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Kentucky Water Resources Research Institute
Steven J. Evans, Assistant Director

MAY 03 2019

PUBLIC SERVICE
COMMISSION

May 3, 2019

Ms. Gwen Pinson
Executive Director
Kentucky Public Service Commission
P.O. Box 615, 211 Sower Blvd.
Frankfort, KY 40602-0615

RE: Application for Approval of Training Course for Continuing Education Credit

Dear Ms. Pinson:

The Kentucky Water Resources Research Institute and has scheduled a training event at the Bath County Water District in Salt Lick, Kentucky on June 12, 2019. The training event includes material from the "Sustainable Management of Rural and Small Systems Workshop," which was developed by the US EPA and the USDA and focuses on ten key management areas for small drinking water and wastewater utilities. The training event also includes material from the "Introduction to Water Distribution Systems Modeling Workshop," which was developed by faculty and staff at the University of Kentucky. The workshop is being offered at no cost to the participants through financial support provided by USDA.

We have enclosed the following materials in support of this application:

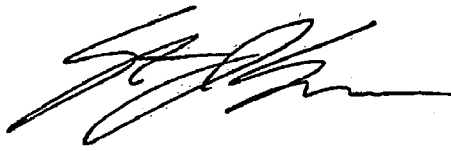
- 1) The name and address of the application (included in this transmittal letter).
- 2) The name and sponsor of the program and the subject matter covered by the program (included in this transmittal letter).
- 3) A summary of the content of the program (training summary/timed agenda is attached)
- 4) The number of credit hours requested by the program: 6
- 5) The name and relevant qualifications and credentials of each instructor presenting the program: Steven J. Evans and Steven W. Hoagland, resumes and curriculum vitae are attached.
- 6) A copy of written materials given to attendees (class PowerPoint slides are attached)

We respectfully request that the training be approved for 6 hours of continuing education credits as management training for commissioners of water districts as referenced in 807 KAR 5:070. Both the modeling workshop and sustainable management workshop have previously been approved by the PSC and DCA for training events held in 2017 and 2018.

If you have any questions or require any further documentation, please do not hesitate to contact me.

Sincerely,

see blue.



Steven J. Evans, Assistant Director
Kentucky Water Resources Research Institute

<https://www.research.uky.edu/kwrri>

see blue.

233 Mining and Minerals Building | 504 Rose Street | Lexington, KY 40506 | P: 859-257-1832 | www.uky.edu

An Equal Opportunity University

HYDRAULIC MODELING AND SUSTAINABLE MANAGEMENT OF RURAL AND SMALL SYSTEMS WORKSHOP AGENDA

June 12, 2019

Bath County Water District, 21 Church St, Salt Lick, KY 40371

8:30 am – 4:15 pm

FACILITATOR(S): Steven Hoagland, Engineer, Kentucky Water Resources Research Institute;
Steven Evans, Assistant Director, Kentucky Water Resources Research Institute

Time	Session
8:30	Set Up/Sign-in/Registration (15 minutes)
8:45	Session 1: Introduction to Water Distribution System Modeling (60 minutes) [Steven H.] <ul style="list-style-type: none">• Definitions and Types of Models• Hydraulic Modeling – How Does It Work?• Summary of Model Applications, Development, and Limitations• Overview of Software
9:45	Session 2: KYPIPE Small Utility Version – Hands-On Demo (60 minutes) [Steven H.] <ul style="list-style-type: none">• Overview of User Interface and Model Setup• System Asset Management• Pipe Break Analysis• System Modifications• Running the Model• Analyzing Results and Generating Reports
10:45	Break (15 minutes)
11:00	Session 3: Bath County Hydraulic Model (60 minutes) [Steven H.] <ul style="list-style-type: none">• Bath County Model Exercises• Model Calibration• Model Applications• Software Installation Procedure
12:00	Lunch

