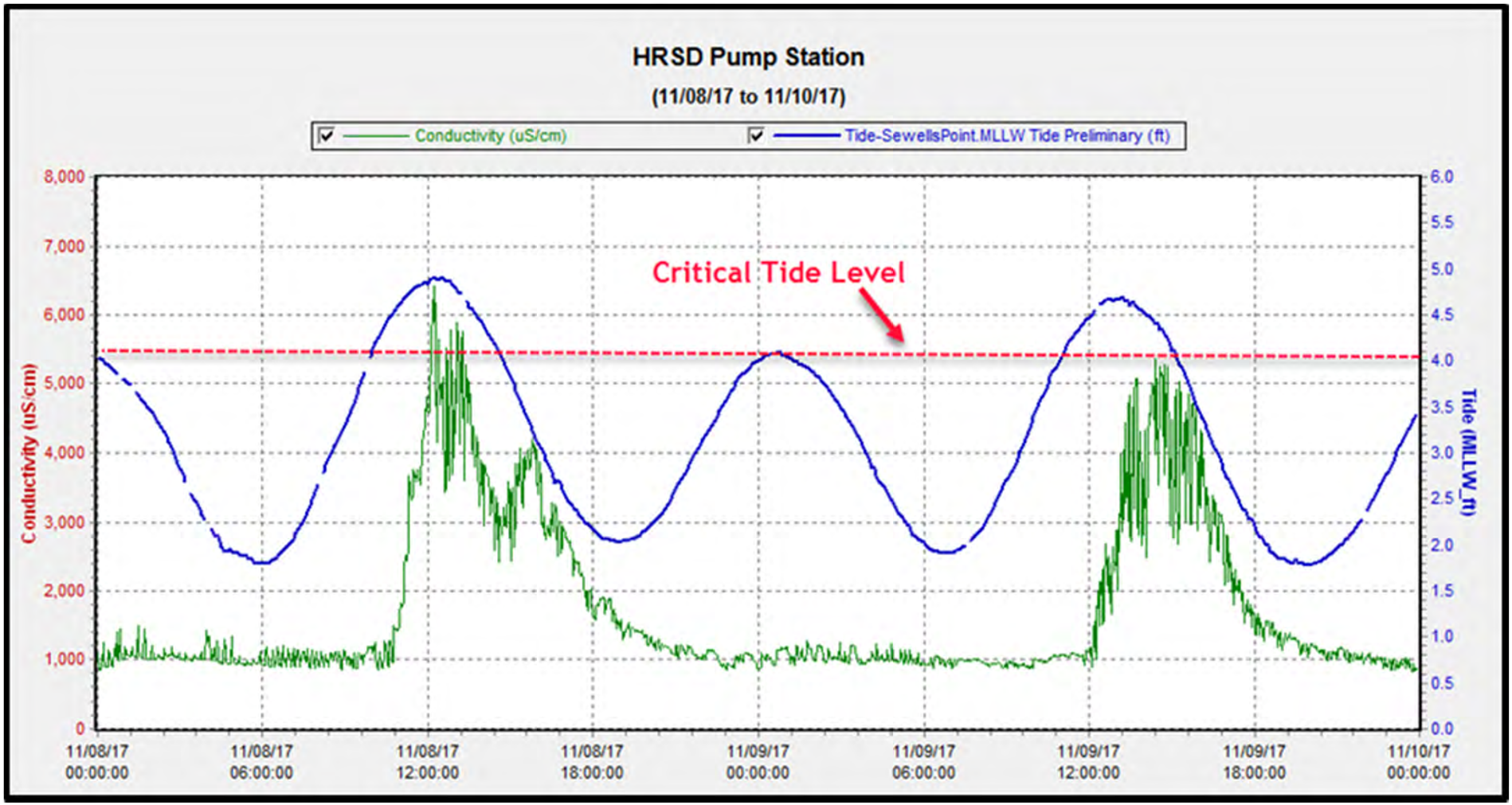
