

THE SEWER WHISPERER



Listen Closely:
Your Sewer is Talking to You

PNWS-AWWA
Washington Water
2022

Tacoma, WA

April 28th, 2022

Speaker and Presentation Overview

- Been with Company for 10 years
 - Based in Southern CA and Handle Western Territory
 - The foundation of the presentation today is based on solutions and overall advantages to remote level/flow monitoring for wastewater collection systems
 - Newer items will touch on stormwater monitoring and H2S monitoring
-

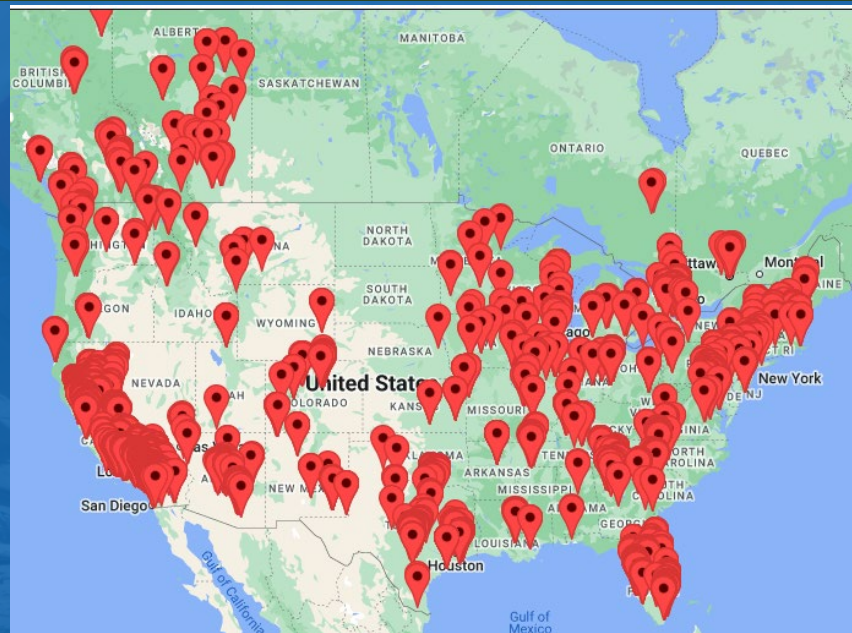
WHO WE ARE

- 17th year of operations
- HQ in Southern California, Escondido, San Diego County
- Founded by two elected water agency officials
 - Greg Quist, Ph.D. (Rincon MWD, SDCWA, Yale, UCSB)
 - David Drake, EE (SDCWA, Rincon MWD, CalTech, USC)
- Teamed with XPV Water Partners in 2016 to accelerate growth
- Industry Innovator - 17 Patents
- Logged over 200 million operating hours
- Over 25,000 surcharges detected



Remote Monitors Across North America

- Example of customers who are using remote monitoring in North America
- Depending on the application, we work with agencies large, small and everyone in-between.
- Customers can utilize a few units up to thousands
- Serving more than 600 utilities with 6,000+ sensors in the field

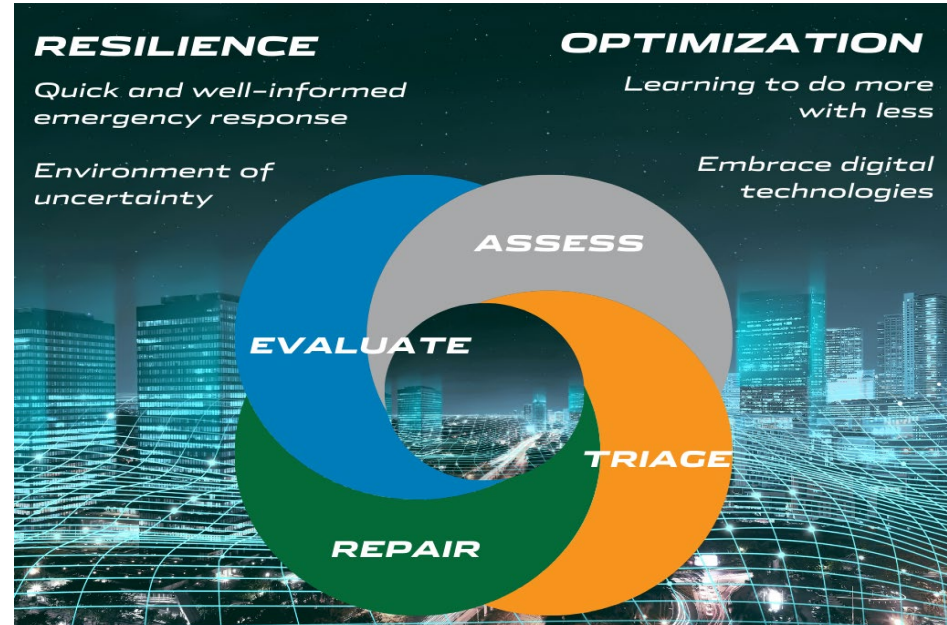


HOW CAN REMOTE MONITORING HELP YOU?

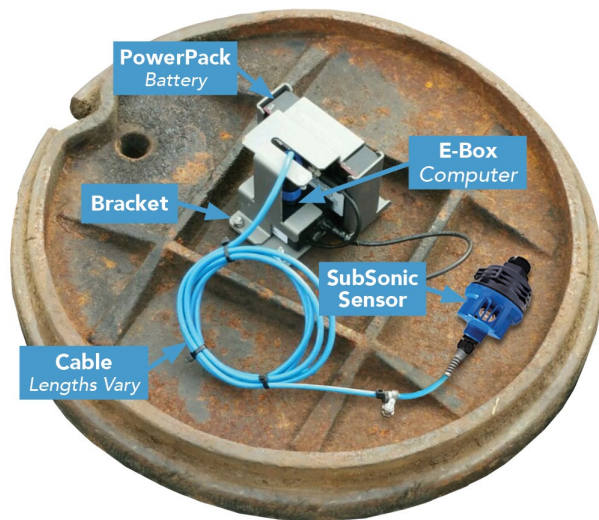
SMART TECHNOLOGY FOR WASTEWATER OPERATORS

Provides a full suite of solution applications:

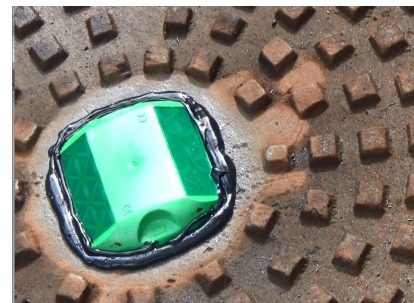
- SSO prevention
- Cleaning optimization
- Inflow and infiltration detection
- CSO outfall monitoring
- H2S monitoring
- Stormwater management
- Entry detection
- Real-time collection system monitoring and condition assessment
- Capital project prioritization
- Asset management



