Pacific Water Conference 2023

Water Operators Workshop

Tuesday, February 7, 2023

This program is made possible under a cooperative agreement with US EPA.

Today's Agenda

- **Welcome**
- **AWWA's Water Audit Software, Joni Johnson, RCAC**
- **Introduction to Asset Management**

Break for lunch

- **Asset Management: How Do I Get Started?**
- **Asset Management and GIS Tools for Success**
- **Closing**

Certificate of Completion (CEU)

This training has been approved for 5 CEU credit hours! (0.5 CEUs)

To ensure you receive your certificate of completion:

- **Sign in and provide your email address on the sign-in sheet**
- **Attend the whole session**

Certificates will be sent via email within 30 days and are for your personal records.

If you have questions or need assistance, please contact smallsystems@syr.edu.

Spotlight: Guest Speak

Michael Miyahara

Introduction to Asset Management Drinking Water Systems

Tuesday, February 7, 2023

This program is made possible under a cooperative agreement with US EPA.

Introductions

Maureen Kerner, *Office of Water Programs*
EFC Associate Director, PE

Ella Ban, *Office of Water Programs*
Environmental Specialist

Caitlyn Leo, *Office of Water Programs*
Research Engineer

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About Us

The Environmental Finance Center Network (EFCN) is a university-based organization promoting innovative and sustainable environmental solutions while bolstering efforts to manage costs.

EFCN
environmental finance center network

Building TMF Capacity for Small Water Systems

Our Building Technical, Managerial, and Financial Capacity Programs for Small Water and Wastewater Systems provide free training and technical assistance across every state, territory, and tribal nations. Technical assistance is available on a first-come, first-served basis.

The Small Systems Water and Wastewater Teams

Great Lakes Environmental Infrastructure Center
Environmental Finance Center for Region 5

Environmental Finance Center at Sacramento State

Wichita State University
Hugo Wall School of Public Affairs
Environmental Finance Center

Southwest Environmental Finance Center

New England Environmental Finance Center

GFOA

EFCWest
Environmental Finance Center West

Michigan Technological University
1885

UNC Environmental Finance Center

NADO Research Foundation

Mississippi State University Extension

University of Maryland Environmental Finance Center

Small System Training Available!

https://efcnetwork.org/training-events

- Asset Management
- Financial Planning
- Building Resilience
- Controlling Energy Costs
- Access to Funding Sources
- Mapping & Data Collection
- Regulatory Compliance
- Operator Certification
- Strategic Planning Tools
- Effective Communication
- The Power of Partnerships: Sharing Resources with Neighboring Systems
- Attracting & Retaining Workforce
- Rate Setting & Affordability
- Basic Water Math

Technical Assistance is Available

https://efcnetwork.org/get-help/

- Adaptation & Resiliency Planning
- Asset Management
- Community Engagement
- Data Collection & Analysis
- Maintenance Practices
- Disseminating Information
- Fiscal Planning
- GIS Programming/Planning
- Infrastructure Funding
- Infrastructure Planning & Design
- Operator Training & Certification
- Management/Board Support
- Rate Payer/Citizen support
- Sustainability & Resiliency
- Partnerships & Collaboration
- Water Efficiency & Reuse
- Work Force Development

Environmental Finance Center at Sacramento State

- Housed in the Office of Water Programs
  - Manager & Operator Training, 50+ years
  - Technical & Managerial Research, 20+years
- Providing TMF Expertise & Tools, 6+years

ENVIRONMENTAL FINANCE CENTER AT SACRAMENTO STATE

WATER PROGRAMS Sacramento State

Environmental Finance Center at Hawai'i

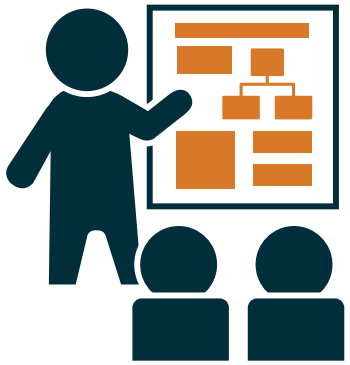
- **Hawaii Community Foundation**
- Presentation Group #90. "Accessing Federal Funding Panelists: Dana Okano, Melissa Unemori. Moderator: Christin Reynolds, One World One Water."

  Presenting Thurs. 02/09, 3:20 – 3:50pm. Room 314

  Attend for a brief overview of the Hawaii Community Foundation's services

HAWAIʻI COMMUNITY FOUNDATION

Technical Assistance is Available



FREE Technical Assistance!

Tomorrow (Wednesday, 2/8/23)
Booth 116

ENVIRONMENTAL FINANCE CENTER
AT SACRAMENTO STATE

Getting to Know YOU

- Where do you work?
- What size system do you serve?
- Why did you decide to attend?
- What (if any) experience do you have with Asset Management?

Today's Agenda

- **Welcome**
- **Asset Management for Small Water Systems**

Break for lunch

- **Asset Management: How Do I Get Started?**
- **Asset Management and GIS Tools for Success**
- **Closing**

Introduction to Asset Management

Asset Management: Answering the Questions

- What is asset management?
- Where does it fit in?
- Why do it?
- What's involved?
- How do I get started?
- What then?
- Are there examples to share? Yes!

Asset Management:
What is it?

Simply put…

https://swefc.unm.edu/home/amkan/Chapter1Videos/IN-2.m4v

The Car Analogy

Flat Tire Options

- Fix tire
- New tire
- New car
- Used car

Cracked Engine Block Options

- Fix engine
- New engine
- New car
- Used car

ne-np.facebook.com, bankrate.com

Some Definitions…

A method for maintaining a system's *assets* at a desired *level of (customer) service* at the *most appropriate cost*

- *Assets: What you have that has value*
- *Level of service: What you want your asset to provide*
- *Most appropriate cost: Lowest life cycle cost (not free!)*

EPA's Definition

USEPA (2020)

A process "utilities can use to make sure that planned maintenance can be conducted and capital assets (pumps, motors, pipes, etc.) can be repaired, replaced, or upgraded on time and that there is enough money to pay for it."

