

# The Cost of Water:

## Private Wireless Networks vs. Cellular Connectivity for Water/Waste Water SCADA Communications



# Biography



## **Mike Dalton**

Wireless Sales Director, Americas

Based in Scottsdale, AZ, Mike is responsible for business development for Siemens' RUGGEDCOM WIN wireless product portfolio. Mike's background with wireless solutions includes over 25 years of selling a wide variety of point-point, point-multipoint, and mesh wireless product for various industry leading manufacturers, while addressing multiple critical infrastructure markets that successfully employ these solutions (utility, water, oil and gas, ITS, enterprise).



## **Todd Wedge**

Business Development Manager, CrossBow Secure Remote Access Solutions

Todd Wedge is a Business Development Manager at Siemens Industry responsible for the CrossBow secure remote access solution in the U.S. Region. Prior to his current role, he led a global program at Siemens PLM Software accountable for market share of fluid dynamics software to universities and research centers. Todd has a 15-year sales and business development background in network and application security for enterprise, government and industrial markets. He holds a Bachelors in Business Administration from the University of Texas at Dallas and a Masters in International Business from the University of London.

# Table of contents - Private Wireless Networks vs. Cellular Connectivity



• SCADA Communications	5
• Connectivity Challenges	6
• The Case for Cellular and Private Networks	7-8
• Siemens' Private Network Solution	8-12
• Public vs. Private – ROI Comparison	13-15
✓ Legacy Private Network vs. 4.9GHz	
• Private Network Customer Examples	16-18
• Comms Connectivity Summary	19



**THE COST OF**  
**WATER** 

## Topics:

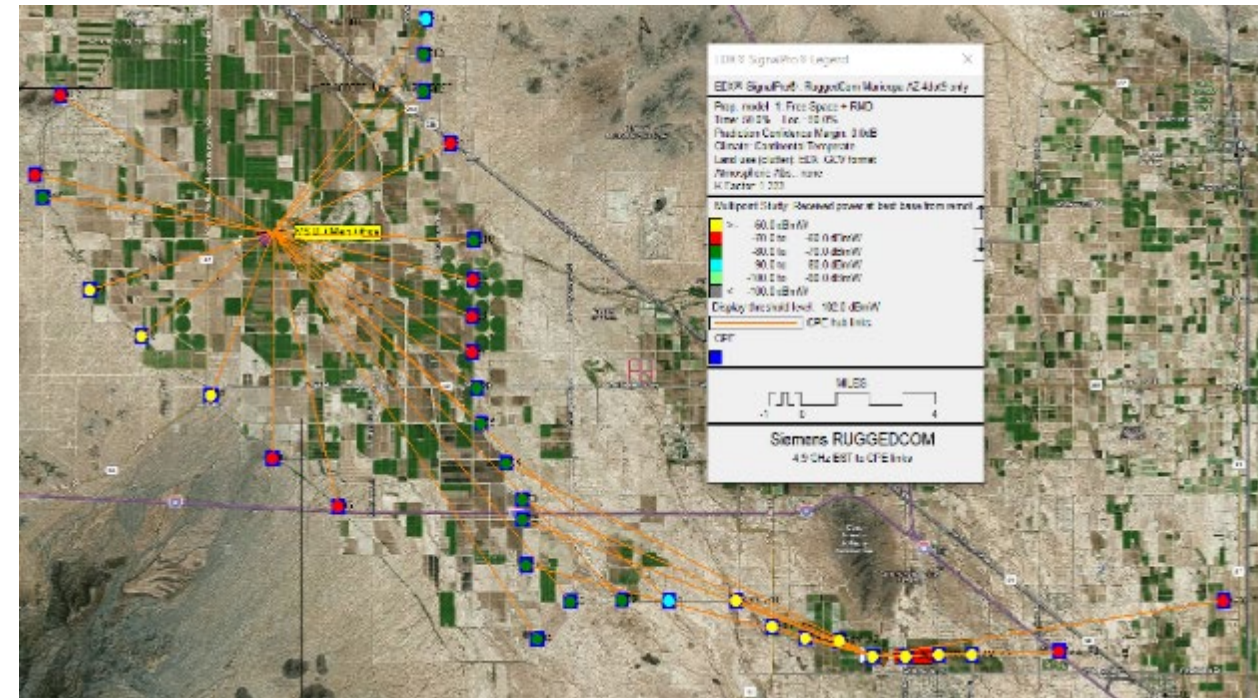
Review and compare the costs and benefits of a private wireless solution vs. cellular connectivity for critical infrastructure SCADA communications



# SCADA Communications for Water Wastewater Operations



- Reliability and timely secure data delivery are a must
- Direct control over operations via real-time info
- Data demand/multiple applications using same communications medium
- QOS is important with multiple applications
- Connectivity options: Cellular, fiber, telco, wireless
- Ever-growing IIOT demanding more bandwidth