Remote Monitoring Hardware



- **E-Box:** computer, data transmission, power management, digital radio
- **PowerPack:** primary battery cells, 2-year lifespan
- **SubSonic Dual Sensor:** 4" to 79" range. Includes Pressure Sensor
- **Antenna:** E-Square or E-Dot flush mount, snowplow resistant, traffic rated
- **Cable:** 15', 25' or custom



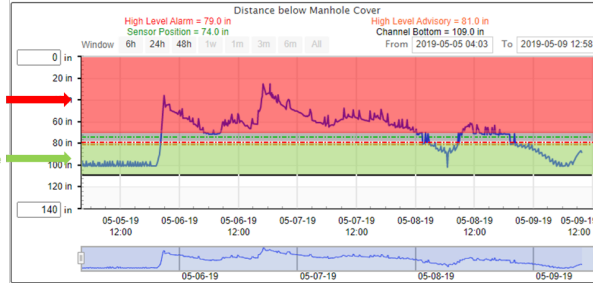
New Remote Monitoring Technology: "Dual Sensor"



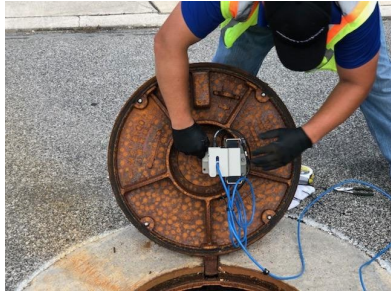
- Full dynamic range of your manhole
- Accuracy on narrow inverts
- Low maintenance
- Ideal for remote locations

Pressure Sensor Mode

Ultrasonic Sensor Mode



Remote Monitor Installation Advantages



- **No confined space entry with standard installation**
- Easily attaches to any manhole or hatch
- One step satellite comms activation
- About 45 minutes to 1 hour per install
- Bracket mounts: flip, slide
- Slide impact shield available
- Optional "Manhole Marker"
- Alternate install: Side Mount Bracket, requires confined space entry



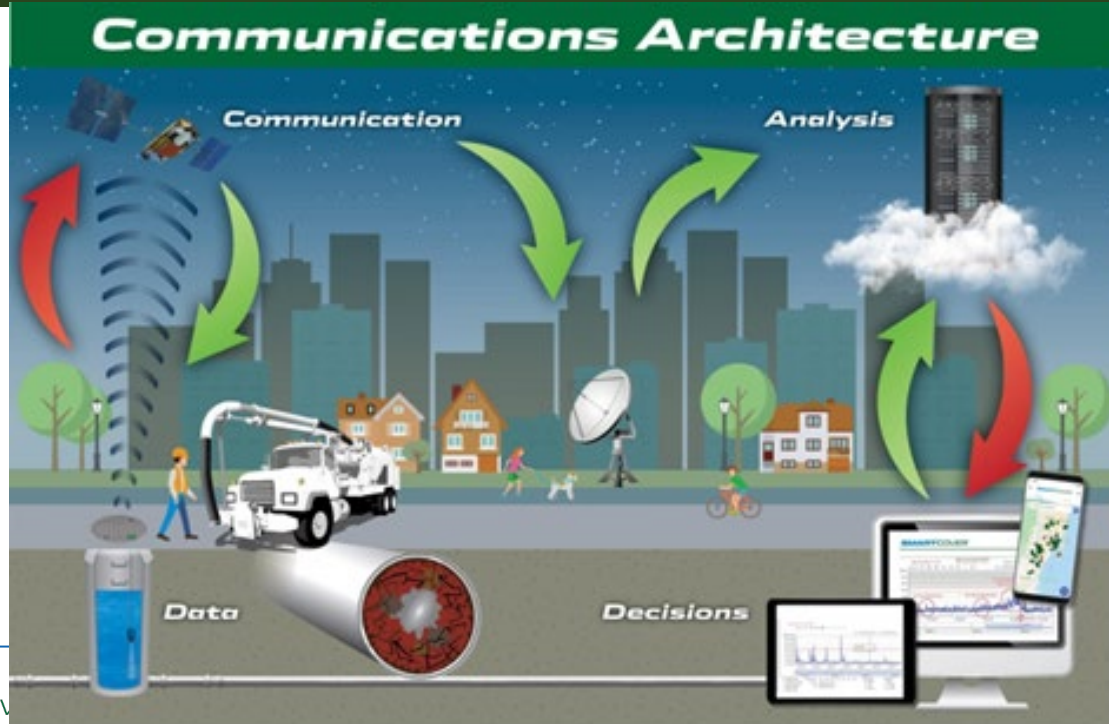
Installation Example

INSTANT INFRASTRUCTURE



WE'VE GOT IT COVERED™

Remote Monitoring: How It Operates



WE'VE GOT IT COVERED

RELIABLE, UNIQUE COMMUNICATIONS



Iridium data transmission is impervious to power outages and severe weather.

- Iridium satellite system includes 66 active satellites in low earth orbit and polar caps
- Global, redundant coverage
- Small horizon visibility
- Mission critical reliability
- Used by the U.S. DOD
- No issue with underpasses or trees
- 100% reliability during hurricanes, blackouts, sever weather patterns

Easy User Access to Data

- Secure, dedicated user website dashboard
- YOU own the data
- Cloud-based, 24/7 access with any web-enabled device
- Unlimited users, data storage, archives, text & email notifications
- Response team notification settings
- Automatic system updates and upgrades
- World-class customer service with a live person



Mobile Application!

UNDERGROUND INSIGHTS ON THE GO



**YOUR SEWER MONITORING
JUST GOT EASIER**

SmartCover Mobile App Now Available for iOS and Android

Easily puts your sewer status at your fingertips – get the insights you want, when and where you need them. The app complements the SmartCover software and is FREE to all our users. It's the latest piece of gear for working on the front lines!

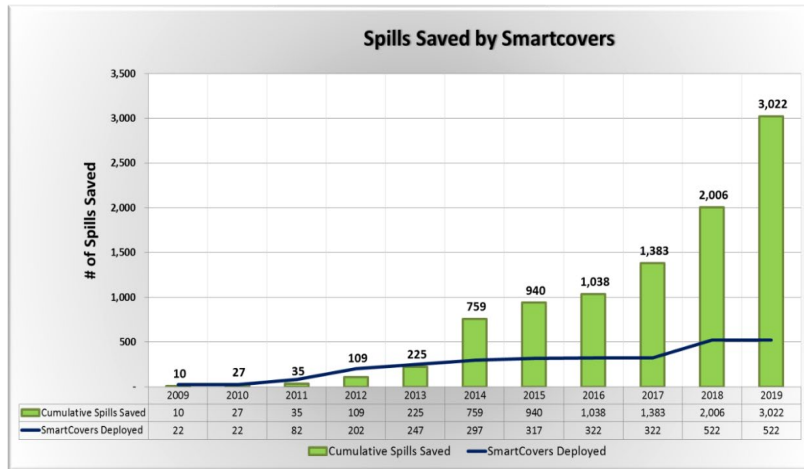
SMARTCOVER
WE'VE GOT IT COVERED™
SmartCoverSystems.com

