A HRSD Story: How we use the PI System to Monitor events on our Infrastructure

Presented By:
Cheryl Weckworth, Lyne Swimpson,
Tiffany Elston, and Robert Davis

Introductions

Cheryl Weckworth
- Data Analyst
- cweckworth@hrsd.com

Tiffany Elston
- Data Analyst
- telston@hrsd.com

Lyne Swimpson
- Data Analyst
- lswimpson@hrsd.com

Robert Davis
- IT Senior Systems Analyst
- rdavis@hrsd.com

Agenda

HRSD
Cleaning wastewater every day for a better Bay.

- Who is HRSD?
- Operational and Environmental Concerns
- How we use the PI System
  - Storm Preparedness
  - Data Center Monitoring
- Future Goals

HRSD - Location

HRSD - Legacy

- 1920s – Estimated 25 MG of raw sewage entering local waters daily
- November 5, 1940 - the referendum to create HRSD was approved
- Mid 1970s HRSD owned and operated 9 treatment plants with plans to open 3 more
- 2020 - Sustainable Water Initiative for Tomorrow (SWIFT)

HRSD - Mission

- We protect public health and the waters of Hampton Roads by treating wastewater effectively
  - HRSD is recognized as a leader in the industry, with an impressive record of environmental permit compliance

HRSD - Vision

HRSD VISION:

Future generations will inherit clean waterways and be able to keep them clean.

HRSD – Service Area

HRSD serves 18 counties and cities

Serving the Cities of:
Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, Williamsburg

And the Counties of:
Gloucester, Isle of Wight, James City, King and Queen, King William, Mathews, Middlesex, Surry and York

HRSD – Fast Facts

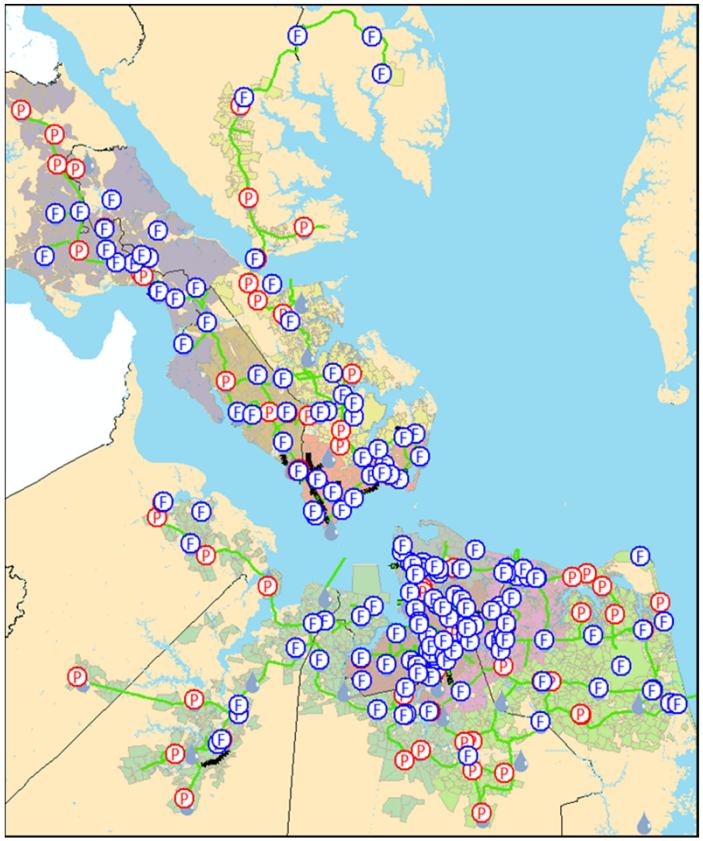
- **Population Served:**
  - 1.7 million (nearly 1/4th of VA's population)
- **Collection System:**
  - More than 600 miles of pipes, 6 to 66 inches in diameter
- **Pump Stations:**
  - ~ 109
- **Treatment Plants:**
  - 9 major plants in Hampton Roads and 7 smaller plants in eastern Virginia
- **Combined Capacity:**
  - 249 million gallons of wastewater per day

HRSD – Data Analysis Section

- Provides environmental and wastewater collection data to HRSD and regional customers

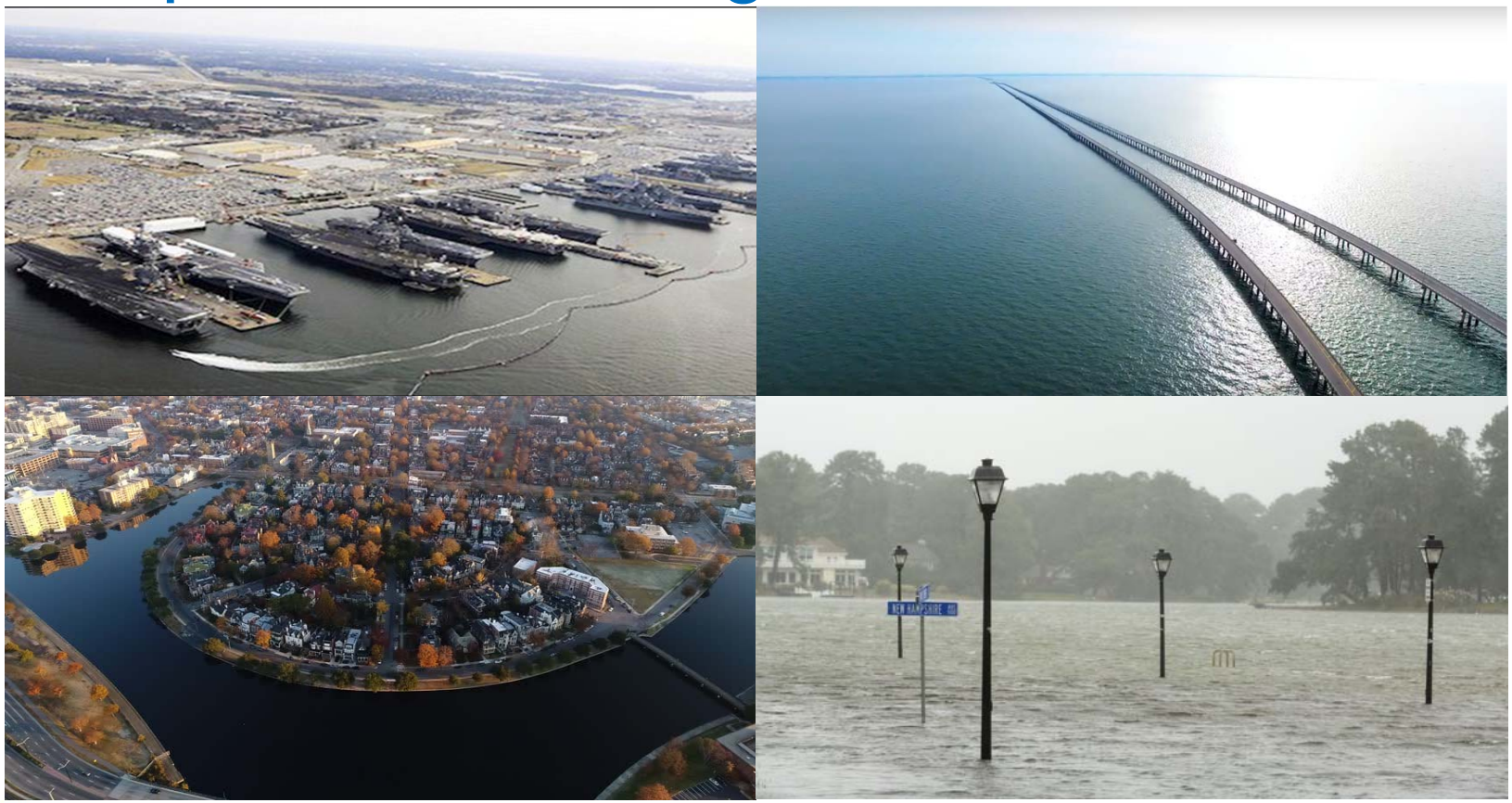
HRSD – Monitoring Network

- 219 flow meters
- 179 pressure sensors
- 73 rain gauges
- 21 groundwater shallow well sensors
- NOAA Tide Data
- Multiple Weather Stations
- Collecting Pump Station data
  - RPMs, Drive Outputs, Wet Well Level



