Committee on Water
Advancing Water Technology
Advancing Water Technology in Nevada and the U.S.

Rebecca Shanahan, Commercialization Fund Manager
WaterStart is a cluster of global leaders in the implementation of water innovation.
$14B 65% 50K

Water-related impact of top global companies*  Percentage of start-ups that fail within first ten years  Water utilities in the United States

SOURCE: THE CARBON DISCLOSURE PROJECT’S SURVEY
• Acts as a portal
• Delivers high-value, shared services
• Assists with commercializing and distributing expertise
• De-risks & incentivizes water innovation
Demand Driven Innovation

Drinking Water
- Technologies for maintaining distribution water quality parameters in real time
- Utility location technology
- Software for aiding in the development of accurate electrical as-built drawings
- Removal of nitrates from well water

Waste Water
- Low cost sludge handling
- Grease and odor control
- Flow and obstruction monitoring

Seeking real deployable technologies!!
• Evaluated 180 proposals from tech companies
• Funded $1,200,000 in Pilot Projects
• Recruited 11 new companies to the State
• 96 new jobs projected over the next 2-3 years
Tech Portfolio Highlights

- Canada
- Smart technology platform utilizing acoustic sensors to monitor for water leaks in real-time
- Piloted technology along 3-mile corridor of the Las Vegas Blvd
- Deferred a $30million pipe replacement project down LV Blvd.
Tech Portfolio Highlights

- United Kingdom
- Pressure transient monitoring in water mains for leak prevention
- Testing and demo at 10 locations
- Resulted in a 50% reduction in the magnitude of transients
Tech Portfolio Highlights

- Australia
- Provides mobile and purpose-built engineering data and work mgmt. platforms in the cloud
- Providing SNWA/LVVWD a secure cloud-based engineering drawing mgmt. soln and a workforce soln for and scheduling jobs and measuring progress
Channels for Innovation Summit

**cfi summit**
channels for innovation • las vegas

**When:**
Friday, October 6, 2017

**Where:**
South Point Hotel and Casino
Las Vegas, Nevada

www.channelsforinnovation.com
Thank You

Rebecca Shanahan
rebecca.shanahan@waterstart.com
Collection System Asset Management

How Smart Technology Closes the Gap for Meeting Regulatory Requirements and Lowering Capital Impact
About SmartCover® Systems™

- San Diego Technology Company
- Twelve years pioneering Smart Technology for Wastewater
- Remote Monitoring, Data & Analysis
  - SmartLevel™ - level monitoring
  - SmartFLOE™ - flow monitoring
  - SmartRain™ – rain data
  - SmartTide™ – tidal data
  - SmartTrend® – trend analysis
- 15 US and International Patents
- Performance Proven with
  - >3,000 installations
  - >150 million operating hours…
National Company

A sampling of Customers

**Western**
San Diego, CA
San Jose, CA
Long Beach, CA
Fresno, CA
Cupertino, CA
Sacramento, CA
Phoenix, AZ
Carson City, NV
Las Vegas, NV
Everett, WA

**Central**
San Antonio, TX
Ft. Worth, TX
Harlingen, TX
Baton Rouge, LA
New Orleans, LA
Memphis, TN
Lebanon, TN
Springfield, IL

**Eastern**
Boston, MA
Newburgh, NY
Howard County, MD
Henrico County, VA
Charlotte, NC
Columbia, SC
Charleston, SC
Henry County, GA
Miami, FL
Sarasota, FL
Severn Trent
Halton Region, ONT

SmartCover® Systems™ PROPRIETARY
Smart Technology & Asset Mgt.

Collection System Asset Management

- Real Time Condition Assessment™
- I & I Assessment
- Optimized Cleaning & SSO Prevention
- CSO Monitoring
- Prioritized CIP

The Payout

Lower Costs and Better Results
Internet of Things uses Smart Technology to Drive Informed Decisions
Smart Technology

*Internet of Things* uses Smart Technology to Drive Informed Decisions
Water Internet of Things

- Sanitary Sewer Systems
- Lift Stations
- Combined Sewer Systems

Wastewater

Storm & Surface Water
- Reservoirs
- Canals
- Storm Water Systems
- Tidal Structures

Potable Water
- Water Tanks
- Pipes
System Architecture

SmartCover® Monitoring Systems

Redundant Ground

Redundant Iridium Satellite Network

SmartCover®: Remote Site Monitor

Bi-Directional User Interfaces

Data

Notifications

Secure network servers

Secure SCS Servers

SmartCover® Systems™ PROPRIETARY
Making Two Ends Meet?

