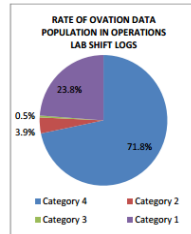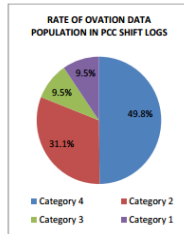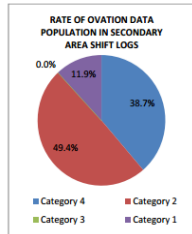# Operational Intelligence Infrastructure for Water Supply Services

Presented by **Ilfat Maatouk**

Betty Thomas

Why we needed the PI System

Business Challenges

A. Data spread across different platforms – different technologies

B. Slow and unreliable reporting processes

C. No tangible way of analyzing equipment efficiencies – present and future

Solution(s)

A. Implemented a centralized system using different components of the PI system

B. Rerouted data using the PI system

C. Use the PI System to monitor and analyze real time data – Predict future data

Results and Benefits

• One unified database with all our data accessible from corporate network

• Less time spent entering data, backfilling, troubleshooting. Less missing data.
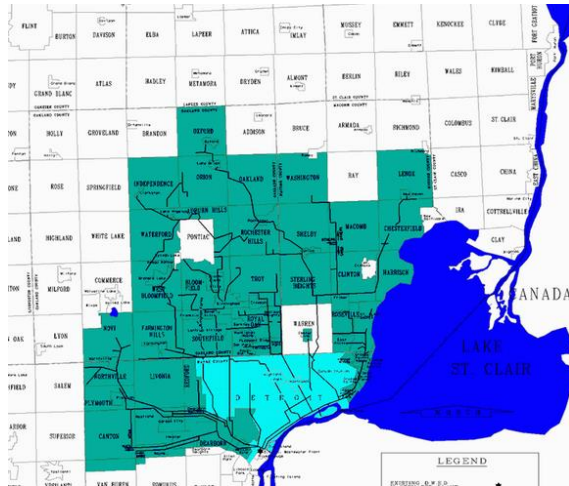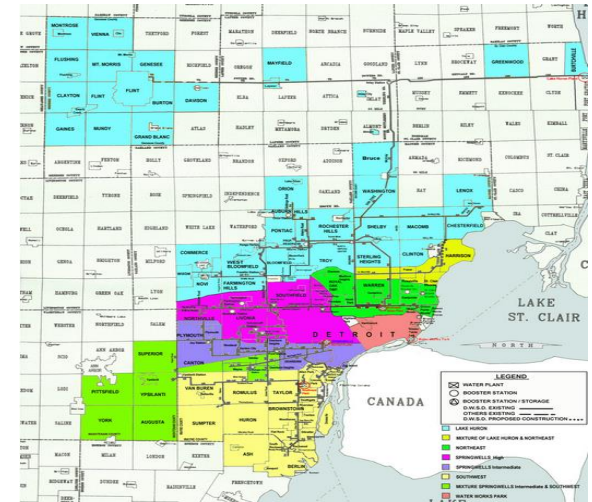
• Still in progress