# Connectivity Challenges

- Number of sites to connect
- Distances involved
- CAPEX or OPEX approach
- LOS and freq band decisions when private wireless network is chosen
- Is cellular best effort good enough - or is QOS for optimal application performance preferred
- Overall network reliability
  - Redundancy options
  - Maintenance and repair
  - Shared or private network



# The Case for a Cellular Communications Connectivity Approach

- Cellular is easy to implement – modem and SIM card, acceptable 1-time upfront costs
- Quickly deployed and in service
- Sometimes OPEX is tolerable – annual budgeting can be preferable to some companies





# The Case for a Private Wireless Network Approach

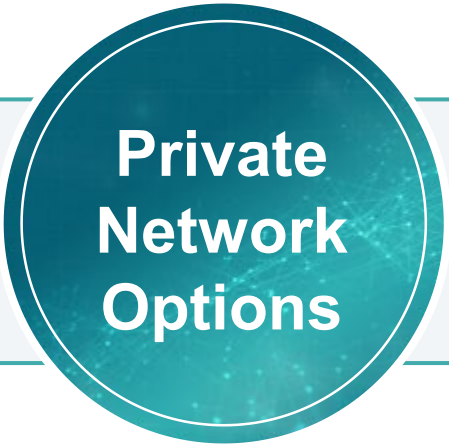


- Critical infrastructure companies want better control over the network than a carrier typically delivers
- One-time CAPEX cost is generally preferable
- 802.16e standard delivers consistent performance via QOS and prioritization for applications
- Private network has better redundancy options
- In a natural disaster, you have primary control over repair cycles



# Wireless Communications

## Private Networks



	Wi-Fi Mesh	Narrowband	Low Power Mesh	RUGGEDCOM WIN
	Small, consolidated deployments, such as video surveillance for campuses	Long range, single application edge device connectivity requiring very little throughput	Meter and sensor communications where high latency and moderate throughput are tolerated	Wireless industry coalition, IEEE 802.16e standards based for broadband wireless access (BWA) networks.
	Private	Private	Private	Private
Throughput	●	●	●	●
Range	●	●	●	●
Deterministic latency	●	●	●	●
Security	●	●	●	●
Ecosystem of interoperable suppliers	●	●	●	●

# Siemens RUGGEDCOM WIN – Private Broadband Wireless Solution for Water/Wastewater communications networks



## Applications

- SCADA Connectivity
- Mobile Workforce
- Video surveillance
- VOIP

## Reliability

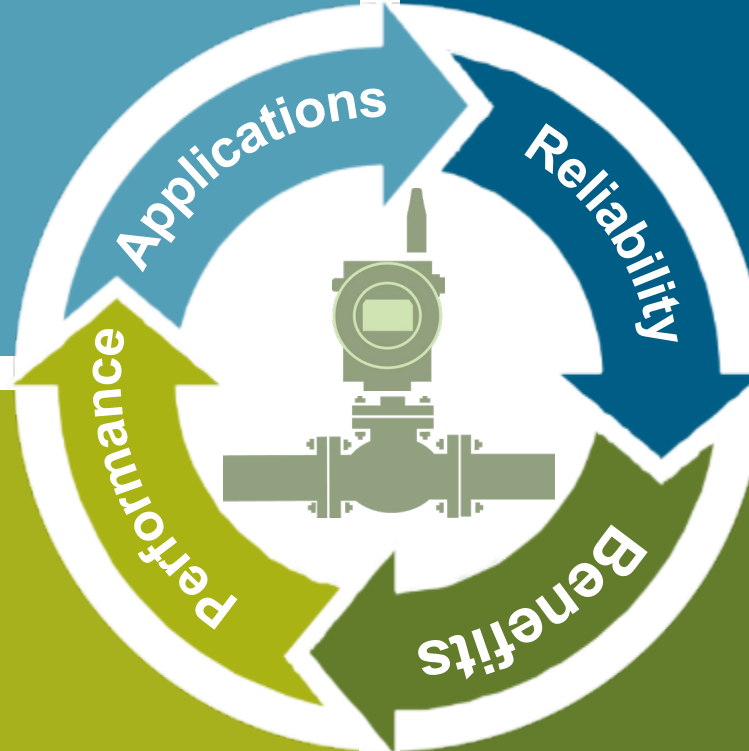
- -40°C to +75°C, IP67
- IEC 61850-3
- Class 1 DIV 2 Compliant
- MIL-STD-810F 509.4
- Redundancy options

## Performance/Security

- Broadband capacity (10 miles)
- Private network (4.9GHz)
- Dedicated bandwidth
- Standards Based, 802.16e
- AES encrypted, AAA authenticated