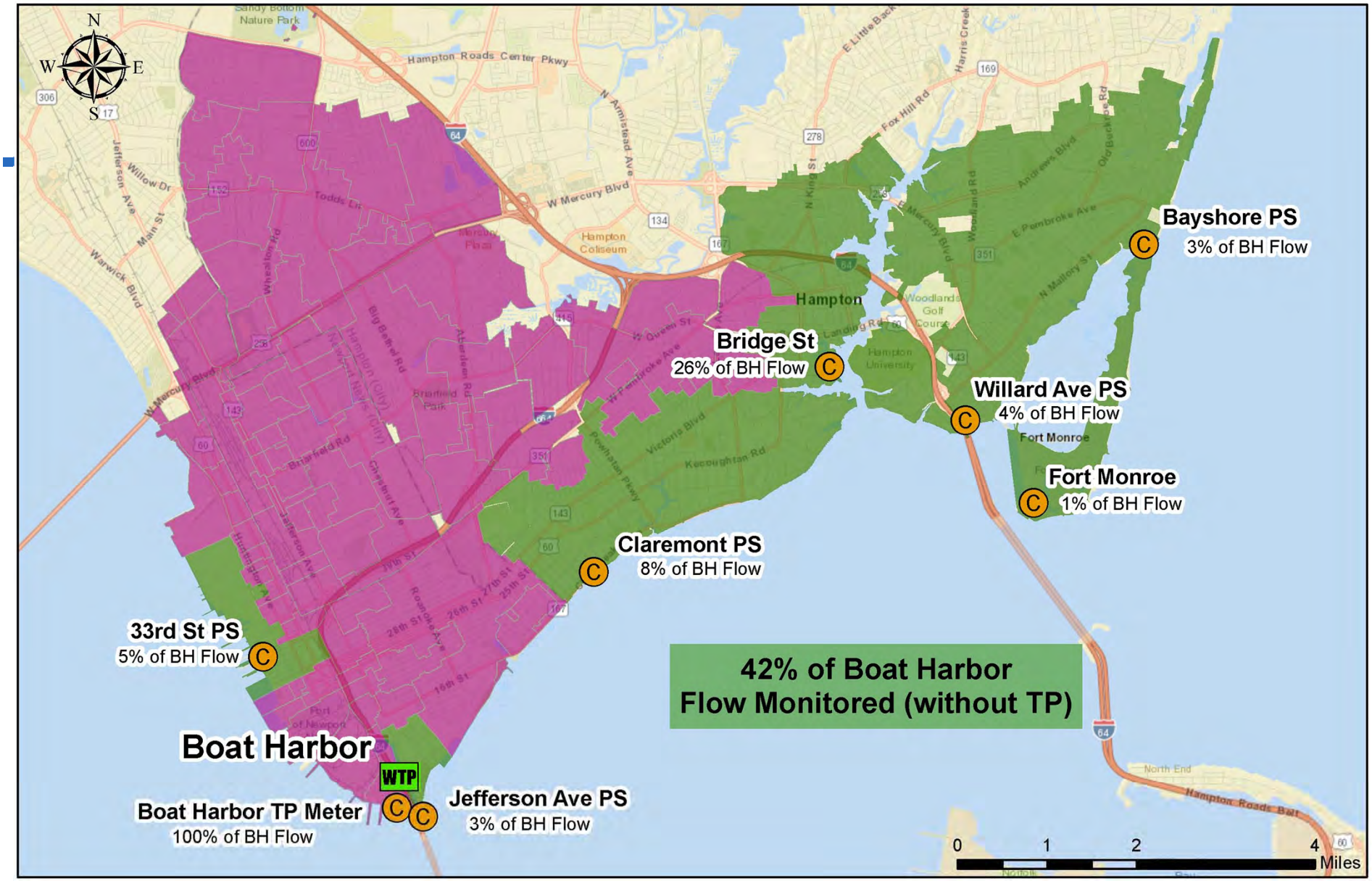
Step 3 – Identify Thresholds