Storm Preparedness

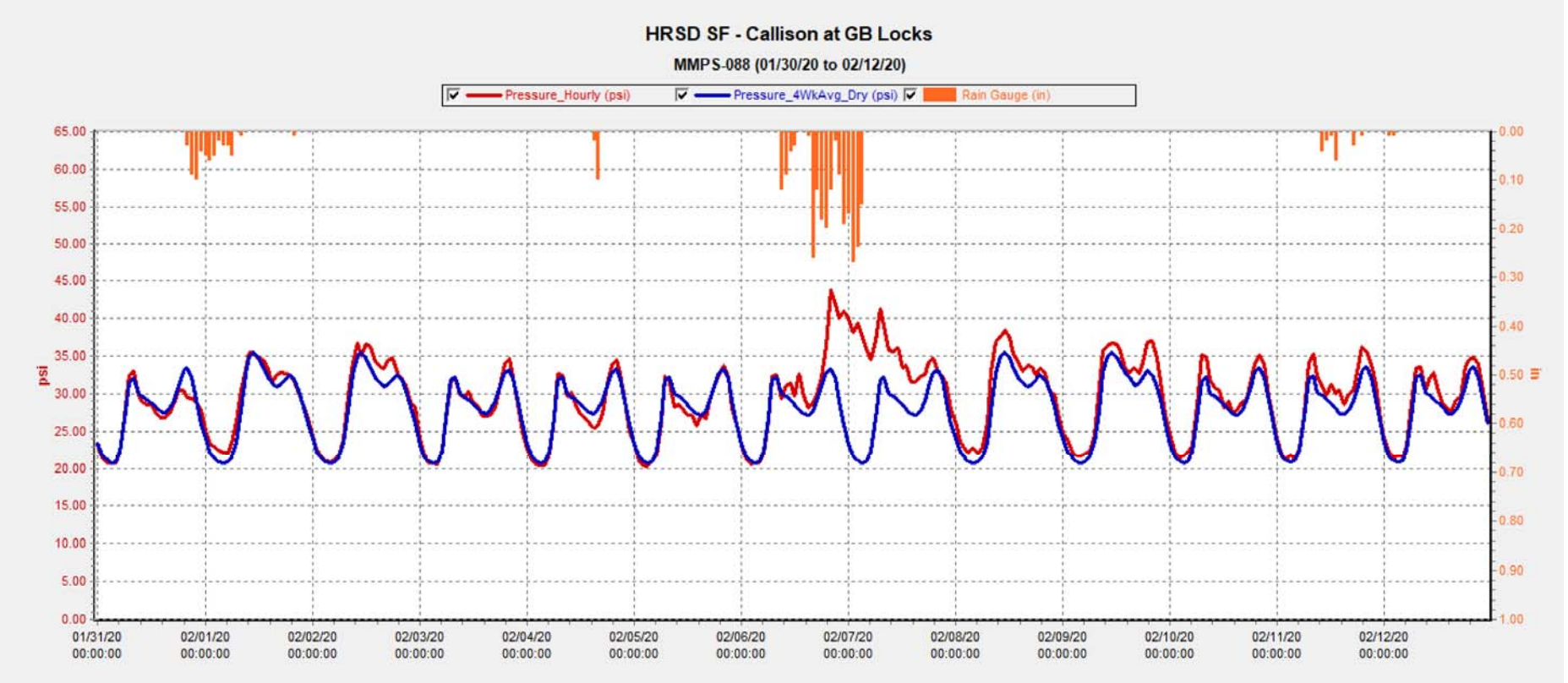
Hampton Roads, Virginia



The Business Challenge - Telog

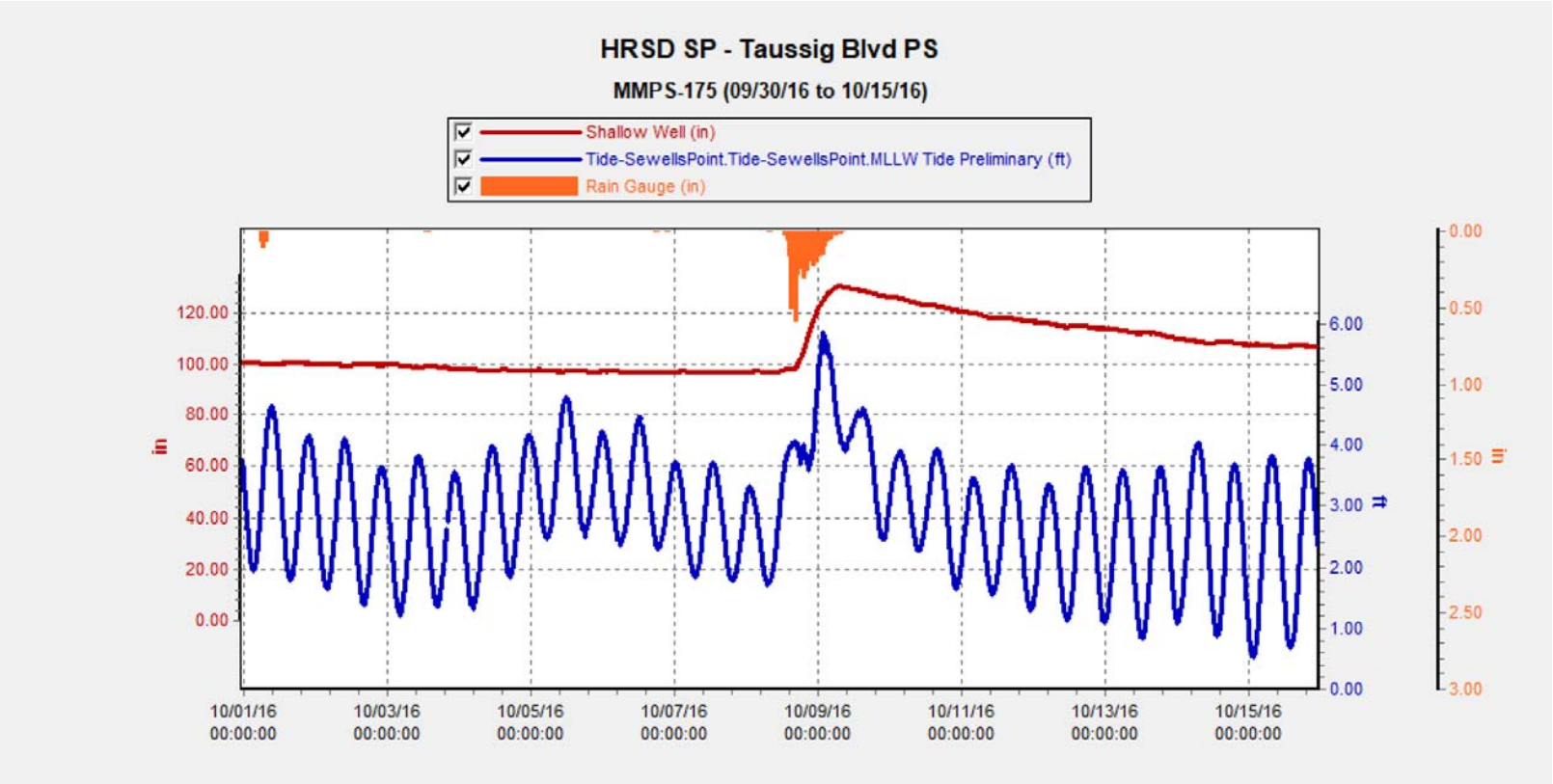
- Basic graphs – limited to 5 measurements
- Took a long time to load large data sets
- Limited Data Analytics
- Not user-friendly
    - templates and reports were not easily created or accessible

Telog – Pressure and Rain



Why is Rainfall Important?

Telog – Groundwater and Tide



Why is Groundwater Important to HRSD?

- Infiltration of groundwater - Cracked pipes and leaky manholes
- Adds additional wastewater for treatment and pump

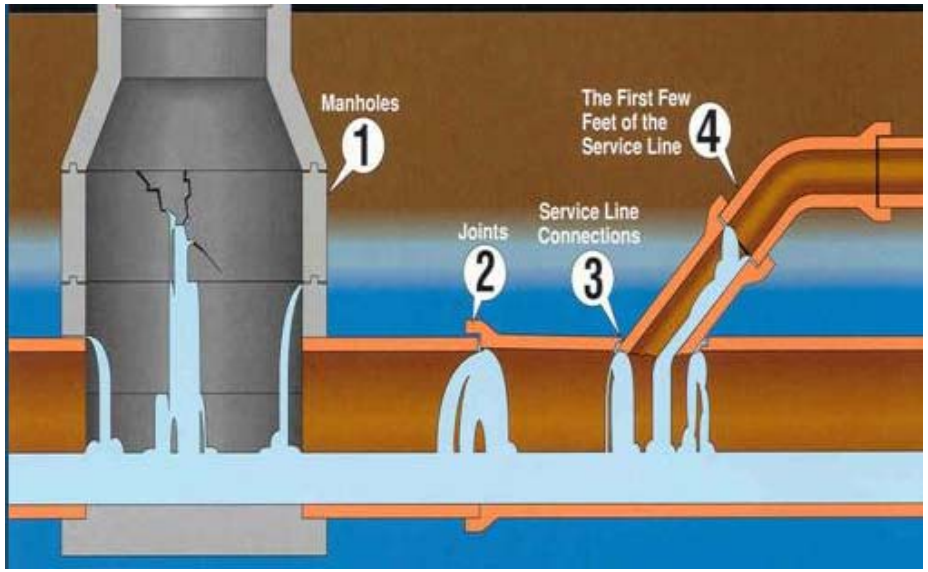


Photo courtesy of ICGA

What Does Infiltration Look Like?