Infrastructure vs. Clean Water
US EPA
“Vast majority of nation’s pipeline was installed after WW-II and has or is reaching the end of its useful life”.

ASCE
“… infrastructure gets a D+”
“… funding gap of as much as $300 billion over the next 20 years…”
Clean Water Act

Goal of the Clean Water Act of 1972
Stop pollution of US surface waters

Implication
Sanitary and Combined Sewer Overflows must be eliminated
Wastewater Pollution Impact

- Human Health Threat
- Environmental Effects
- Bad Press
- Political turmoil
- Unplanned Cost
Wastewater Pollution Impact

- Human Health Threat
- Environmental Effects
- Bad Press
- Political turmoil
- Unplanned Cost
The BIG Money Problem....
The Coming Tsunami

Example City

Miles of Pipeline

Pipeline Age (Yrs)

0-9 10-19 20-29 30-39 40-49 50-59 60-69 70-79 80-89 90-100
Condition Assessment

Asset Database + Data Collection & Inspection + Analysis (PACP, e.g.) = Risk-Based Priorities for Rehab

SmartCover® Systems™ PROPRIETARY
## Condition Ranking System

### Table 8. Condition state and rehabilitation priorities

<table>
<thead>
<tr>
<th>Condition state</th>
<th>Implication</th>
<th>Impact rating</th>
<th>Rehabilitation priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Failed or imminent failure</td>
<td>1 to 5</td>
<td>Immediate</td>
</tr>
<tr>
<td>4</td>
<td>In bad condition, high structural risk</td>
<td>5</td>
<td>Immediate</td>
</tr>
<tr>
<td>3</td>
<td>In poor condition, moderate structural risk</td>
<td>4 to 5</td>
<td>Medium</td>
</tr>
<tr>
<td>2</td>
<td>In fair condition, minimal structural risk</td>
<td>5</td>
<td>Medium</td>
</tr>
<tr>
<td>1 or 0</td>
<td>In good or excellent condition</td>
<td>1 to 5</td>
<td>Not required</td>
</tr>
</tbody>
</table>

McDonald and Zhao (2001)
## Upgrade Approaches

<table>
<thead>
<tr>
<th>Option</th>
<th>$$/ft*</th>
<th>$$/mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW Replacement</td>
<td>~$50</td>
<td>$264,000</td>
</tr>
<tr>
<td>HIGH Replacement</td>
<td>~$1,000</td>
<td>$5,280,000</td>
</tr>
<tr>
<td>LOW Re-Lining</td>
<td>~$30</td>
<td>$158,400</td>
</tr>
<tr>
<td>HIGH Re-Lining</td>
<td>~$250</td>
<td>$1,320,000</td>
</tr>
</tbody>
</table>

- **Longer lifetime**
- **Shorter lifetime Lower capacity**

For simplicity: $1MM/mile

*Sources: various*
Results of Condition Assessment

- 202 miles of pipe
- Replacement cost ~ $202MM
- Level 5: 19 miles
- Level 4: 33 miles
- Level 3: 52 miles
- Level 2: 66 miles
- Level 1: 32 miles

Pipe Condition

- Level 5: Really bad – fix NOW!
- Level 4: Bad and getting worse – fix soon
- Level 3: Poor condition – watch closely
- Level 2: Fair condition
- Level 1: Good condition
The Classic Solution

• Prioritize pipelines
• Set schedule for repair
• Design, permitting, EIR
• Generate budget for repair
• Get budget approval for repairs

• Hire the contractors
• Spend the money
• RAISE THE RATES !?!
Infrastructure Risk

202 miles of pipe
Replacement cost ~ $202MM

Level 5: 19 miles
Level 4: 33 miles
Level 3: 52 miles
Level 2: 66 miles
Level 1: 32 miles

Pipe Condition

- **5**: Really bad – fix NOW!
- **4**: Bad and getting worse – fix soon
- **3**: Poor condition – watch closely
- **2**: Fair condition
- **1**: Good condition
Financial Scenario

5 $19MM now
4 $33MM in 4 yrs
3 $52MM in 10 yrs

Basic Terms:
- 20 year note
- 3% rate

= DOUBLE current bill

$7MM/year
28K connections
= $20/month
Even Worse???