LiDAR Based Tidal Overlay



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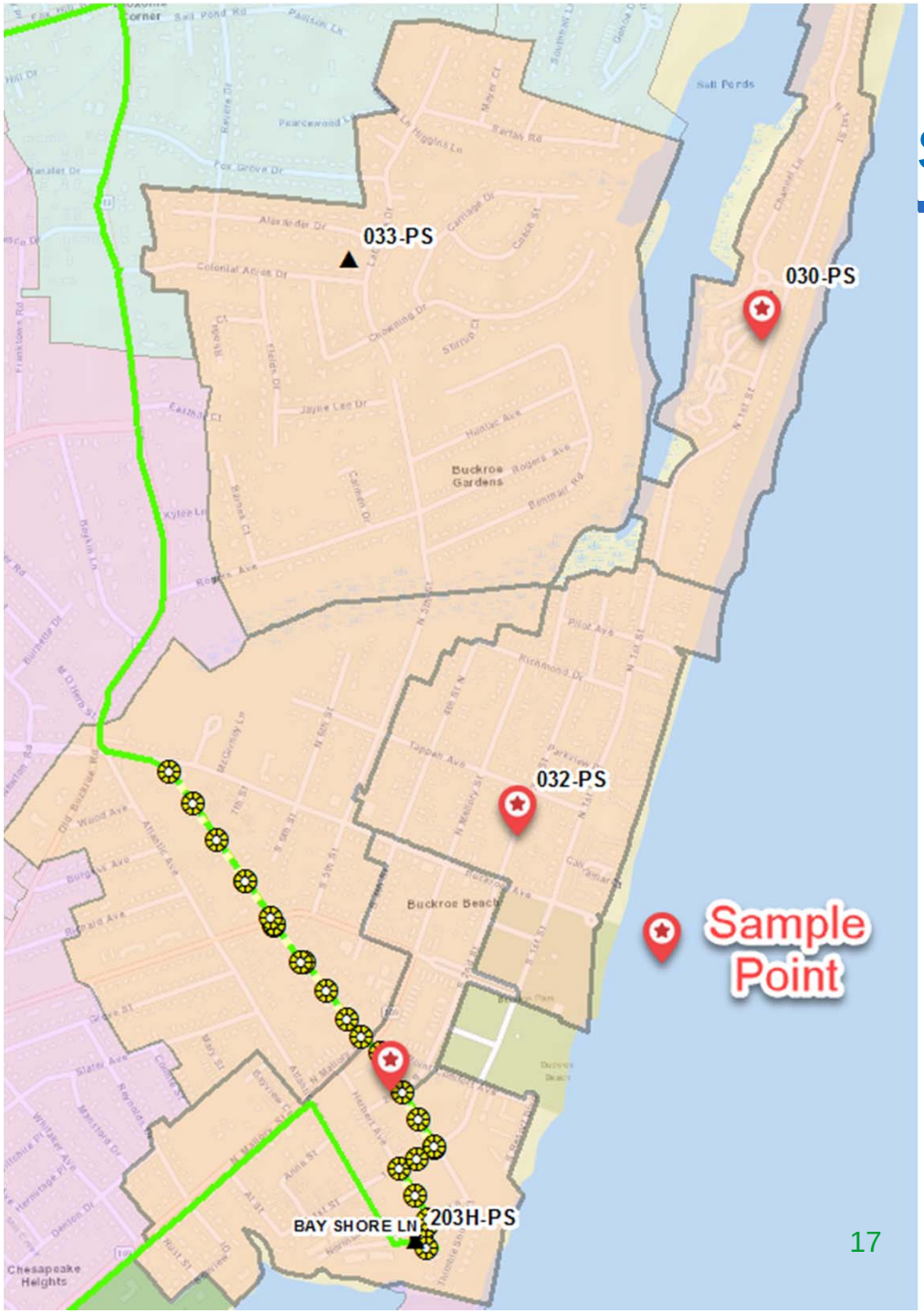
Conducitivity Monitoring for Boat Harbor Service Area

Legend

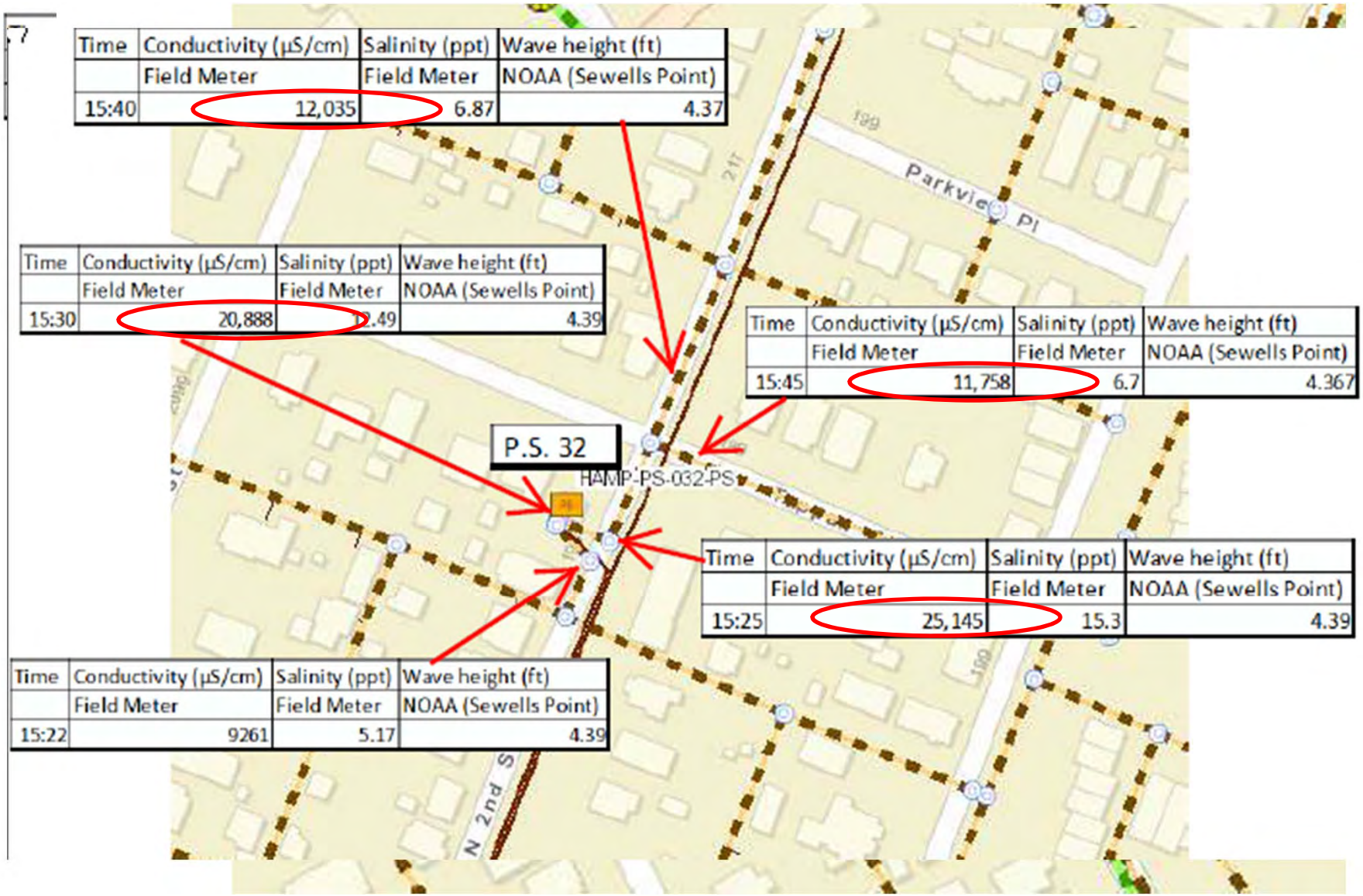
- C — Conductivity Meters
- WTP — Treatment Plant
- Catchments Monitored by BH
- Catchments Monitored



Step 4 - Field Investigation

- Isolate sources by sampling upstream lift stations
- Sept. 27th high tide event
- Negligible rainfall