- 1:00 **Sustainable Management Workshop Objectives (10 minutes) [Steven H.]**
- 1:10 **Session 4: Overview of Key Management Areas (20 minutes) [Steven E.]**
- Presentation of Key Management Areas
 - Group Discussion: Other Important Management Areas for Sustainability
- 1:30 **Session 5: Utility ‘Self-Assessment’ Exercise (50 minutes) [Steven H. / Steven E.]**
- Explain “Sustainable Management Self-Assessment” (5 minutes)
 - Participants Conduct Self-Assessment (15 minutes)
 - Explain Plotting of Results: achievements vs. priorities (5 minutes)
 - Participants Plot Results (10 minutes)
 - Table Discussion (15 minutes)
 - What are your areas of focus (the orange and red areas)?
 - Why are they an area of focus?
 - What are the commonalities and differences among table participants’ achievements, priorities, and challenges?
 - How might your perspective on these priorities change if you are an:
 - Operator
 - Manager
 - Board Member
 - Judge Executive
- 2:20 **Break (15 minutes)**
- 2:35 **Session 6: Improving Outcomes (50 minutes) [Steven H., Steven E.]**
- Tips from previous Improving Outcomes Exercises (5 minutes)
 - Each participant completes an improvement worksheet for one low achievement/high priority management area (25 minutes)
 - Discussion Questions:
 - What will constitute ‘high achievement’ in this management area and what are the causes of your achievement gaps?
 - What changes will the utility need to make to **improve performance** and who will need to be involved for these changes to take place?
 - How could you track your performance progress?
 - What will be the **biggest challenges** to performance improvement?
 - Participants share improvement worksheet results at their tables (20 minutes)
- 3:25 **Session 7: Creating an Action Plan (50 minutes) [Steven H., Steven E.]**
- Discuss Utility Management Improvement Plan
 - Complete a Sustainable Management Action Plan Worksheet
- 4:15 **Adjourn**

Steven J. Evans, Assistant Director

Kentucky Water Resources Research Institute
233 Mining and Mineral Resources Building
University of Kentucky, Lexington, KY 40506-0107

Telephone: 859-257-1299
Fax: 859-323-1049
Email: steve.evans@uky.edu

EDUCATION

M.A. (Education), Georgetown College, 2004
B.S. (Biology), University of Kentucky, 2001

PROFESSIONAL EMPLOYMENT

2017 – Present: Assistant Director, Kentucky Water Resources Research Institute, Lexington, KY.
2010 – 2017: Project Manager, Third Rock Consultants, Lexington, KY.
2006 – 2017: Environmental Scientist, Third Rock Consultants, Lexington, KY.
2005 – 2006: Lab Director and Quality Assurance Director, EnviroData Group, Lexington, KY.
2004 – 2005: Biology and Inorganic Chemistry Laboratory Section Manager, EnviroData Group, Lexington, KY.
2002 – 2004: Lab Technician, EnviroData Group, Lexington, KY.

RESEARCH INTERESTS

Watershed management and planning, water quality monitoring and analysis, stormwater management with emphasis on illicit discharge detection and identification and public involvement and low impact development, stakeholder involvement and education, geospatial mapping and analysis, and environmental permitting.

PROFESSIONAL SERVICE ACTIVITIES

2017-Present: Interagency Technical Advisory Committee on Groundwater, Chair
2017-Present: Lexington Stormwater Stakeholders Advisory Committee
2017-Present: Watershed Water of Kentucky, Science Advisor
2017-Present: Kentucky River Watershed Water, Board Member
2018-Present: Friends of Cane Run, Vice President
2018-Present: University of Kentucky MS4 Working Group
2018: American Society of Civil Engineers – Kentucky Section: 2018 Infrastructure Report Card: Drinking Water Working Group

PROFESSIONAL MEMBERSHIPS

Kentucky Stormwater Association
Kentucky Academy of Science

PUBLICATIONS/PRESENTATIONS

1. S. Evans. 2018. Water in Kentucky: How things are flowing at KWRRRI. October 5, 2018. Kentucky Geological Survey Seminar Series.
2. Curl, Douglas C. and Steven J. Evans. 2018. Kentucky Water Quality Report Cards: Interactive Mapping Tools and Grading Algorithms to Communicate Science to the General Public. Geological Society of America Abstracts with Programs. Vol. 50, No. 6 doi: 10.1130/abs/2018AM-319377
3. Evans, S.J., M. McAlister. 2018. “The Clean Water Act.” Kentucky Watershed Academy Watershed Coordinator Training Series: Module 1. Full day workshop developed for Kentucky Division of Water and U.S. EPA. Presented on August 16, 2018.