EPA's Five Core Components

1. Asset Inventory
What assets do you have & what is their condition?

2. Level of Service
What are the service goals for your system?

3. Criticality
Which are the most important assets to maintain?

4. Life Cycle Costs
How much will it cost for O&M (including asset replacement)?

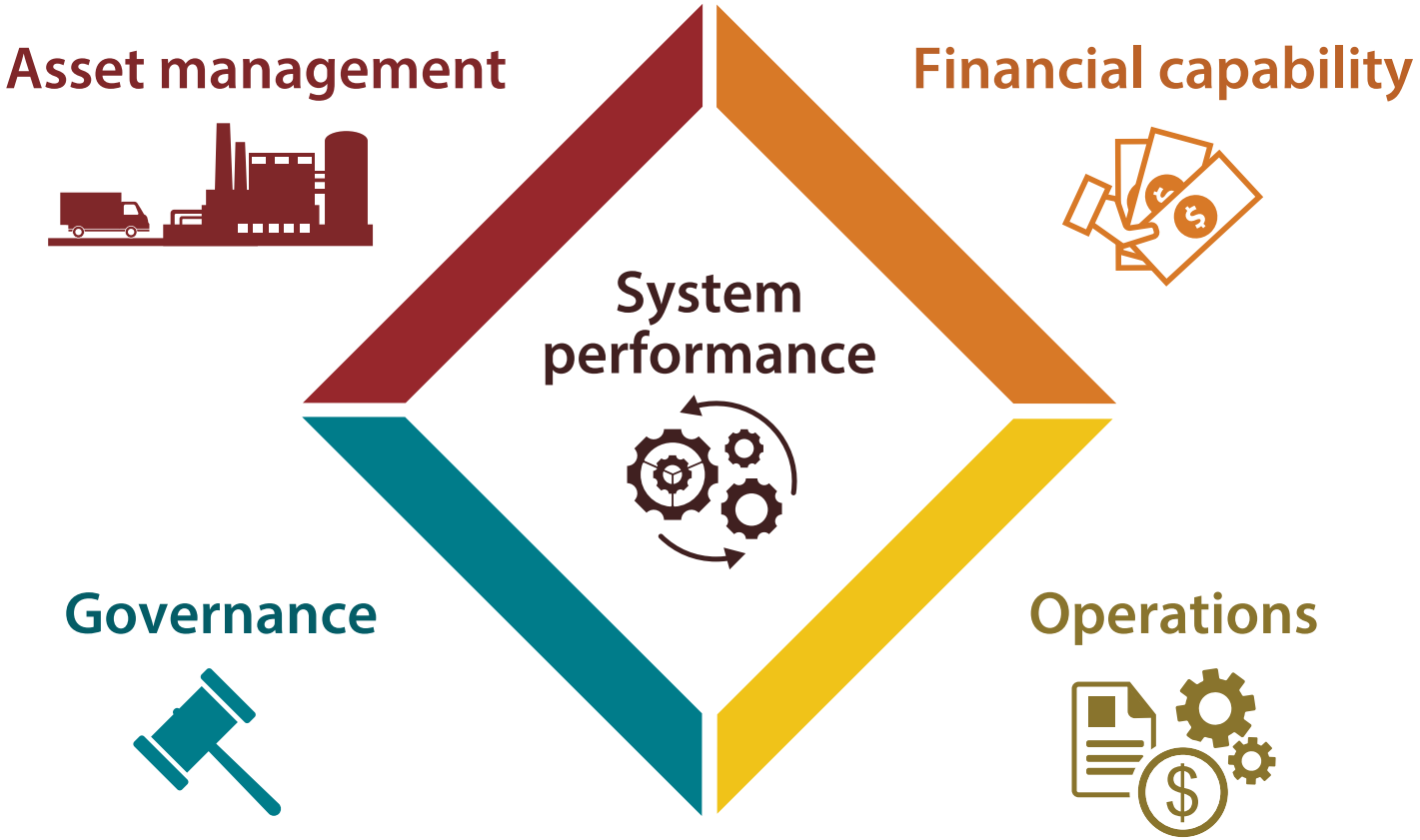
5. Long Term Funding
How are you going to pay for it all?

EPA's Five Core Components

https://www.youtube.com/watch?v=BgfFtV9mLJ0

Asset Management:
Where does it fit in?

Key Factors in Water System Performance

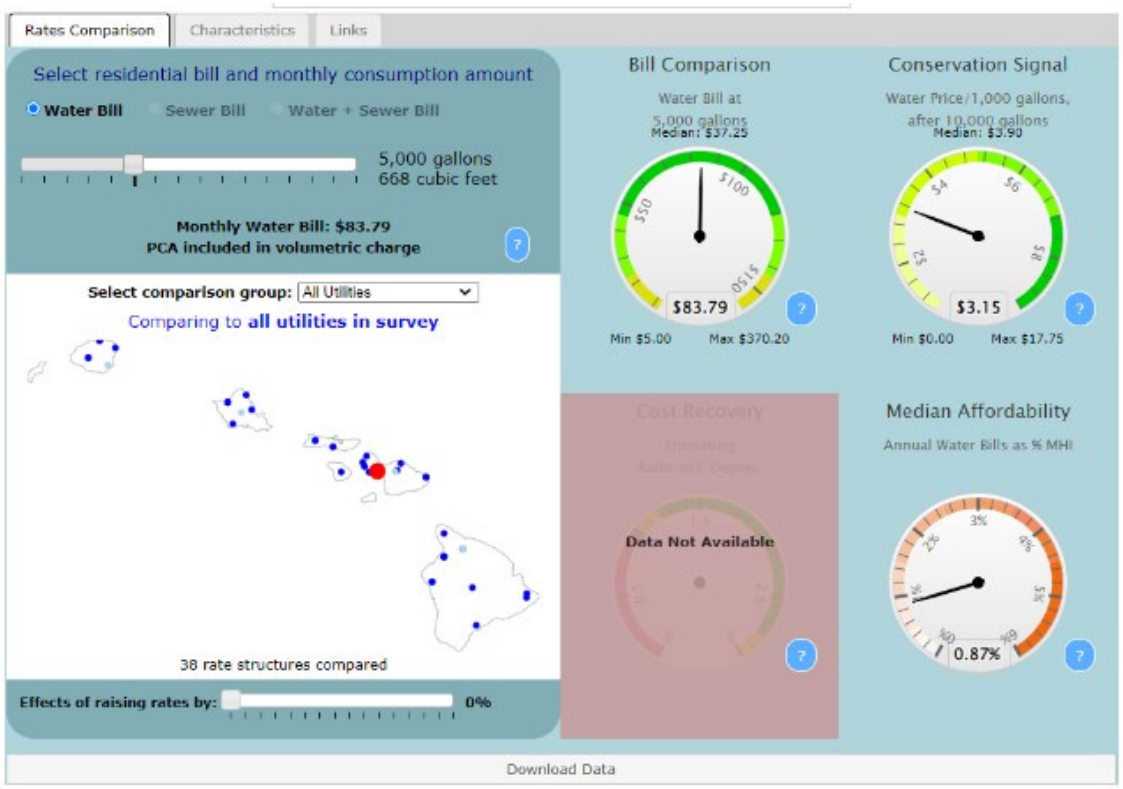


Fiscal Sustainability

- **Fiscal sustainability:**

  when a system can cover all regular operating expenses and long-term replacement and investment needs