Agenda

- The PI System in the Process and Business Networks

- Reporting with the PI System

- The future of the PI System at DWSD

- Thoughts for improvement

- Financial solutions

About DWSD

Drinking Water

- ✓ 1,079 square miles
- ✓ Detroit and 127 suburban communities
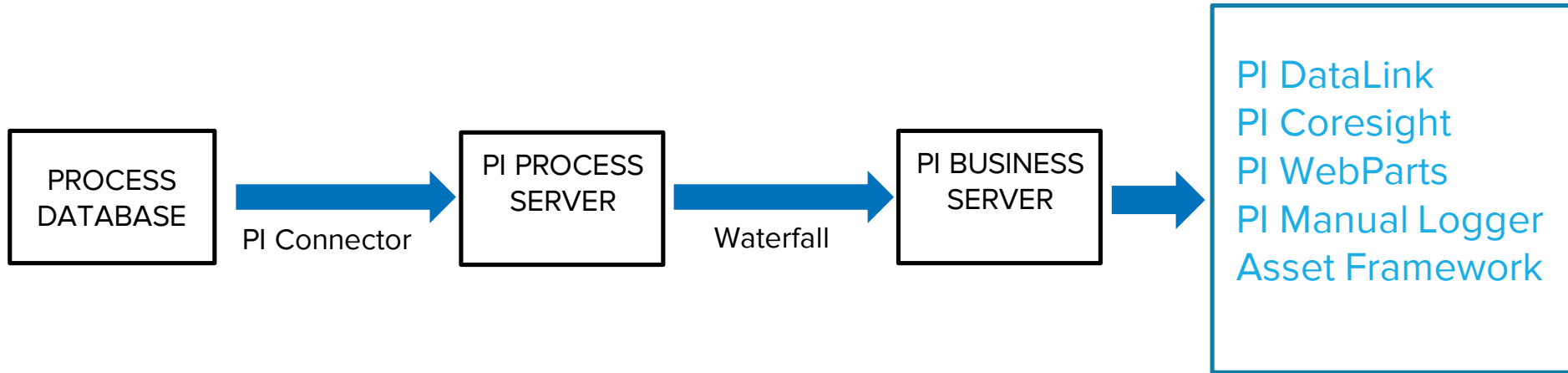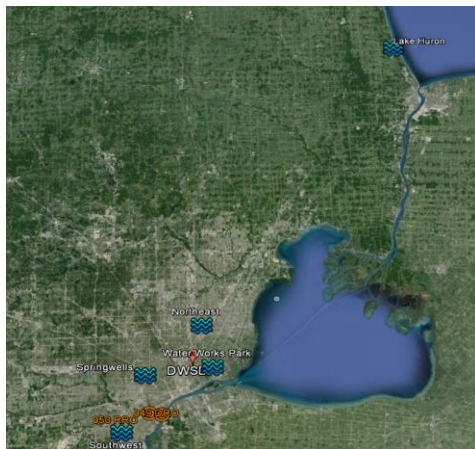- ✓ 40% of Michigan's population
- ✓ 610 MGD produced

Waste Water

- ✓ 710MGD of water treated
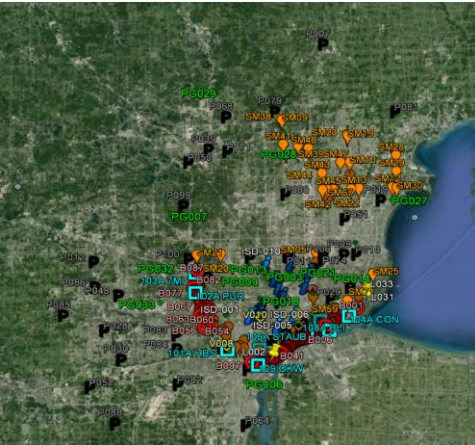- ✓ 946 square miles
- ✓ +3000 miles of sewer lines
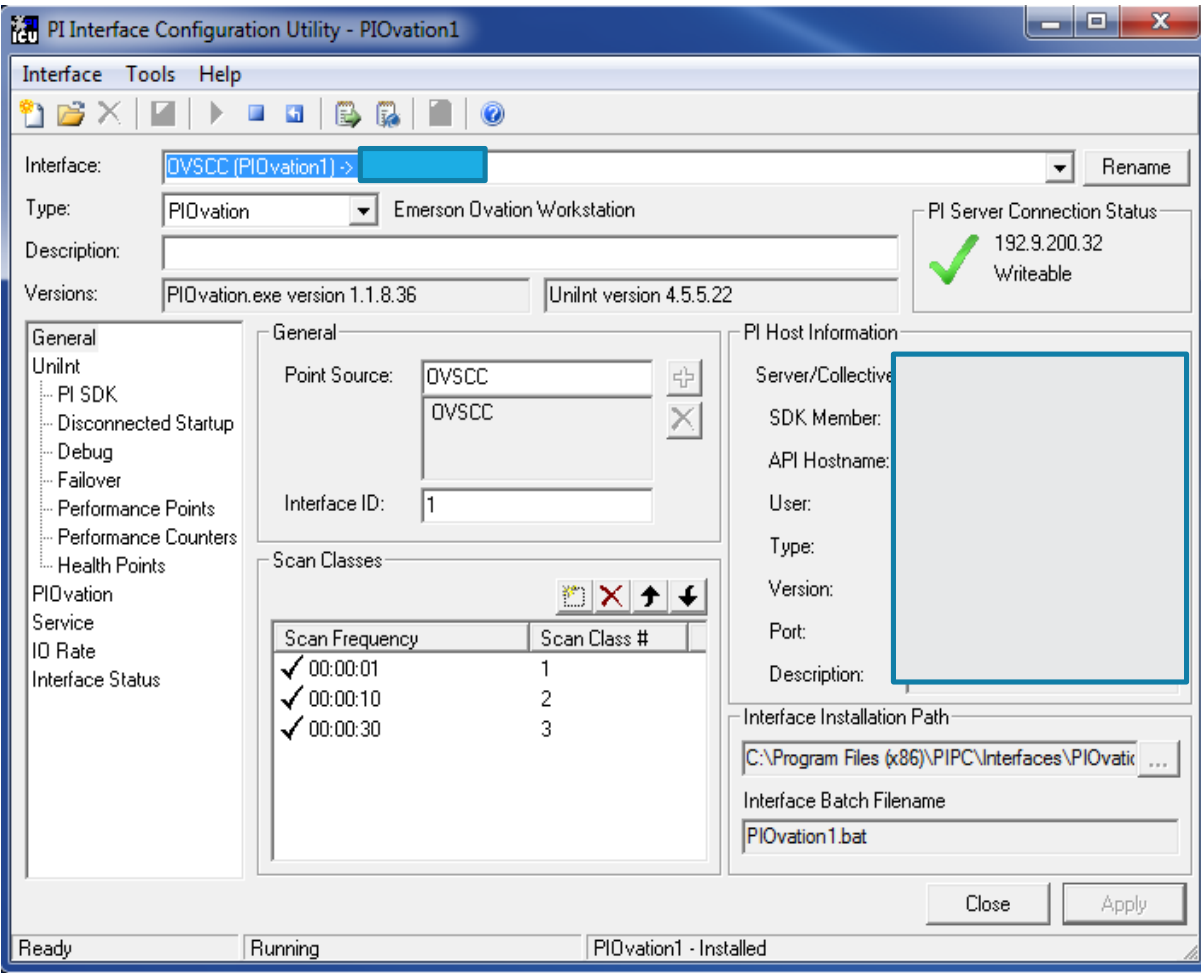
The PI System in the Process and Business networks