How the PI System Changed how we Monitor Storm Events

PI Vision

- ✓ Ease of access
- ✓ User-friendly
- ✓ Better visualization

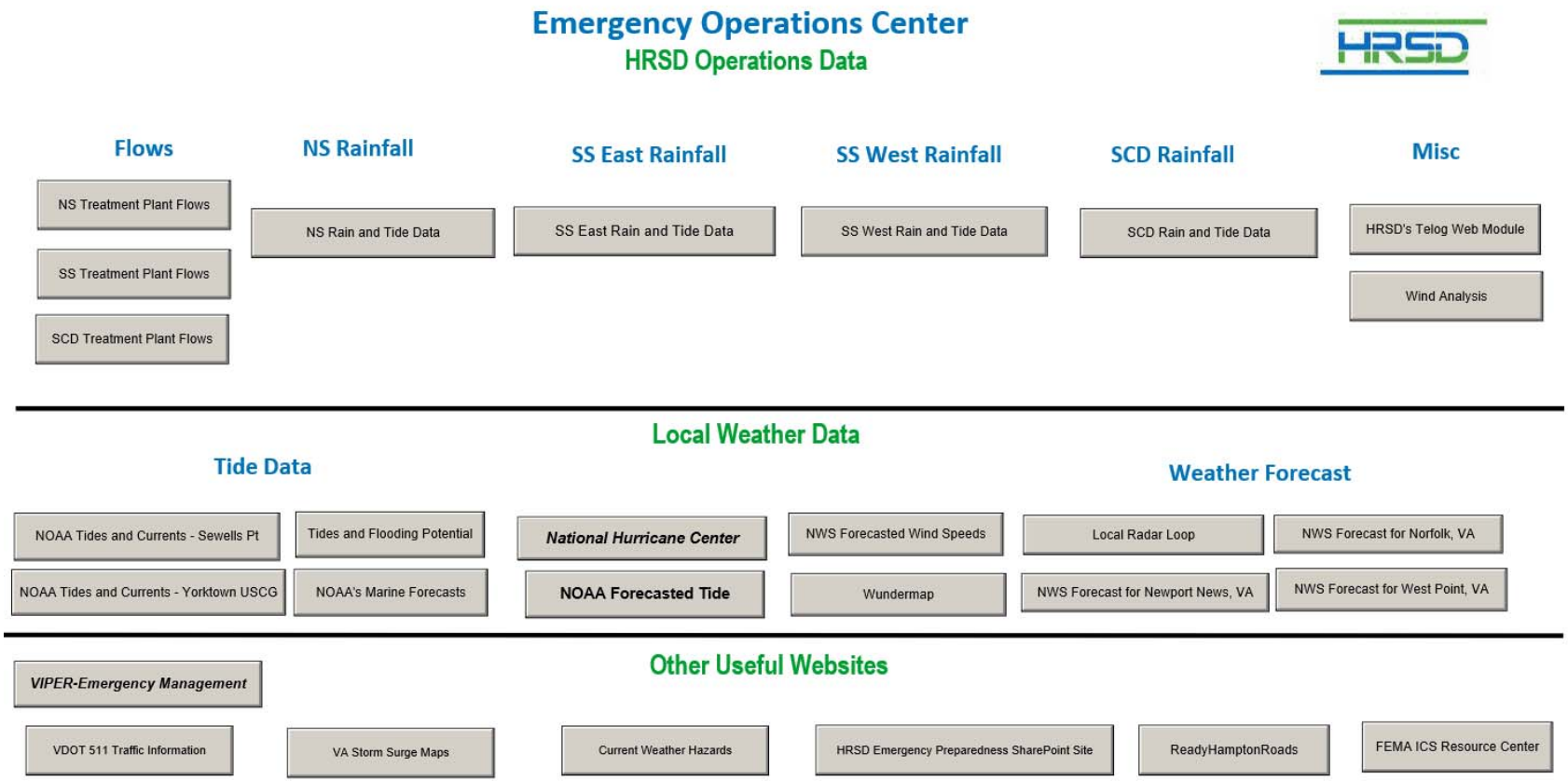
PI Datalink Report

- ✓ Dynamic reports update in real-time
- ✓ Increased efficiency

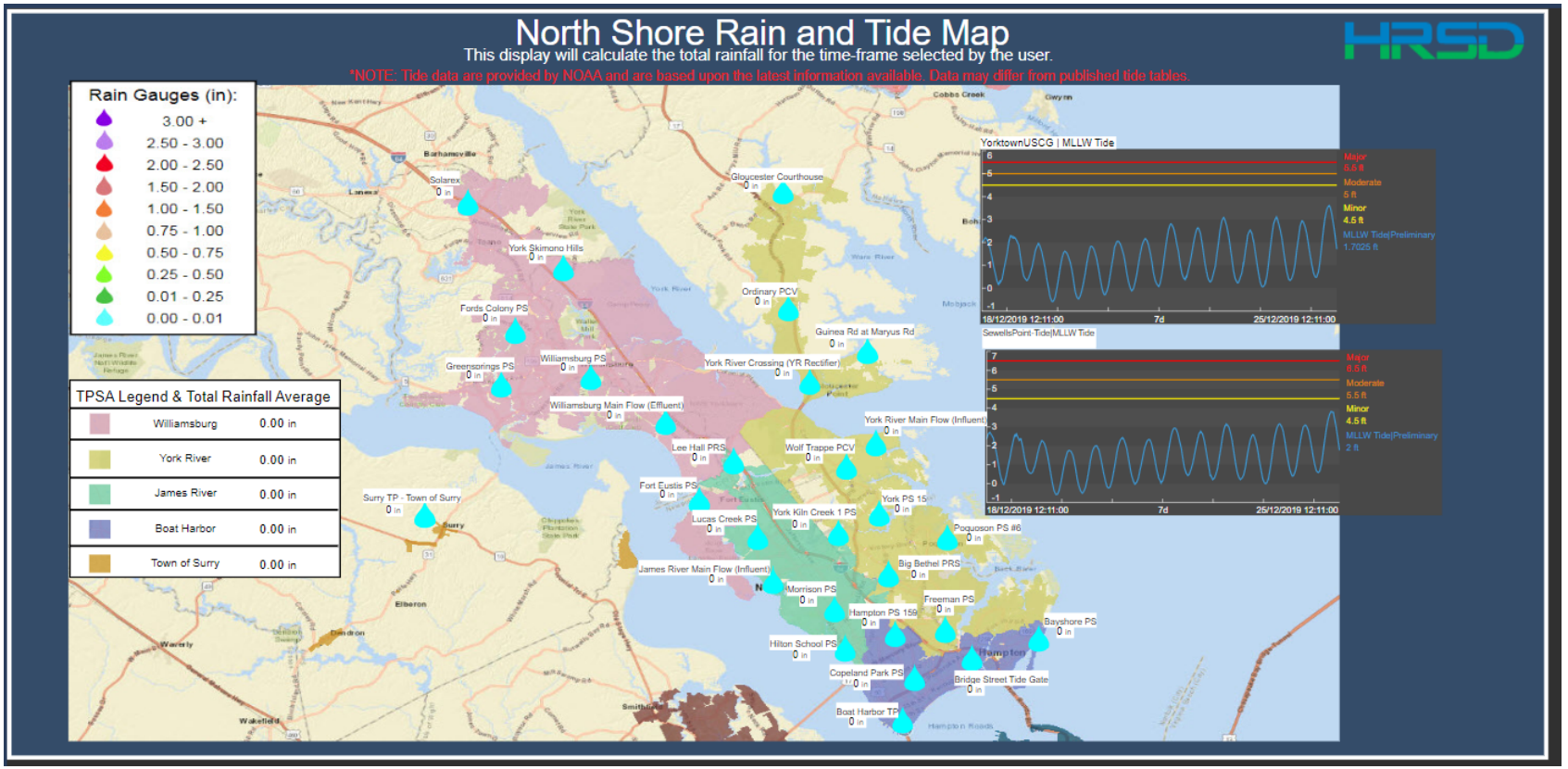
PI Asset Framework and PI Notifications

- ✓ Powerful Analytics
- ✓ Meaningful Notifications

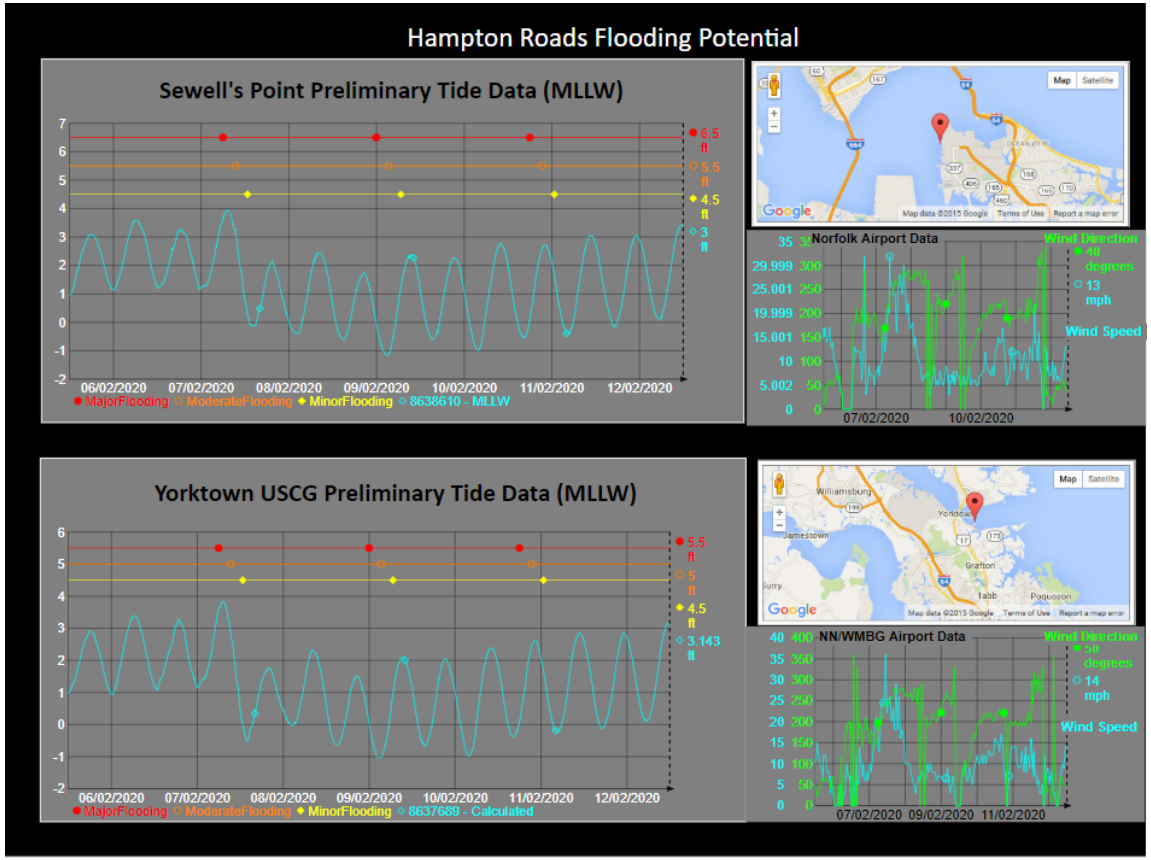
Storm Dashboard



Rainfall Accumulation

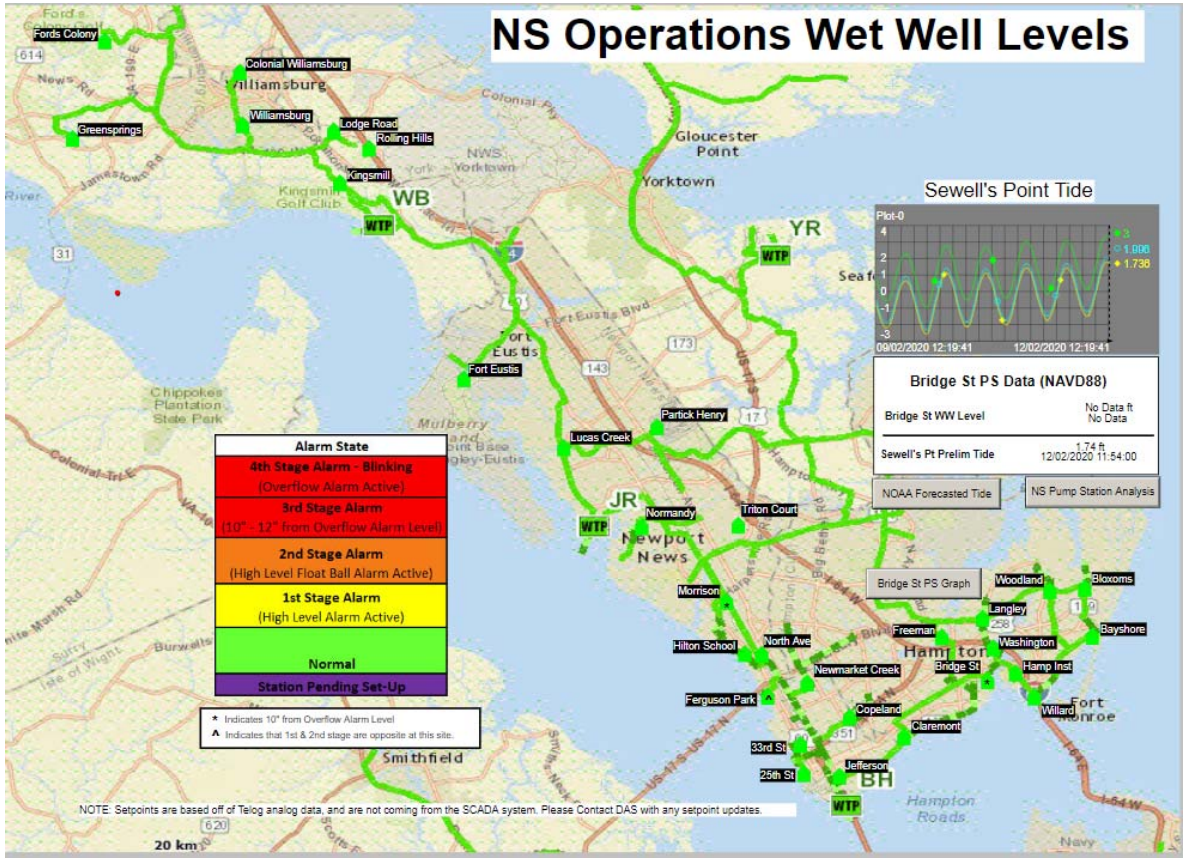


Flooding Potential

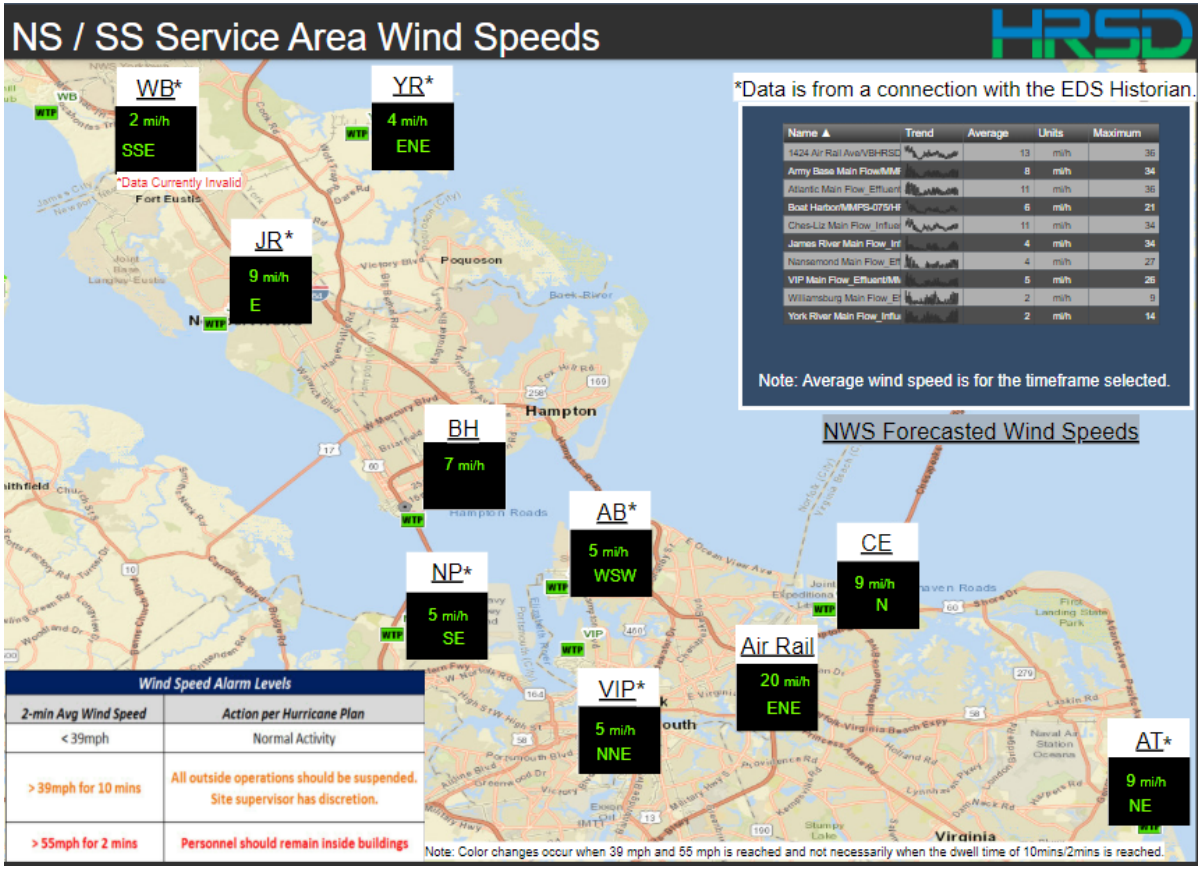