- **What should revenue cover?**
  - Operations and maintenance
  - Staff and labor
  - Capital costs
  - Debt and capital expenses (depreciation)



Rates dashboard indicators for an example water utility in Hawai'i

What are My "Full" System Costs?

- Use **asset management** to estimate capital and O&M costs.

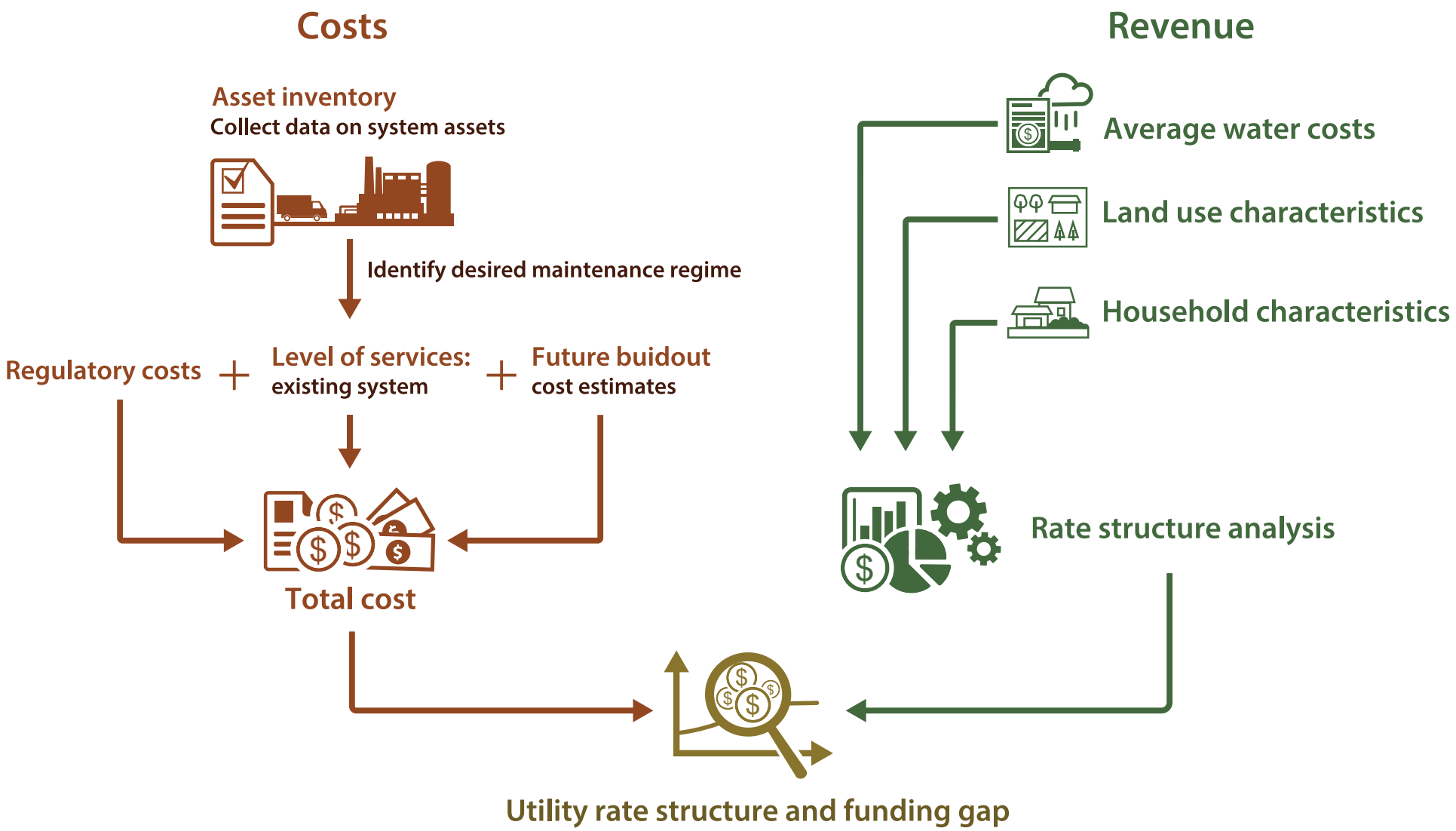
  Asset management is a key part of maintaining reliable system operations

- Asset management is an identified need, especially in small systems

Includes technical, managerial, and financial aspects:

Evaluate system needs:
Infrastructure and management (O&M, permit compliance, future buildouts)

Evaluate financial needs:
Estimating costs and revenues (component costs, staff and labor, funding options)


Costs
Asset inventory
Collect data on system assets
Identify desired maintenance regime
Regulatory costs
Level of services:
existing system
Future buidout
cost estimates
Total cost
Revenue
Average water costs
Land use characteristics
Household characteristics
Rate structure analysis
Utility rate structure and funding gap

How Do We Prioritize Investments?

- No “right” way to prioritize investments
  - More important assets may be critical for operations, or oldest
- Some questions:
  - What are the oldest components to replace in my system?
  - What parts of my system have the largest “consequence” of failure?
  - What are the most expensive parts to replace?
  - What parts require special expertise to replace?

1. Existing threat to public health, safety, or environment;
2. Potential public health, safety, or environmental concern;
3. Internal safety concern or public nuisance;
4. Improved system operations & maintenance (O&M) efficiency; and
5. It would be nice to have...

