David L. Johnson, Deputy General Manager
Engineering and Operations
LVVWD and SNWA

Las Vegas, Nevada, US

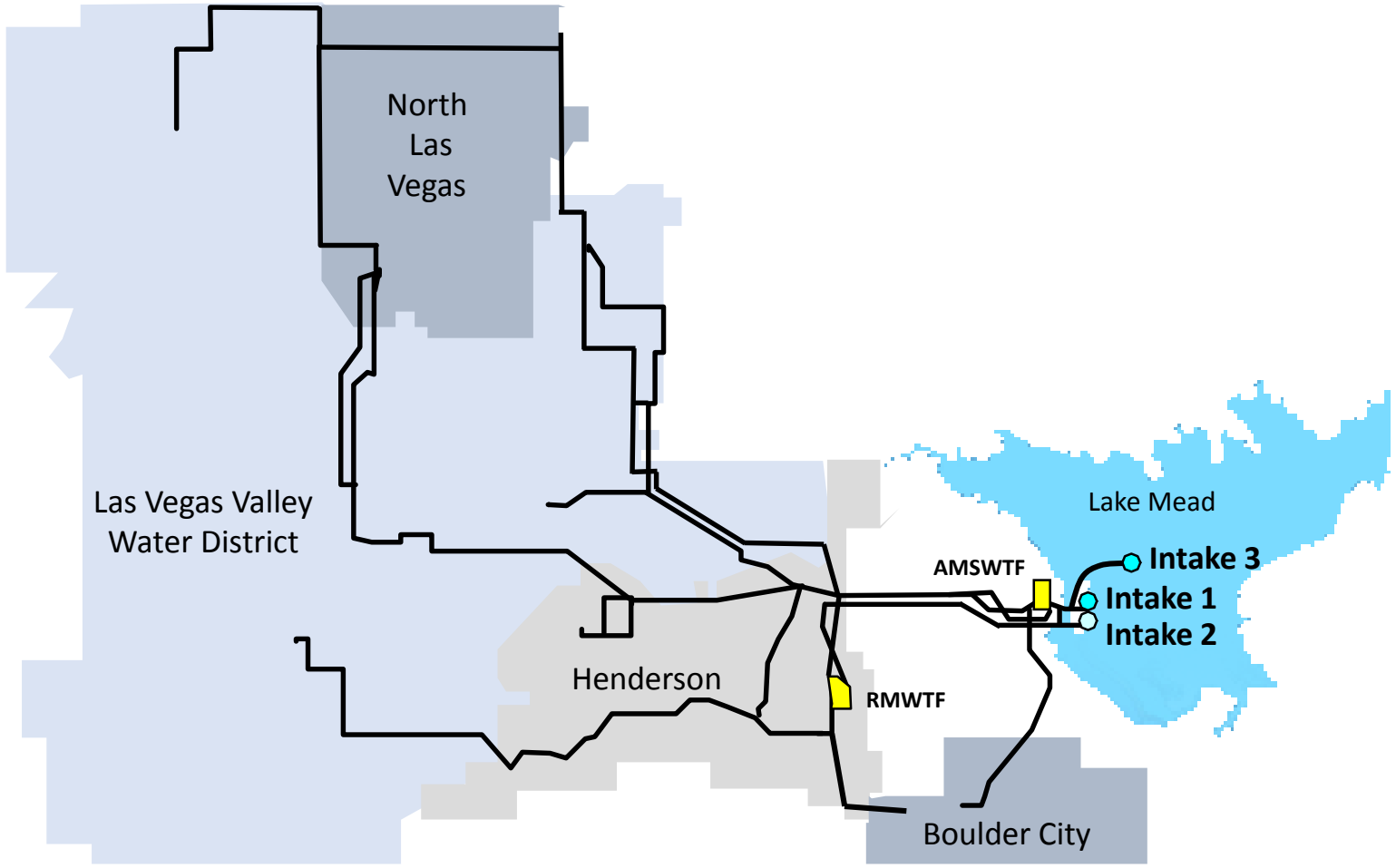
Approximately:

- **1,600 square miles**
- **2 million residents**
- **40 million annual visitors**
- **4 inches annual rainfall**