- iOS and Android compatible
- Unlimited users
- FREE to all users
- Available through Google Play and Apple App Store

WE'VE GOT IT COVERED™

SSO Monitoring and Prevention

Save Paper Work, \$\$, and Reduce Outside Stress



- Flooding hot spot
- High frequency cleaning location
- Lift stations
- Siphons
- Easements
- Grease areas
- Environmentally or politically sensitive areas
- Previous spill location
- Future CIP or old pipe sites

- 3,022 Spills saved from 2009-2019
- \$5,000 average cost per spill
- ROI over 10 years estimated at **11.4 MILLION**

Lift Station Back Up

WHEN POWER GOES OUT, SYSTEMS GO DOWN

- Independent, redundant monitoring
- Safeguards against power loss during severe weather
- Battery powered, off the grid
- Satellite signal strong when cellular overloaded or down
- Complements SCADA
- Pump failure or partial failure



Smarter Cleaning Utilizing Remote Data

How can Remote monitoring help with time and resources?

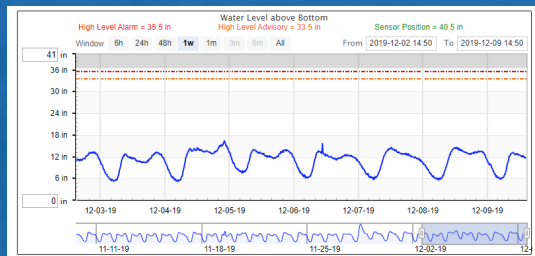


Go from “just in case” to “as needed” saves valuable resources.

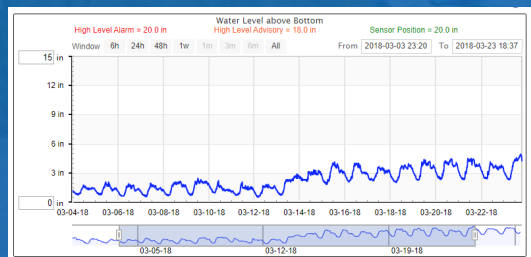
- EPA’s Capacity, Management, Operations and Maintenance (CMOM) Program
- Demand on resources:
 - Personnel
 - Equipment: trucks, infrastructure
 - Management
 - Capital funding
- Accelerates pipe deterioration
- “Just in case” repetitive cycle

FLOW TREND ANALYSIS

PROPRIETARY SOFTWARE

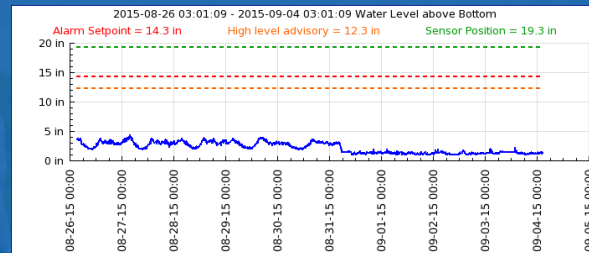


Normal Pattern

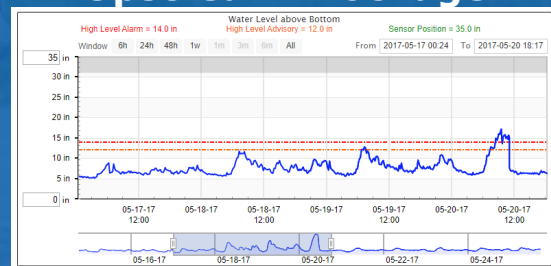


Grit Build Up

- Monitors multiple segments
- BOTH up and downstream
- Detects blockages from most common causes -- Fats, Roots, Oils, Grease (FROGS).



Upstream Blockage

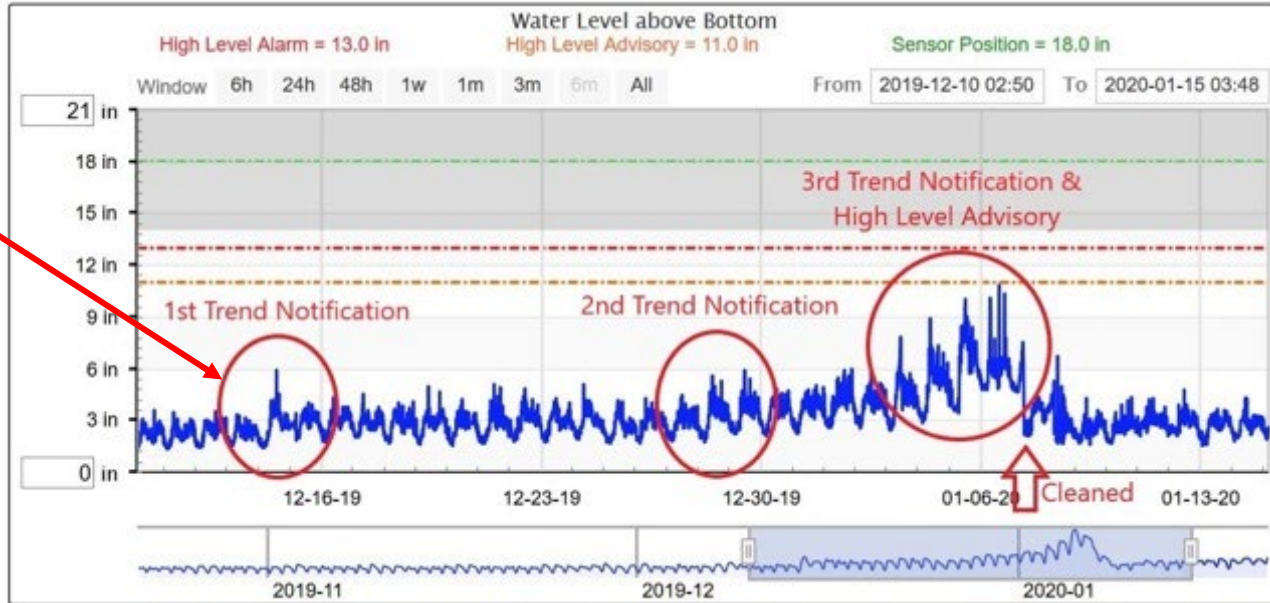


Downstream Blockage

Utilizing Data to Clean When Needed

**1st Advisory
3 Weeks Prior
to Required
Cleaning**

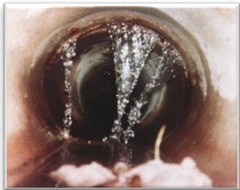
**Helps Trigger
and Prioritize
Cleaning
Activity As
Needed**



= NO SPILL!