PROBLEM #1: Financing may not be approved or is reduced
- Smaller project or NO project
- Spills, maintenance GO UP, ... not down

PROBLEM #2: Condition assessment is snapshot
- Don’t know rate of change of conditions
- Conditions DO NOT get better with time
REMEMBER...

1. ASCE (wastewater, 2013):
   “…funding gap of as much as $300 billion over the next 20 years…”

2. Capital costs ~ $1 million/mile

3. EPA:
   1.2 MM miles sewer pipe @ $1MM/mile
   = $1.2 TRILLION in replacement costs
The Solution

Smart Infrastructure

1. University of Cambridge CSIC
Mt. Crested Butte, Colorado

- 6,500 year-round residents
- 10,000 during ski season
- 1.2 MGD plant
- 14.2 miles of pipeline
- ~300 manholes

The Crested Butte News
State imposes fines for 2005 sewer spill

Consent order 2006: replace pipe: $10 million
Solution: Install & Operate Remote Level Monitoring System

Cost Savings:
- Replace $10MM monitors - $100K
- Savings: $9.9MM and no spills

Colorado State DPH Approved monitoring system
Case Study 2: Monitor & Target Capital

Elsinore Valley Municipal Water District
Lake Elsinore, CA

35,000 connections
283 miles of sewer line
Force main: 12 miles
Lift Stations: 31
Don’t Build: Monitor

Consulting engineering capacity study recommends up-sizing pipeline: INSUFFICIENT CAPACITY

Upgrade Cost: $29MM

32 level monitors installed @ $120K
• Collection system data acquired
• Protect against overflows

Outcome:
• Monitors show peaking factors in model too high
• Project down-sized to $9 million

Savings: $20MM and no spills
Don’t Build: Monitor

Consulting engineering capacity study recommends up-sizing pipeline: INSUFFICIENT CAPACITY

Upgrade Cost: $29MM
32 level monitors installed @ $120K
- Collection system data acquired
- Protect against overflows

Outcome:
- Monitors show peaking factors in model too high
- Project down-sized to $9 million

Savings: $20MM and no spills
Monitor vs. Replace

= SAVING BIG BUCKS

<table>
<thead>
<tr>
<th>Agency</th>
<th>Capital Project Estimate</th>
<th>Monitoring Capital</th>
<th>Annual Monitoring Cost</th>
<th>Project Capital Spent</th>
<th>Capital Saved</th>
<th>ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPUD</td>
<td>$240K</td>
<td>$4K</td>
<td>$1K</td>
<td>$0</td>
<td>$236K</td>
<td>59:1</td>
</tr>
<tr>
<td>MCBWD</td>
<td>$10M</td>
<td>$100K</td>
<td>$6K</td>
<td>$0</td>
<td>$9.9M</td>
<td>99:1</td>
</tr>
<tr>
<td>EVWD</td>
<td>$29MM</td>
<td>$120K</td>
<td>$3.2K</td>
<td>$9.1M</td>
<td>$19.90</td>
<td>166:1</td>
</tr>
</tbody>
</table>

Real time remote monitoring:
- Conserves capital - delay or defer
- Produces real-time condition assessment
- Eliminates risk of overflows
Longer Term...