Flooding Potential

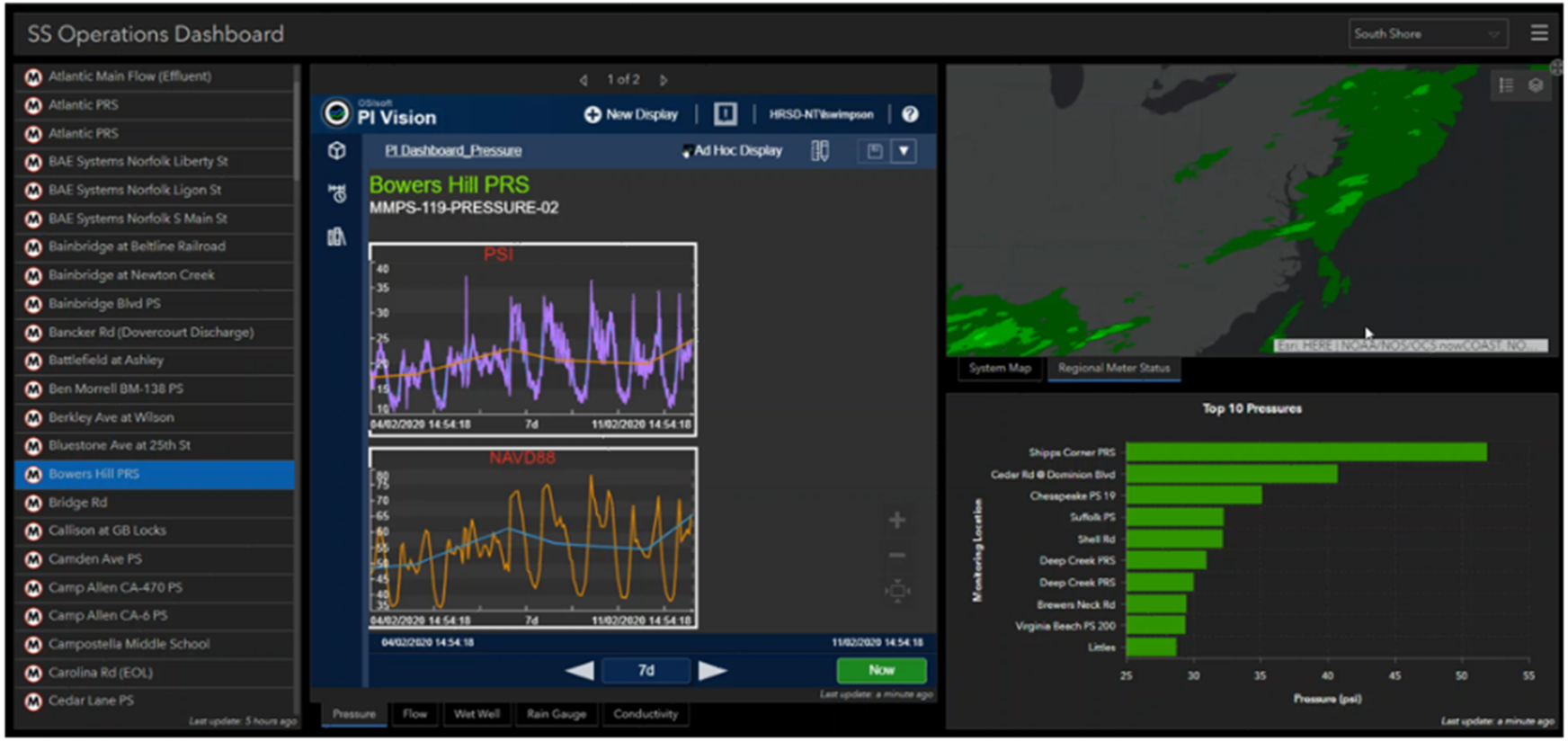
Potential Overflow



Winds Speed and Direction

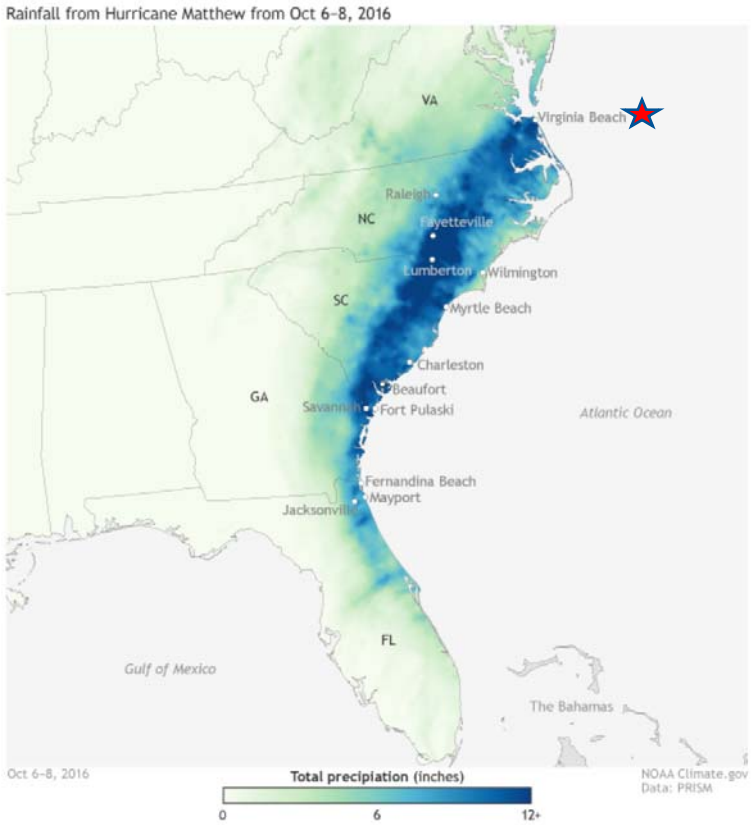


PI Operations Dashboard – Demo 1



Application and Use Case

Tropical Storm Matthew



What Happened:

Tightly tracked along the North Carolina Coast and headed out to sea just before reaching Virginia

Impacts to our area were primarily due to long duration bands of rain on the backside of the cyclone

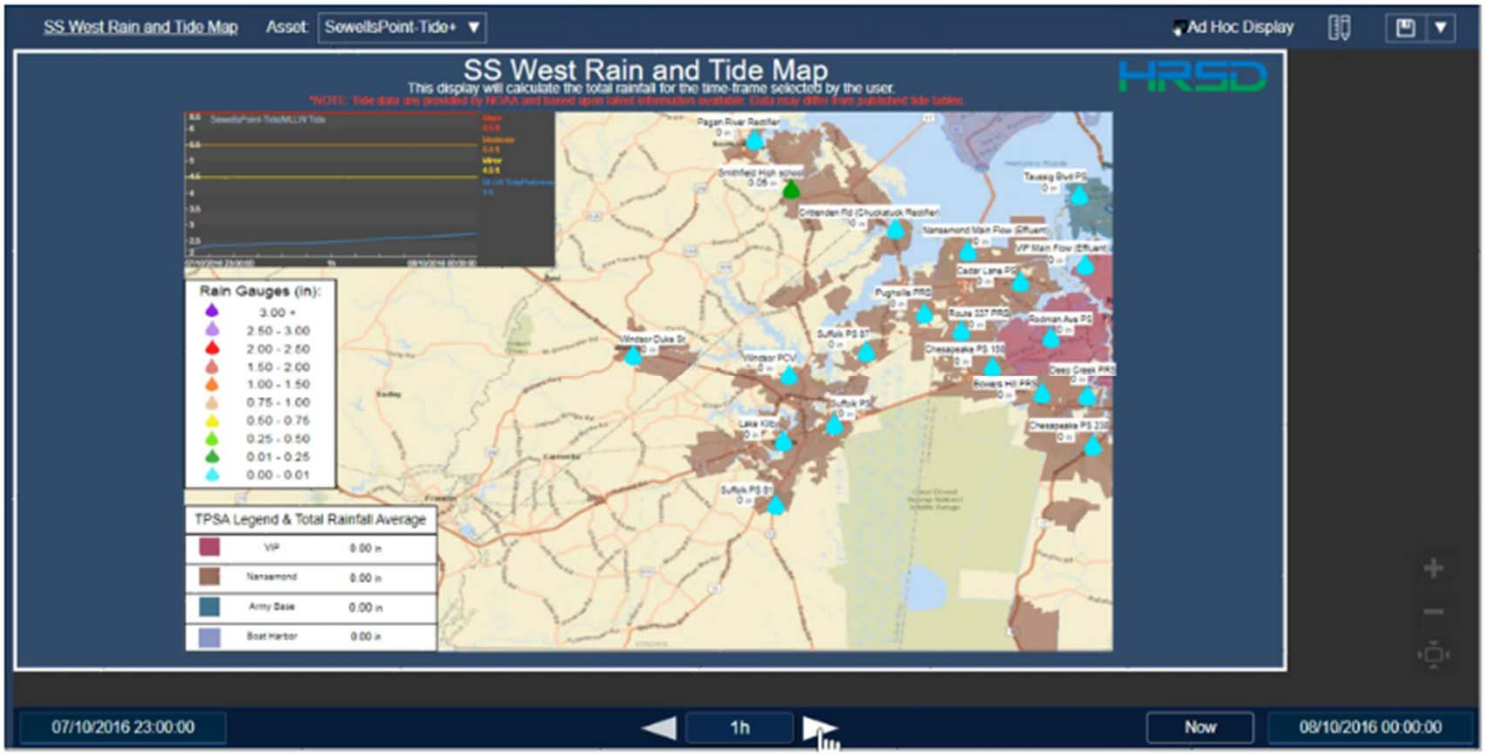
Rainfall totals reached over 14” in some areas of Hampton Roads