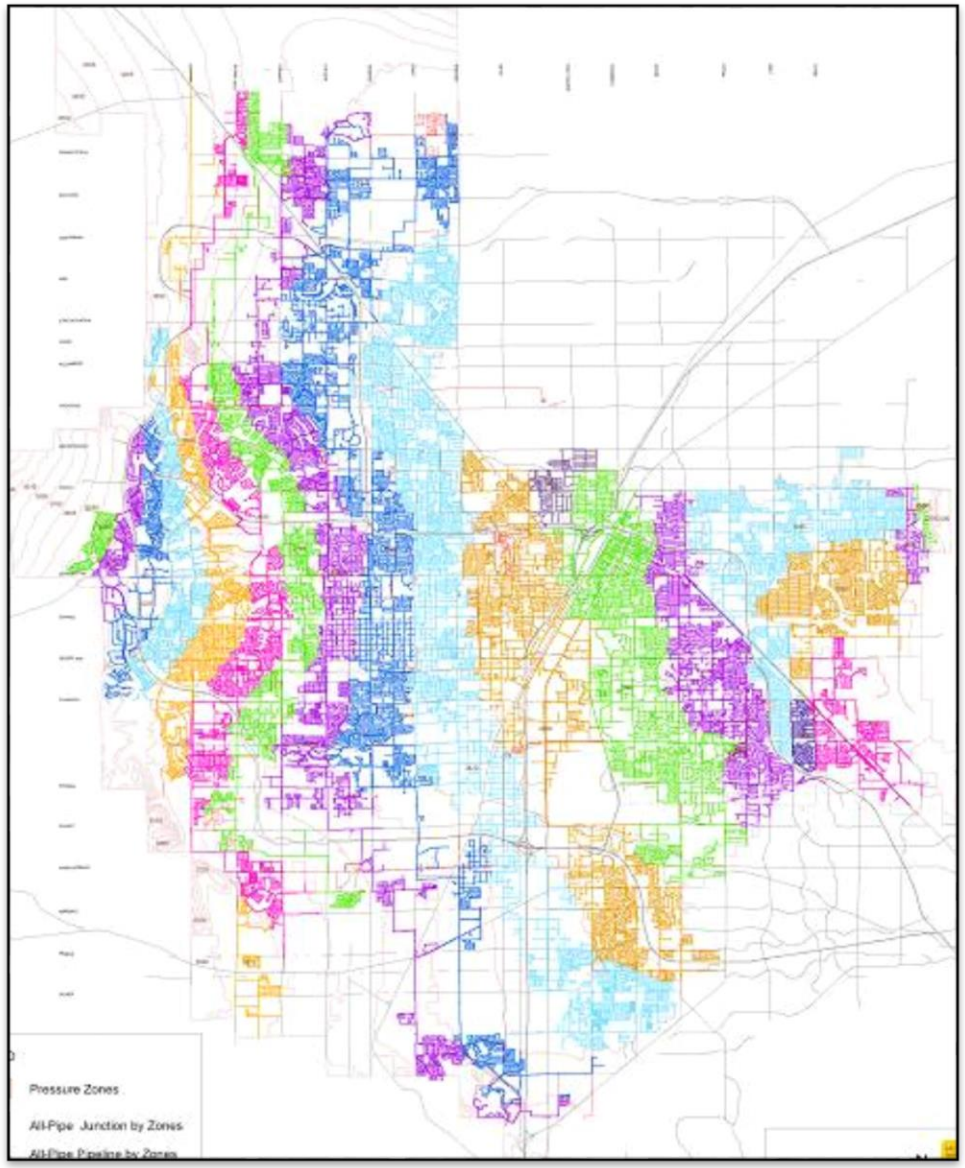
Seven of every ten Nevadans rely on the SNWA to supply water to homes and businesses.

SNWA (REGIONAL) INFRASTRUCTURE

- 3 drinking water intakes
- Water quality laboratory and research center
- 38 distribution reservoirs
- 28 pumping stations
- More than 163 miles of pipelines
- 900 MGD treatment capacity via two advanced water treatment facilities