System Architecture


```
PROCESS        PI Connector    PI PROCESS      Waterfall    PI BUSINESS            PI DataLink
DATABASE  ───────────────▶     SERVER     ───────────────▶  SERVER     ─────────▶  PI Coresight
                                                                                    PI WebParts
                                                                                    PI Manual Logger
                                                                                    Asset Framework
```

Stations with a PI Connector:

Direct Connection between remote sites and Controls System

PI ICU: Connectivity between PI and other programs

- PI Connectors in all stations
- Control over polling rate, exception, compression, interpolation, range

Data Recovery

3 ways of communication
- PRIMARY
- PNT
- RADIO

PI provides back up:
- Communication loss
- Historian failure

Monitoring Flows: Notifications & Event Frames

Event Frames

CONDUCTIVITY			
Current Value	17-Mar-15 14:12:00	212.524	µS
Monthly Maximum	17-Feb-15 22:34:49	230.988	µS
Monthly minimum	17-Mar-15 02:06:00	210.3881836	µS
Monthly Average		218.981	µS

DISSOLVED O2			
Current Value	17-Mar-15 14:10:00	9.976	ppm
Monthly Maximum	16-Mar-15 16:07:30	9.982	ppm
Monthly minimum	09-Mar-15 17:31:30	9.002	ppm
Monthly Average		9.857	ppm

TOTALIZERS|PG014 **38.19 in**

L079-GRATIOT & MT.ELLIOT|LEVEL **4.0608 ft**

PRESS|DISCHARGE I **63.208** psi

DWF SM AP-S-1 20: **0.28083** ft3/s

AP-S-1-ENTERPRISE & DEARBORN|FLOW 0.28083 ft3/s
AP-S-1-ENTERPRISE & DEARBORN|LEVEL 0.63101 ft

2/26/2015 1:00:00 PM   6d 23h   3/5/2015 12:00:00 PM
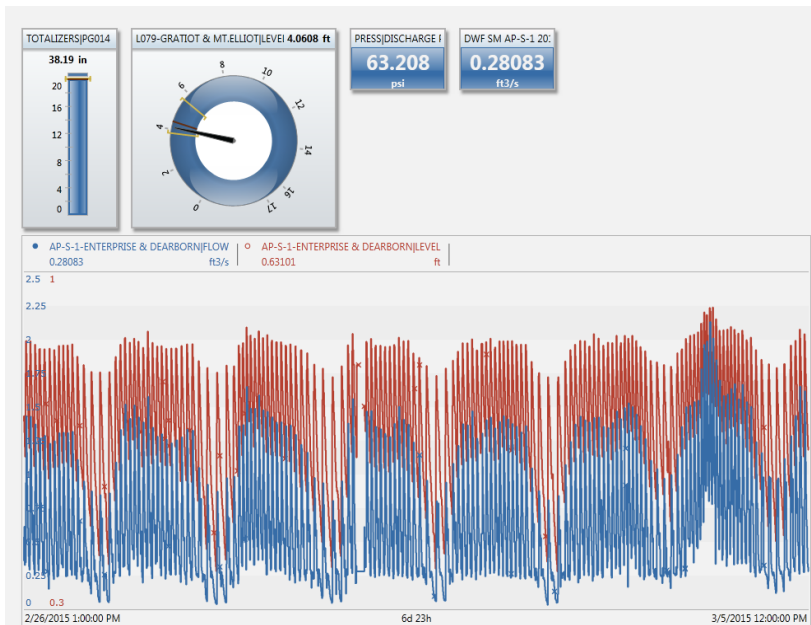
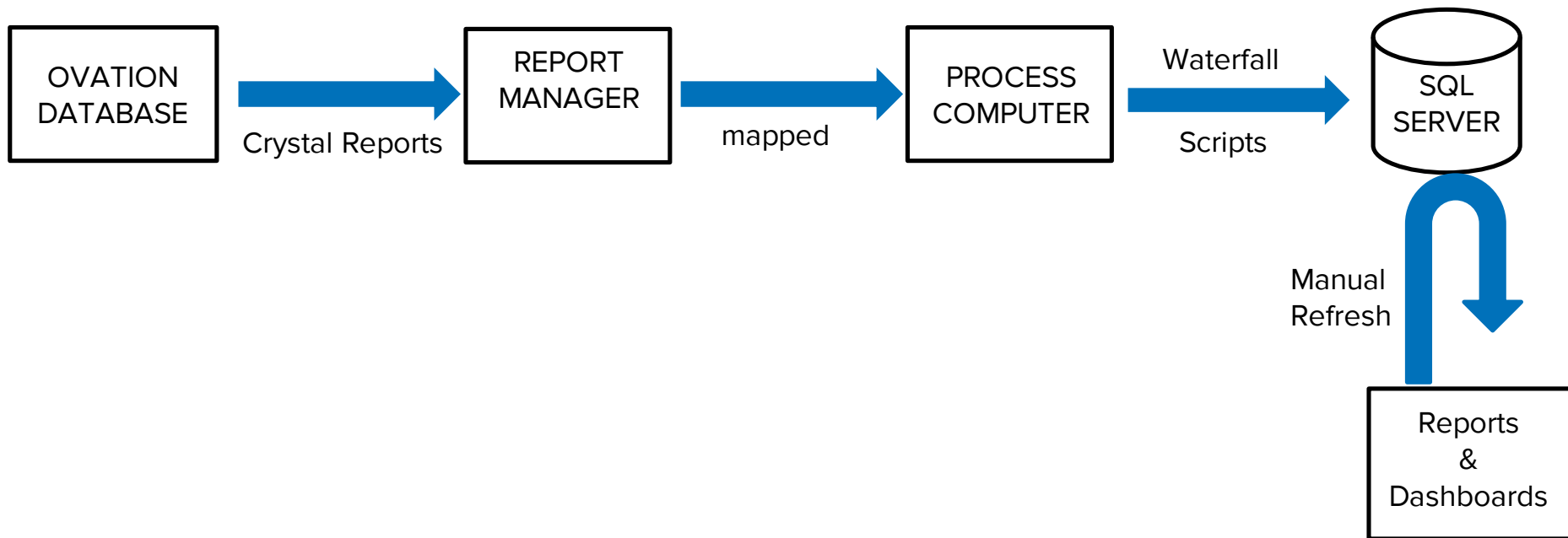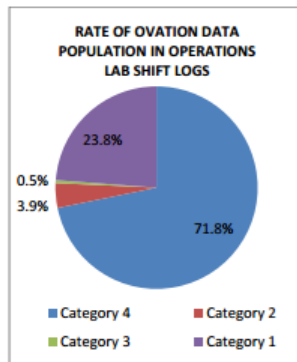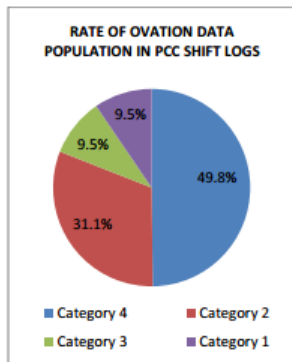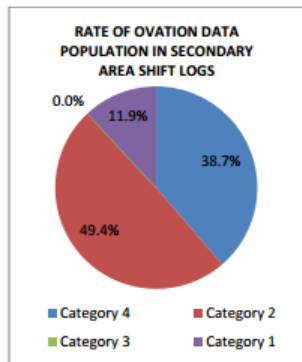| Timestamp	DN-S-2 Flow
18-Mar-15 00:00:00	23.89177704
18-Mar-15 00:05:00	23.85446167
18-Mar-15 00:10:00	19.55451584
18-Mar-15 00:15:00	12.78993702
18-Mar-15 00:20:00	12.82536793
18-Mar-15 00:25:00	12.77845001
18-Mar-15 00:30:00	12.8285017
18-Mar-15 00:35:00	12.85520935
18-Mar-15 00:40:00	12.85520935
18-Mar-15 00:45:00	12.86955929
18-Mar-15 00:50:00	12.87017536
18-Mar-15 00:55:00	12.84119797
18-Mar-15 01:00:00	12.86428356
18-Mar-15 01:05:00	12.85752773
18-Mar-15 01:10:00	12.90472984
18-Mar-15 01:15:00	12.8521595
18-Mar-15 01:20:00	12.8521595
18-Mar-15 01:25:00	14.33553696
18-Mar-15 01:30:00	24.15716743
18-Mar-15 01:35:00	24.07622719

Display & Share Data PI Coresight PI DataLink

- Data accessible to wide range of people across network
- Efficient visualization
- Clear and reliable
- Monitor data fluctuations over time
- Manipulation of data

Reporting with the PI System

Reporting Prior to the PI System

OVATION DATABASE → *Crystal Reports* → REPORT MANAGER → *mapped* → PROCESS COMPUTER → *Waterfall Scripts* → SQL SERVER → *Manual Refresh* → Reports & Dashboards

The challenge: unreliability of process

Curtesy of Saad Ishac

- Regularly missing data
- Reports constantly generating and scripts running
- Too many interfaces used
- Inability to pin down problem

Introducing the PI System

OVATION DATABASE → Native PI Connectors → PI PROCESS SERVER → Waterfall → PI BUSINESS SERVER
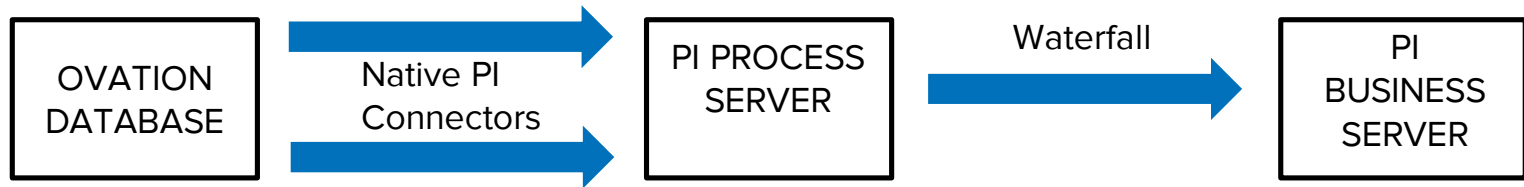
- Redundant Connectors
- Fast and reliable data
- No missing data due to reporting processes
- No need for intermediate interfaces

Asset Framework
PI Manual Logger
PI DataLink
PI Coresight
Analyses
PI ProcessBook
Notifications
Event Frames
PI SMT

PI Manual Logger

Add and configure tours

- Notes
- Time scheduling
- Privileges
- Data Validation
- Tag entry Preformat

TOURS

PI Manual Logger Web

Tour Run: Jan 29, 2015, 09:00:00 am

Timestamp Edit

☐ Navigate to remaining items only

◀   # 1 of 10 (9 remaining)   ▶

PS1 GRIT BOX 1 STS-D
PUMP STATION 1 GRIT BOX 1 STATUS

Tour Name
Tag Name

Instructions
Data must be entered 7 hours into the shift. If no data is available, leave blank

Value (%)

172

Limits violated: HH(100)
HH:100 LL:0
Previous: 155 - Jan 29, 2015, 09:00:00 am

Limits set by Admin

Timestamp
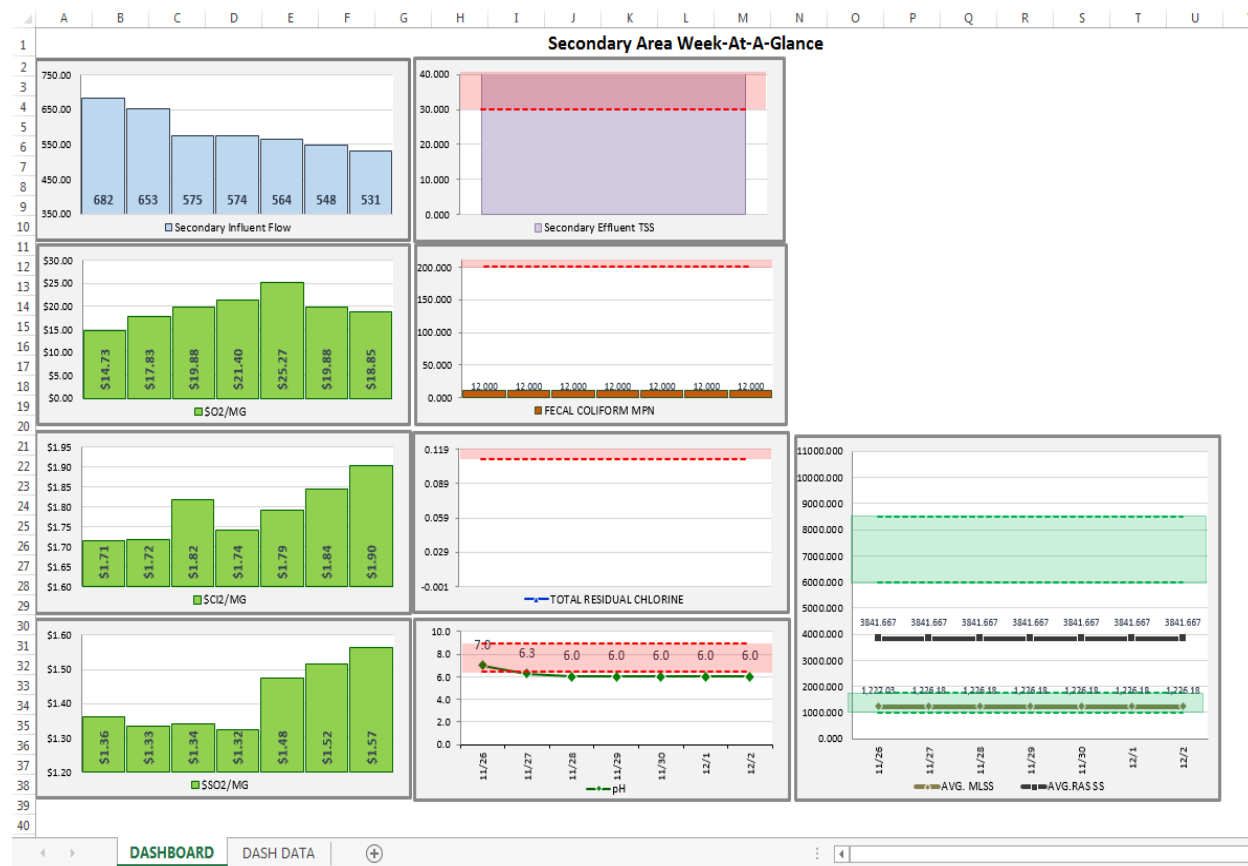Jan 29, 2015, 09:00:00 am

Comment

▸   **See historical values**

- Minimal training required
- Data Entry
- Comments
- Timestamp edit
- No configuration allowed

OSIsoft®   **USERS CONFERENCE 2015**

© Copyright 2015 OSIsoft, LLC

PI DataLink: Dashboard

- Calculated, compressed, sampled data
- Data from Ovation, PI ML, and analyses

Analyses and Templates

- Averages, counts, logic based commands
- Conversion from bits to words
- Unit Conversions
- Combines Ovation and manual data