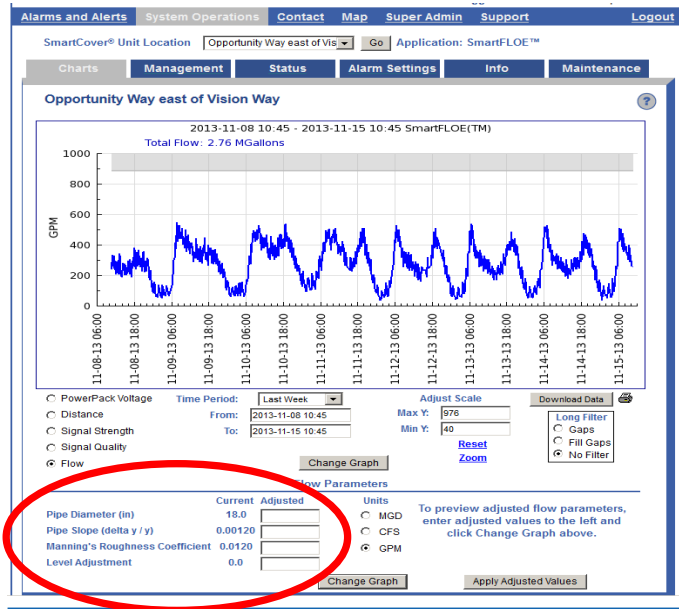
Utilizing Remote Monitoring for Flow Estimation

ADVANTAGES FOR PERVASIVE DATA COLLECTION



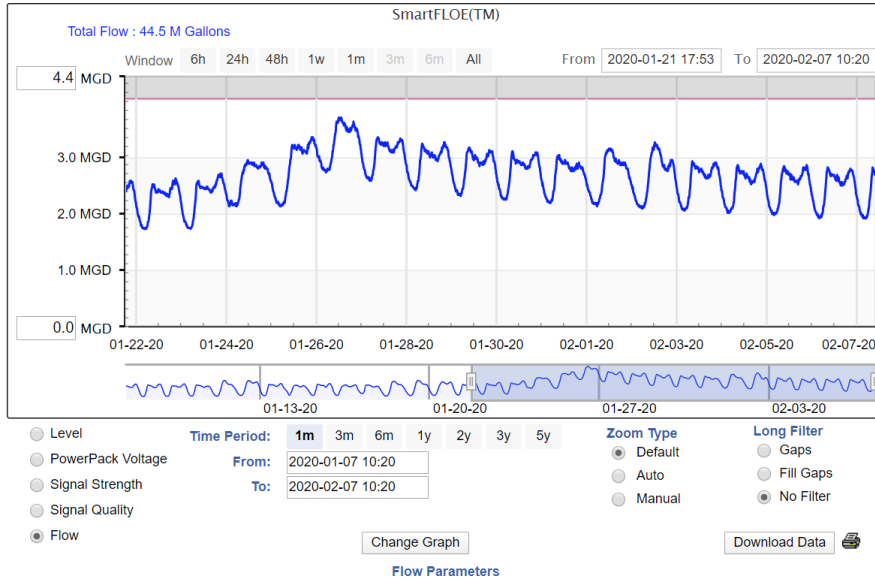
- NO CONFINED SPACE ENTRY installation
- Fast relocation with simple manhole cover attachment
- I&I reports use same dashboard
- Two-year battery life is low maintenance and ensures no data loss
- Non-contact sensors - no sensor fouling or maintenance
- Rain, tidal, river, stream data fully integrated

How Flow Estimation Works



- Input from each location
 - Pipe diameter
 - Slope ($\Delta y/y$)
 - Roughness coefficient, pipe material
- Dynamic measure at site: distance or level
- Ability to adjust variables based on KNOWN values or error correction
- Used in conjunction or after AV meters, depending on the project

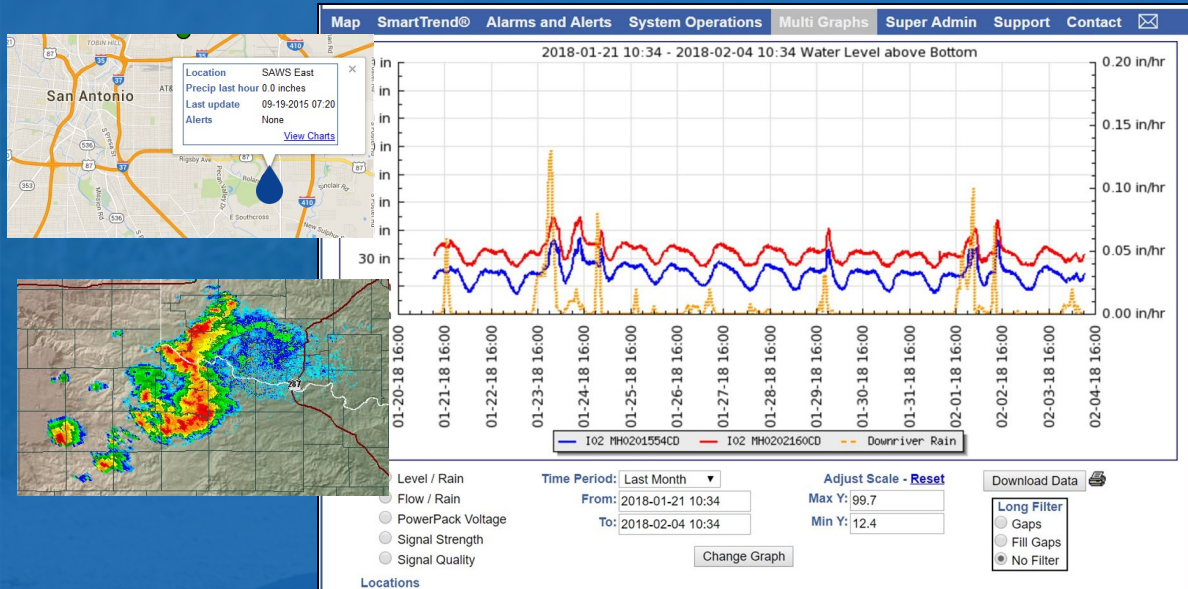
How Flow Estimating Can Be Utilized



- **Inflow & infiltration studies**
- Capacity studies
- CMOM/SSMP
- Bypass projects
- General flow monitoring