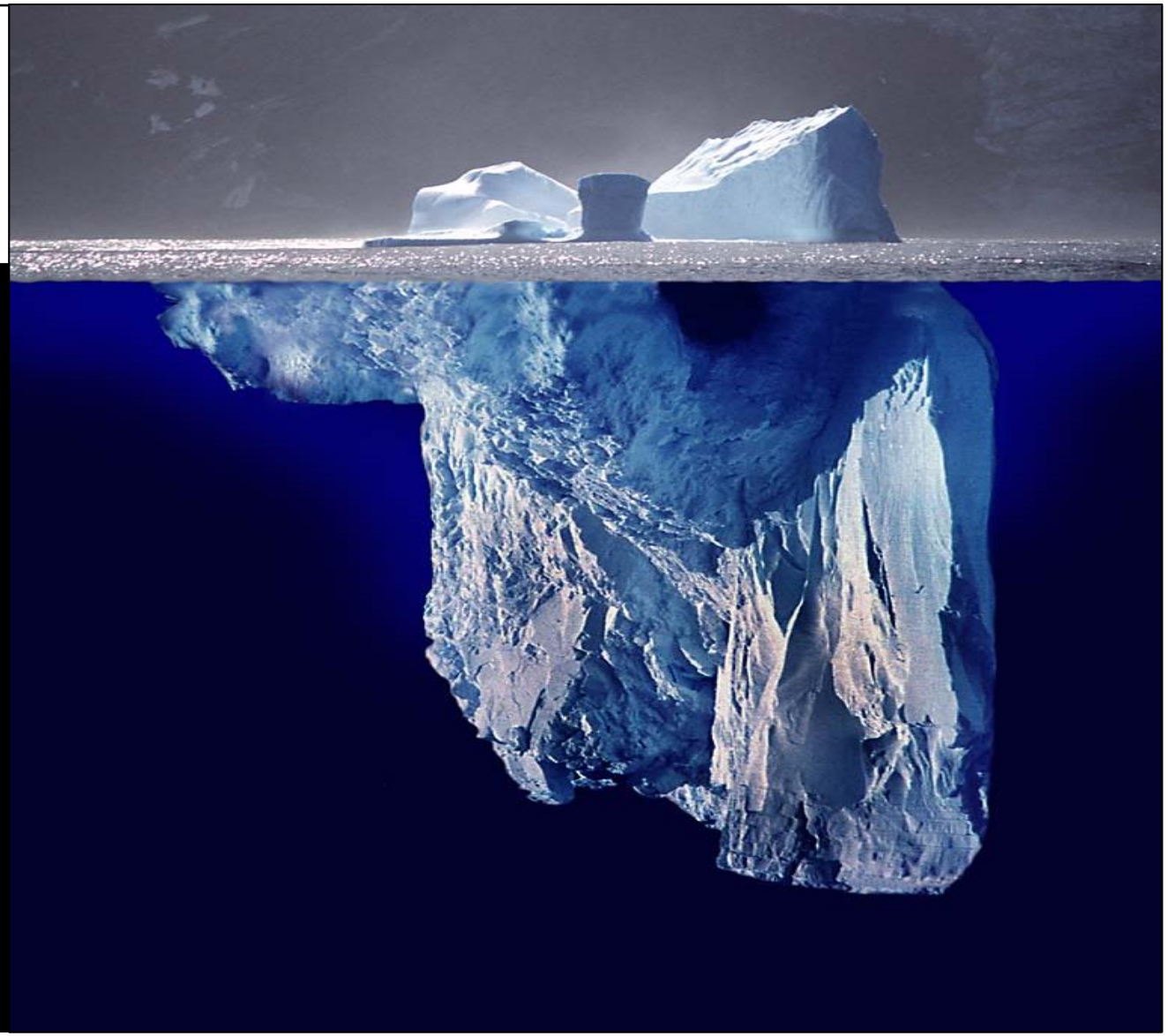
LVVWD INFRASTRUCTURE



- 6th largest water district in the US
- Over 375,000 active services
- 23 active pressure zones
- More than 4,500 miles of pipe
- More than 1,600 miles of service laterals
- 68 reservoirs - more than 900 million gallons of storage
- 65 pumping stations
- 76 production wells
- 27 artificial recharge wells
- Over 110,000 valves
- 6 solar-electric facilities - 3.1 megawatts of power

**District size ranking based on max-day demand*

20%	Pumping stations, wells, and related infrastructure having a replacement value of $1.3 billion
80%	Over 4,100 miles of pipes having estimated replacement value of $4.9 billion



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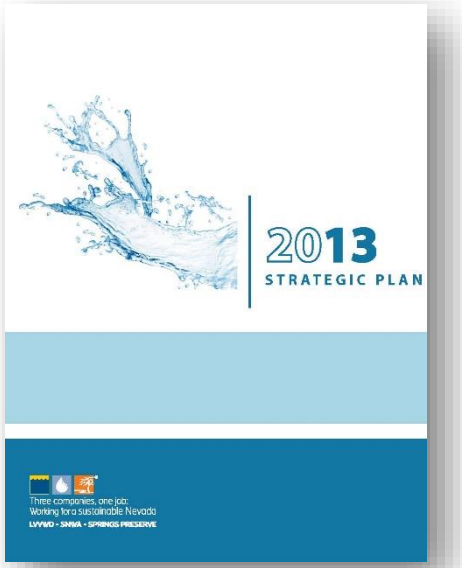
STRATEGIC PLAN



Vision: To be a global leader in service, **INNOVATION** and stewardship

Mission: Provide world class water service in a sustainable, adaptive and responsible manner to our customers through reliable, cost effective systems.

Goals:

1. Assure quality water through reliable and highly efficient systems
2. Deliver an outstanding customer service experience
3. Anticipate and adapt to changing climatic conditions while demonstrating stewardship of our environment
4. **Develop innovative and sustainable solutions through research and technology**
5. Ensure organizational efficiency and manage financial resources to provide maximum customer value
6. Strengthen and uphold a culture of service, excellence and accountability

INNOVATION GOALS AND STRATEGIES

Goal 4: Develop innovative and sustainable solutions through research and technology

Strategies:

1. Identify, prioritize and implement sustainable and cost-effective solutions to organizational challenges.
2. Promote a culture that is innovative, creative and makes effective use of technology.
3. Allocate the resources necessary to advance research, technology and other innovations.
4. Develop and strengthen partnerships on a global basis to leverage resources and advance innovation.

CURRENT PRIORITY STATEMENTS

PRIORITY 1:	Real-Time Energy and Water Quality Management System (EWQMS)
PRIORITY 3:	Innovative Technologies for Distribution Systems
PRIORITY 6:	New Technology for Maintaining Water Quality Parameters in Real-Time
PRIORITY 10:	Utility Location Technology
PRIORITY 12:	Use the Itron AMR System to Manage the Distribution System
PRIORITY 13:	Using Software to Aid in the Development of Accurate Electrical As-Built Drawings
PRIORITY 14:	Development or Purchase of Software that can Interface with the Existing Laboratory Information System which Will Improve Reporting Reliability and Sampling Efficiency
PRIORITY 16:	Removal of Entrained Air in Well Water
PRIORITY 17:	Removal of Nitrates from Well Water
PRIORITY 18:	Removal of Perchlorates from Well Water
PRIORITY 19:	Removal of Bromate Disinfection By-Products from Distribution System
PRIORITY 20:	Lake Sampling of Phosphate and Dissolved Organic Carbon Using a Solar Powered Barge
PRIORITY 21:	Remote Sensing for Leaks
PRIORITY 22:	Reduction of TDS in Well Water
PRIORITY 23:	Buried Valve Open/Closed Status Indication

PRIORITY 1 - OPERATIONAL EFFICIENCY

Real-Time Energy and Water Quality Management System (EWQMS)