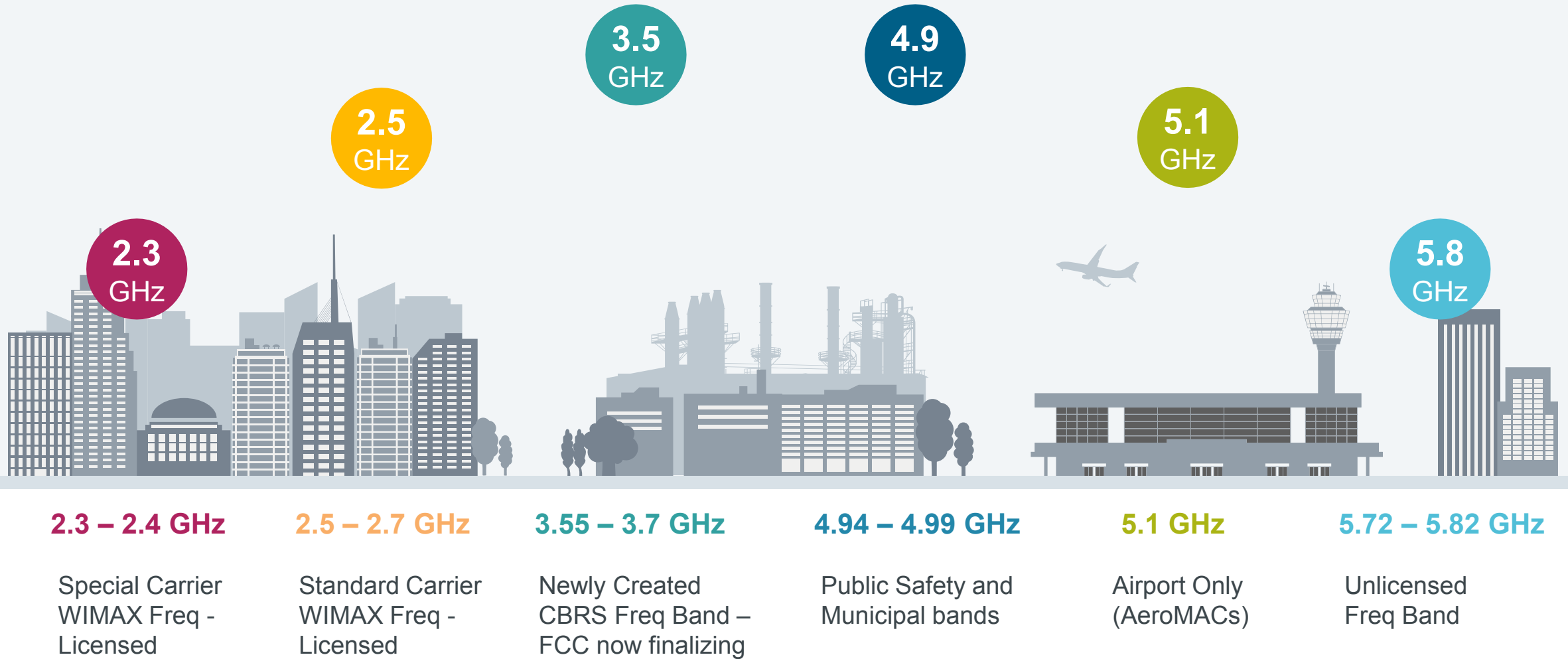
## Benefits

- Greater bandwidth
- Less network interference
- Low latency/repeatable performance
- Scalability
- Greater security