I&I: Tools Used with Flow Estimation

RAIN, TIDE, RIVER, STREAM OVERLAY

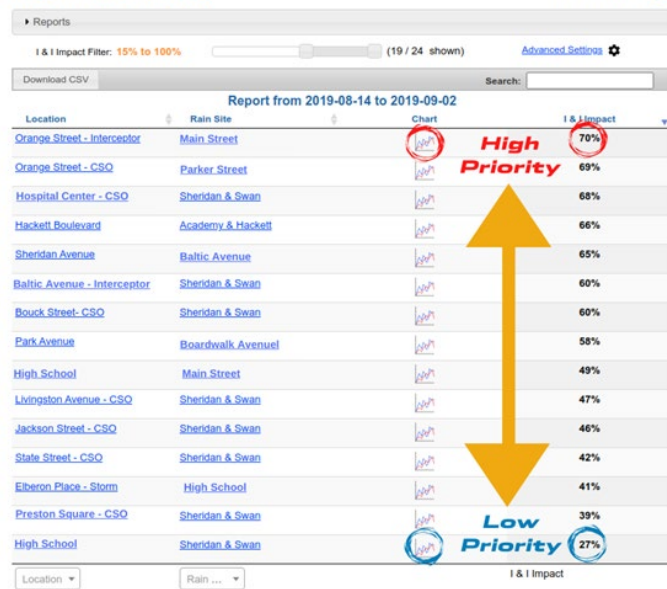


- U.S. National Oceanic and Atmospheric Administration (NOAA) doppler radar and other data sources
- Multiple sites
- Hourly updates
- Download data to spreadsheets
- NO MAINTENANCE
- Automatic software updates
- 0.62 miles or 1km² area

I&I: Tools Used with Flow Estimation

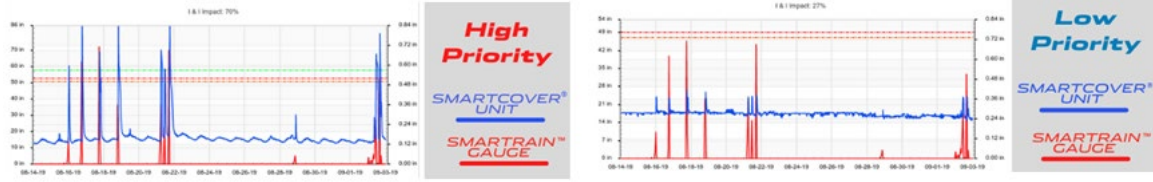
PROPRIETARY SOFTWARE: IInSight™

Inflow and Infiltration Report



I&I Impact Report can provide:

- Insights on when and where I&I is occurring
- Location ranking for where the I&I impact is highest
- Quantifying the correlation between localized rainfall and sewer response
- Analyzed data from single or multiple rain events
- Focused I&I inspection, rather than global



WE'VE GOT IT COVERED™

South Suburban Sanitary District, OR

Background

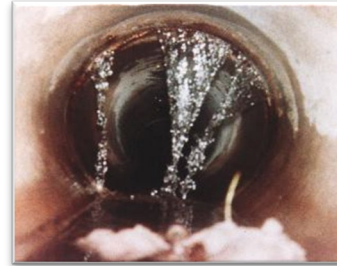
- Multiple Interviews, meetings, and system reviews were conducted with Mike Fritschi, District Manager, and his team
- Located in Klamath Falls, OR
- Covers roughly 10 square miles and serves a population of approximately 25,000 people with more than 7,500 households and businesses
- Most of the sewer mains were installed in the 1960s and 1970s and are comprised of asbestos cement (AC) pipe
- Owns and maintains more than 100 miles of sewer pipe with about 1,000 manholes



South Suburban Sanitary District, OR

The Challenge

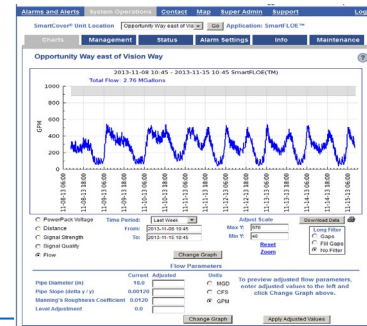
- Mike came into the district in 2011, and was looking for a way to quantify I&I and figure out where it was coming from
- The District initially started by utilizing the traditional Area Velocity (AV) Meter. These units are well established as reliable flow monitoring systems
- However, the AV meters weren't the best fit for the project:
 - Hard to move
 - Expensive
 - Manual Downloading required



South Suburban Sanitary District, OR

The Solution

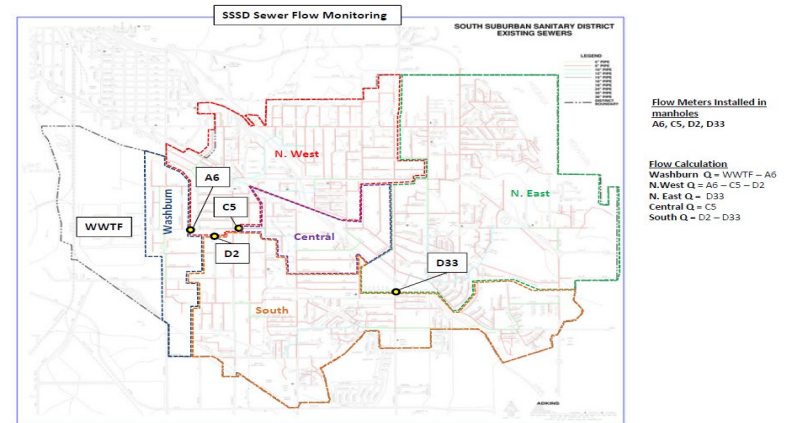
- Instead of the traditional approach, Mike reached out to our team for assistance
- As mentioned before, the monitors were less expensive, easier to move around for their project, do not require confined space entry, and can send data automatically to a secure website for viewing
- In conjunction with the AV meter(s), SSSD also had the flexibility to “calibrate” the monitors to match a known flow value, thereby giving them the same accuracy as the AV meter



South Suburban Sanitary District, OR

The Strategy

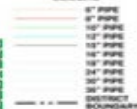
- Install monitors at their specific “Sewer Sheds”
- View the data, and see which sewer shed was contributing most to SSSD’s potential I&I problem during rain events.
- Using the monitor’s Website, SSSD was able to view the data remotely, compare the data with wet and dry data, and see which sewer sheds were giving them the most impact.
- From there, SSSD was able to create “virtual” meters by combining certain meters from different basins.