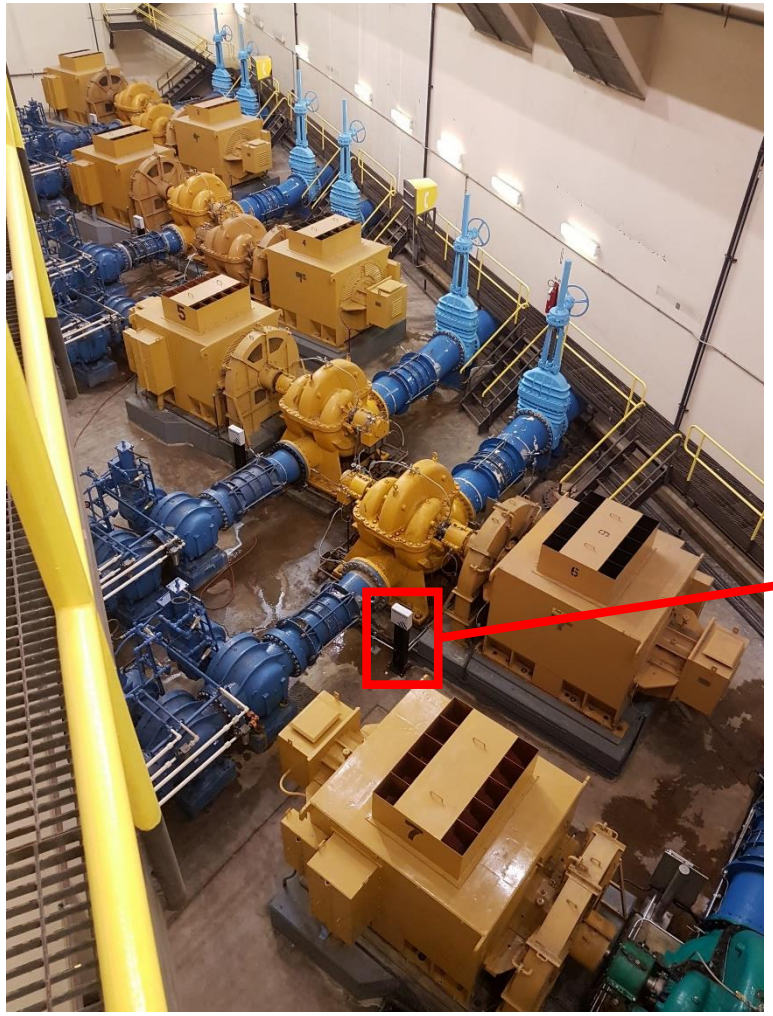
Solution: ***Riventa Technology*** (thermodynamic metering) is being evaluated as part of the EWQMS project (Riventa - $98,720)

- The SNWA needs a flow meter that can be placed within the minimum pipe diameters as prescribed by the hydraulic institute
- The SNWA system typically does not have the required pipe diameters to install accurate metering
- To our knowledge, the PROFLOW system is the only system that will monitor all the essential mechanical and hydraulic parameters to detect the onset of problems or degradation of performance
- This is the only system that has proven technology to measure individual pump efficiency and flow rate using thermodynamic metering
- This system also comes with cloud based evaluations

RIVENTA

FREEFLOW Pump Monitoring System

Precision Thermodynamic Efficiency Measurement



RIVENTA®

PRELIMINARY RESULTS

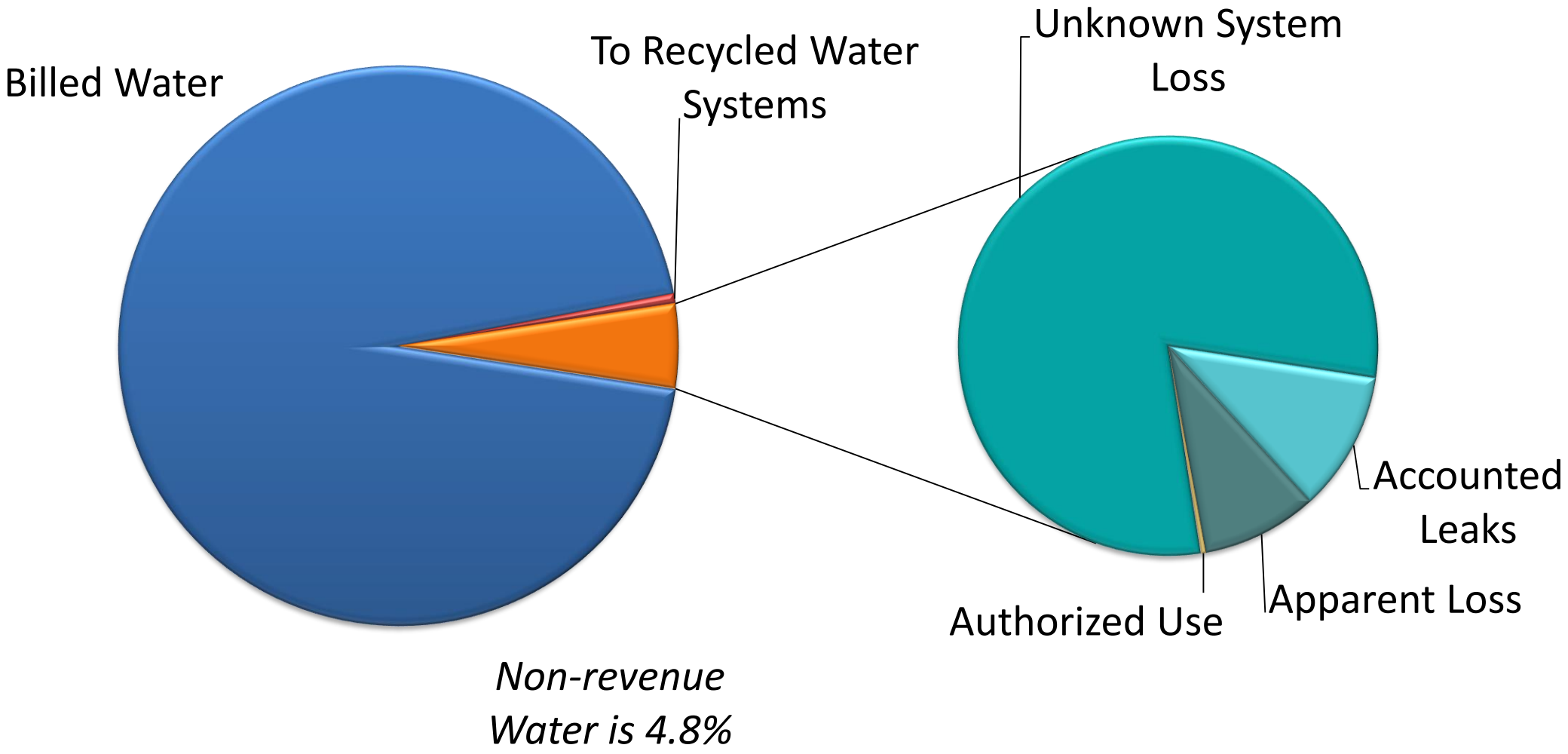
Identify Pump Performance and Upgrade Opportunities