Field Investigation



Time	Conductivity (µS/cm)	Salinity (ppt)	Wave height (ft)
	Field Meter	Field Meter	NOAA (Sewells Point)
15:40	12,035	6.87	4.37

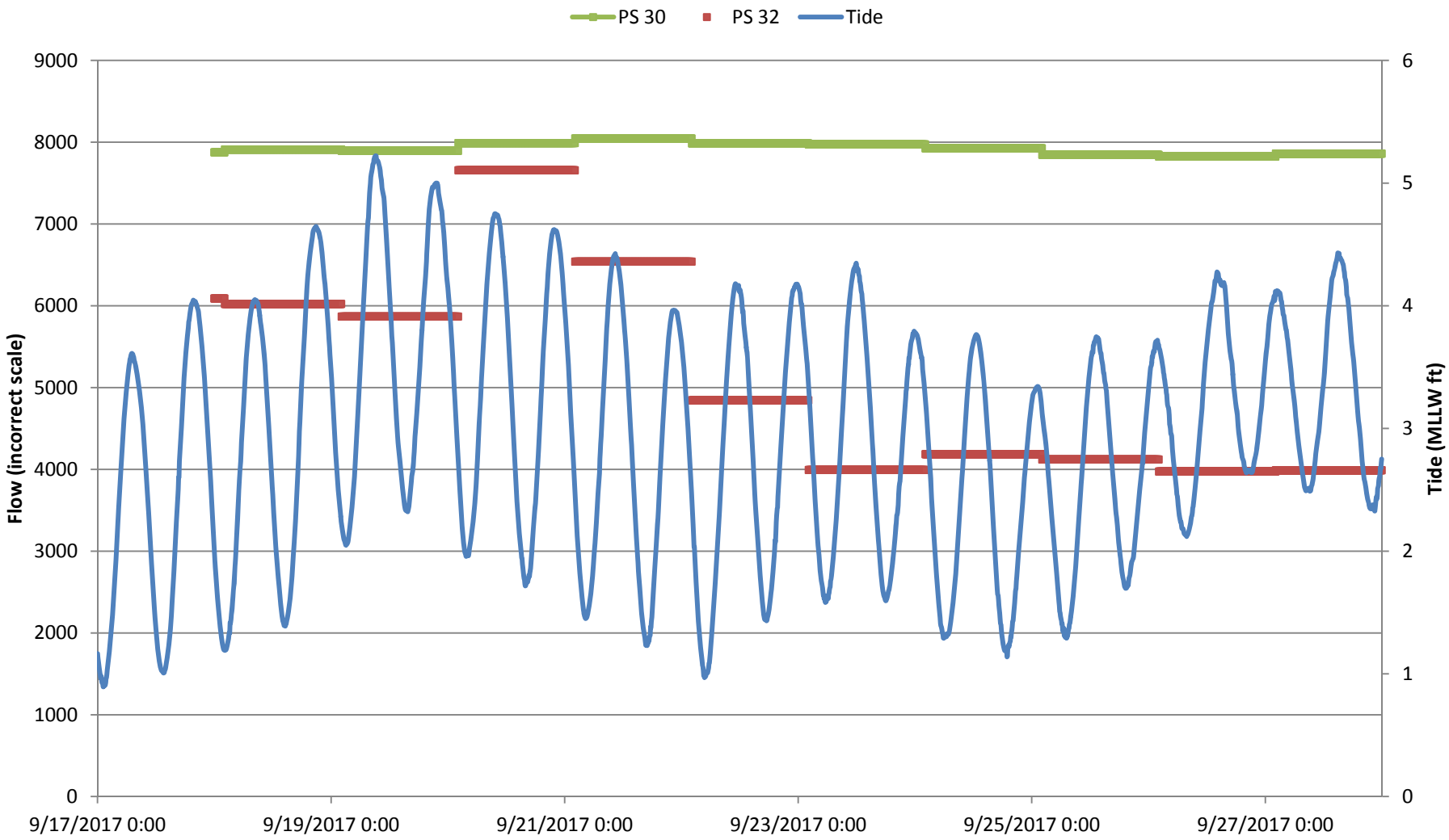
Time	Conductivity (µS/cm)	Salinity (ppt)	Wave height (ft)
	Field Meter	Field Meter	NOAA (Sewells Point)
15:30	20,888	[illegible].49	4.39