4. Ormsbee, L. and S.J. Evans. 2018. "Sustainable Management of Rural and Small Systems Workshop." Workshop held July 9, 2018 at Fountain Run Water Utility. Kentucky Water Resources Research Institute in cooperation with West Virginia University.
5. Koyagi, E., S.J. Evans, and L. Ormsbee. 2018. Kentucky Water Resources Research Institute University of Kentucky Program Evaluation Report Fiscal Years 2011-2015. Office of External Research Water Resources Discipline U.S. Geological Survey. 118 p.
6. Evans, S.J. and Ormsbee, L. 2018. "Kentucky Water Resources Research Institute Annual Technical Report FY 2017." U.S. Geological Survey 104B Research Program Final Report. 121 p.
7. Koyagi, E. and S.J. Evans. 2018. "Kentucky Water Resources Annual Symposium Proceedings." Symposium held March 19, 2018 at Marriott Griffin Gate Resort, Lexington, KY
8. Gilbert, L. and S.J. Evans. "Watershed Organizations of Kentucky." Poster. Produced for Kentucky Division of Water and U.S. EPA.
9. Evans, S.J. 2018. "Communicating through Citizen Science: The Watershed Watch of Kentucky Experience." Invited speaker at Kentucky Geological Survey Annual Seminar 2019. Kentucky Geological Survey Core Library.
10. McAlister, M and S.J. Evans. 2017. "Kentucky River Watershed Watch: Summary of 2017 Sampling Results." Report produced by Kentucky Water Resources Research Institute. Funded by Kentucky River Authority.
11. Ormsbee, L; S.J. Evans, and K. Peterson. 2017. "Watershed Supply Report: Beam-Suntory, Loretto, KY." Kentucky Water Resources Research Institute. Project Report for Beam-Suntory Maker's Mark Facility.
12. Ormsbee, L; S.J. Evans, and L. Pacholik. 2017. "Watershed Sustainability Report: Beam-Suntory, Clermont, KY." Kentucky Water Resources Research Institute. Project Report for Beam-Suntory Jim Beam Facility.
13. Evans, S. J. and J. Shelby. 2017. "Combined Water Quality / Quality Assurance Project Report for Cane Run Comprehensive Watershed Based Plan." Third Rock Consultants. Project Technical Report for Kentucky Division of Water.
14. Evans, S. J.; J. Carey; D. Price; R. Walker; K. Miller; R. Lamey; L. Hicks; A. Rains. 2017. "Quality Assurance Project Plan: Lexington-Fayette Urban County Government Municipal Separate Storm Sewer System (MS4) Monitoring Plan." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality. Revision 2.
15. Evans, S. J.; J. Carey; D. Price; R. Walker; R. Lamey; L. Hicks; A. Rains. 2017. "Quality Assurance Project Plan: Lexington-Fayette Urban County Government Watershed-Focused Monitoring Plan." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality. Revision 2.
16. Olson, W.C. and S.J. Evans. 2016. "Severe Erosion Survey: Cane Run Watershed, Fayette and Scott County Kentucky." Third Rock Consultants. Project Technical Report for Kentucky Division of Water.
17. Evans, S. J. and J. Shelby. 2016. Technical Memorandum on Illicit Discharge Detection and Elimination Chemical Fingerprint Library. Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality.
18. Evans, S.J. et al. 2016. "Chestnut Creek Watershed Based Plan, Marshall County, KY." Third Rock Consultants. Project Report for Friends of Clarks River National Wildlife Refuge. US EPA Section 319(h) Grant No. C999486-1-12.
19. Evans, S.J. and W.C. Olson. 2015. "Lexington-Fayette Urban County Government 2014 Annual Monitoring Report, Lexington, Kentucky." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality.
20. Olson, W.C. and S.J. Evans. 2014. "North Elkhorn Creek Watershed Assessment, Lexington, Kentucky." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality.

Curriculum Vitae (Abridged)

Steven W. Hoagland, EIT

Phone: (859) 433-0475
steven.hoagland2@gmail.com

712 Vermillion Peak Pass
Lexington, KY 40515

EDUCATION

- MS** University of Kentucky, Civil Engineering (2016)
Emphasis: Hydraulics, Water Resources Engineering
Committee Members: Lindell Ormsbee,* PhD; Scott Yost, PhD; James Fox, PhD
**Advisor*
- BS** University of Kentucky, Civil Engineering (2014)
Emphasis: Water Resources Engineering
Undergraduate Research Advisors: Lindell Ormsbee, PhD; Scott Yost, PhD

PROFESSIONAL EXPERIENCE

Kentucky Water Resources Research Institute, Lexington, KY (Sep. 2018 - Present)

Civil Engineer

- Responsible for planning, coordinating, and conducting training workshops for rural water and wastewater utilities in Kentucky's Appalachian region; and developing hydraulic models for rural water utilities and training utility employees on model use.
- Reviewed funding proposals for USGS 104b and 104g research grant programs.
- Lead and participated in laboratory exercises to determine the variability and accuracy of field kits when testing for Phosphorus and Nitrogen concentrations.