Projected annual energy cost	$1,820,261		
Projected annual energy saving	**Saving ($)**	**Saving (%)**	**Payback (Years)**
Real-time pump scheduling	$95,200	5.2%	1.0
Pump Refurbishment	$177,438	9.7%	1.4

*Project cost = $98,720

RIVENTA®

UNACCOUNTED FOR WATER



Non-revenue Water is 4.8%

PRIORITY 3 - DROUGHT MITIGATION

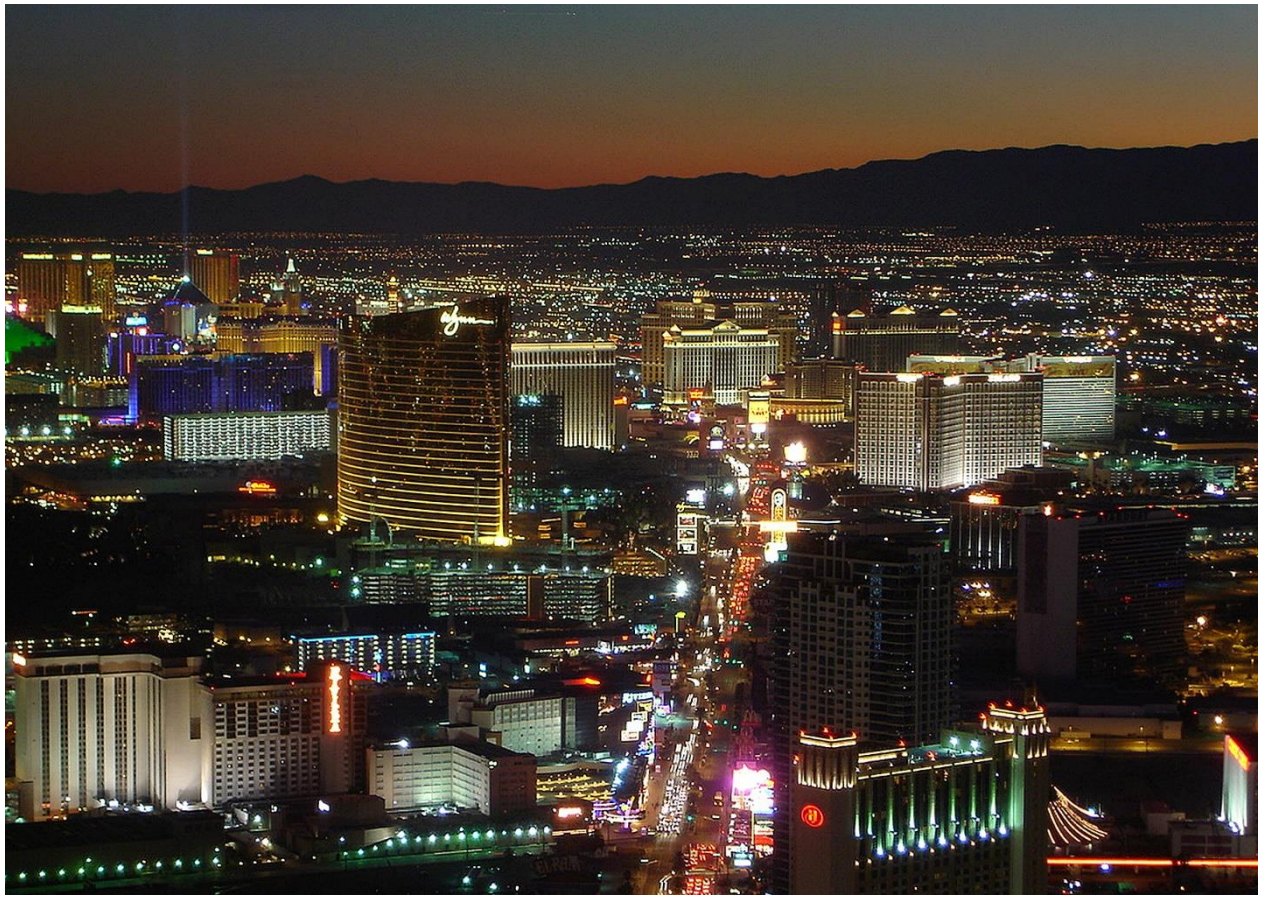
Innovative Technologies for Distribution Systems