Pre-existing saturated conditions set the stage for disastrous flooding

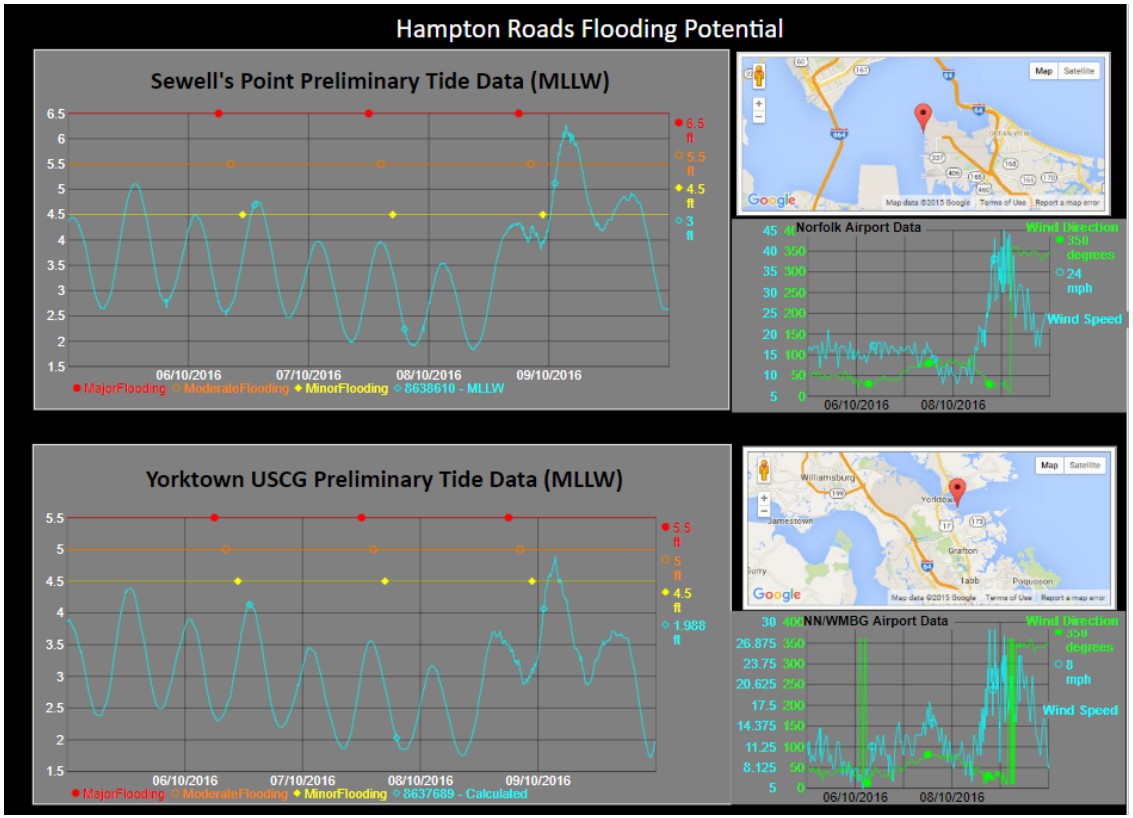
Tropical Storm Matthew Aftermath

Tropical Storm Matthew Aftermath

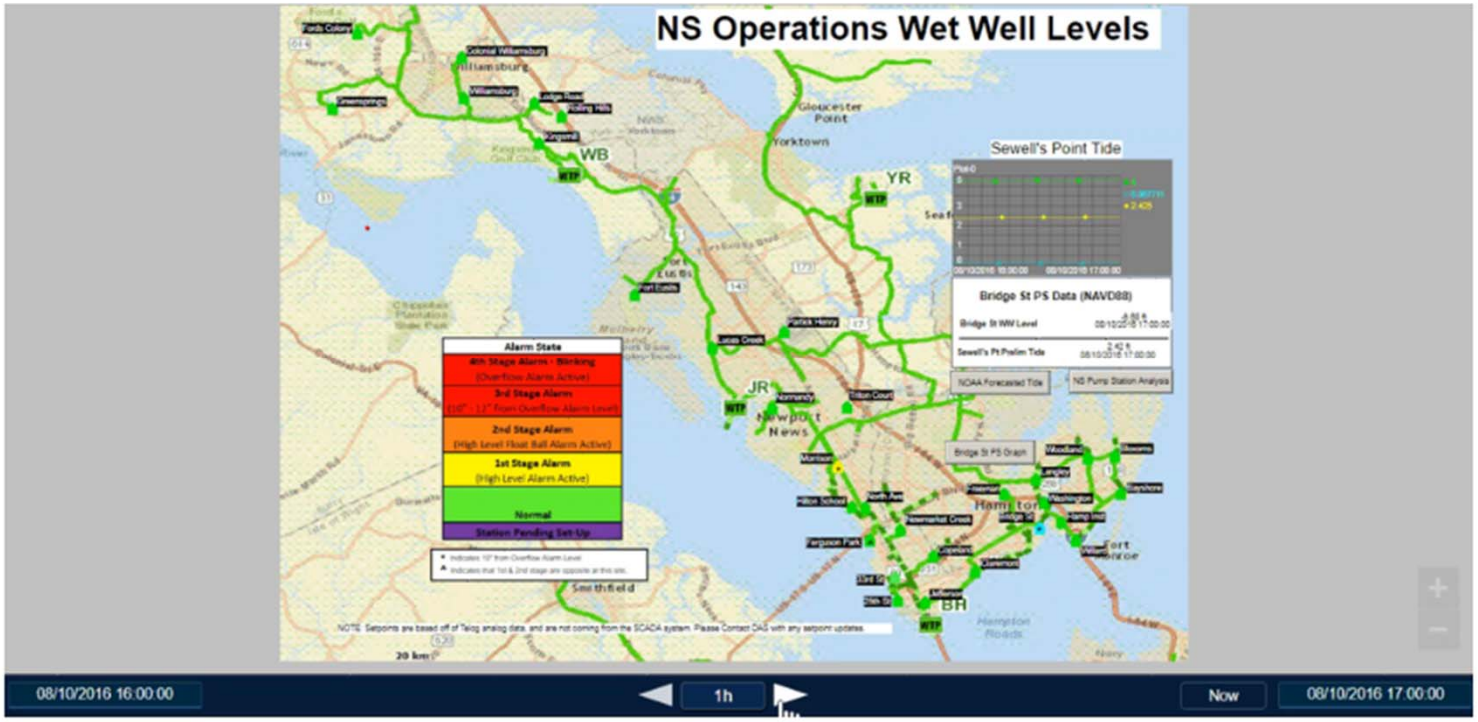
Tropical Storm Matthew – Demo 2



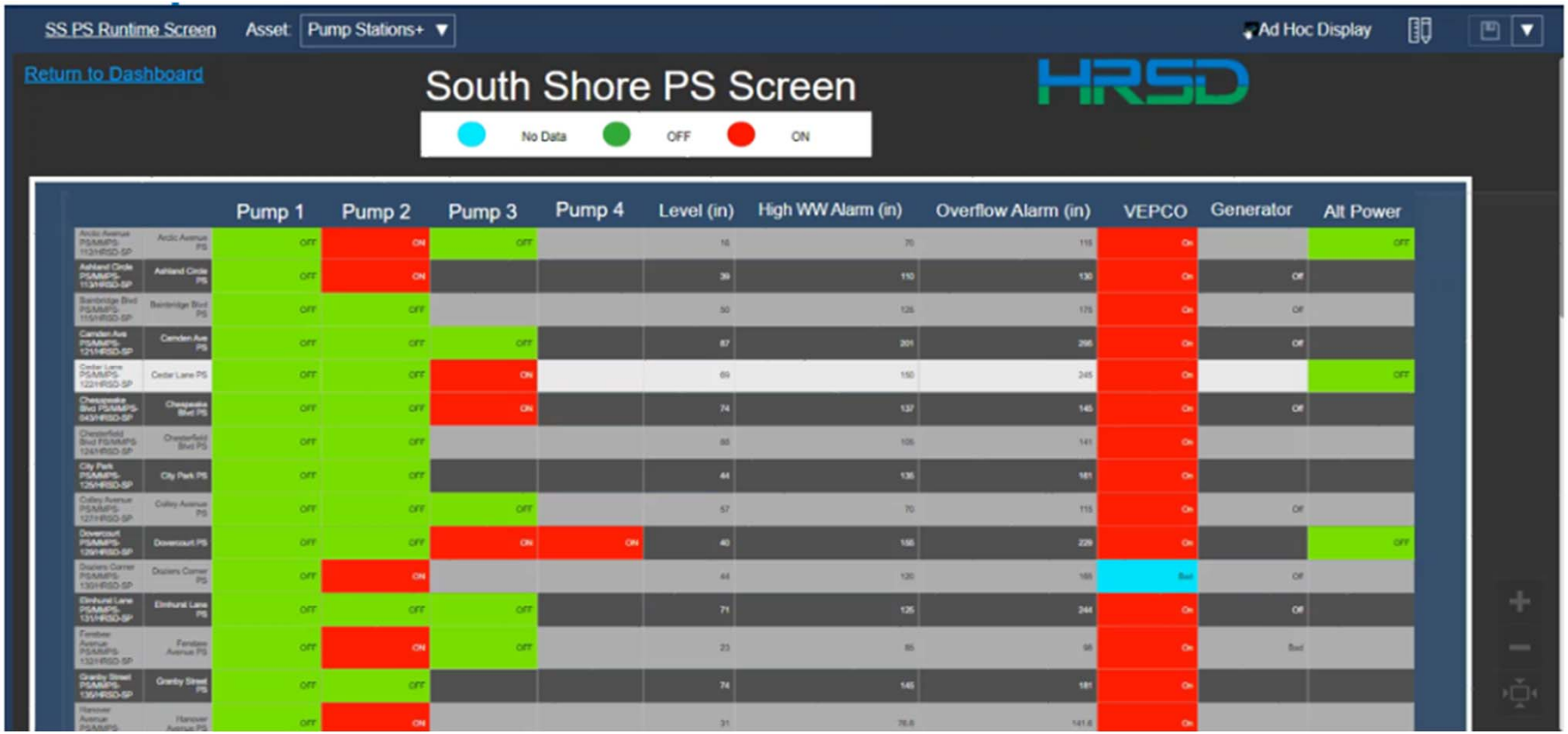
Tropical Storm Matthew



Tropical Storm Matthew – Demo 3

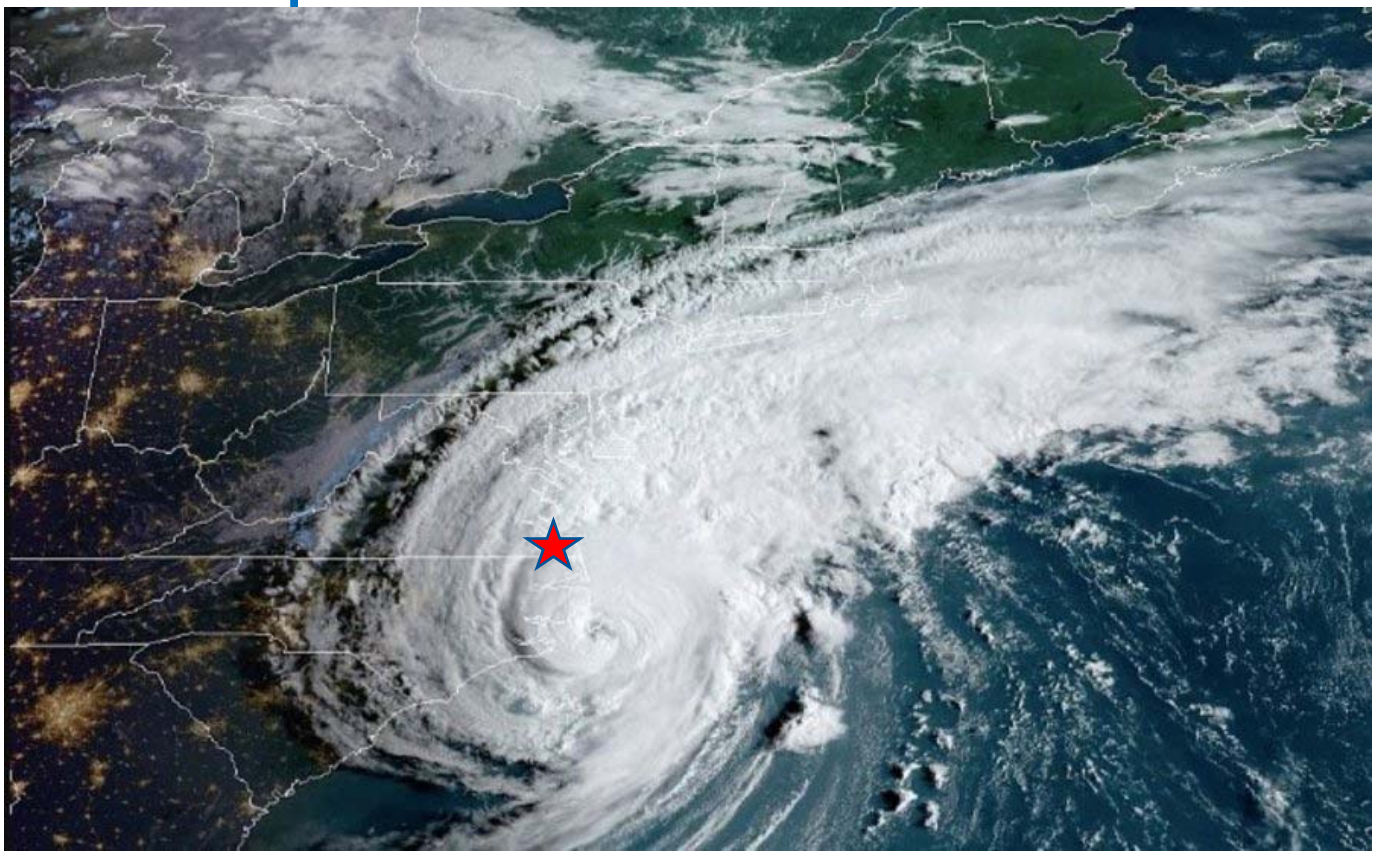


Tropical Storm Matthew – Demo 4



Tropical Storm Matthew – Demo 5

Storm Preparedness



Data Center Monitoring

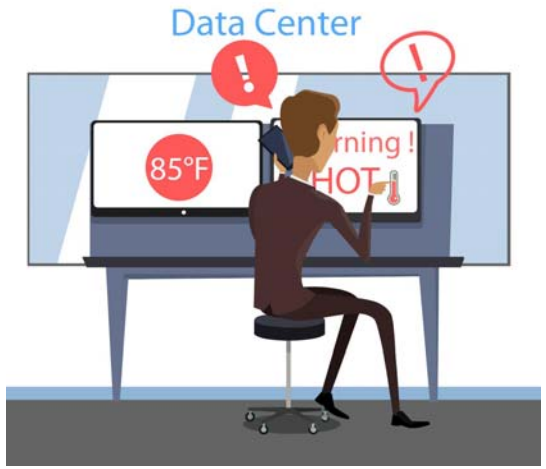
What is a Data Center?