Many Potential Factors:

(source: EPA 2003)

Ranking Assets

- Prioritizing assets helps mitigate failure risks

Water Treatment Plant: Reordered List

Process Unit	Number of Units	Approximate Date of Installation	Typical Lifespan (Years)	Remaining Life Span (as of 2011)	Approximate Replacement Cost or Original Cost (Unit Cost)	Total Cost	Current Replacement Cost/Remaining Life in Years	POF	COF	Rank
RAW WATER PUMP STATION										
Transmission Line from Pump Station to SWTP (~3,100 feet of 8" PVC C900 Pipe)	1	1992	35 - 40	20	22,500	22,500	1,125	8	9	9
Raw Water Vacuum Pump	1	2000	3	1	1,500	1,500	1,500	9	5	7
Intake and Raw Water Line (600 feet of 10" PVC Pipe with concrete casing)	1	1992	35 - 45	15	45,000	45,000	3,000	4	9	7
450gpm/25 hp Raw Water Intake Pump/Motor	2	1992	10 - 15	10	14,000	28,000	2,800	3	9	6

Invest in This Asset First

Long-Term Planning

Steps for developing a long-term plan

- Estimate annual and long-term system costs
  - Asset management and Level-of-Service
- Evaluate goals for a rate structure
- Estimate revenue from various types of rates
- Communicate with your Board & community

Asset Management:
Why do it?

Lots of Competing Demands

- Regulatory compliance
- Cost efficiency
- Health & safety
- Resiliency
- Investment decisions
- Long-term planning
- Risk management
- Services & outputs
- Efficiency & effectiveness
- Communication
- Aging infrastructure
- Competition for funding
- Upgrading outdated tech

Lots of Decisions

- What are the benefits of a project?
- What are the risks of not doing the project?
- What do customers really want?
- What financing is available for a project?
- Does a project meet a critical need?
- How do we prioritize projects?
- What is the best expenditure of funds?
- What are the alternatives?

A basis for making good decisions

Asset management allows you to assess, document, and communicate:

- Assets owned
- How long will they last?
- What are my repair and replacement costs?
- What is sufficient revenue?

A Guide for:

- Tracking O&M
- Prioritizing O&M Needs
- Planning for Replacements
- Estimating Costs
- Selecting Funding/Financing Options
- Communicating Intent, Plans, & Progress

Experiences

https://swefc.unm.edu/home/amkan/Chapter1Videos/IN-12.m4v

In Summary, Asset Management…

- Addresses multiple needs
- Makes management decisions easier
- Directs spending to achieve desired results

Asset Management Benefits Exercise

What are some benefits of asset management?

- Make better financial decisions
- Meet regulatory requirements
- Reduce system “down--time”
- Reduce # of emergency repairs
- Prioritize rehabilitation & replacement needs
- Provide time to review cost--effective options.
- Communicate to customers & regulators effective use of money
- Improve access to funding

Questions?

“It’s a great thing to break.”

-James Taylor

Asset Management:
What's involved?

Five Core Components…Five Steps

1. Build an Asset Inventory
2. Define Level of Service Goals
3. Identify Critical Assets
4. Estimate Life-Cycle Costs
5. Evaluate Long-Term Funding/Financing

Five Components…Five Steps…Common Sense

https://swefc.unm.edu/home/amkan/Chapter1Videos/IN-3.m4v

Asset Management 5 Components Exercise

What are the 5 Core Components of Asset Management?

1. Asset Inventory
2. Level of Service
3. Criticality
4. Long Term Funding
5. Life Cycle Costing

Step 1: Build an Asset Inventory

More Questions

- What assets do we have?
- Where are they located?
- What's their condition?
- What's the expected remaining life?
- What's their energy use?
- What's their value?
- How do I organize all this?!

What assets do we have?







How do we define Assets?

- Use a dollar amount threshold
- Whether it requires a work order

Assets

Asset components:

Too detailed…

$500?

$1000?

$3000?

Selecting Assets

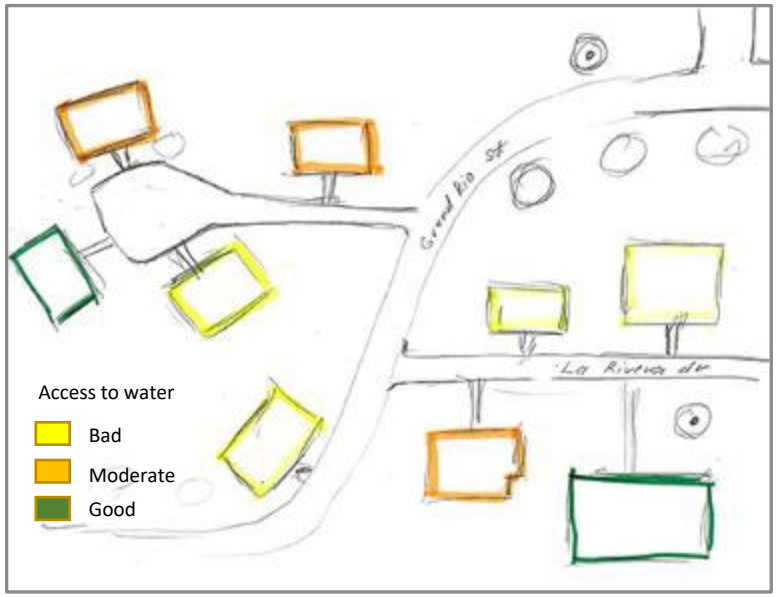
https://swefc.unm.edu/home/amkan/Chapter3Videos/IV-2.m4v

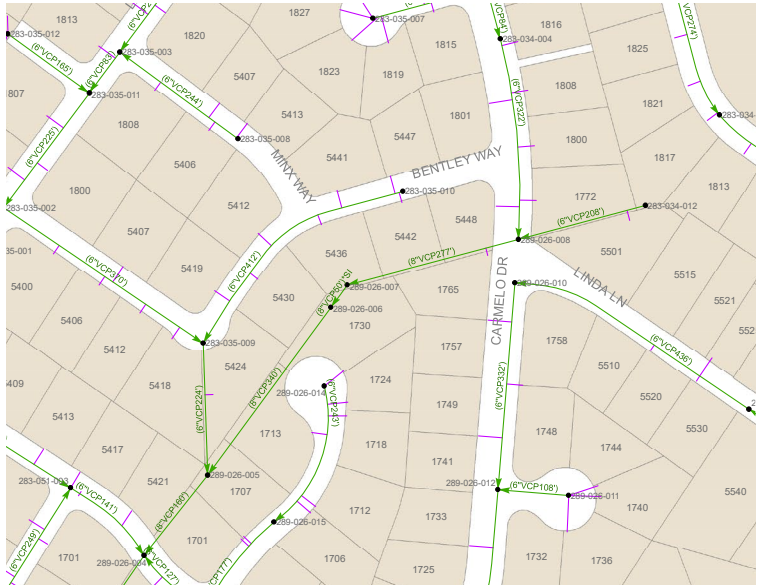
Selecting Assets

https://swefc.unm.edu/home/amkan/Chapter3Videos/IV-3.m4v

Where are the assets located?