## Private Wireless Networks - spectrum choices - USA



# Wireless Private Network Solutions

RUGGEDCOM WIN Portfolio



**RP-100, RP-110**  
Rugged POE Injectors



**WIN5100**  
Subscriber radio  
without antenna

**WIN7200**  
Standard power  
Base station



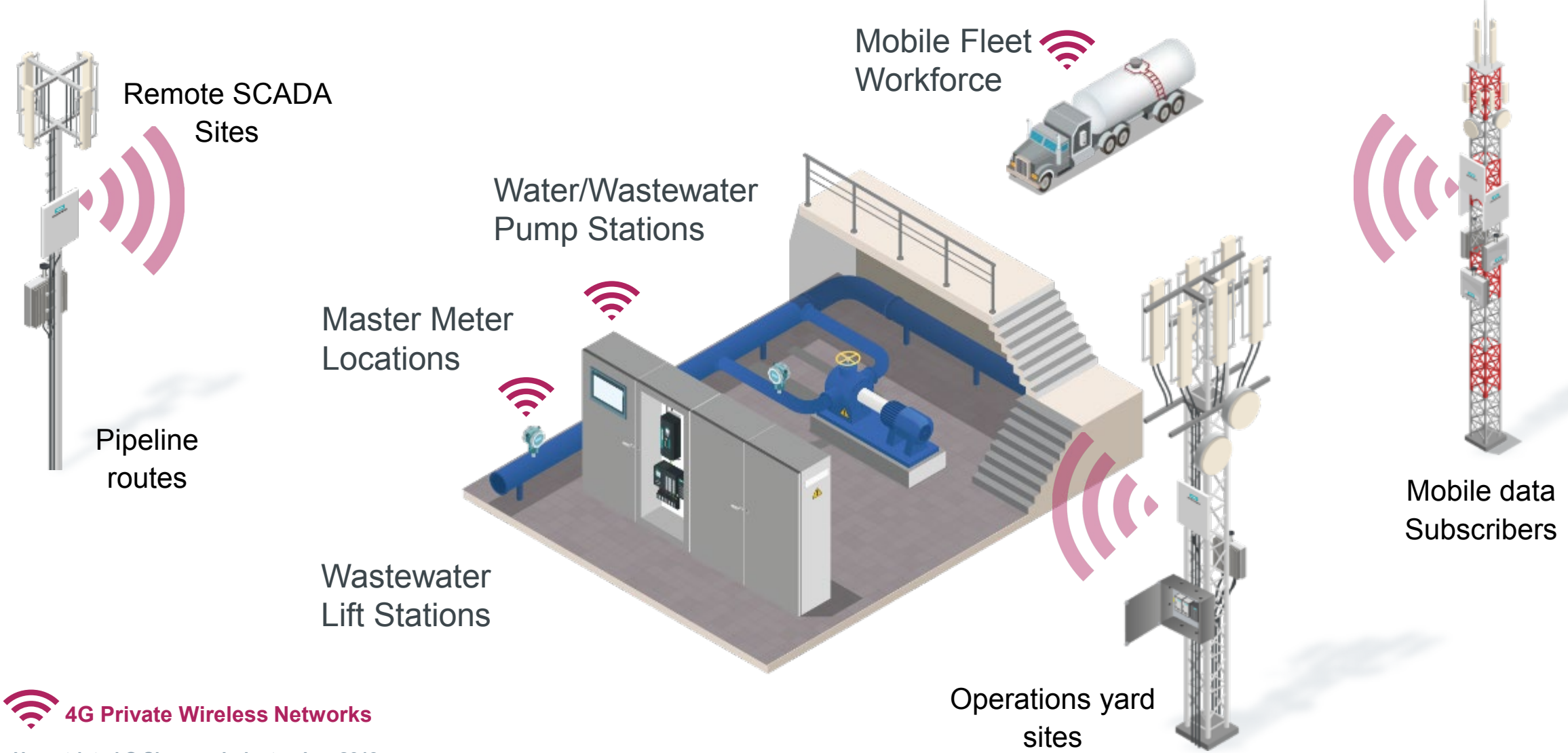
**WIN5200**  
Subscriber radio with  
integrated antenna



**WIN7000**  
High Power Base  
Station

# RUGGEDCOM WIN Solution – Where it Fits...

**SIEMENS**  
*Ingenuity for life*



 **4G Private Wireless Networks**

Unrestricted © Siemens Industry, Inc. 2019



# Private Network vs. Public Network – Calculations

## Approach #1 – Cellular Connectivity via SIM Cards from AT&T or Verizon

Carrier Gateway Set-up Fee (one time)	\$625
RM1224 Cell Modems (one time, 50 sites)	\$50,000
Modem install (one-time, 50 sites)	<u>\$7,500</u>
<b>Total one-time costs</b>	<b>\$58,125</b>
5GB/mo/device plan	\$83.33
50 devices (50 x 83.33) x 12 months	\$49,998
1/10 of one time costs or \$5,812 to annualize	<u>\$5,812</u>
<b>Total ongoing annual costs</b>	<b>\$55,810</b>

## Approach #2 – RUGGEDCOM WIN Private Wireless System

3 ea. Base stations with sector antenna	\$22,707
50 each subscriber radios	\$65,000
Misc. cabling, surge, etc.	\$14,586
Installation	<u>\$75,000</u>

**Total private wireless approach  
(one-time) \$177,293**

**3.2 yrs**

**Payback ROI for Private Wireless Network Approach**

## Other Problems Solved #1 - Upgrading from Legacy Private Wireless Networks

### Challenges with Legacy Networks

- Aged 900MHz radio system for SCADA
- Unreliable: RF interference due to high noise floor
- Low throughput: < 1Mbps max
- Best effort bandwidth – no true QOS capabilities
- Replacement radios/parts: many legacy products discontinued