- Houses the supporting infrastructure for software applications

- Often taken for granted until a failure takes place.

How do you protect a Data Center?

- Build a facility that will withstand a hurricane
- Monitor environmental conditions
- Maintain a stable power supply



HRSD Data Center

- The HRSD Data Center Locations:
  - North Shore
  - South Shore
  - Small Communities
- Redundant HVAC
- Power Surge Protectors
- Emergency Power Generation
- FM200 Fire Suppression System

The Business Challenge

- Prior to July 2015
  - No formal monitoring of thermal events in the data center
  - Data Center HVAC system had issues in the past
  - Only knew of issues after equipment failure
- July 2015
  - Began environmental monitoring using Telog® recorders
  - Allowed for the ability to be alerted to thermal events

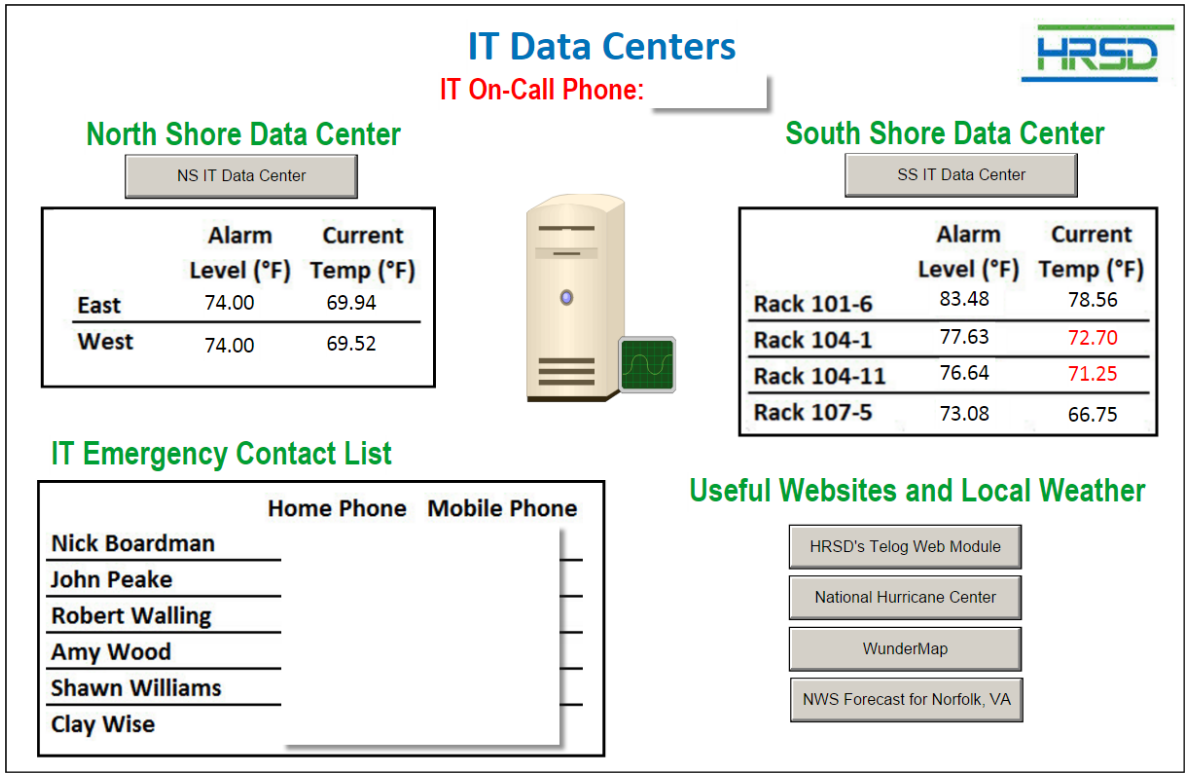
The Business Challenge

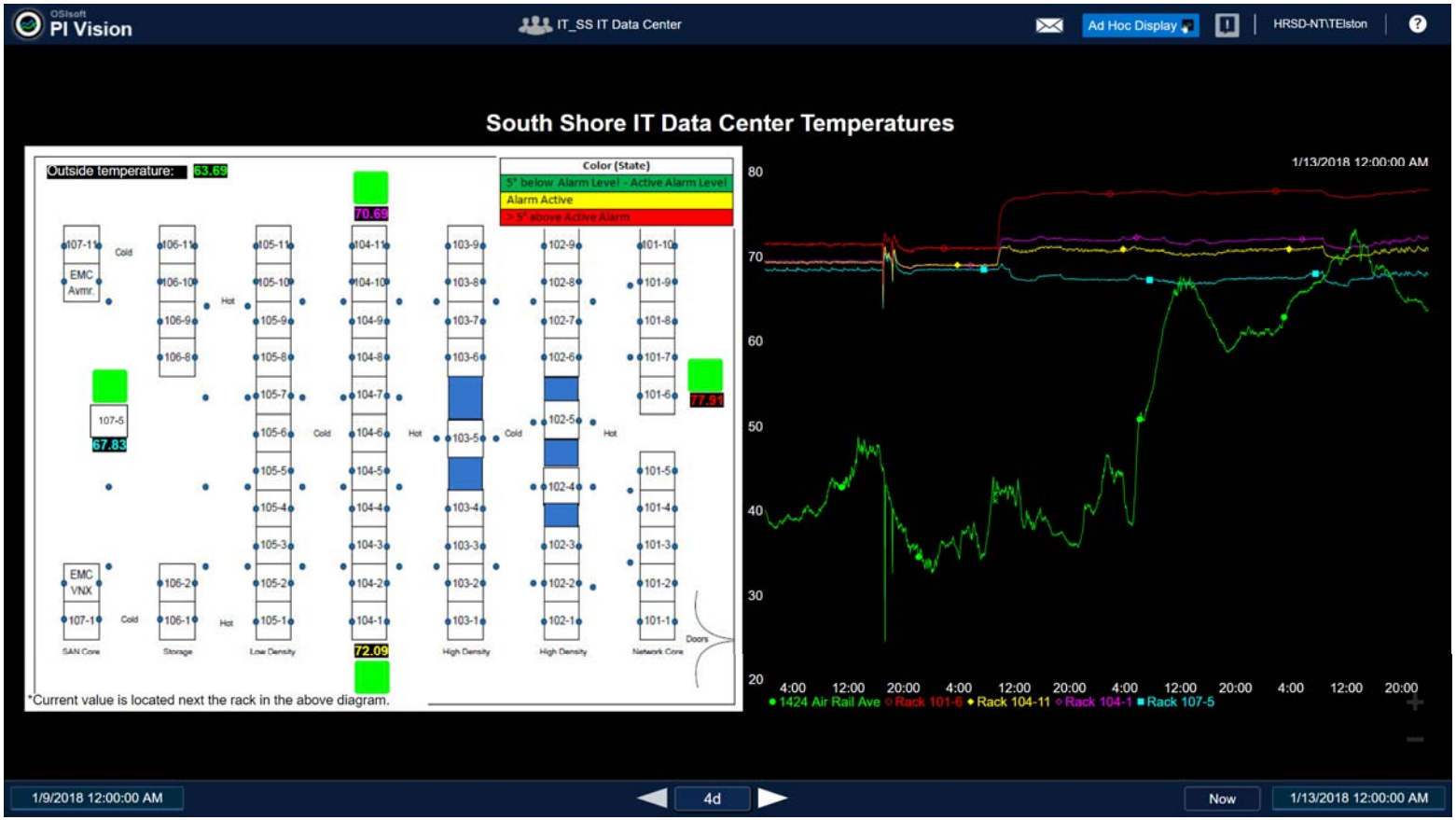
telog®
A TRIMBLE COMPANY

- Advantages
  - Thermal monitoring
  - Alert levels
- Disadvantages
  - Hardwired Sensors
  - Delay in available data

How the PI System Changed how we Monitor the Data Center

- First Steps
  - Began bringing Telog® data into PI System and created PI ProcessBook screens for visualization





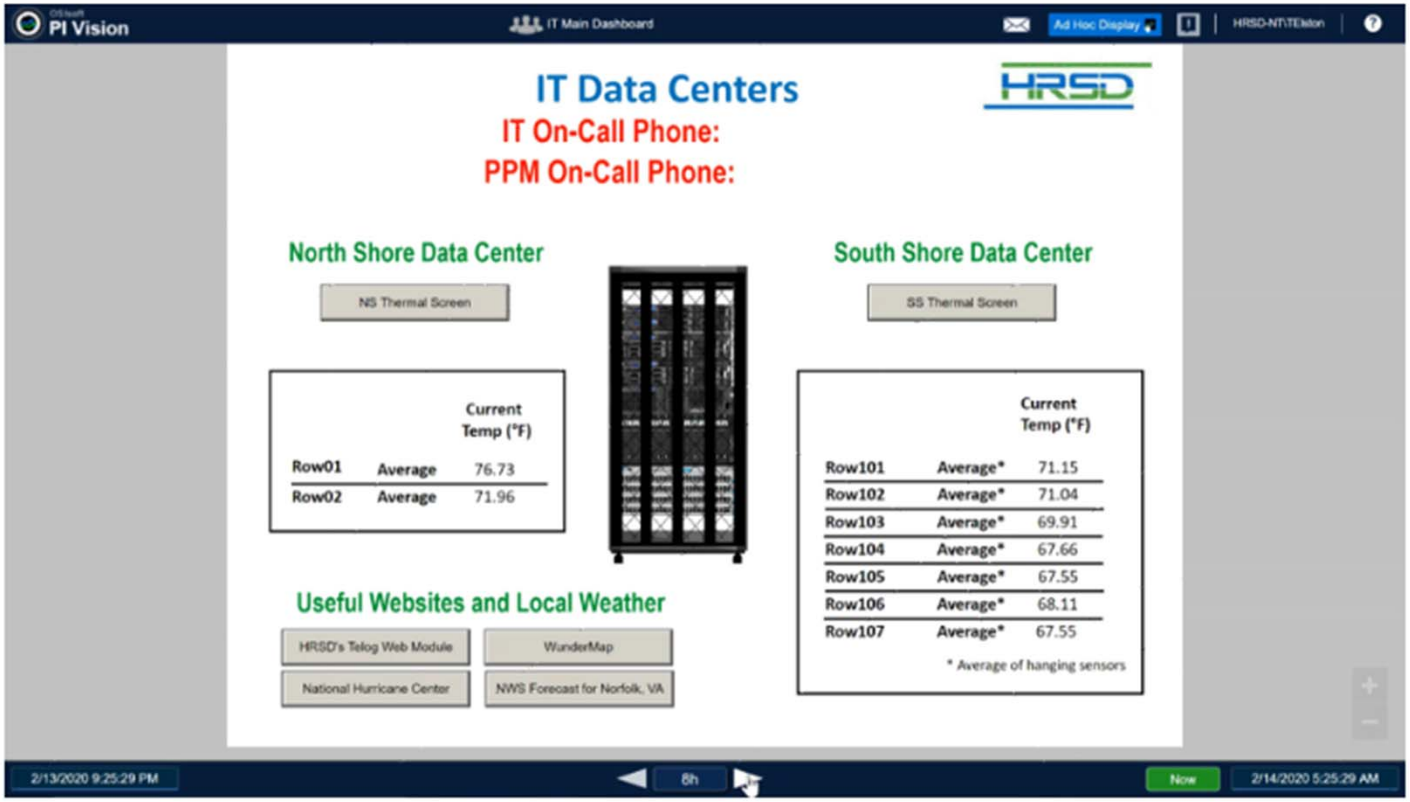
How the PI System Changed how we Monitor the Data Center

- August 2016
  - Installed RF Code™ sensors and integrated these sensors into the PI System
  - Increased monitoring for both data centers