- Create a visual picture
  - Hand drawn maps
  - Google Maps
  - GIS Systems

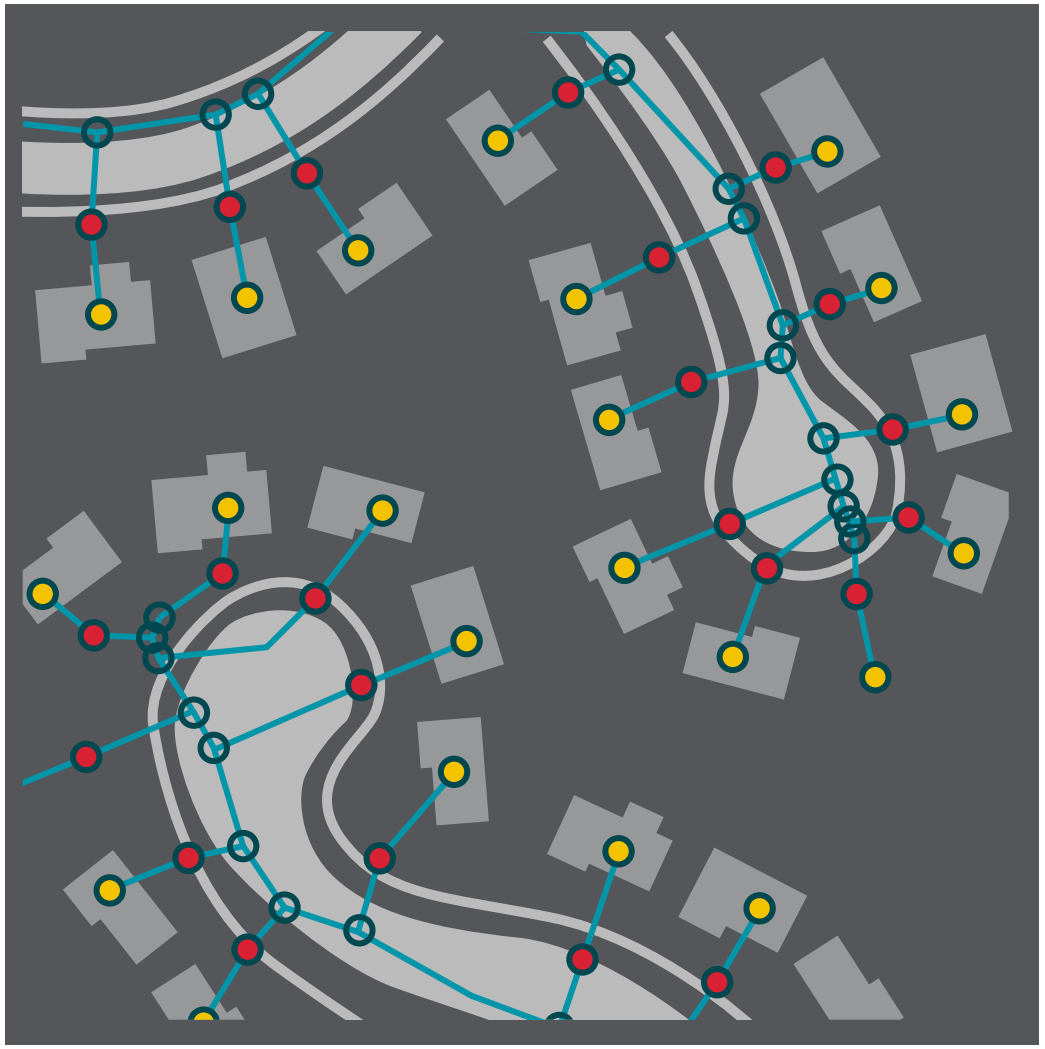




Where are the assets located?