SSSD Sewer Flow Monitoring

SOUTH SUBURBAN SANITARY DISTRICT EXISTING SEWERS

LEGEND



Flow Meters Installed in
manholes
A6, C5, D2, D33

Flow Calculation

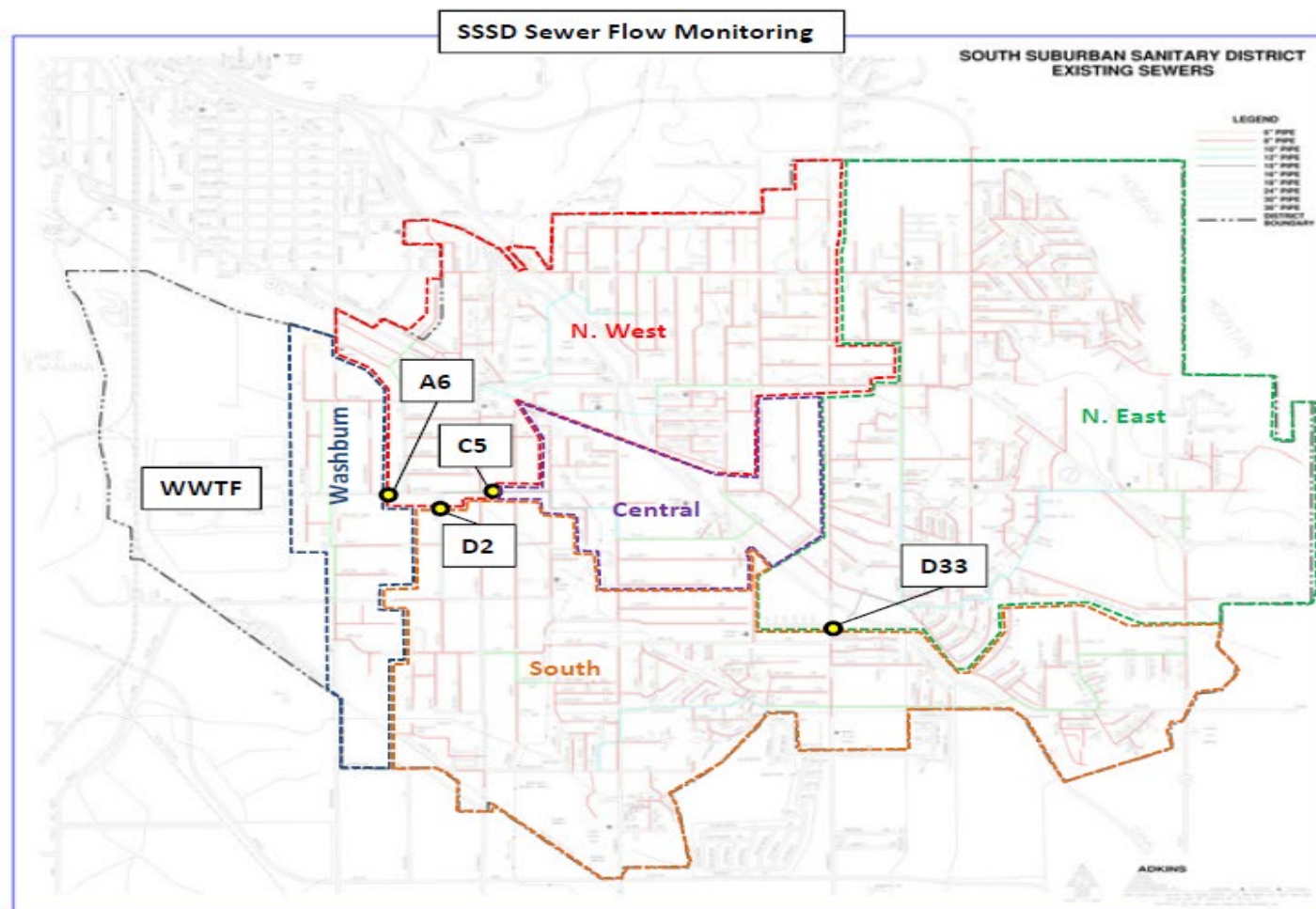
Washburn $Q = WWTF - A6$

N. West $Q = A6 - C5 - D2$

N. East $Q = D33$

Central $Q = C5$

South $Q = D2 - D33$

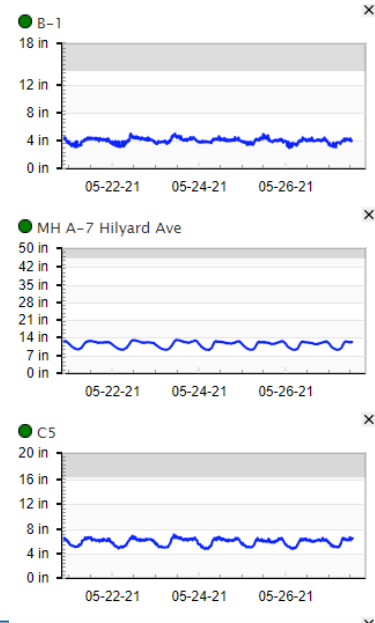


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South Suburban Sanitary District, OR

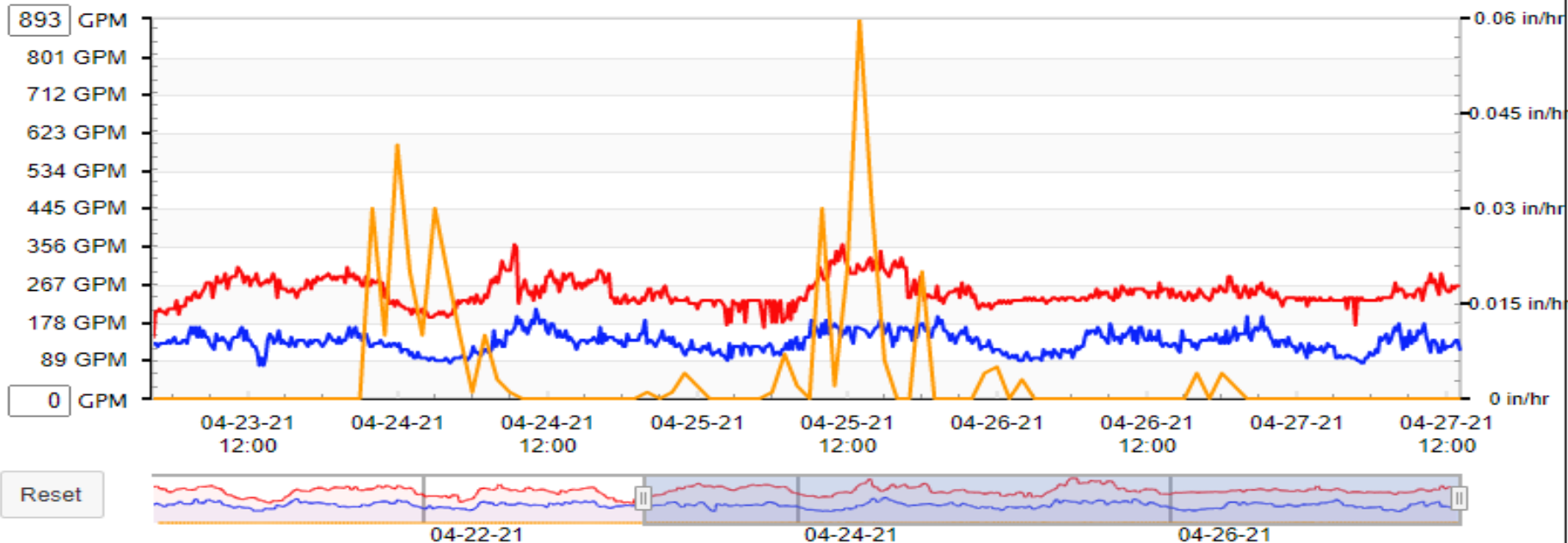
The Results

- SSSD was able to separate their different “Sewer Sheds”, and show data for each during wet and dry weather
- Using this remote monitoring, they were able to view the data remotely, and figure out which sewer sheds were giving them the most I&I
- They picked out specific basins to then investigate further
- Moving forward, they still receive the ongoing data at each of these sites, which they can use to proactively prepare for future projects



Window 6h 24h 48h 1w 1m 3m 6m All

2021-04-23 04:20 — 2021-04-27 13:05



Time Period: Custom

From: 2021-04-20 13:05

To: 2021-04-27 13:05

Long Filter: No Filter

Update Chart

Download Data

Locations

- A-32
- B-1
- [RAIN] Klamath SmartRain

- Flow GPM
- Flow GPM
- Rain

+

-

Total : 836,847 Gallons

+

-

Total : 1.56 M Gallons

+

-

Total : 0.39 in

Chart up to 5 data series by selecting additional locations & their data types.

South Suburban Sanitary District - 812 SSSD

You are logged in as: [bquist](#) :: Super Admin :: [Switch Organization](#) :: [Log out](#)

Map SmartTrend® Alarms and Alerts System Operations Multi Charts Super Admin Support

- ☒ All Sensors (13)
- ☐ Alerts (0)
- ☐ Alarms (0)
- ☐ Alarms Disabled (0)
- ☐ Advisories (0)
- ☐ Archived (4)

APPLICATIONS

- ☒ SmartFLOE™ (9)
- ☒ Combined Flow (2)
- ☒ SmartFLOE™ - U Shaped (1)
- ☒ SmartRain™ (1)
- ☒ All

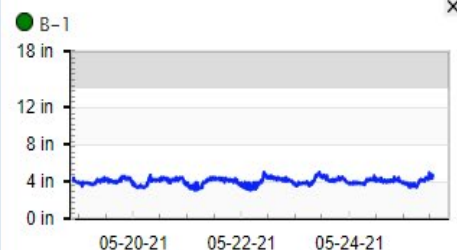
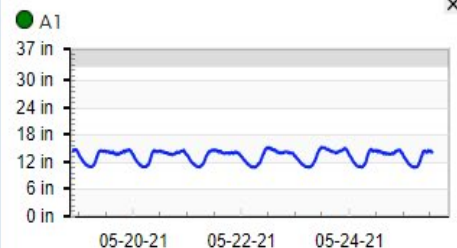
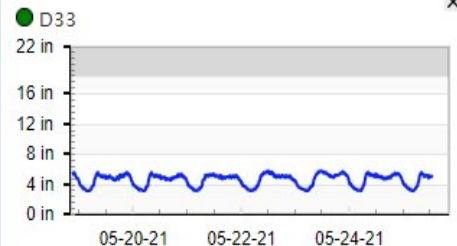
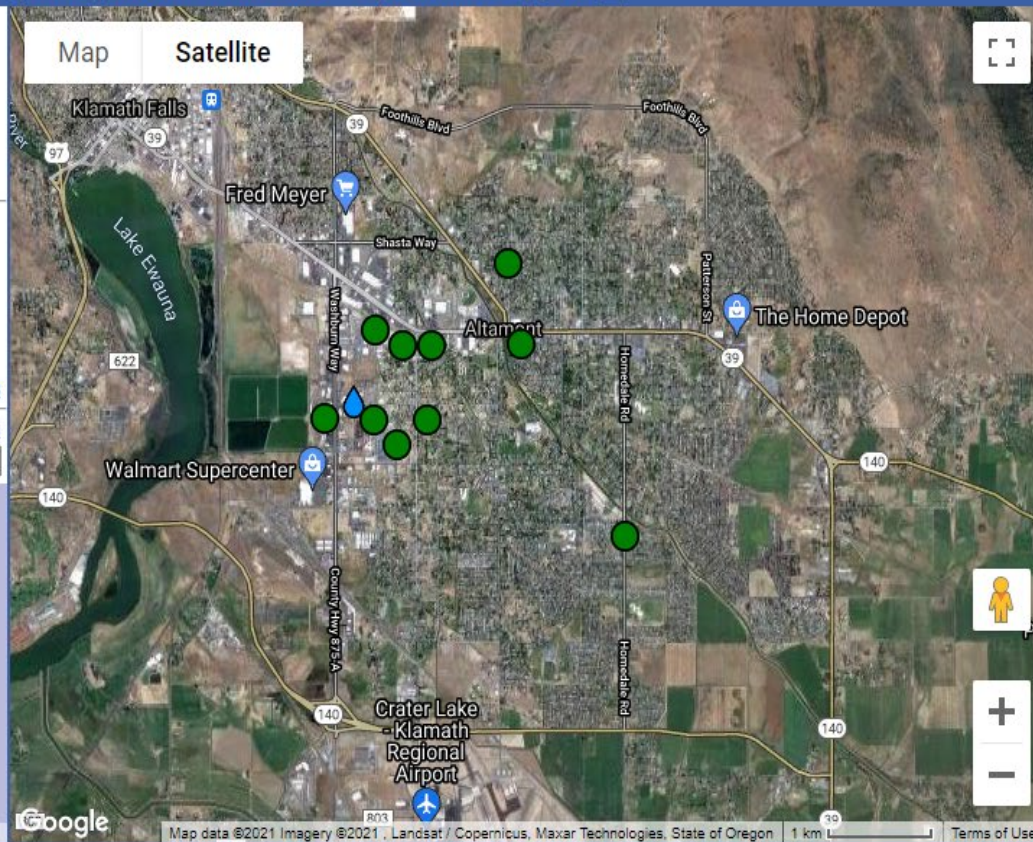
[Show All Applications](#)

LOCATIONS

[Icon Legend](#)

Search Locations

- ☒ 3213 Austin St
- ☒ A-13-2
- ☐ A-15
- ☒ A-32
- ☒ A1
- ☒ B-1
- ☒ B11
- ☒ C5
- ☒ D33
- ☒ MH A-7 Hilyard Ave
- ☐ N. West Q
- ☐ South Q



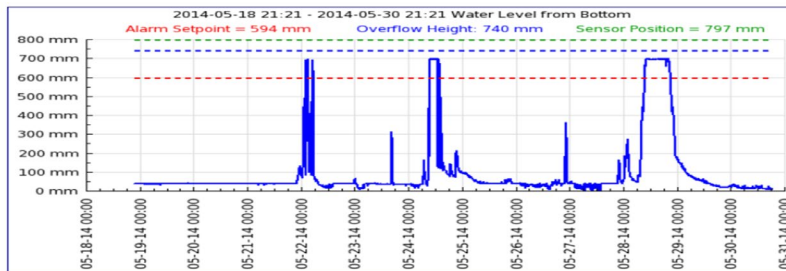
WE'VE GOT IT COVERED™

CSO MONITORING

MONITORING RANGE OF LOCATIONS

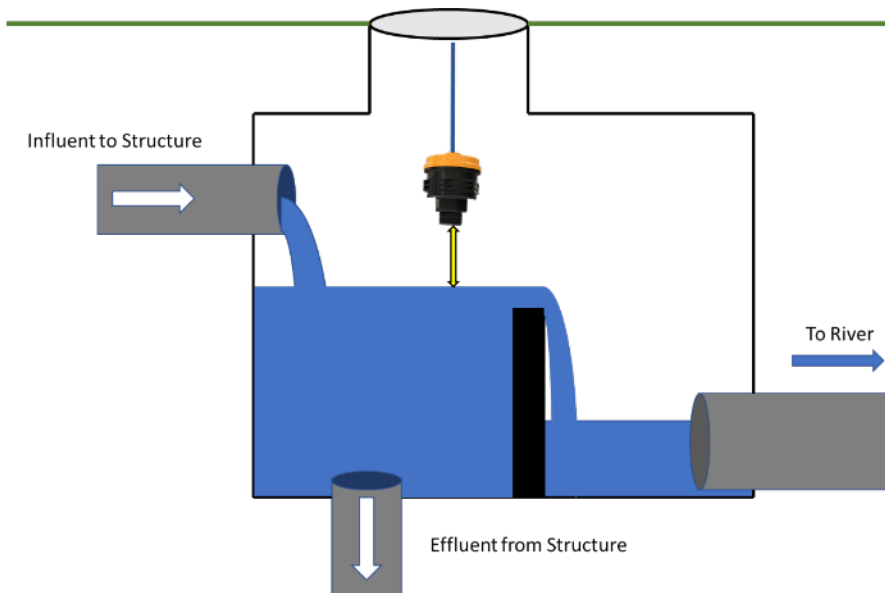


- Monitoring for normal water levels
- Detect start/stop times of overflows and durations
- Flow quantity
- Built-in public notification



COMBINED SEWER OVERFLOWS

DIVERSION STRUCTURE BASICS



- Standard weir equations used for flow calculation
- No two control/diversion structures are the same!
- Sensor location flexibility is key
- Reliable real-time data during storm events is key

Remote Monitoring in Stormwater

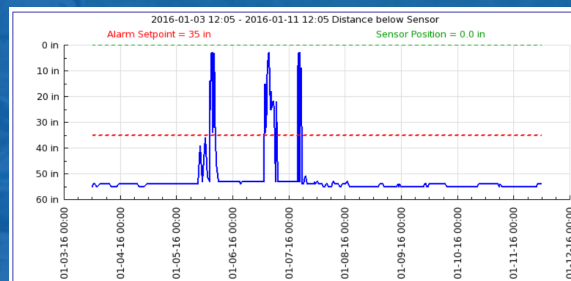
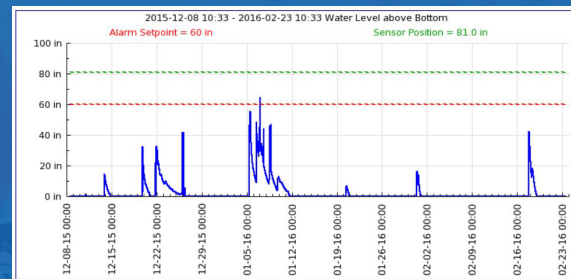
REAL-TIME RESPONSE DURING RAIN EVENTS



- Stormwater monitoring
- Net service verification
- Expense control function



- Stormwater monitoring
- Storm drain dry well response
- Pre-position equipment



Remote Monitoring: Thinking Outside the Sewer

ELECTRICAL ENCLOSURES



- National Electrical Manufacturers Association (NEMA) defines standards for electrical enclosures
- Water intrusion monitoring & alert system
- Industrial and nuclear facilities
- Canals, rivers, colder regions
- Remote monitoring eliminates time consuming visual inspection
- Corrosion resistant

H2S Monitoring System

REAL-TIME REMOTE HYDROGEN SULFIDE MONITORING

- Enables reliable, real-time measurement of H2S levels over extended periods of time.
- Knowing where the H2S problem is allows for targeted mitigation strategies
- Applications where the H2Scents system can be deployed include:
 - H2S studies (collection system and treatment plant)
 - Monitoring odor and corrosion hot spots
 - Chemical dosing optimization for H2S control
- Municipal locations where the system can be deployed include:

• Force main discharges	• Headworks/bar screens
• Pump station wet wells	• Aerated grit basins
• Gravity lines	• Primary clarifiers
• Siphons	• Solids dewatering operations



New Benefits in the H₂S Monitoring Space

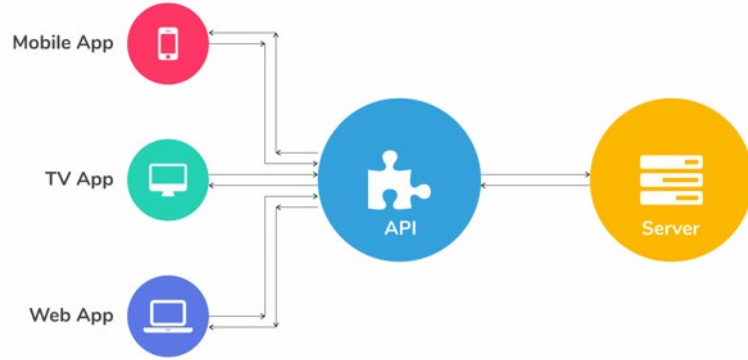
H₂SCENTS® BENEFITS AND FEATURES



- Min. 3-month calibration interval
- Common interface – integrates with existing SmartCover dashboard
- Measures 0-1,000 ppm
- Ability to overlay H₂S data with level, flow, or rain data

SCADA/DATA INTEGRATION

APPLICATION PROGRAMMING INTERFACE (API)



- Standardized programming interface using modern data formats
- HTTPS (Web) based
- JSON (Javascript Object Notation) responses
- Easy to interface with using almost any programming language
- Secured using (JWT) JSON Web Tokens and TLS Encryption

KEY DIFFERENTIATORS

- Superior data management and done-for-you analytics and reports
- Satellite communications backbone withstands downtime due to severe weather, cellular or power outages
- Unlimited data storage, users, and notifications using a web-based platform available on any smart device
- Bi-directional, adjustable alarm settings allows operators to quickly respond to sewer issues
- Ideal for remote infrastructure sites
- Automatic software updates
- Monitoring data fused with flow, tide, rain



NOTABLE FEATURES

- Entry detection included at every sensor site
- Two (2) year battery life
- Mobile app for all active accounts, iOS and Android devices
- API available
- **NO CONFINED SPACE ENTRY** installation or service

CONTACT

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Local Channel Partner: Whitney Equipment

Brad Vande Vusse: bvandeusse@weci.com

Laura Haggard: lhaggard@weci.com

Website Walkthrough (time permitting)



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