### Siemens' Private Wireless Network Solution

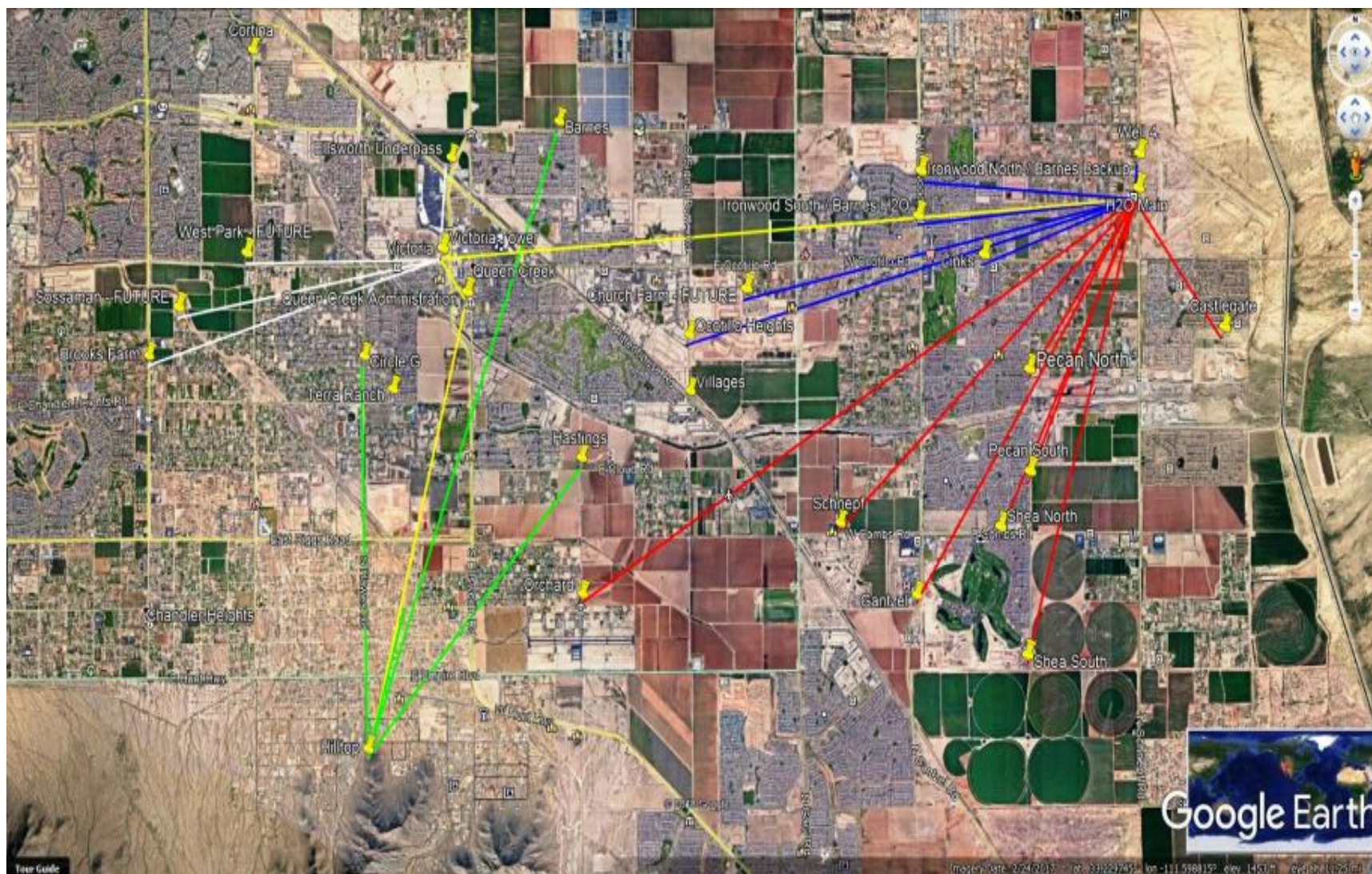
- Municipalities can apply for the use of the FCC's licensed 4.9 GHz frequency band
- RF interference issues are eliminated
- 10~ times the throughput of 900MHz systems
- Prioritization and QOS as part of the radio standard used (802.16e)
- Eliminate outdoor enclosures for radio equipment
- Mobile applications supported (fleet vehicles)
- Siemens support commitment



# Town of Queen Creek, AZ

## Water

**SIEMENS**  
*Ingenuity for life*



### Problems:

- **Old 900MHz radios could not adequately support basic SCADA communication**
- **1-5 minute response times**
- **RF interference at 900MHz**
- **Old radios were a bottleneck for new sites and video**

- **3 base station towers**
- **Four 4.9 GHz Base station radios with sector antennas**
- **24 subscriber radio locations**
- **Rugged POE injectors**
- **Designed for clear LOS**
- **3 new towers required**