How the PI System Changed how we Monitor the Data Center

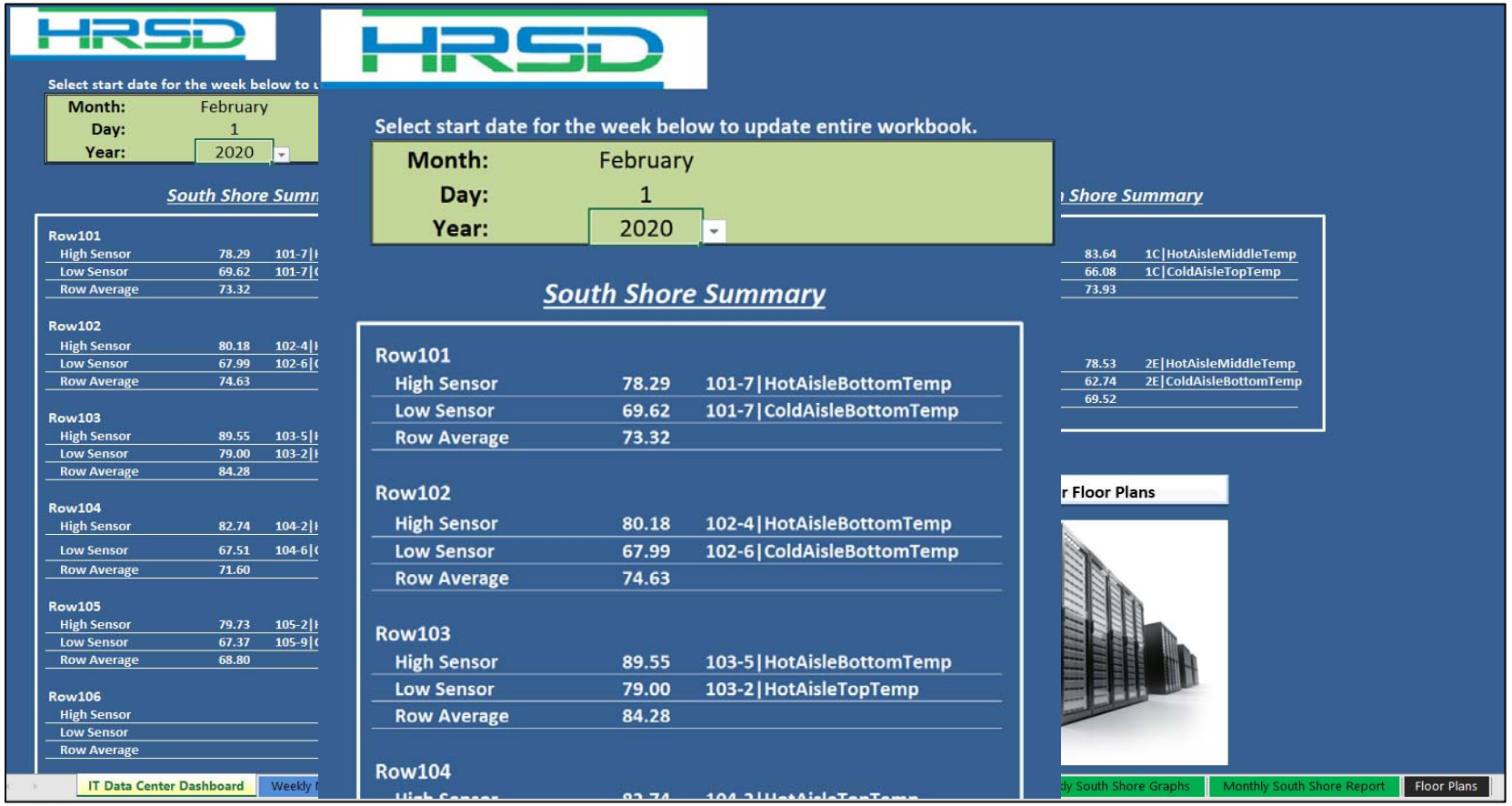
- PI Vision Displays
- PI Datalink Report
- PI Asset Framework, PI Event Frames and PI Notifications

PI VISION – Demo 6

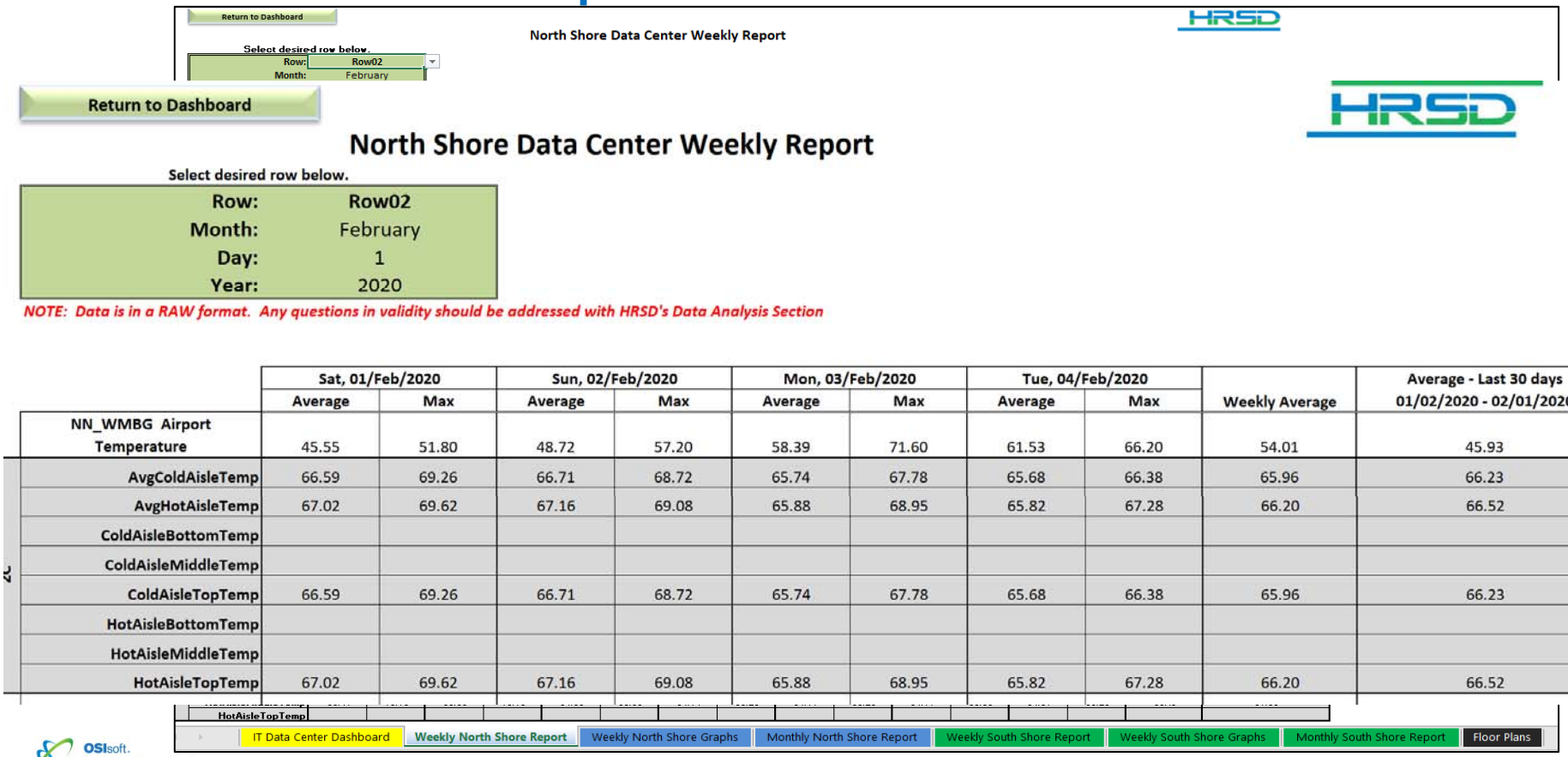


PI Vision - Live Data

PI Datalink Report

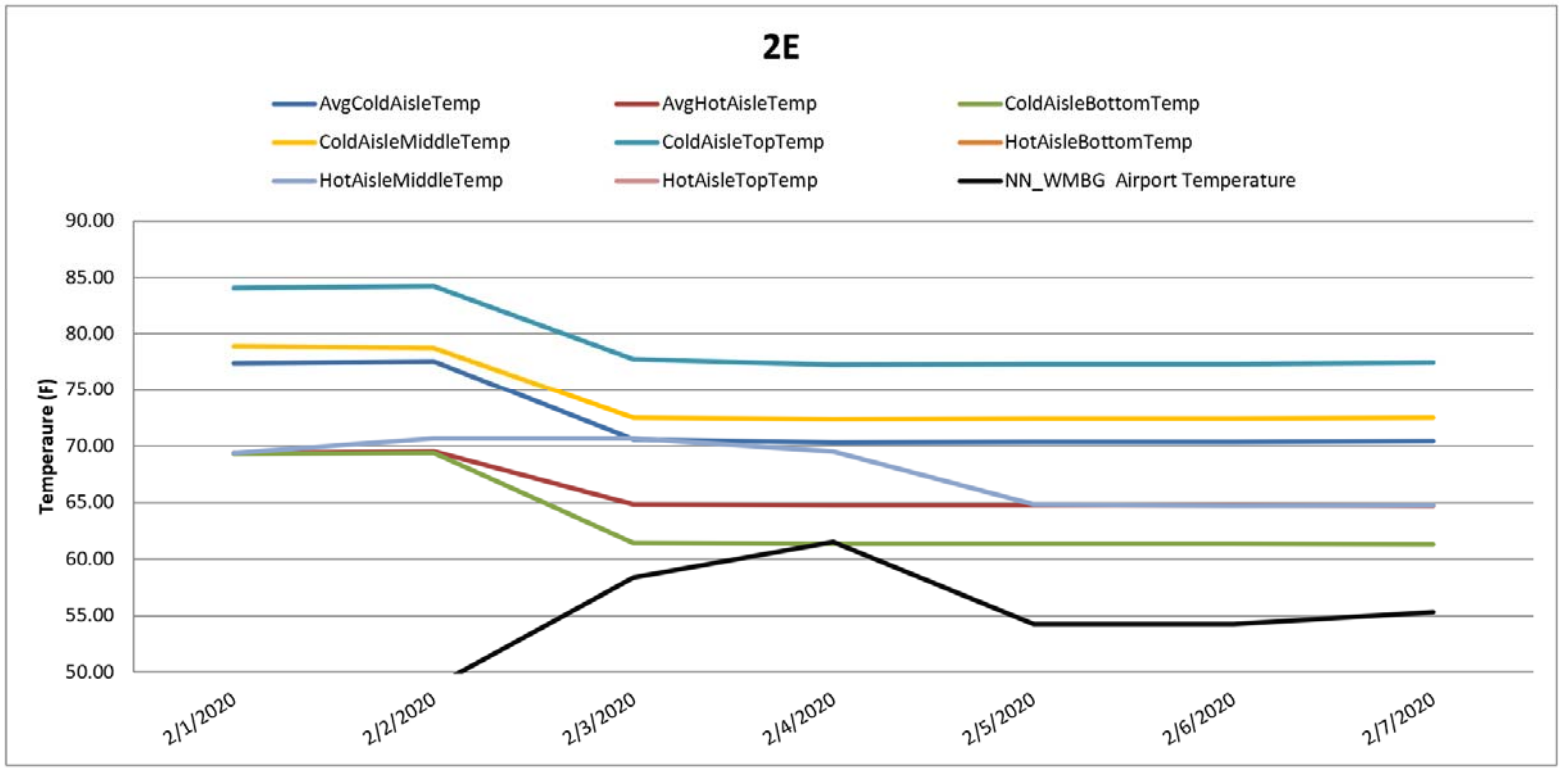


PI Datalink Report



	Sat, 01/Feb/2020		Sun, 02/Feb/2020		Mon, 03/Feb/2020		Tue, 04/Feb/2020			Average - Last 30 days
	Average	Max	Average	Max	Average	Max	Average	Max	Weekly Average	01/02/2020 - 02/01/2020
NN_WMBG Airport Temperature	45.55	51.80	48.72	57.20	58.39	71.60	61.53	66.20	54.01	45.93
AvgColdAisleTemp	66.59	69.26	66.71	68.72	65.74	67.78	65.68	66.38	65.96	66.23
AvgHotAisleTemp	67.02	69.62	67.16	69.08	65.88	68.95	65.82	67.28	66.20	66.52
ColdAisleBottomTemp										
ColdAisleMiddleTemp										
ColdAisleTopTemp	66.59	69.26	66.71	68.72	65.74	67.78	65.68	66.38	65.96	66.23
HotAisleBottomTemp										
HotAisleMiddleTemp										
HotAisleTopTemp	67.02	69.62	67.16	69.08	65.88	68.95	65.82	67.28	66.20	66.52

PI Datalink Report



PI Datalink Report

Return to Dashboard

North Shore Data Center Monthly Report

Select row below.