Time	Conductivity (µS/cm)	Salinity (ppt)	Wave height (ft)
	Field Meter	Field Meter	NOAA (Sewells Point)
15:45	11,758	6.7	4.367

Time	Conductivity (µS/cm)	Salinity (ppt)	Wave height (ft)
	Field Meter	Field Meter	NOAA (Sewells Point)
15:25	25,145	15.3	4.39

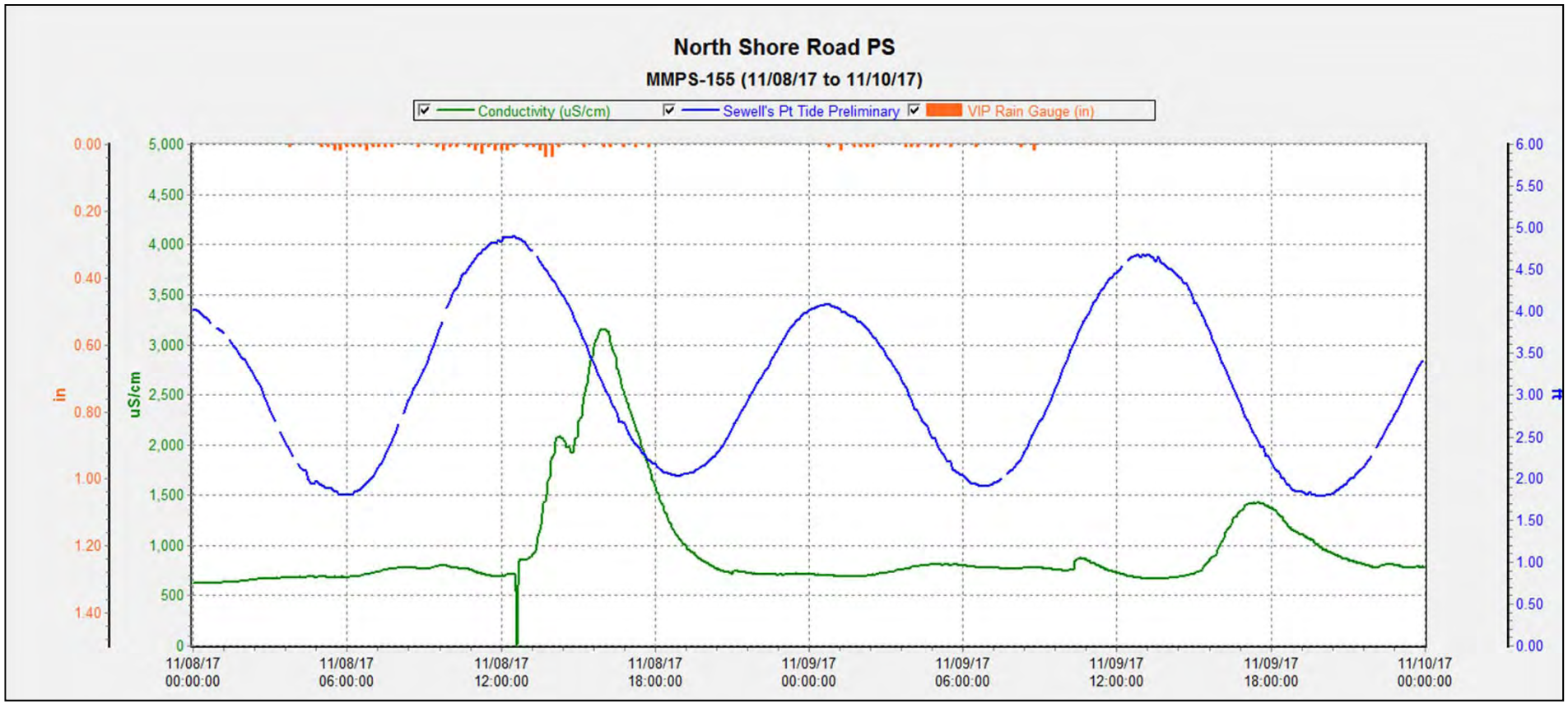
Time	Conductivity (µS/cm)	Salinity (ppt)	Wave height (ft)
	Field Meter	Field Meter	NOAA (Sewells Point)
15:22	9261	5.17	4.39