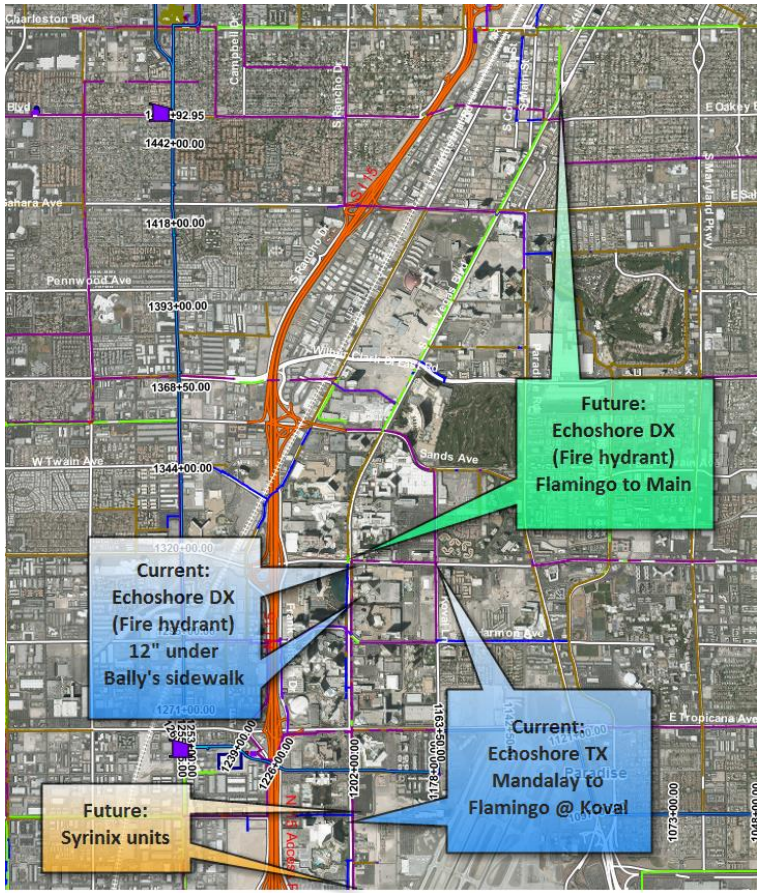
Solutions: ***Echologics Accoustic:*** Technology was fully adopted

Syrinix PipeMinder: Transient Technology was adopted (Syrinix - $38,980)

- Syrinix PipeMinder monitors pipelines and networks for pressure transients traveling through the system (Transmission and Distribution networks)
- SNWA identified ten locations throughout the network as areas that *may* experience pressure transients caused by pumps and/or valves that may need to be optimized
- A total of ten PipeMinder units were supplied to SNWA/LVVWD for deployment in these selected areas
- Syrinix provided ground technical support to assist in deploying the units and in training staff in the use of the RADAR site
- LVVWD found several serious transients and has since ratified the problems by essentially calming the system
- **The project paid for itself in only a few months**
- The Syrinix systems are now being migrated within other portions of the distribution system

ECOLOGICS AND SYRINIX UNITS ARE USED ON THE LAS VEGAS STRIP FOR PERMANENT LEAK DETECTION MONITORINING





Syrinix
Intelligent Pipeline Monitoring

echologics
A Mueller TECHNOLOGIES COMPANY

SYRINIX PRESSURE TRANSIENT MONITORING

Repair costs associated from pressure transients in the form of leaks can range from $4,000 to $250,000.

Prevent one leak and the system has paid for itself!

PRIORITY 21 – DROUGHT MITIGATION

Remote Sensing for Leaks

Solution: ***Utilis Satellite Leak Surveillance***

- The LVVWD operates and maintains over 4,500 miles of pipelines
- The LVVWD is currently looking for a remote sensing leak detection technology that has the ability to efficiently locate leaks prior to surfacing
- This technology could range from satellite technology to AMR/AMI leak analytics
- Utilis Israel, Ltd. developed a unique technology for leak detection in urban fresh-water distribution networks using technology that is used to look for water on other planets
- 6/2016: Received 1st set of results that consisted of ~800 leak locations. Each leak location consisted of a 200-ft diameter area
- 9/2016: Received 2nd set of results that focused on SNWA areas with approximately 1,000 leak locations identified. Asset Management technicians investigated 28 locations and found 9 leaks. Majority of the leaks found were already surfacing and a total of 559 fittings were sounded in the 28 areas investigated.
- **We are working with Utilis to improve their accuracy**