Row: Row01

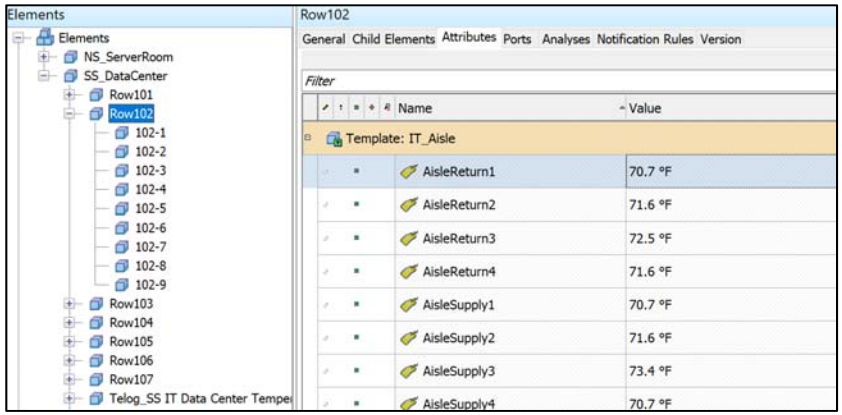
Month: Row01 / Row02

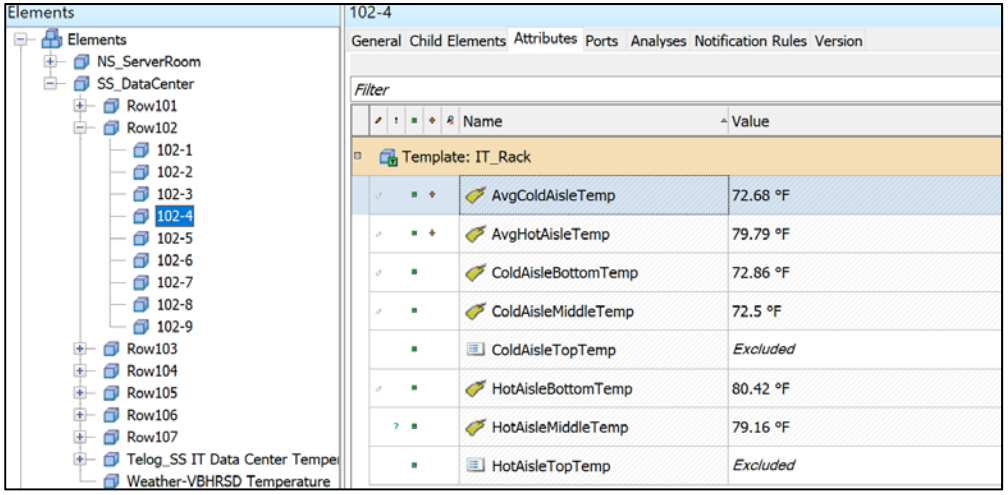
Year: 2020

NOTE: Data is in a RAW format. Any questions in validity should be addressed with HRSD's Data Analysis Section

Date	NN_WMBG Airport Temperature	Average COLD Aisle Temperatures					Average HOT Aisle Temperatures				
		1A	1B	1C	1D	1E	1A	1A	1C	1D	1E
Sat, 01/Feb/2020	45.74			74.78					78.93		76.50
Sun, 02/Feb/2020	48.01			74.95					79.11		76.63
Mon, 03/Feb/2020	58.47			64.38					76.70		76.10
Tue, 04/Feb/2020	61.62			64.31					76.70		76.11
Wed, 05/Feb/2020	53.00			64.34					76.71		76.15
Thu, 06/Feb/2020	55.70			64.31					76.81		76.15
Fri, 07/Feb/2020	55.91			64.30					76.89		76.16
Sat, 08/Feb/2020	40.55			64.49					76.70		76.04
Sun, 09/Feb/2020	42.32			64.48					76.65		75.96
Mon, 10/Feb/2020	53.60			74.83					78.82		76.41

PI Asset Framework and PI Notifications





PI Asset Framework and PI Notifications

- Two Alarm Levels based on hanging sensors
  - WARNING Alarm
    - If average is > 75˚ for 15 minutes

WARNING: SS Data Center has reached the warning threshold of 75F for 15 minutes!

P PI-System-Alert@hrsd.com
To Elston, Tiffany

You forwarded this message on 9/4/2019 6:12 PM.

Time Stamp at Start: 09-04-2019 05:53:04
Average at Start: 74.883

**Average is of all hanging sensors

SS Data Center Thermal Dashboard

  - CRITICAL Alarm
    - If average is > 80˚ no dwell time

CRITICAL ALARM: SS Data Center has reached Alarm Threshold of 80 F. Attention is needed immediately!!

P PI-System-Alert@hrsd.com
To Elston, Tiffany

You forwarded this message on 9/4/2019 6:38 PM.
This message was sent with High importance.

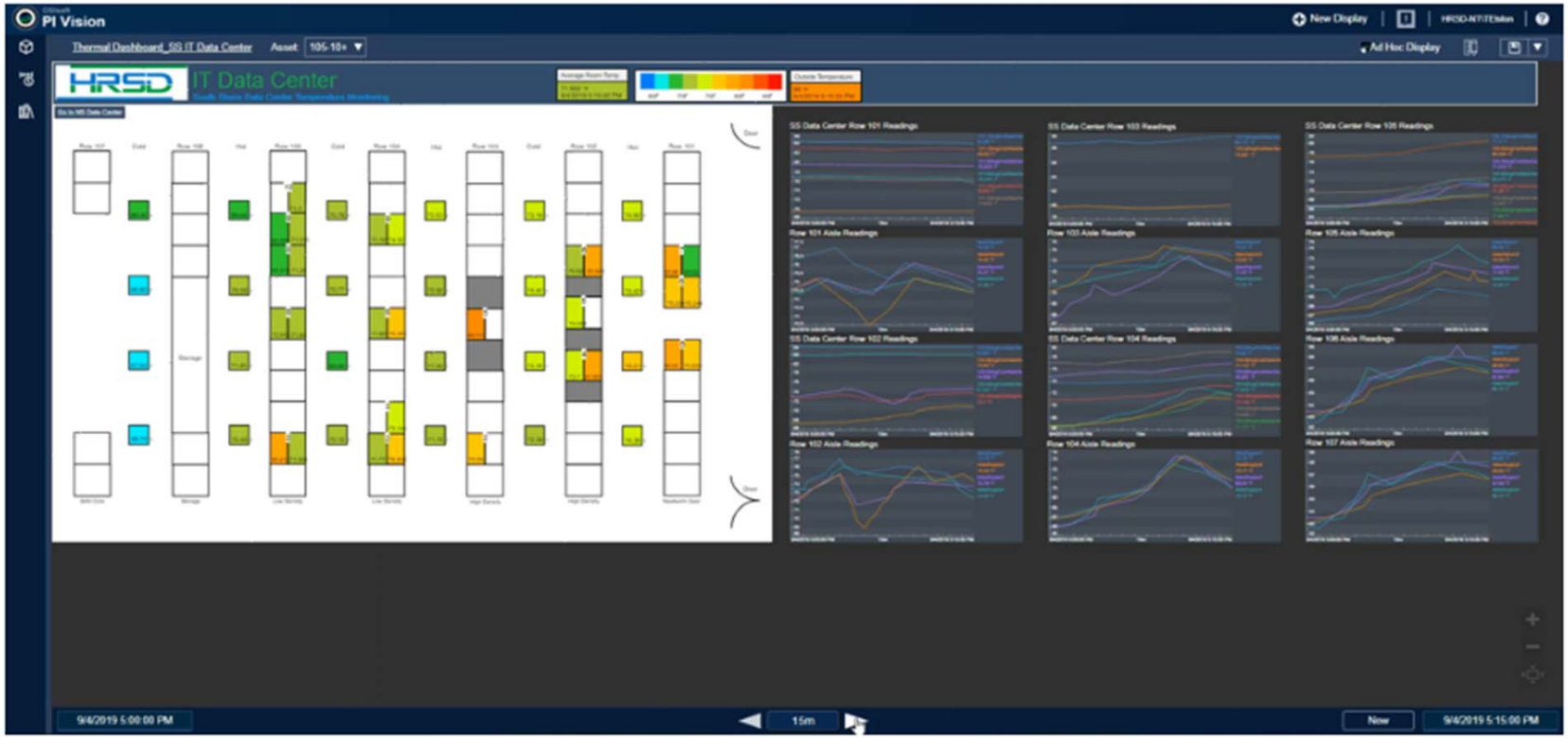
Time Stamp at Start: 09-04-2019 06:28:20
Average at Start: 80

**Average is of all hanging sensors

SS Data Center Thermal Dashboard

Application and Use Case

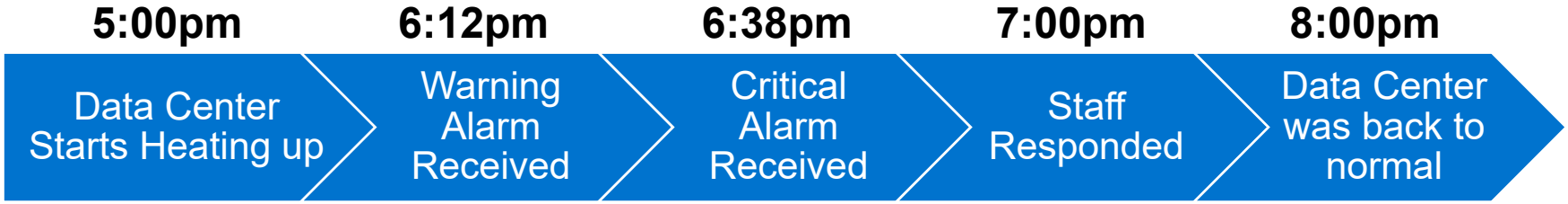
September 2019 Event – Demo 7



Thermal-Dashboard_SS-IT-Data-Center

September 2019 Event

- Two days before Hurricane Dorian was supposed to impact our area



- Cause – Comm failure for panel that controls the chillers

A HRSD Story

CHALLENGES	SOLUTION	BENEFITS
▪ Storm Preparedness	▪ Use the PI System to monitor tide, wind rainfall, flooding potential as well as wet well level and pump station monitoring.	▪ More time efficient ▪ Ease of use for users in the field ▪ Speed of data delivery ▪ Bigger picture of current situations
▪ Data Center Monitoring	▪ Use the PI System to increase thermal monitoring within our main data centers	

Future Plans for Expansion

- Storm Preparedness
  - Forecasted Tide, Wind and Rain Data – currently in the testing phase
  - Condition Assessment of key assets using PI data in Power BI analytics

- Data Center
  - Installation of more sensors
  - Monitoring the Computer Room Air Conditioning (CRAC) units and chillers
  - Integration of the building automation system into PI
  - Expansion to our Small Communities Data Center

Contact Information

HRSD
Cleaning wastewater every day for a better Bay.

Cheryl Weckworth
- Data Analyst
- cweckworth@hrsd.com

Tiffany Elston
- Data Analyst
- telston@hrsd.com

Lyne Swimpson
- Data Analyst
- lswimpson@hrsd.com

Robert Davis
- IT Senior Systems Analyst
- rdavis@hrsd.com

Questions?

Please wait for the **microphone**

State your **name & company**

Please remember to...

Complete the Survey!

Navigate to this session in the mobile app for survey