Tetra Tech, Inc., Lexington, KY (Jan. 2016 – Sep. 2018)

Civil Engineer

- Responsible for balancing a multi-project workload, coordinating with co-workers and clients in other states, responding to clients in a timely manner, meeting deliverable deadlines, and delegating project work to engineering interns.
- Project work includes civil site design, construction administration, hydrologic and hydraulic modeling, and municipal program management.

Civil Site Design and Construction

1. Blue Grass Airport, Lexington, KY
2. West Hickman Wastewater Treatment Plant, Lexington, KY
3. Wolf Run WWS Facility, Lexington, KY

Municipal Program Management

1. Blue Grass Airport, Environmental Management Program
2. LFUCG, Municipal Separate Storm Sewer System (MS4) Program

Hydrologic and Hydraulic Modeling

1. City of Cape Coral, FL – Irrigation
2. City of Gateway, FL – Irrigation
3. City of Grand Rapids, MI – Storm
4. City of Port St. Lucie, FL – Potable
5. City of Tampa, FL – Combined Sewer
6. Genoa-Osceola, MI – Sanitary Sewer
7. GLWA, MI – Combined Sewer
8. Miami-Dade County, Potable
9. Miami Int'l Airport, FL – Potable
10. Westover Air Reserve Base, MA – Potable

Curriculum Vitae (Abridged)

PUBLICATIONS

Journal Publications

1. Hoagland, S., Hernandez, E., and Ormsbee, L., "Hydraulic Model Database for Applied Water Distribution Systems Research," *in preparation*.
2. Ormsbee, L., Peterson, K., and Hoagland, S., "Is It Time to Revise the Curve Number Method: Especially for Urban Applications?" *in preparation*.

Conference Proceedings

1. Hernandez, E. Hoagland, S., and Ormsbee, L., "Water Distribution Database for Research Applications," Proceedings of World Environmental and Water Resources Congress, West Palm Beach, FL, May 22-26, 2016, pp. 465-474.
2. Hoagland, S., Schal, S. Ormsbee, L., and Bryson, S., "Classification of Water Distribution Systems for Research Applications," Proceedings of World Environmental and Water Resources Congress, Austin, TX, May 17-21, 2015, pp. 696-702.

Thesis



1. Hoagland, S., "Transient-Based Risk Analysis of Water Distribution Systems," Civil Engineering Theses and Dissertations, University of Kentucky, 2016. https://uknowledge.uky.edu/ce_etds/39.

Technical Reports

1. "Monitoring of Post-Construction Stormwater Controls," Lexington-Fayette Urban County Government, June 2018.
2. "WQV and RRV Analysis of Existing Stormwater Controls for the Hope Center Apartments at 1518 Versailles Road," Lexington-Fayette Urban County Government, August 2017.
3. "Hydrologic / Hydraulic Analysis of Residential Detention Basin WH+61+A1 at 109 Hidden Woods Court," Lexington-Fayette Urban County Government, June 2017.

PRESENTATIONS AND WORKSHOPS

1. "Introduction to Water Distribution Systems Modeling Workshop," Martin County Water District, Inez, Kentucky, March 5, 2019.
2. "Erosion and Sediment Control Plan Preparation Workshop," Developers, Contractors, and Consultants, Lexington-Fayette Urban County Government MS4 Program, March 20, 2018.
3. "Erosion and Sediment Control Plan Review Workshop," Municipal Staff and Fayette Construction Site Inspectors, Lexington-Fayette Urban County Government MS4 Program, March 1, 2018.
4. "Challenges and Perspective from an EIT," Water Professionals Student Chapter, University of Kentucky, November 30, 2017.
5. "Classification of Water Distribution Systems for Research Applications," World Environmental and Water Resources Congress, Austin, TX, May 20, 2015.


Introduction to Water Distribution System Modeling
 Steven Hoagland
 &
 Dr. Lindell Ormsbee


1


Workshop Outline

- Introduction to Modeling
 - What is a model?
 - Types of models
- Water distribution modeling
 - How it works
 - Applications
 - Miami-Dade Example
 - Model Development
 - Model Limitations
- Overview of Software
 - KYPIPE, EPANET, Bentley, Innovyze
 - KYPIPE Small Utilities Version
 - User Interface
 - Background Maps
 - Asset Management Data
- Pipe Break Analysis
 - Adding Valves and Hydrants
 - Adding Pipes and Nodes
 - Generating a Flow Analysis
 - