

Who am I?

Why am I talking to you today?

Tim Schade

Regional Manager for
AMR/AMI Metering





- Authorized Sensus distributor - water and electric products - 17 states
- 265 branches in 43 states
- 13 Ohio branches
- 830+ Sensus FlexNet deployments
- 200+ deployed by Core & Main
- Dedicated AMR/AMI National Metering Group

Fixed Base Meter Systems

AMI – What is it?

Advanced Metering Infrastructure

(Market term used to refer to a fixed network meter reading system in which the meter endpoints transmit to a fixed position)

Industry Terms

- Fixed base meter reading
- Smart grid
- IOT – Internet of Things
- AMR – automated meter reading (drive-by)
- Point-to-Multi point
- Mesh – Multiple Path Communication – “Hopping”

General Terms

- AMI – Advanced Metering Infrastructure
- Endpoint – Connected to the meter (MTU, MXU, Radio)
- Collector – Device that receives endpoint transmissions (Base Stations)
- Hosted – Data is store off site – “in the cloud”
- Server – Computer that stores the data – Usually onsite at the Utility
- RNI – Regional Network Interface - “Head end System” - Software that Stores the Data
- MDM Software – Analytical Software used by the Utility

Fixed Base - AMI Components

SmartPoints



RF Collector



Office / Billing



Various types of AMI functionality

- One Way
 - Endpoint Only Transmits
- Two Way
 - Endpoint Transmits & Receives

Frequency

Licensed - Primary

- FCC dedicated Licensed Frequency (Low Noise)
- Higher Range and Power
- Endpoint – 2 watts–5 watts of power

Unlicensed (900Mhz ISM Band) (RF Noise)

- Unlicensed 900 MHz is widely used in many industries
 - 902 mhz – 928 mhz ISM RF frequency band
- Lower Range and Lower Power
- Endpoint – Less than 1 watt of power

Utility is competing with the homeowner for bandwidth to get the meter read



RF “Noise” Basics – Primary vs ISM Band

1) HOW LOUD CAN YOU SPEAK?



2) HOW WELL CAN YOU HEAR?

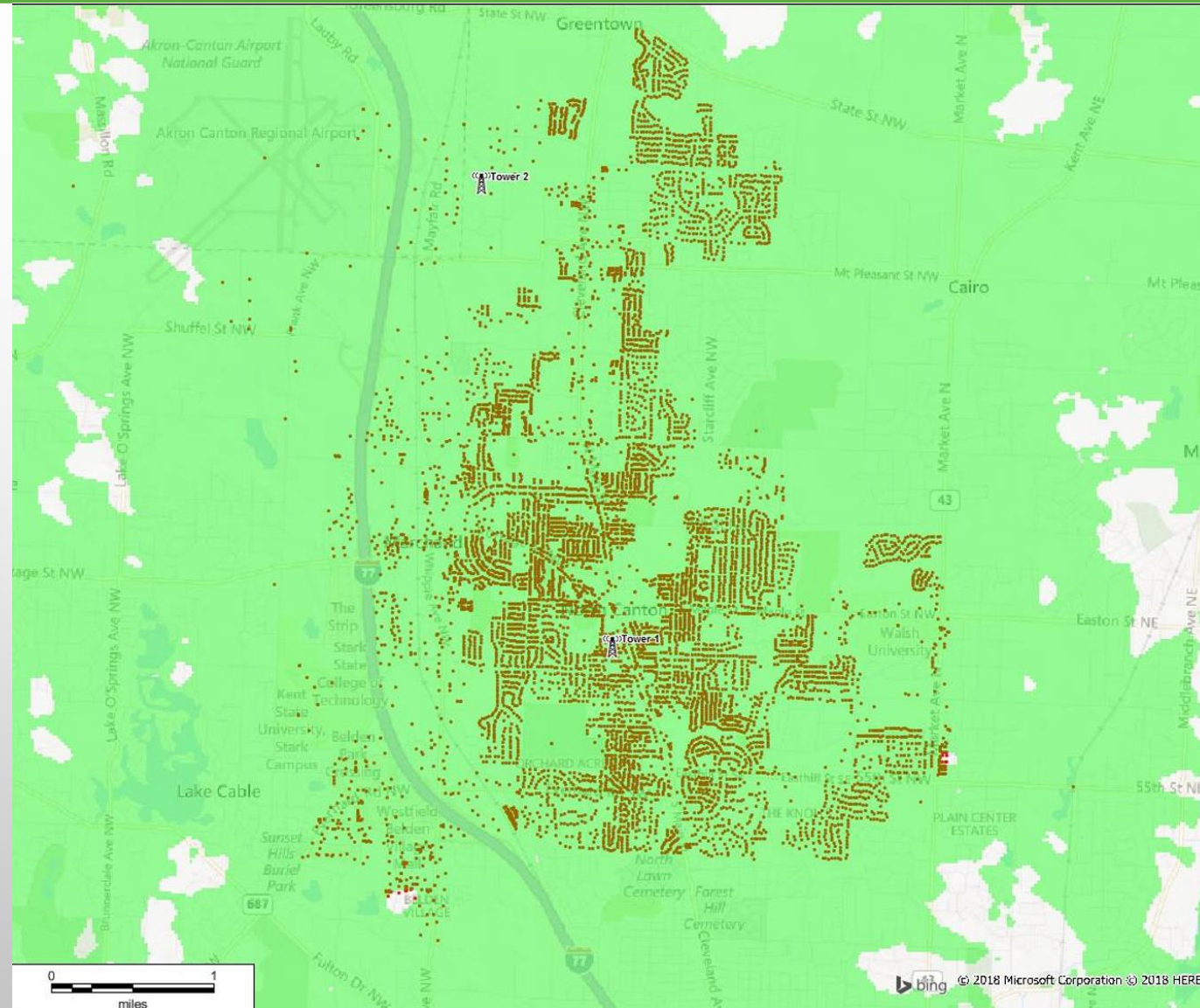


3) HOW NOISY IS THE BACKGROUND?

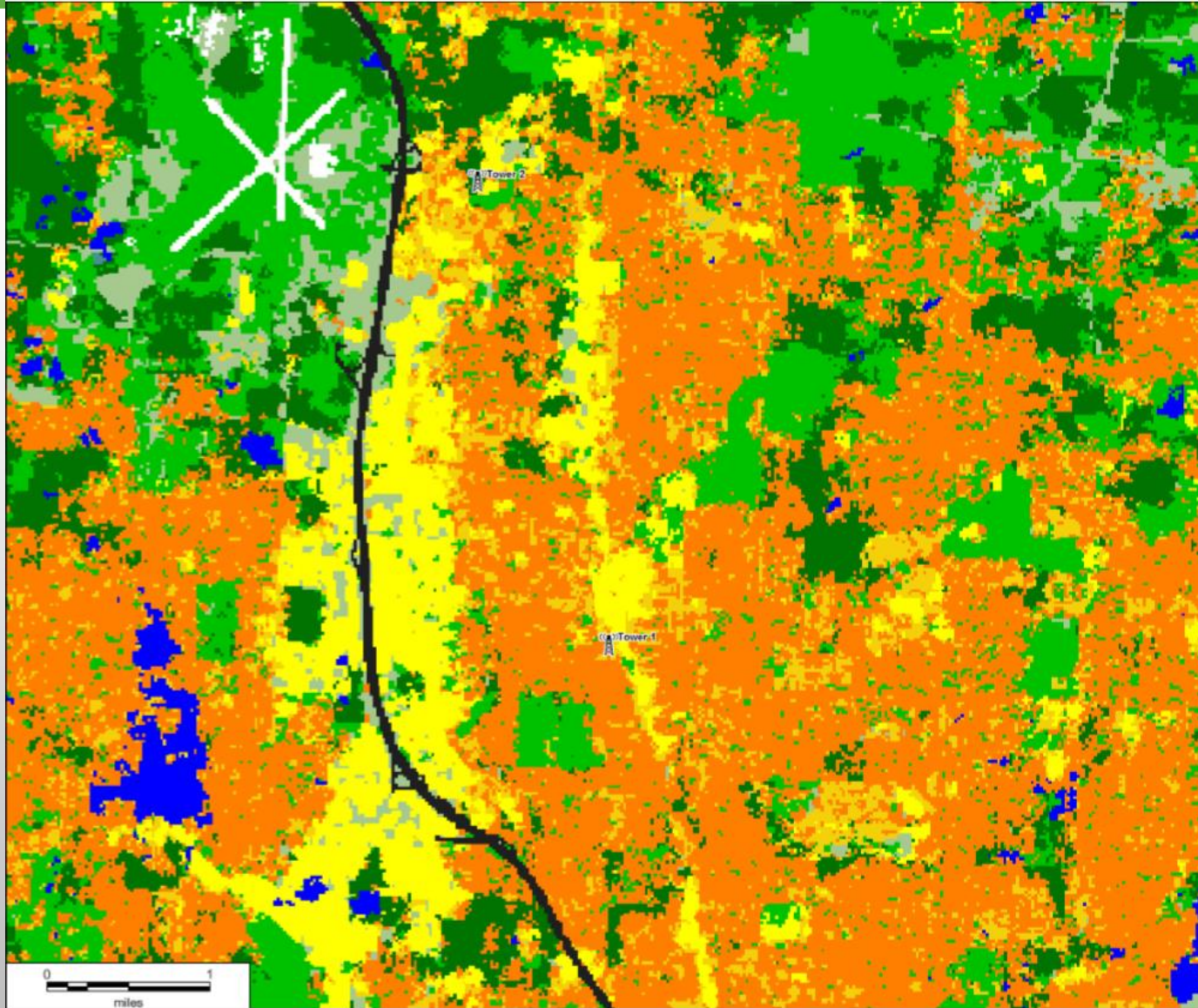
**10 to 100X more
Noise in Unlicensed
Bandwidths**



North Canton, OH – Propagation Study



North Canton – Collectors And Clutter



FlexNet Design Base station and Clutter

LEGEND:

- Base Station Location
- High Density Urban
- Commercial - Industrial
- Suburban Few Trees
- Suburban With Trees
- Airports
- Major Transportation
- Open
- Grass - Agriculture
- Forest
- Wetland
- Inland Water
- Sea Water

FACTORS INFLUENCING PROPAGATION MODELING

- **SYSTEM LEVEL INPUTS**

- FREQUENCY, ANTENNAS, TRANSMIT POWER, RAD CENTERS, COORDINATES, ETC...
- ENDPOINT TYPE, ENDPOINT LOCATION (I.E. INDOOR, OUTDOOR, PITSET, BEHIND A TRUCK, ETC...)

- **ENVIRONMENTAL FACTORS**

- TERRAIN (I.E. HILLY OR FLAT)
- CLUTTER (I.E. RURAL, SUBURBAN, OR URBAN)
- GROUND COVER (I.E. GRASS, TREES, BUILDINGS, CARS, ETC...)
- METEOROLOGICAL & ATMOSPHERIC CONDITIONS (I.E. PRESSURE, TEMPERATURE, WATER CONCENTRATION, SOLAR FLARES, ETC...)

- **MODELS**

- DETERMINISTIC, HYBRID, RAY-TRACING



WHAT CAN A FIXED BASE SYSTEM MONITOR???

Water Transmission & Distribution

- Meter Reading
- Water Leaks
- Alarms

Water Transmission & Distribution

- Pressure Monitoring
- Chlorine Residual Monitoring

Wastewater

- Level Monitoring
- Lift Station Status



Stormwater

- Level Monitoring

Water Supply (Surface & Ground)

- Level Monitoring
- Water Quality Monitoring

Reclaimed Water

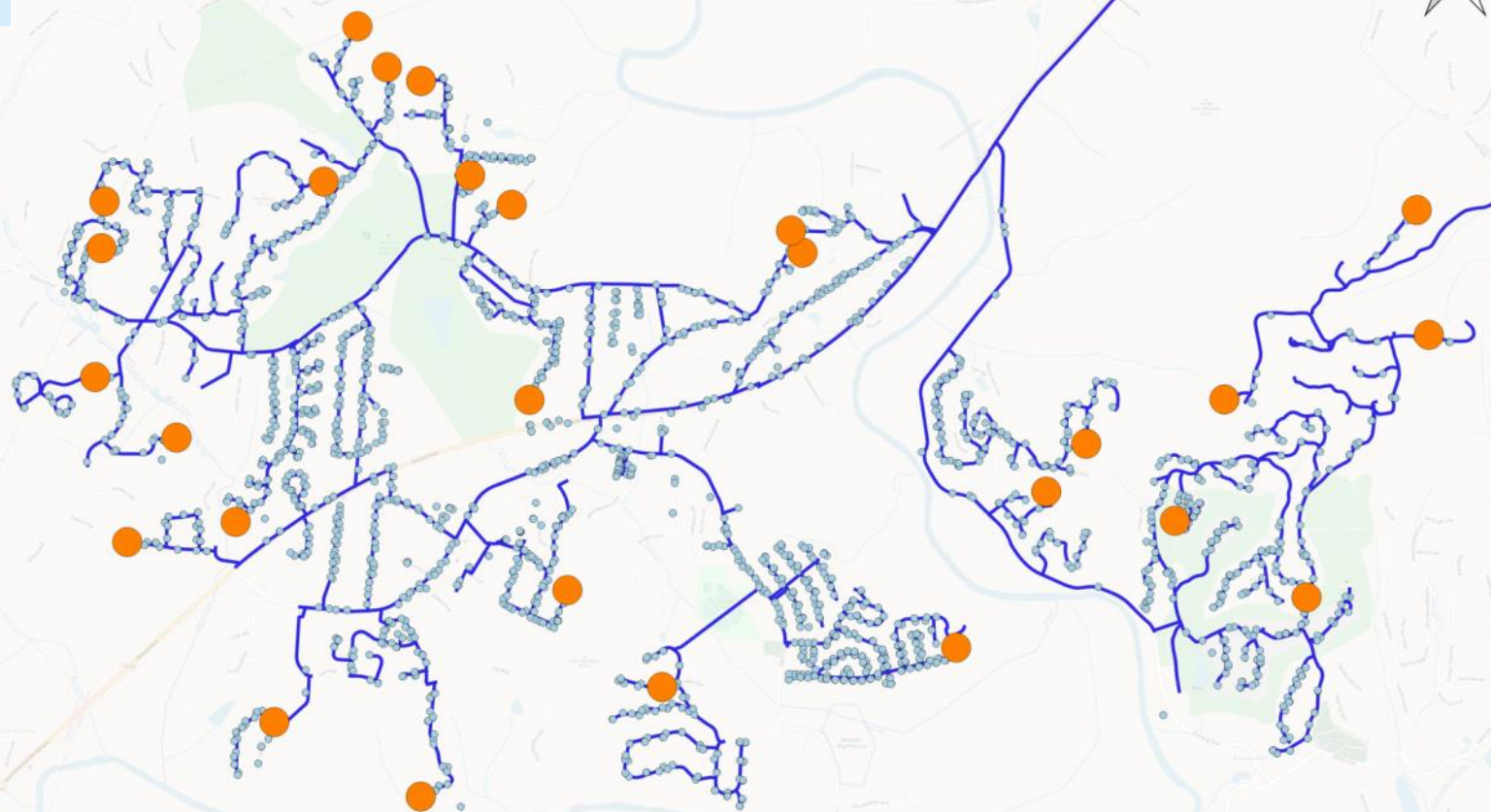
- Pressure Monitoring

Pressure Monitoring – Booster Pump



Pressure
Monitoring

750 0 750 1500 m



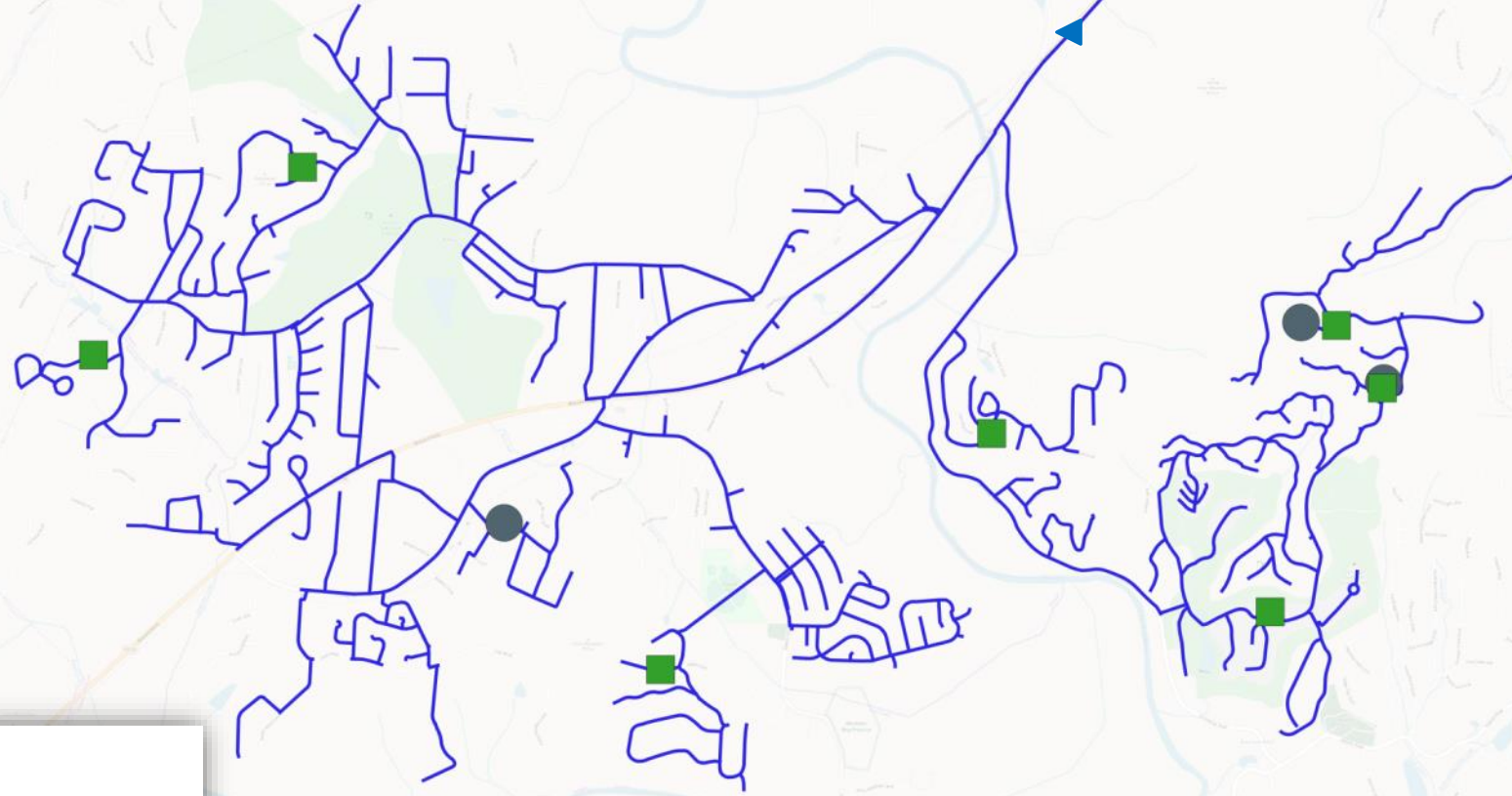
Residential Water Meters Are Used For Their
Pressure And Temperature Capabilities.

SGWs

750 0 750 1500 m



- Storage Tanks [3]
- Pump Stations [7]
- Water Mains



Transmit Tank And Pump Station
Operational Data Over AMI Fixed Base
System.

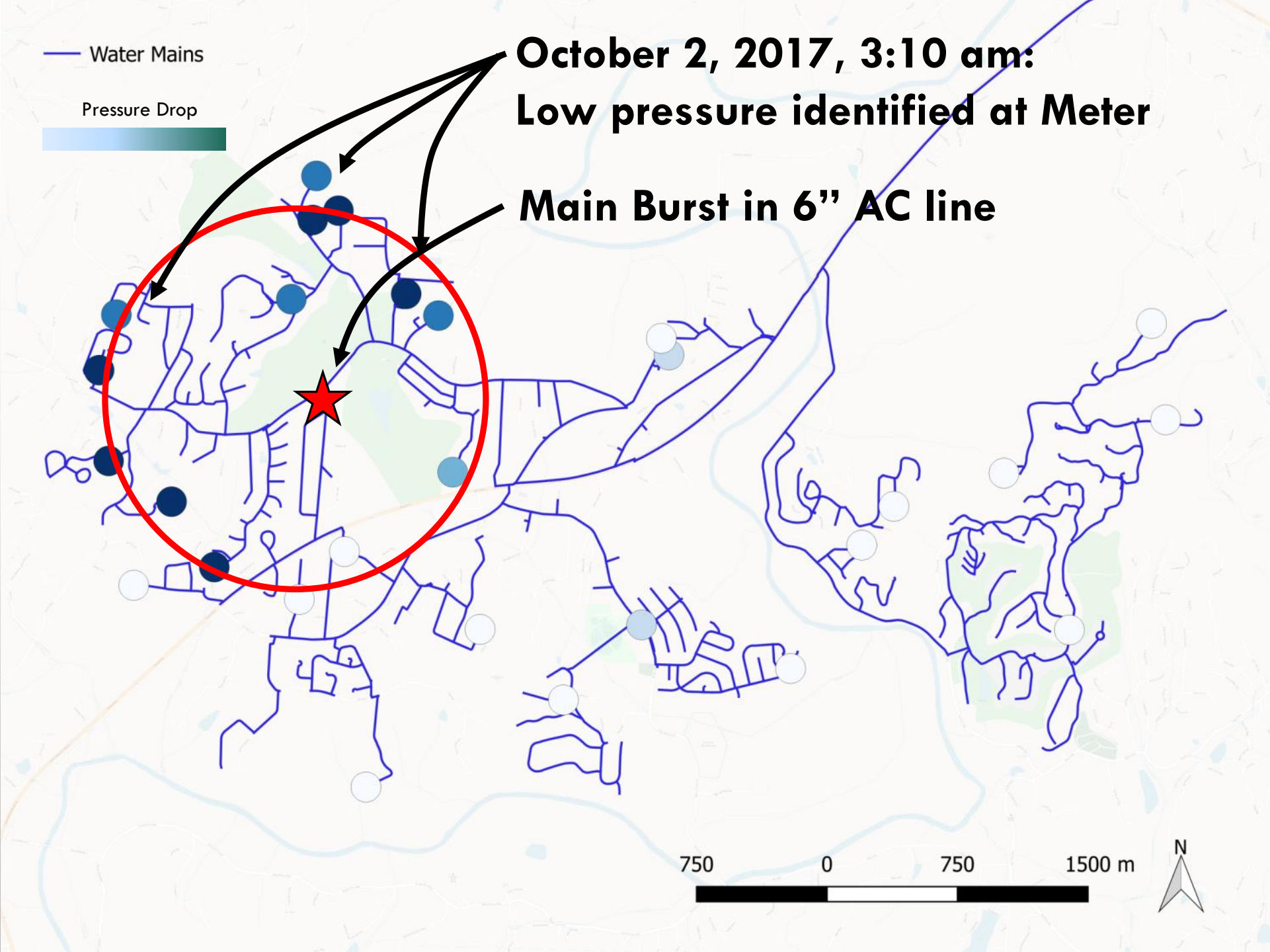
— Water Mains

Pressure Drop



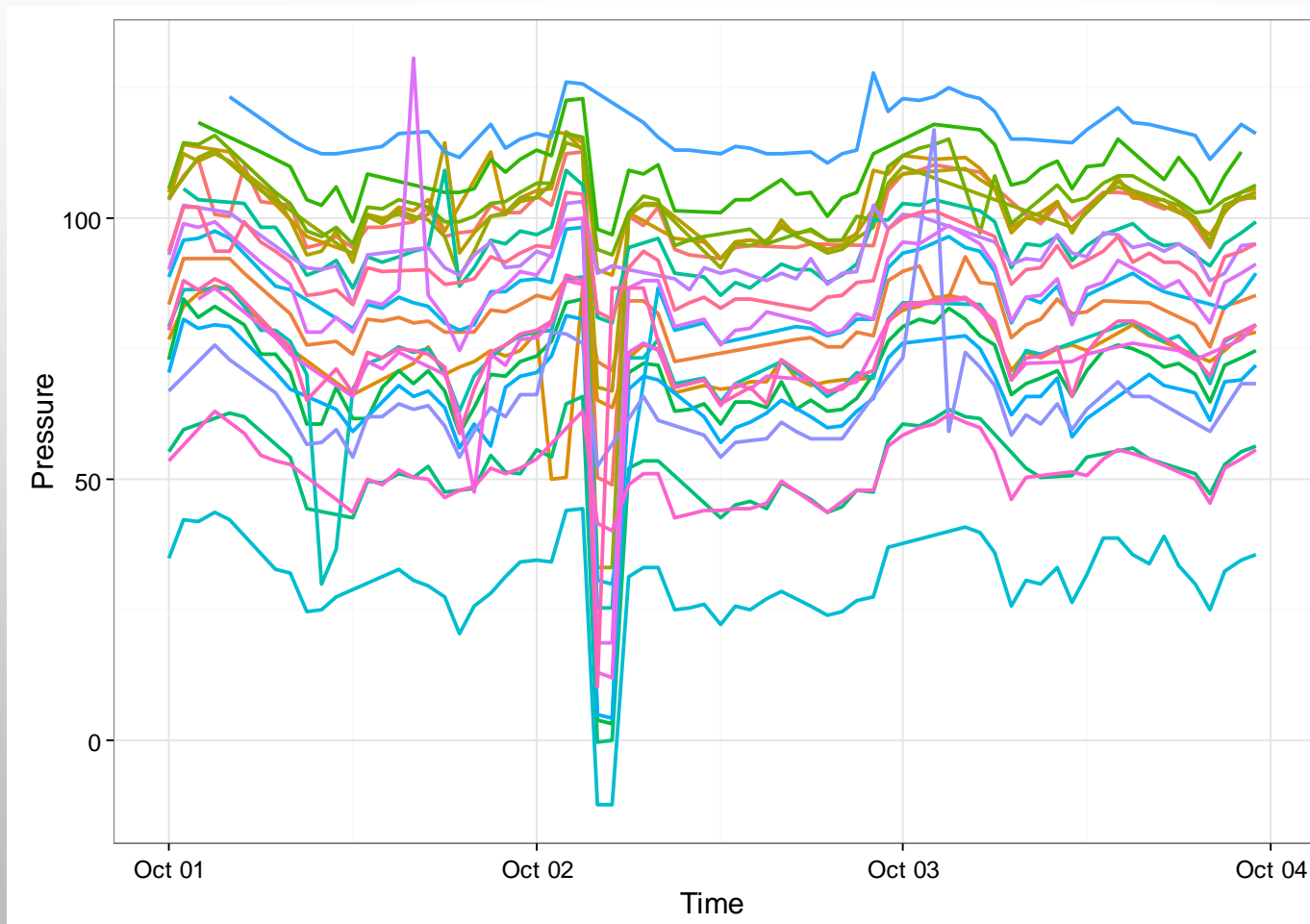
**October 2, 2017, 3:10 am:
Low pressure identified at Meter**

Main Burst in 6" AC line



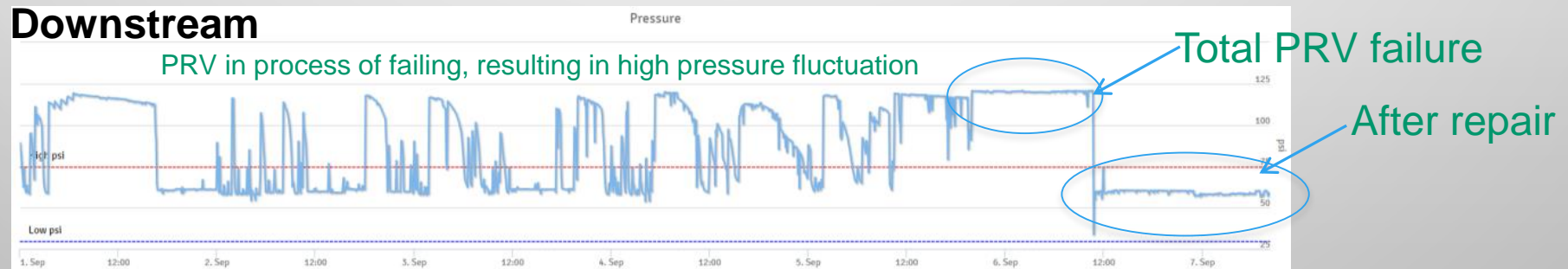
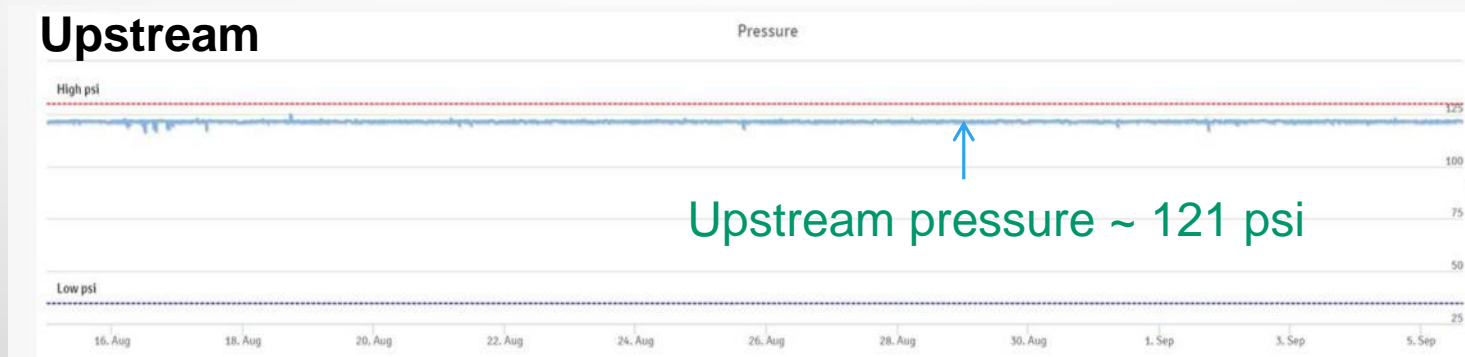
Pressure Monitoring

Pressure Readings From Residential Meters...



Pressure Monitoring

- SMART GATEWAY DETECTED PRV FAILURE AT PRV SITE
- RUBBER DIAPHRAGM IN PRV CRACKED AND FAILED
- ABLE TO CATCH BEFORE MAIN BREAKS OR CUSTOMER SERVICE LINE BREAKS



Chlorine Residual Monitoring

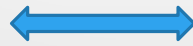
- DEPLOYED...
 - **AMI TRANSMISSION DEVICE** ON CHLORINE ANALYZER
 - **AMI TRANSMISSION DEVICE** COMMUNICATES FREE CHLORINE RESIDUAL BACK TO THE RNI (HEAD END SYSTEM)



Chlorine Analyzer



AMI Transmission Device



Water Supply (Surface & Ground)

- Surface Water Supply

- Level
- Ph
- Dissolved Oxygen (DO)
- Turbidity
- Conductivity



- Groundwater Wells

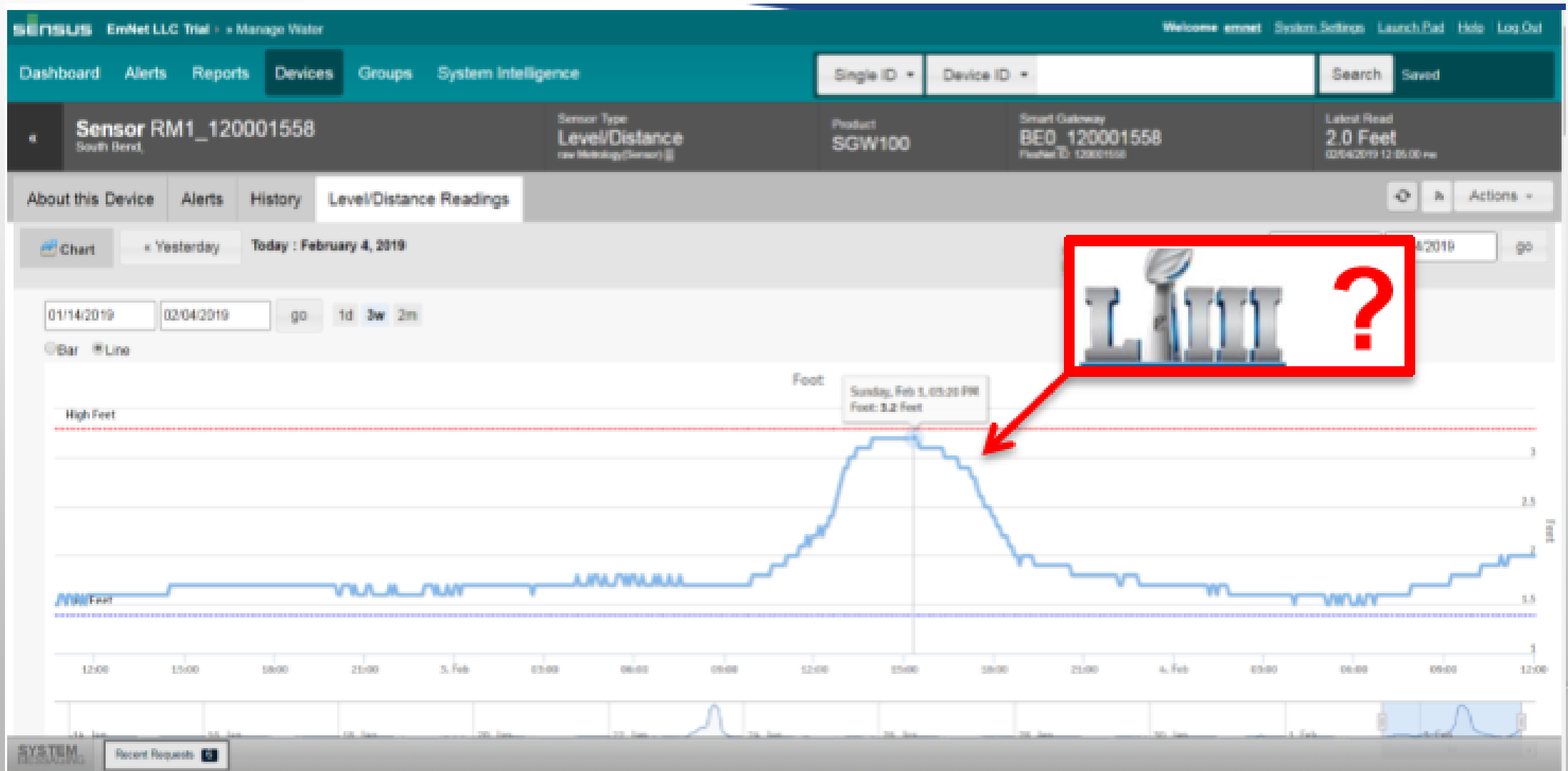
- Level
- Conductivity



Sewer Level Monitoring



February 4, 2019



AMI Meter System

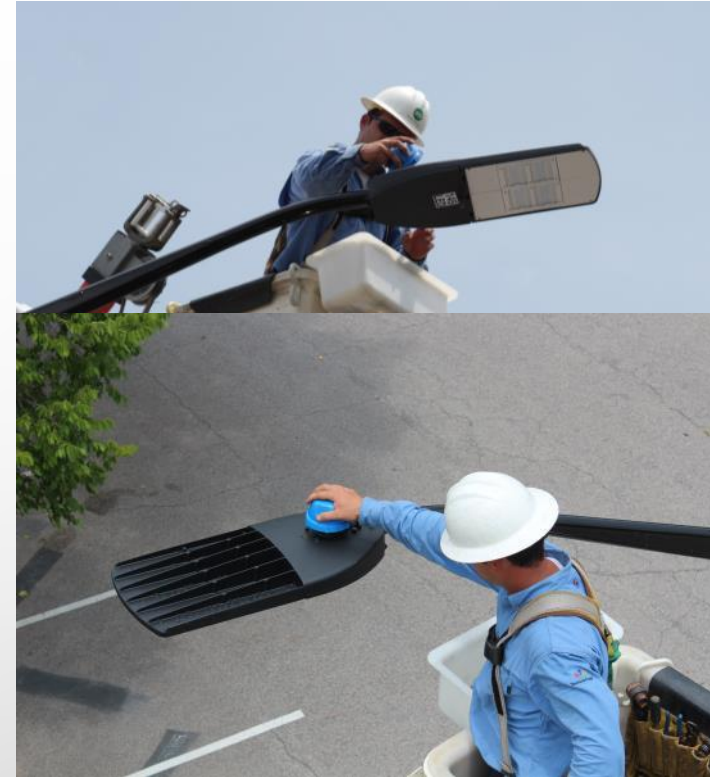
So Much More Than a
Meter Reading!



Electric



Gas




Lighting


Analytics Software

**It's all about
the Data!!!**

Meter Insight

Billing Cycle: All Cycles [YESTERDAY](#) [TODAY](#)