PI DataLink End Of Shift Reports

- Compressed data
- SQL Query for comments
- Data from Ovation, PI ML, and analyses

Visualization

- Share graphics on business network
- Alerts when CSO events are active
- Monitor critical variables
- Accessible through PI Coresight

Thoughts for improvement

- PI WebParts
  - ❖ More plotting options: histograms, fill colors
- PI ML Web
  - ❖ Organize tours into groups, subgroups, tree view
  - ❖ Clock scheduling: set a specific data entry time
  - ❖ Filtering and locking tours according to user privileges
  - ❖ Reject value or display pop up message
  - ❖ Clear cache for display
- PI Coresight
  - ❖ Ability to see values on trend
  - ❖ Import graphs

The Future of the PI System at DWSD
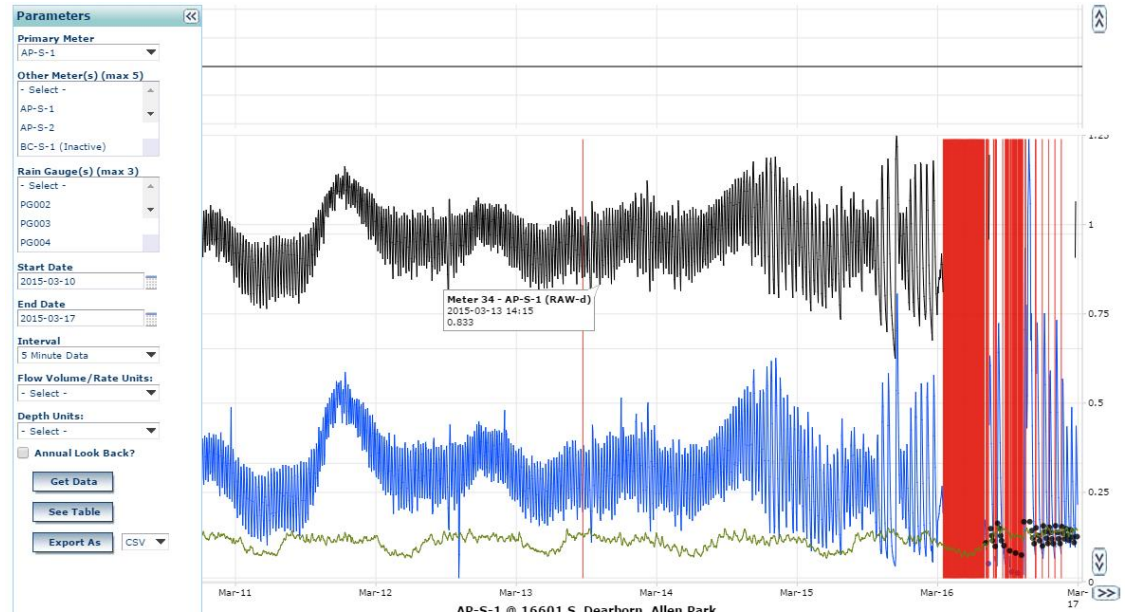
- Implement the PI system to remote sites for real time monitoring

- Monitor and maximize pump efficiency

- Energy Management

- Vibration analysis

- Power monitoring

- Sewer Meter Billing

Sewer Meter Billing

- Linear Interpolation
- Green line
- Correlations
- Flow calculations
- Notifications
- Replace data
- Peaks

Financial Solutions

- 2012-2015: $500,000
  - ❖Automating Reports
  - ❖Notifications and Event Frames
  - ❖Using the PI System as a back up
  - ❖Replacing costly software with the PI system
- Savings and Improvements expected in the next 5 years: $2,000,000
  - ❖Monitoring Real time data
  - ❖Energy consumption tracking
  - ❖Increasing pump efficiency
  - ❖Predictive data

Conclusion: the benefits of the PI System

- Fast and reliable data

- Reduced uncertainty

- Easy integration and implementation

- Convenient analyses and manipulation of data

- Complete control over data

- Ability to share data throughout the network

- One database tied to all data sources

Ilfat Maatouk

imaatouk@dwsd.org

Engineer

Betty Thomas

bthomas@dwsd.org

Engineer

Anil Gosine

gosine@dwsd.org

System
Administrator

DWSD

Questions

Please wait for the **microphone** before asking your questions

State your
name & company

THANK
YOU