Pump Run Analysis

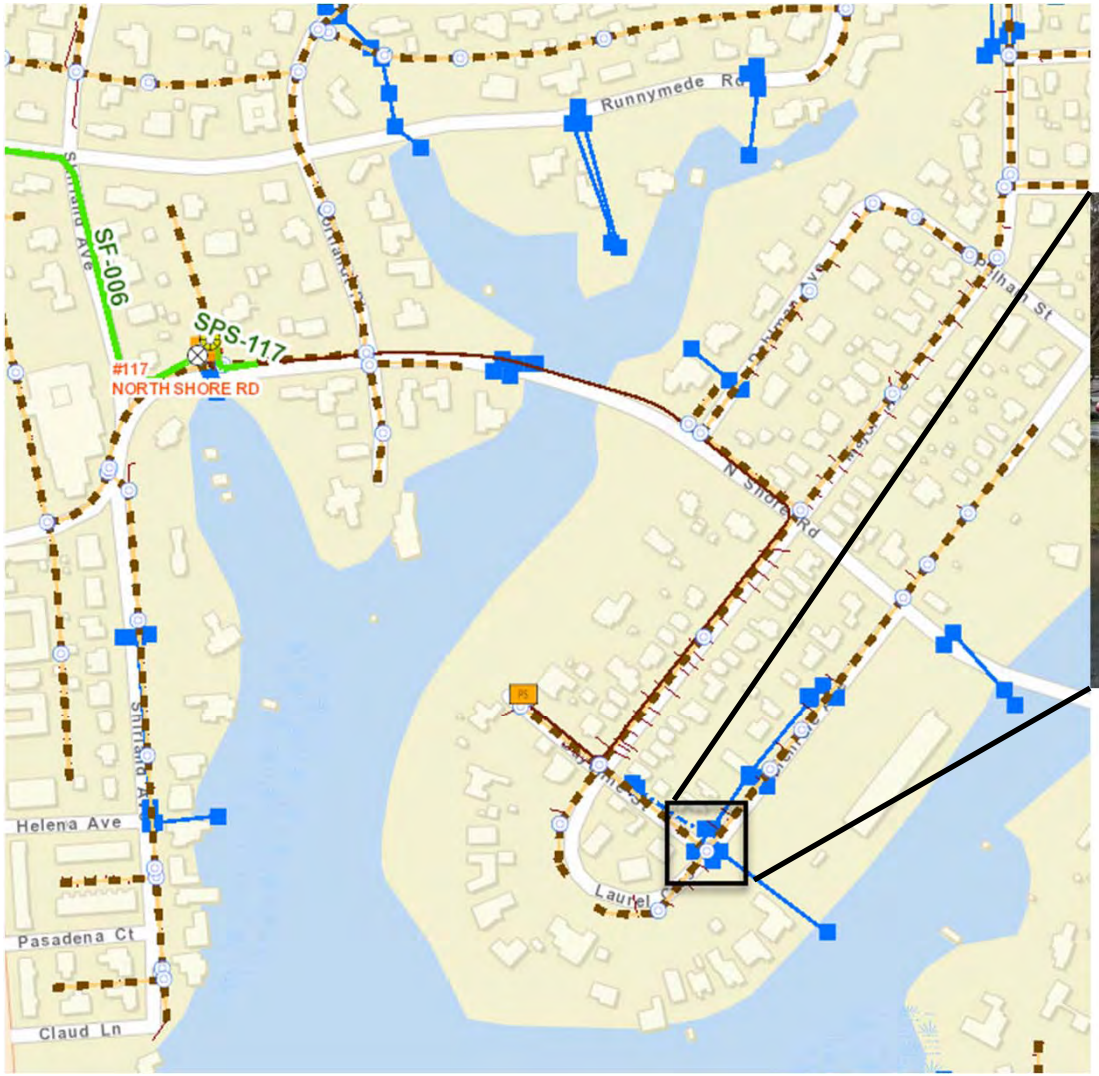


Hampton PS 32 Service Area

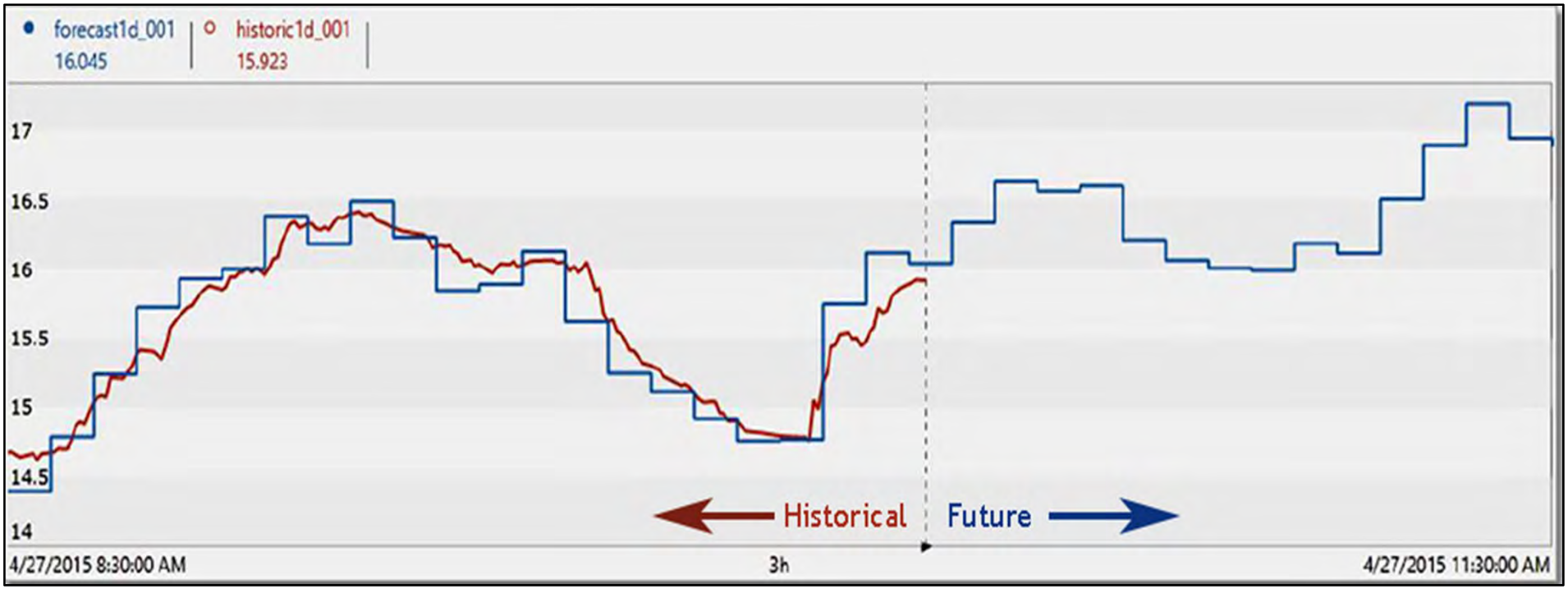
North Shore Rd



North Shore Rd



Forecasting and Alarming



- Relevant staff can be alarmed when tides are predicted above critical level

Next Steps

- Continue desktop and field investigation of vulnerable systems
- Quantify seasonal antifreeze procedures and other industrial sources
- Forecasted data, smart sewer
- Eye on sea level rise, subsidence
- Targeted asset inspections and identify rehab needs ($)

Questions / Comments?

Acknowledgements:
Kim Peterson
Rob Bohon

Operations &
Water Quality Departments