Siemens Solution Partner involved



# Other Problems Solved #2 - Upgrading from Manpower Alone

## New Port Richey, FL Wastewater

Problems

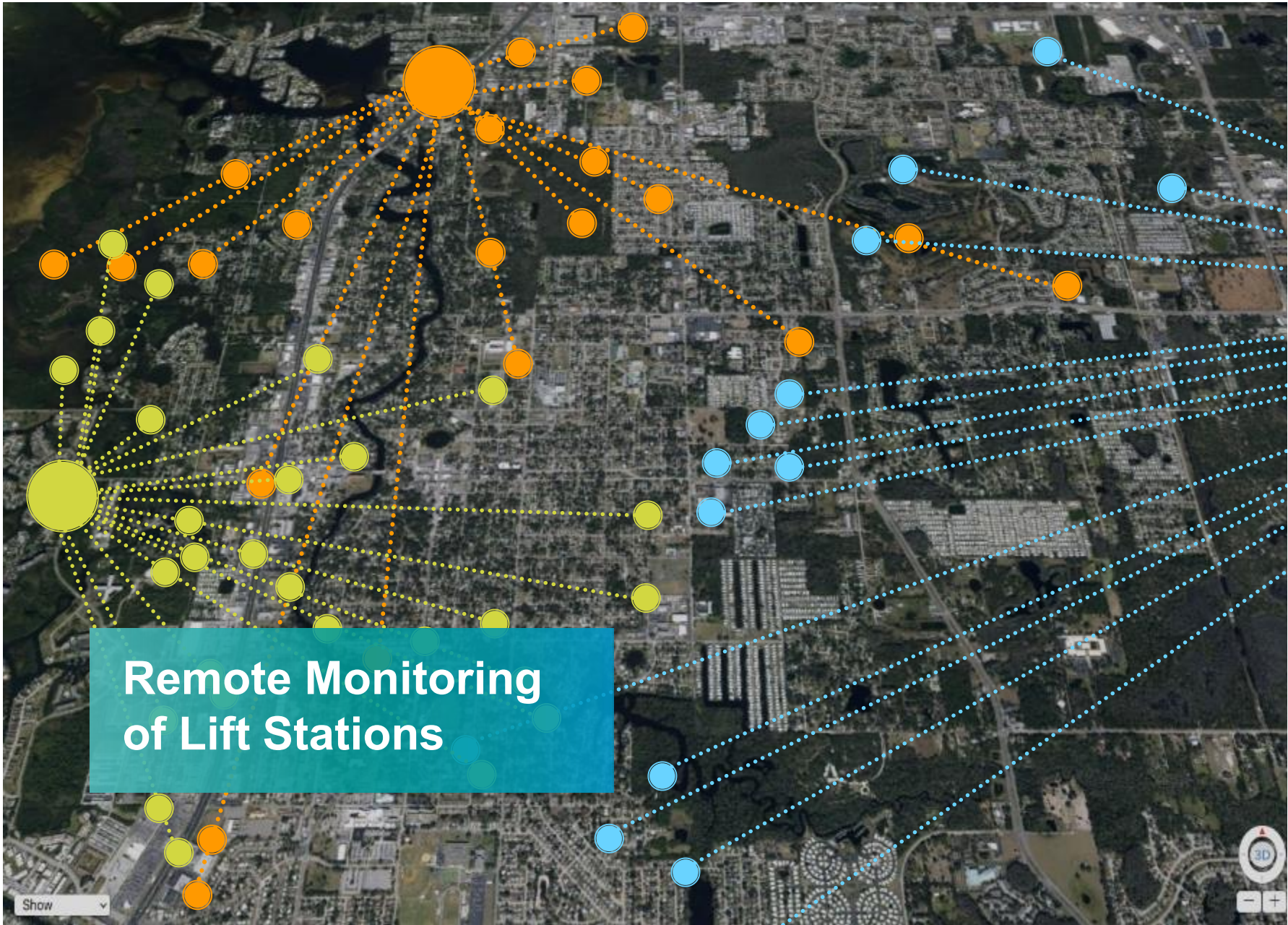
- No remote comms – all manual reporting
- Daily waste of manpower
- Time intensive

- 4.9 GHz frequency band used
- 67 Lift Stations
- Increased bandwidth
- Implementing video surveillance

Siemens Solution Partner involved



Source: Siemens Industry, Inc.  
City of New Port Richey, FL Water/Wastewater Authority



# Summary



- Application growth is propelling through-put requirements beyond just SCADA
- In general, critical infrastructure companies (Water, Electric, O&G) prefer a CAPEX model
  - However - SCADA comms connectivity can take several forms and hybrid approaches are common
- Secure and reliable private wireless networks can be implemented with a reasonable ROI
- Professional system integrators are an important must when designing a private wireless network
- FCC licensed spectrum (4.9GHz) can often be used in the W/WW market



# Access Control in Water/Wastewater Networks

Todd Wedge  
Siemens Industry - RUGGEDSOLUTIONS



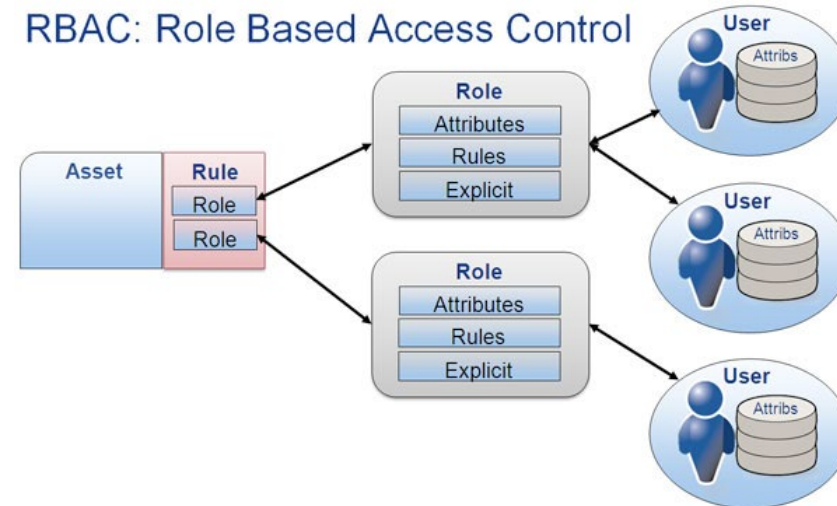


The **principle of least privilege** (PoLP) is an information security term that refers to a user or program that should have the least authority possible to perform its job.