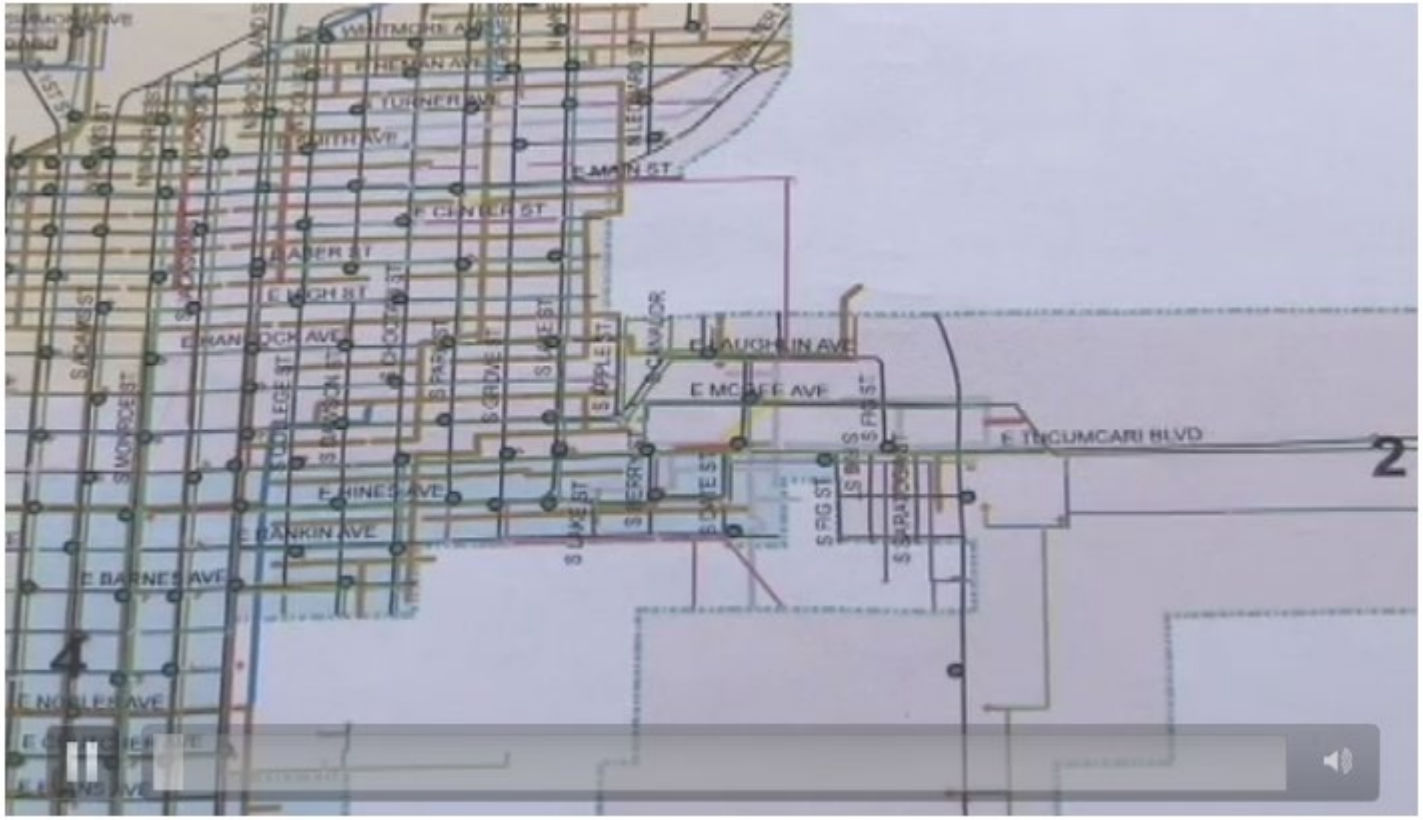
Data Sources:

- Existing Knowledge
  - As Builts/Maps
  - Operators
- New Knowledge
  - Site Visits
  - GPS Devices



esri.com

Where are the assets located?



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Expected remaining life

Remaining Life = Estimated Useful Life - Age

Age & useful life are good starting points.

Then consider site-specific conditions (usage, install, material quality)

How Long Will It Last?
Typical Life Expectancies of Water Supply equipment.

Component	Worksheet	Useful Life
Walls and Springs	Drinking Water Source	25 years
Intake Structures		35 years
Pumping Equipment		10 years
Disinfection Equipment	Treatment System	5 years
Hydropneumatic Tanks	Tanks	10 years
Concrete and Metal Storage Tanks		30 years
Transmission Structures (Pipes)	Distribution System	35 years
Valves	Valves	35 years
Mechanical Valves		15 years
Computer Equipment/Software	Electrical Systems	5 years
Transformers/Switchgears/ Wiring		20 years
Motor Controls/ Variable Frequency Drivers		10 years
Sensors		7 years
Buildings	Buildings	30 years
Service Lines	Service Lines	30 years
Hydrants	Hydrants	40 years

Note: These expected useful lives are drawn from a variety of sources. The estimates assume that assets have been property maintained. The adjusted useful life of an asset will be equal to or less than typical useful life

Asset Condition




Condition Monitoring Approaches

- Vibration
- Temperature
- Power or Oil Use
- Efficiency Change
- Run Time
- TV Inspection
- Pressure Testing
- Leak Testing
- Visual Inspection
- Life Expectancy Review

Rating Conditions

Rating	Condition Description	Age Description
Excellent	New or fairly new; No known or suspected issues	>90% of useful life remaining
Very Good	No known or suspected issues, but no longer a new asset	75-89% of useful life remaining
Good	A few known or suspected issues	40-74% of useful life remaining
Fair	Known/suspected issues that may impact asset's ability to continue to perform in the next several years	5-34% of useful life remaining
Poor	Known/suspected issues that may impact asset's ability to continue to perform in the next 1-2 years	<5% of useful life remaining

Monetary value

- Historic Value
  - Cost to install
- Current Value
  - Depreciation
- Replacement Value
  - Cast iron pipe vs. PVC
- Asset vs system replacement

Name of cost	Item name	Item character	Total cost($)
Civil cost	Treatment room	Area – 200 m^2	7,035
Mechanical cost	(i) Tank	Volume – 50 m^3	2,500
	(ii) Pipe	Pipeline length – 200 m	2,200
	(iii) Valve and others (pc)	2,000	3,000
Electrotechnical cost	(i) Rotameter (pc)	1	600
	(ii) Pressure gauges (pc)	2	180
	(iii) Pump (pc)	2	46,000
Membrane module cost	SS – membrane module (pc)	870	177,000
Total capital cost ($)			197,115

Cost resources

Recent utility projects

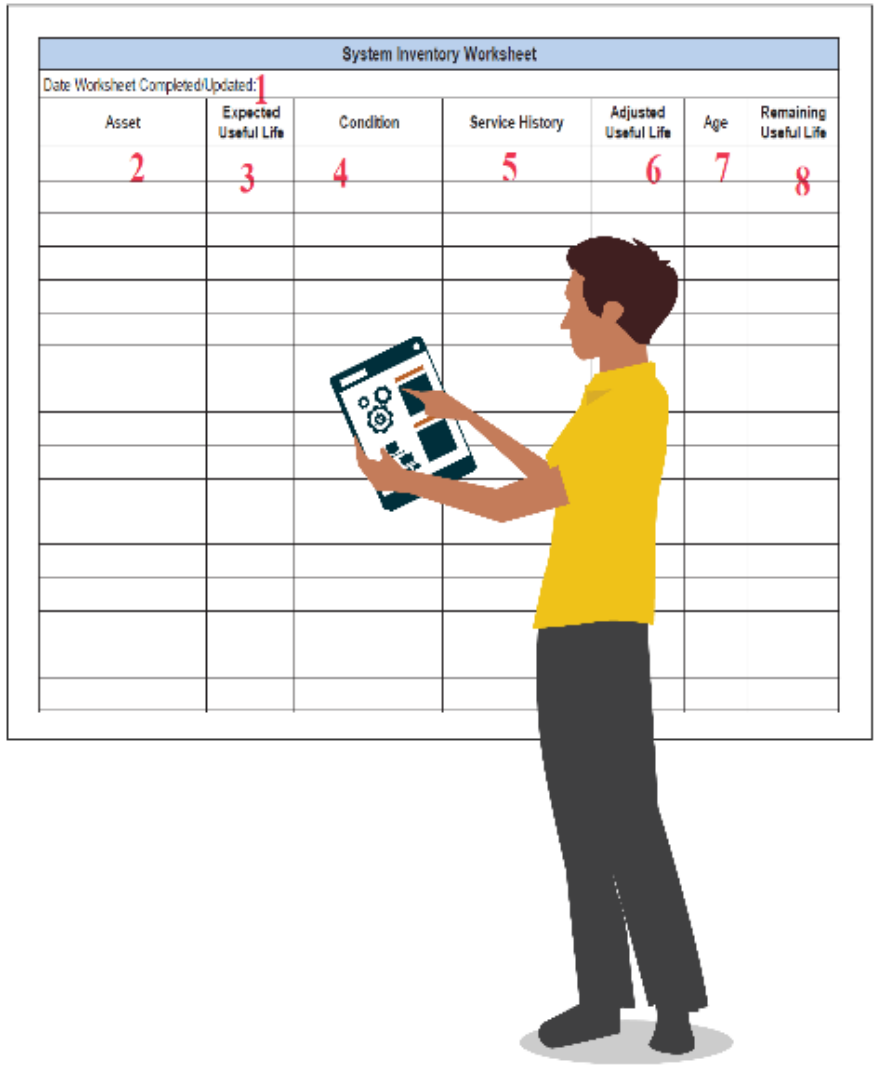
Neighboring utilities

Publications

How do I organize all this?!

Multiple formats

- Paper
- Spreadsheets
- Commercial Products



Questions?

Five Core Components…Five Steps

1. Build an Asset Inventory
2. Select a Level of Service
3. Identify Critical Assets
4. Estimate Life-Cycle Costs
5. Evaluate Long-Term Funding/Financing

What is Level of Service?

"…the quality or expected reliability that must be provided…

to meet a community's basic needs and expectations"

-Grand Rapids, MI 2016

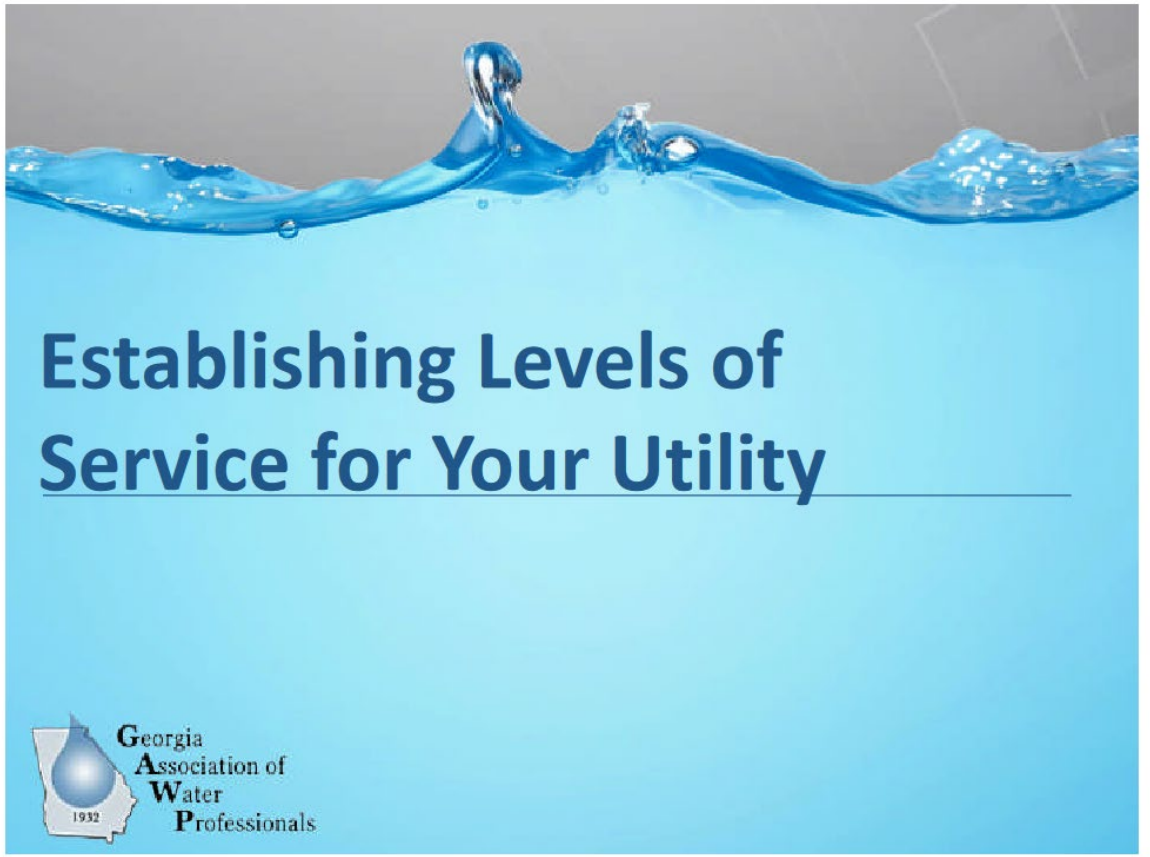
Level of Service Agreement

What does a Level of Service (LOS) Agreement Provide?