UTILIS

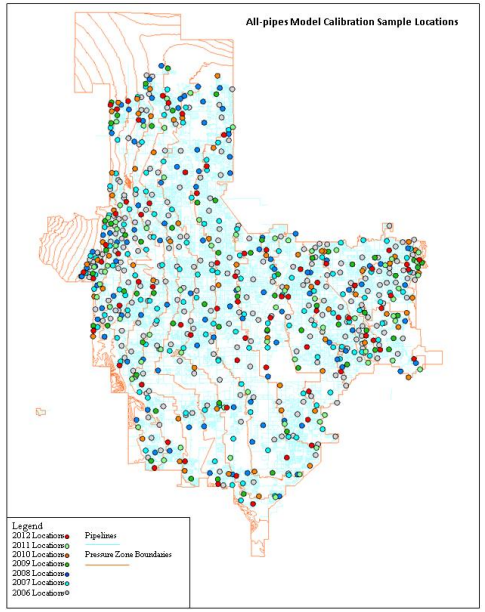
PRIORITY 6 – WATER QUALITY PROTECTION

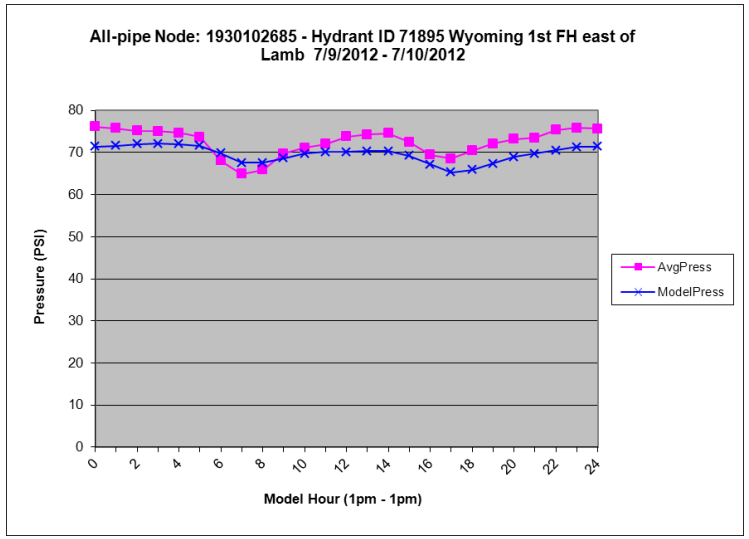
New Technology for Maintaining Water Quality Parameters in Real-Time

Solution: ***Parker Online TTHM Instrumentation***

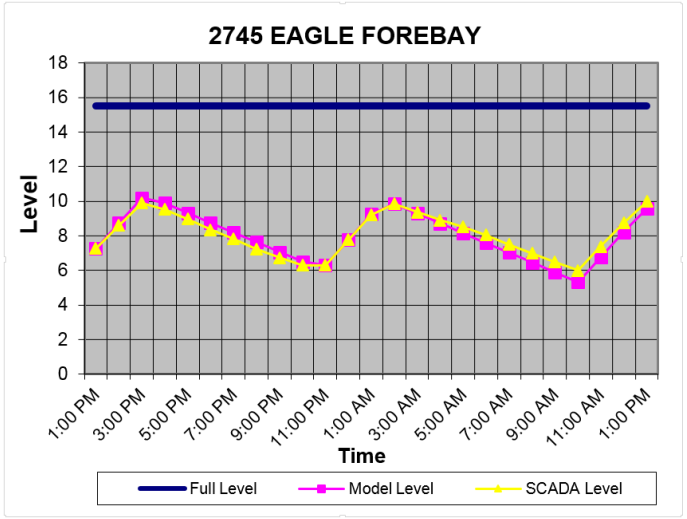
- Compliance with the Stage II Disinfection By-Product Rule 2012 requires reporting of compliance averages at each sampling point instead of averaged across the entire distribution system (locational running annual average)
- Though the maximum contaminant level remains at 80 ug/L, the revised mathematical change produces a more stringent regulation
- Monitoring: finished water line – post disinfection with chlorine and clearwell storage at RM, AMS, Grand Teton, and Warm Springs
- Parameters: chloroform, bromoform, chlorodibromomethane, bromodichloromethane and total THMs
- Collects data every 30 minutes
- The system helps planners to develop the **DAILY OPERATIONS MODEL** to manage water age within the distribution system

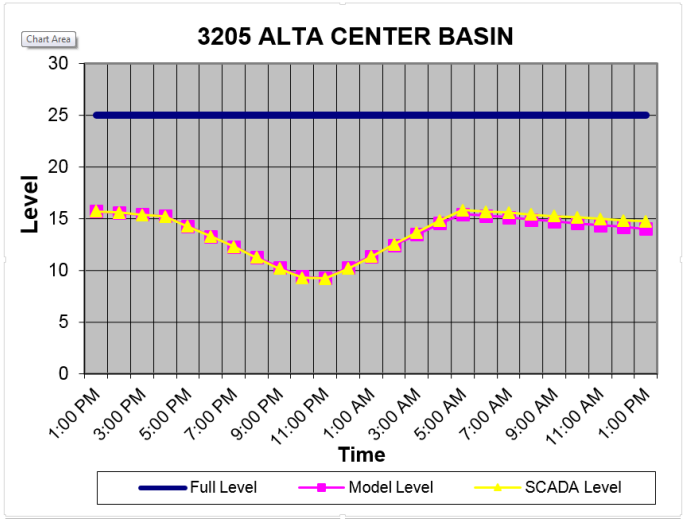
DAILY OPERATIONS MODEL – OPERATIONAL EFFICIENCY





Model vs. Field Pressure Difference	% of Model Nodes
<5 psi	100%
<4 psi	97%
<3 psi	94%