Cost/mile, $K, two project alternatives

<table>
<thead>
<tr>
<th>Year</th>
<th>ALTERNATIVE A (Build Pipeline)</th>
<th>ALTERNATIVE B (Monitor)</th>
<th>SAVINGS A - B</th>
<th>% SAVINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>$67</td>
<td>$22</td>
<td>$45</td>
<td>66.9%</td>
</tr>
<tr>
<td>Year 2</td>
<td>$133</td>
<td>$29</td>
<td>$104</td>
<td>78.2%</td>
</tr>
<tr>
<td>Year 3</td>
<td>$200</td>
<td>$36</td>
<td>$164</td>
<td>82.0%</td>
</tr>
<tr>
<td>Year 4</td>
<td>$266</td>
<td>$43</td>
<td>$223</td>
<td>83.8%</td>
</tr>
<tr>
<td>Year 5</td>
<td>$333</td>
<td>$50</td>
<td>$283</td>
<td>85.0%</td>
</tr>
</tbody>
</table>

AT LEAST 67% savings
NO ADDITIONAL RISK
Transforming ‘Best’ Practices
Not-So Smart Maintenance

- Best Practices dictate rigorous cleaning of pipes
- Schedules are based on history
  - The past cannot predict the future
- The result is exaggerated action
  - Segments are cleaned unnecessarily
  - Condition assessment is subjective - visual inspection at the site
  - There is no “protection” between cleanings
Case Study 3: Smart Cleaning

• San Antonio Water System (SAWS) Cleaning Routine based on historical information:
  • Monthly: 204 sites
  • Quarterly: 620 sites

• Calculated cost of cleaning per site
  • $500 per site per instance
  • 2,448 ‘monthlies’ per year
  • $1,224,000 annual cost

Is there a better way?
A Smart Solution

• Smart Technology Pilot Demonstration
  • Focus question: can technology reduce frequency & expense with no increased risk?
  • SAWS’ Pilot Set-up (Aug. ‘15 through Jul. ‘16)
    • 10 monthly cleaning sites selected
    • Sites cleaned prior to start
    • SmartCovers® installed & added to system network map
    • SmartTrend™ trend analysis performed daily
    • Crews directed to clean based on level change
    • Cleaning work order issued only when data as indicates
Detection of Small Changes

SmartTrend™: Automated data trend analysis of level change

PS 639 MH 11


Alarm Setpoint = 5 in  Sensor Position = 0.0 in

“WATER LEVEL IS RISING”
Significant Cleaning Reduction

High frequency cleaning: 10 sites x 12 months = 120 instances

SmartClean™ Pilot: 7 instances

Reduction: 94.1% cleaning saved \((120 - 7)/120\)
# SAWS Pilot Results

## Pilot Summary

<table>
<thead>
<tr>
<th>Pilot System Tested</th>
<th>High Freq. Cycle (10 Sites)</th>
<th>Pilot Duration</th>
<th>High Freq. Expectation</th>
<th>SmartClean™ Results</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Antonio</td>
<td>Monthly</td>
<td>12 months</td>
<td>120</td>
<td>7</td>
<td>94.1%</td>
</tr>
</tbody>
</table>

## The Bottom Line

- High Frequency Cleaning annual costs: $1,224,000
- Savings at 85%* reduction: $1,040,400
- Implementation Costs: $ 699,200 (start-up)
- Annual Costs Year 2 through 5: $ 590,000

**Total Savings (5 Years)**: $ 2,142,800

*Calculation based on a lower, conservative reduction*
**SmartClean™ Process**

**Technology Benefits Summary**

- Productivity gain - personnel/equipment re-directed to more critical tasks
- Continuous SSO protection - full monitoring in between cleanings
- Lower risk - less time crews in traffic
- Lower carbon footprint

- Extended Asset Life - lower frequency cleaning reduces pipe and structure wear
Transformational Change

Smart technology brings *transformational*, not incremental, change...

Users of smart technology gain visibility into the collection system

- Capital demands are reduced or even eliminated
- Operational practices are significantly improved with corresponding cost reduction
- Management has real-time information to make decisions, this lowers risk.

The *essential* choice: Use history and models to drive decisions?

Or, do we use *Smart Technology* to let us see the road ahead
Thank You!

SmartCover® Systems™

Jay Boyd
Senior Vice President
760-291-1980

www.smartcoversystems.com
Committee on Water