- Communicates operation to the customers
- Assists in identifying critical assets
- Provides a means of assessing overall utility performance
- Provides a direct link between costs and service
- Serves as an internal guide for management and operations staff
- Communicates energy efficiency and water conservation goals

The Level of Service (LOS) Process

1) Identify SMART Goals
2) Involve Customers & Staff
3) Track Progress



Source: Georgia Association of Water Professionals

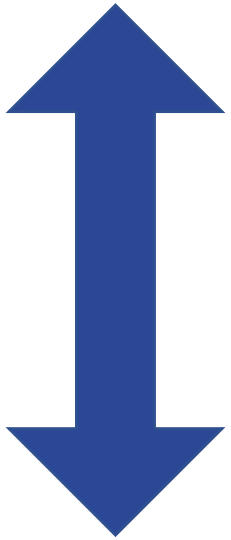
Develop Goals

Goal Categories

- Energy Efficiency
- Water Efficiency/Conservation
- Social Considerations
- Environmental Considerations
- Customer Service
- Regulatory Requirements

Level of Service

Maximum Level = Highest capabilities of all assets



Your Choice

Minimum Level: Meet all regulatory requirements

Internal & External Goals

Internal

- Internal goals do not directly impact customers
- Set by utility staff

Examples:

- Maintenance Scheduling
- Energy Efficiency

External

- Customer impacts
- Set with customer input

Examples:

- Response for sewer back-ups
- Response time for other customer complaints

SMART Goals

Specific	Details exactly what needs to be done
Measureable	Achievement or progress can be measured
Achievable	Objective is accepted by those responsible for achieving it
Realistic	Objective is possible to attain (important for motivational effect)
Time Bound	Time period for achievement is clearly stated

https://www.assetivity.com.au

Examples of SMART Goals

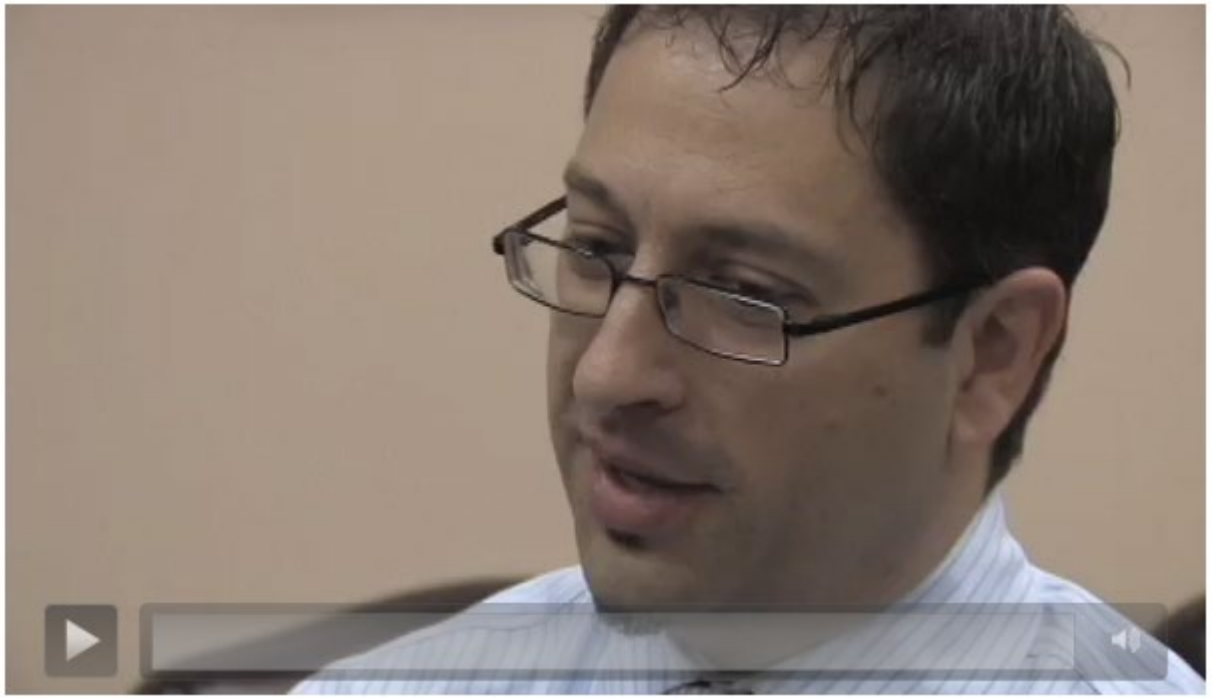
- Fewer than 10 taste complaints per quarter related to WTP
- Minimum water pressure of 50 psi throughout system, 95% of the time
- Customer service line available from 8 am – 5 pm, 5 days per week
- Customer complaints addressed within 1 business day, 95% of the time
- 75% planned maintenance, 25% reactive maintenance
- Reduce energy consumption by 10% at the water treatment plant

An LOS Worksheet

LOS Goal	Criteria Assessment
System will meet all State and Federal regulatory standards.	Is it measurable? *Yes* How will it be measured? C*ompliance reports* How often will it be measured? *Monthly*
Less than 10 taste complaints per year.	Is it measurable? *Yes* How will it be measured? *Review of customer complaint logs* How often will it be measured? *Annually*
Reduce energy consumption by 10%.	Is it measurable? *Yes* How will it be measured? *Review of energy usage* How often will it be measured? *Annually*

Involve Customers

- Door to door
- Annual meetings
- Focus groups
- Surveys
- Internet polls
- Social networking
- Customer call/complaint logs



https://swefc.unm.edu/home/amkan/Chapter4Videos/LS-1.m4v

Balancing LOS & Cost

- Higher LOS: ↑ Costs
- Customer willingness to pay

https://swefc.unm.edu/home/amkan/Chapter4Videos/LS-6.m4v

Tracking Progress

Consider these questions:

- How frequent will the data I need be available?
- How much time will it take to get the data for tracking?
- How often do I need to report this type of information to elected officials or the board?
- How often do I need to communicate with my customers on meeting this goal?
- How often will it be possible to make adjustments if I find I'm not meeting the goal?

Asset Inventory Exercise

What information is needed to develop an asset inventory?

- Definition of critical assets
  - ✓ Age
  - ✓ Cost to replace

Asset Inventory Exercise

What information is needed to develop an asset inventory?

- List of critical assets and their characteristics
  - ✓ Type (pump, pipeline, hydrants, valves, tanks…)
  - ✓ Category (water source, treatment system, distribution system, storage…)
  - ✓ Age, expected life, remaining life
  - ✓ Cost to replace (current past cost + inflation)
  - ✓ Location
  - ✓ Priority

Level of Service Exercise

What is Level of Service?

- Service that meets a community's basic needs & expectations

What are some examples of Level of Service Goals?

- Fewer than 10 taste complaints per quarter related to WTP
- Minimum water pressure of 50 psi throughout system, 95% of the time
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Questions?

Break For Lunch