07/18/2017

[apply](#)Device Group: All Groups 

Meter Insight was last updated at 7:56 AM on July 18, 2017

7327

Active Meters 

69

Orphaned Meters 

14

Inactive Usage 

10

Stale 


8

Almost Stale 

3

No Read Available 

0

Max Threshold Exceptions 

0

Min Threshold Exceptions 

0

Unknown Radio 

Alarm Insight

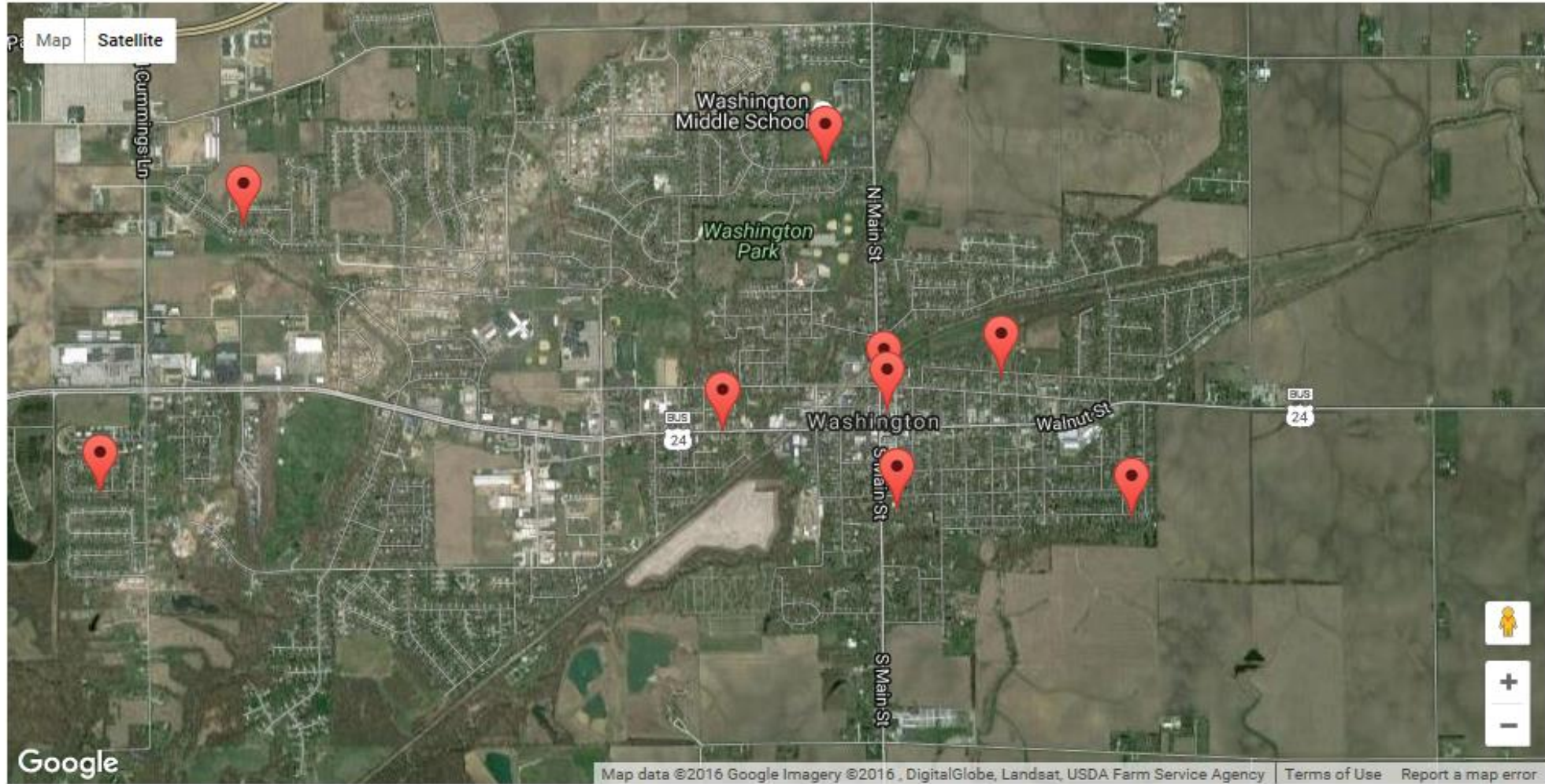
10/13/2016

10/16/2016

[apply](#)

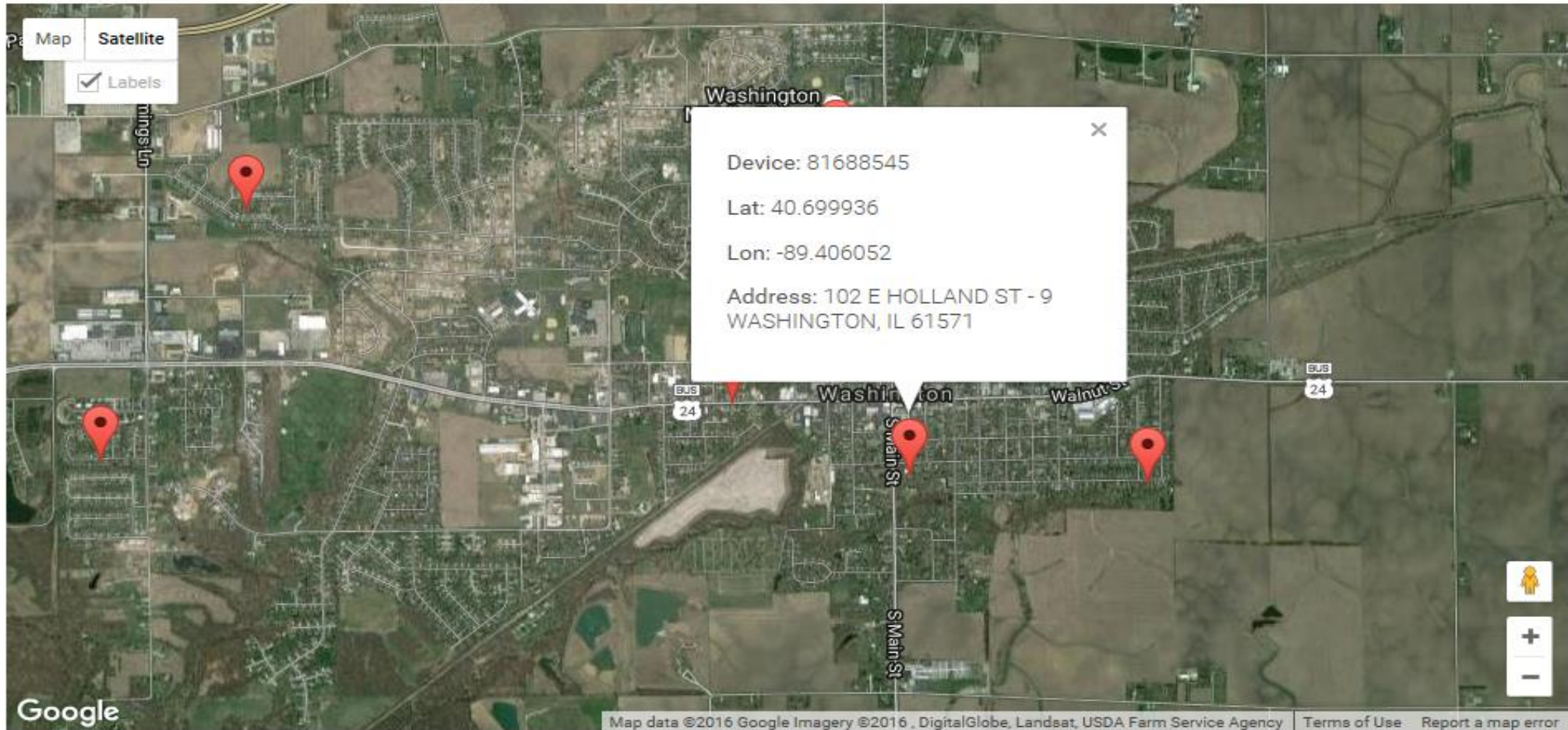
[back](#)

Leak Detected



Alarm Insight 10/13/2016 10/16/2016 apply back

Leak Detected



The map displays several red location pins. A popup window is open for one of the pins, providing the following information:

- Device: 81688545
- Lat: 40.699936
- Lon: -89.406052
- Address: 102 E HOLLAND ST - 9 WASHINGTON, IL 61571

The map interface includes a top-left menu with 'Map', 'Satellite', and 'Labels' (checked) options. The bottom of the map shows the Google logo and copyright information: 'Map data ©2016 Google Imagery ©2016 DigitalGlobe, Landsat, USDA Farm Service Agency Terms of Use Report a map error'.

10/09/2016 10/16/2016  Customer Name HD SUPPLY - 81276608 

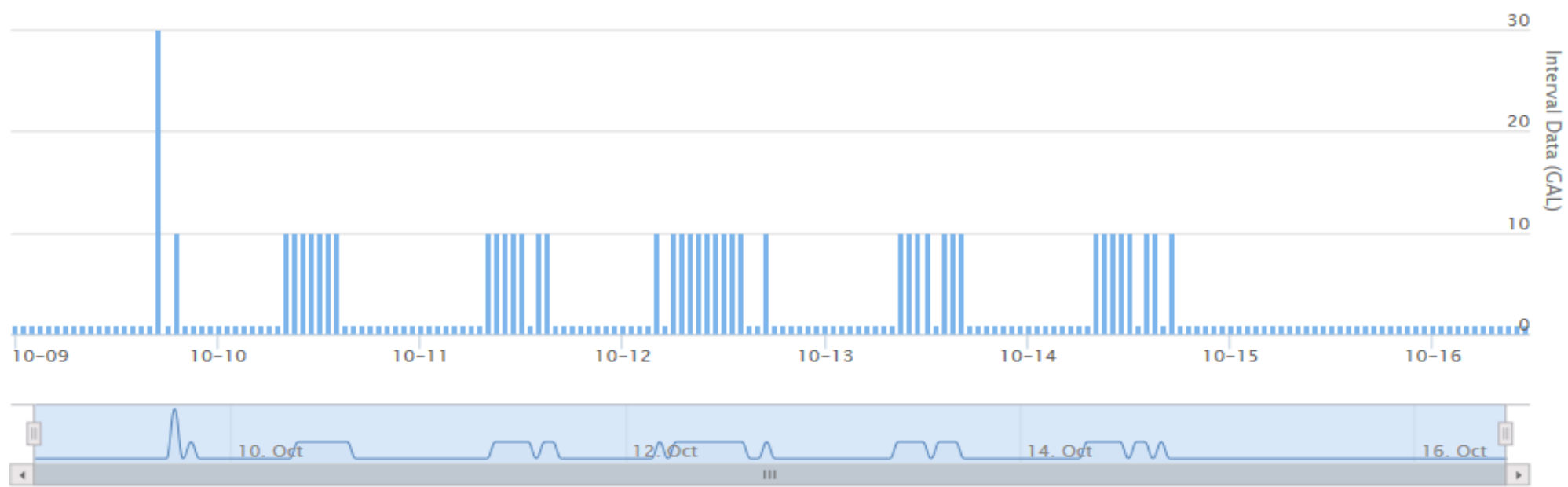
Device Number	81276608	Account Number	051000400001
Device Type	Meter	Customer Name	HD SUPPLY
Meter Type	Water	Parent	Unspecified
Radio ID	84603740	Location	115 N Cummings Ln Washington IL 61571
Status	Active	Latest Read	10315 GAL 10/16/16 11:00:00 AM

- Data
- Alarms
- Usage Profile
- Watch Me
- Map
- Details
- Commands
- Utility Defined Fields
- Add/Remove Groups

Data Type

Table Graph

[Print](#) [Download](#)



10/03/2016 10/10/2016  Customer Name HD SUPPLY - 81276608 

Device Number	81276608	Account Number	051000400001
Device Type	Meter	Customer Name	HD SUPPLY
Meter Type	Water	Parent	Unspecified
Radio ID	84603740	Location	115 N Cummings Ln Washington IL 61571
Status	Active	Latest Read	9916 GAL 10/10/16 7:00:00 AM

- Data
- Alarms
- Usage Profile
- Watch Me
- Map
- Details
- Commands
- Utility Defined Fields
- Add/Remove Groups



Print



02/27/2017 03/06/2017  Customer Name 

Device Number	81276608	Account Number	051000400001
Device Type	Meter	Customer Name	HD SUPPLY
Meter Type	Water	Parent	Unspecified
Radio ID	84603740	Location	115 N Cummings Ln Washington IL 61571
Status	Active	Latest Read	35273 GAL 03/06/17 10:00:00

Data Alarms Watch Me Map Details **Actions** Utility Defined Fields Add/Remove Groups

Actions Options ✕

Action			Valid Values Options	
Read Meter Request <input type="radio"/>	<input type="radio"/>	▶	Read <input type="radio"/>	<input type="radio"/>
Change Valve State <input checked="" type="radio"/>	<input type="radio"/>			

Export Work Order
Send Action
Cancel

Actions Copy Print CSV Excel PDF

Action Type Search: Show entries

◇	Type	◇	Name	◇	User	▼	Issued Date	◇	Expected Completion	◇	Actual Complete	◇	Status
	Read Meter Request		Read		tyler.tucker@sensus.com		03/01/17 09:17:31		03/01/17 09:20:31		03/01/17 09:18:47		Complete 
	Read Meter Request		Read		tyler.tucker@sensus.com		02/27/17 13:52:08		02/27/17 13:55:08		02/27/17 13:52:44		Complete 

← Previous 1 Next →

Showing 1 to 2 of 2 entries

02/27/2017 03/06/2017  Customer Name 

Device Number	81276608	Account Number	051000400001
Device Type	Meter	Customer Name	HD SUPPLY
Meter Type	Water	Parent	Unspecified
Radio ID	84603740	Location	115 N Cummings Ln Washington IL 61571
Status	Active	Latest Read	35273 GAL 03/06/17 10:00:00

Data Alarms Watch Me Map Details **Actions** Utility Defined Fields Add/Remove Groups

Actions Options
✕

Action	Valid Values Options
Read Meter Request <input type="radio"/>	Open <input type="radio"/>
Change Valve State <input type="radio"/>	Close <input type="radio"/>
	Reduce <input type="radio"/>

Export Work Order
Cancel

Actions
Copy
Print
CSV
Excel
PDF

Action Type Search: Show 10 entries

◇	Type	◇	Name	◇	User	▼	Issued Date	◇	Expected Completion	◇	Actual Complete	◇	Status	Q
	Read Meter Request	Read			tyler.tucker@sensus.com		03/01/17 09:17:31		03/01/17 09:20:31		03/01/17 09:18:47		Complete	Q
	Read Meter Request	Read			tyler.tucker@sensus.com		02/27/17 13:52:08		02/27/17 13:55:08		02/27/17 13:52:44		Complete	Q

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1
Next →

Showing 1 to 2 of 2 entries



Questions



Authorized Sensus Electric Distributor
Authorized Sensus Water Distributor