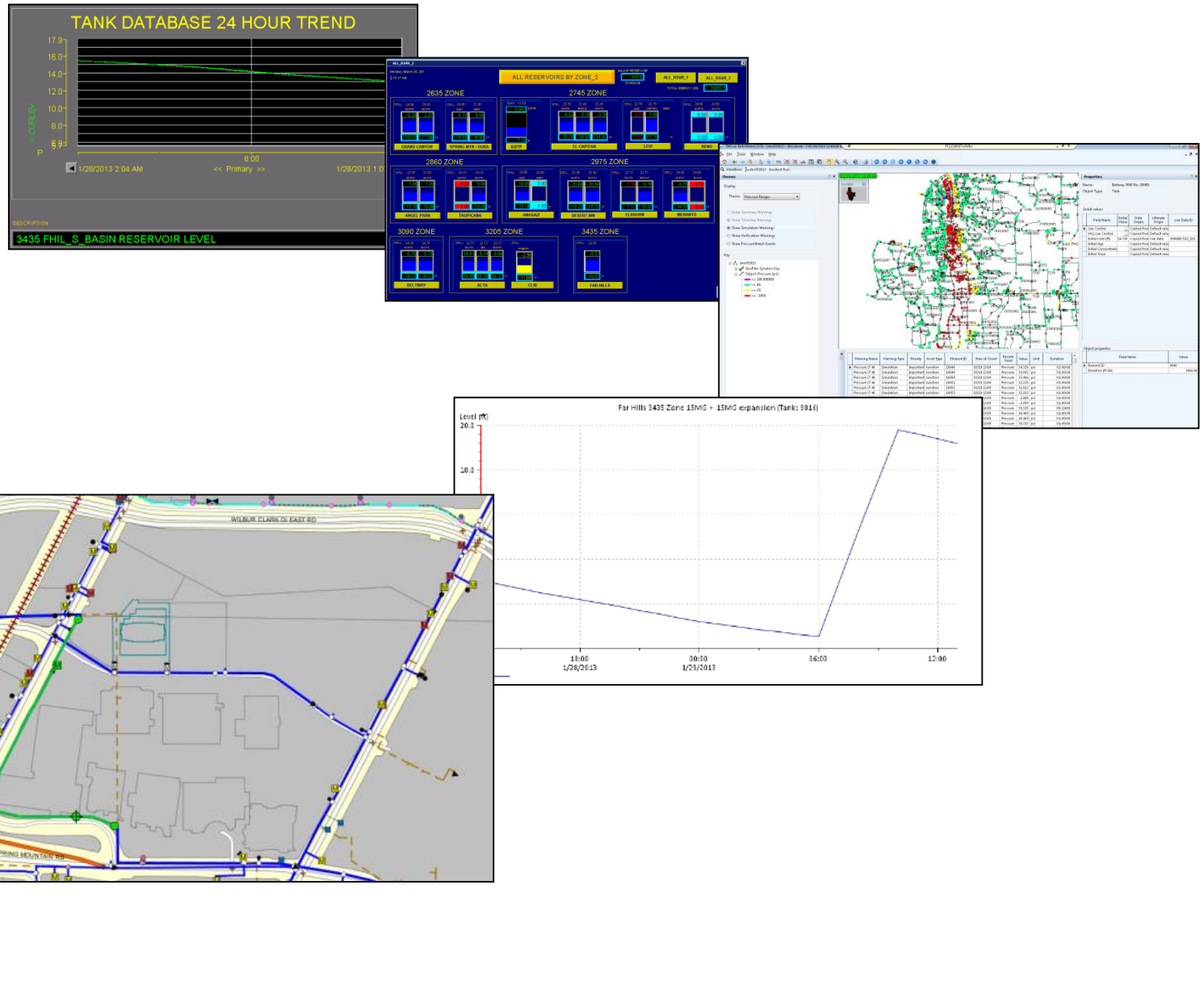




All-pipes Model: 180,000 Pipes

SCADA INTERFACE WITH THE OPERATIONS MODEL

- Get current system conditions from SCADA
- Water Age Management
- Project System Operation



PRIORITY 17 – WATER QUALITY

Removal of Nitrates from Well Water

Solutions: ***WellToDo:*** Nitrate Treatment Evaluation (WaterStart-$50,000; SNWA-$50,000; WellToDo-$92,500)
Ionex: Nitrate Treatment and Brine Residual Management (All costs covered by Ionex)

- The LVVWD operates and maintains several ground water production wells within the Las Vegas Valley
- The system has a very small portion of its wells producing nitrates at levels below the SDWA MCL
- The LVVWD is looking for technology that efficiently removes Nitrates from wells in remote locations
- An agreement between **WellToDo** and WaterStart provides for investigation of the catalytic reduction technology for nitrate removal
- 12/2016 to 1/2017: Pilot plant operated at LVVWD Well 18
- Proof-of-Concept data was generated from this phase of testing that illustrates the potential of the technology to remove nitrate (5.3 mg-N/L) and perchlorate (6.0 µg/L) to below reporting limits
- 3/2016: Planning meeting held between SNWA, LVVWD, WaterStart, and **Ionex** to discuss logistics for pilot testing of ion exchange resin to remove nitrate from LVVWD groundwater supplies
- 6/2016: Portable ion exchange testing apparatus was installed depicting high performance of removal for 4 days at LVVWD Well 24

IMPLEMENTATION CHALLENGES

- Insuring cross-departmental staff collaboration in creating priority listings
- Identifying and locating new innovations outside industry and physical boundaries
- Getting cooperation from staff to test or implement the newly identified innovations
- Fighting complacency by finding a *champion* to take charge and lead the innovation to success
- Protecting intellectual property and getting legal staff approval
- Securing an *Innovation Fund and* getting financial staff endorsement
- Sharing the decisions, risks and rewards with other utilities and/or partners
- Developing integration strategies for new solutions that address cyber-security concerns.


QUESTIONS?