## Role-Based Access Control

RBAC defines the users' security roles, permissions, authorization, and role hierarchy to access critical systems in an industrial control system (ICS).

RBAC: Role Based Access Control



## What is a factor?

A factor is a type of authentication. When you claim to be someone, you need to provide further information to prove that you are who you say you are.

### Something You Know



Username, password, PIN or security questions

### Something You Have



Smartphone, one-time passcode or Smart Card

### Something You Are



Biometrics, like your fingerprint, retina scans or voice recognition

# Factors of Authentication

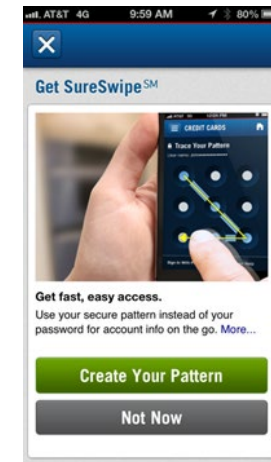
## Factor #4: Somewhere You Are

- Internet Protocol (IP) address
- Media Access Control (MAC) address
- Geolocation services



## Factor #5: Something You Do

- Windows 8 Picture Password
- SureSwipe login from Capital One





## Good Practices for Secure Remote Access

- Eliminate all direct connections to critical assets
- Use multifactor authentication where possible
- Use only full tunneling cryptographic technology
- Establish user-specific authentication servers
- Require role-based authorization levels

# Water/Wastewater Cybersecurity Guidelines

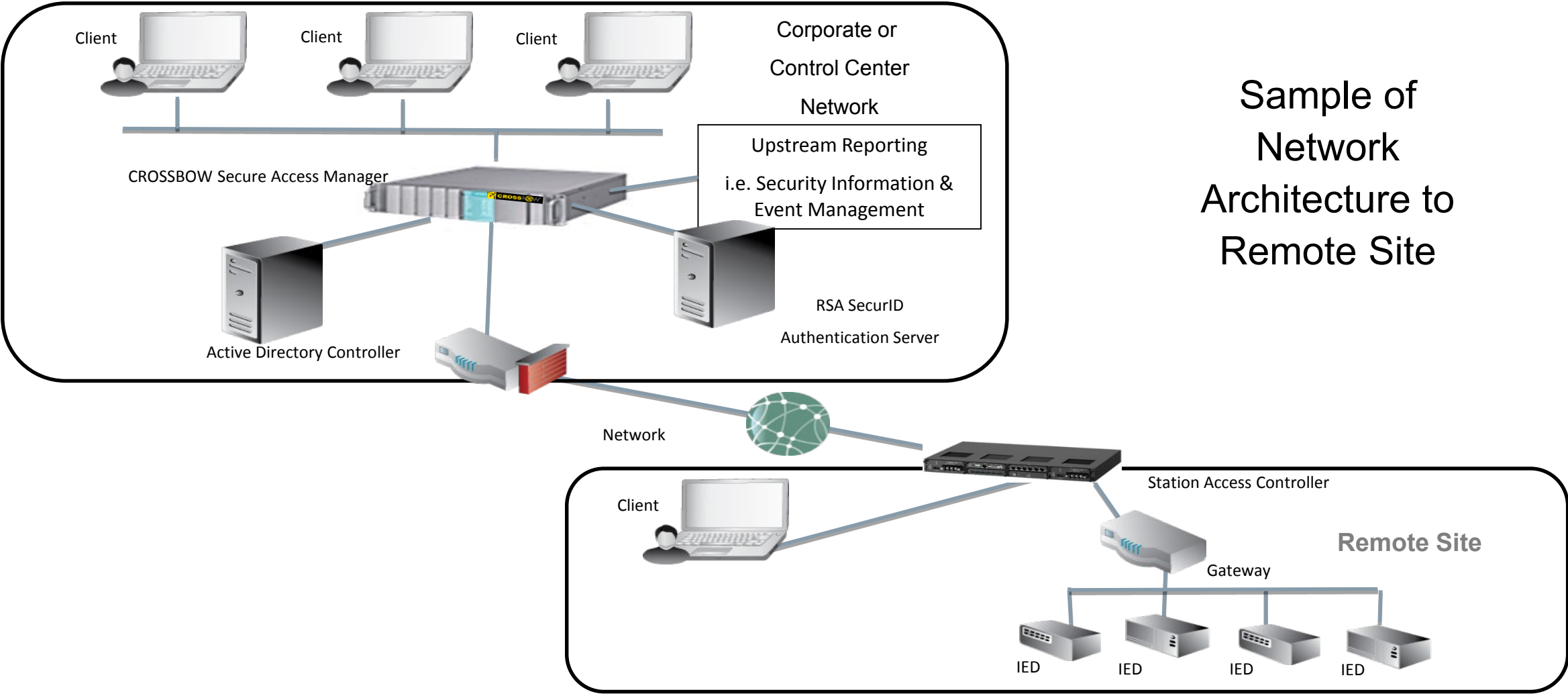


- AWWA using National Institute of Standards & Technology (NIST) as a guide
- Updated guideline issued in 2017
- Security framework includes best practices from NIST, AWWA, WaterISAC and others

## Practice Categories:

- Governance and Risk Management
- Business Continuity/Disaster Recovery
- Server and Workstation Hardening
- Access Control
- Application Security
- Encryption
- Telecom, Network Security & Architecture
- Physical Security
- Service Level Agreements (SLAs)
- Operations Security (OPSEC)
- Education
- Personnel Security

# CROSSBOW Secure Remote Access



# CROSSBOW Starter Edition



## What Is It?

- Lower cost entry point for water/wastewater plants
- Starter Edition includes:
  - 5 Users
  - 100 IEDs
  - CROSSBOW Secure Access Manager and Client Software
  - Installation and User Manuals
- Priced just under \$25,000 in above configuration





## Other Chapters in the Cost of Water



### **Chemical Dosing: What is improper dosing costing you?**

Presented by Eric Heilveil, Flow Marketing

Similar to poor efficiencies in pumping routines, inaccurate dosing of chemicals in wastewater can result in increased operating costs and fines. Chemical treatment in water can represent a considerable cost in the operating budget; yet it is important to balance this cost with the reassurance of safe water supply.



#### **Key takeaways include:**

- How to monitor and improve chemical dosing accuracy
- Identify how much can be saved by improving the accuracy and repeatability of your dosing systems
- Learn how to minimize costs with strict adherence to government regulations

**The recording of this webinar is available on the following website:**

[usa.siemens.com/cost-of-water](https://usa.siemens.com/cost-of-water)



## Other Chapters in the Cost of Water



### Leak Detection: What is lost water costing you?

Presented by Jack Roushey, Flow Marketing



In addition to energy costs, the loss of treated water either through leakage or theft is a significant cost associated with the operation of a water treatment facility and distribution network. It is estimated that upwards of 18% of all treated water is lost due to these two issues. This webinar introduces Siemens' "**Cost of Water**" calculator for leak detection to help users identify the amount of lost revenue you may be experiencing.

#### **Key takeaways include:**

- How much water is lost by local municipalities
- How can they calculate the potential losses
- What can they do to help reduce this loss

The recording of this webinar is available on the following website:

[usa.siemens.com/cost-of-water](https://usa.siemens.com/cost-of-water)



## Other Chapters in the Cost of Water



### **Economy Pumping: What are your daily pumping routines costing you?**

Presented by Herman Coello, Level Marketing



One of the biggest costs associated with the operation of a water treatment facility and distribution network is the energy consumed in pumping systems. It is estimated that optimization of a facility's pumping systems can lead to a reduction in energy costs by 20% or more. This webinar will show you how implementing an energy cost savings strategy through economy pumping routines can contribute to your optimization efforts.

#### **Key takeaways include:**

- How to calculate the overall cost of your pumping systems
- How much you can save by operating pumps during off-peak energy pricing
- How to optimize pumping routines with pump controllers and level measurement technology

**The recording of this webinar is available on the following website:**

[usa.siemens.com/cost-of-water](https://usa.siemens.com/cost-of-water)





## Upcoming Webinars



### How Do You Build a Resilient Water Infrastructure?

Presented by Cindy Mason, Digitalization

**Wednesday, April 17, 2019 at 2 p.m. EST**

Resiliency of water service is becoming increasingly difficult to achieve with an aging infrastructure, rapid population growth and a lack of resources. However, these challenges can be overcome through digital enhancements delivering more efficient processes and preservation of supply.

Siemens is a global leader in electrification, automation and digitalization solutions capable of enhancing the performance of water delivery and treatment processes. Join our webinar to learn about scalable solutions that deliver resiliency of supply through asset performance optimization and automation solutions for future-proof facilities.

#### **Key takeaways include:**

- How to build resiliency within your network
- How to reduce resource needs and costs
- How to establish a Digital Twin

## Contact Information



### **Todd Wedge**

Business Development Manager – CROSSBOW, US Region  
Siemens Industry, Process Industries & Drives Division

Seattle, WA 98104

Phone: +1 206 427 8892

E-mail: [todd.wedge@siemens.com](mailto:todd.wedge@siemens.com)

**[usa.siemens.com](http://usa.siemens.com)**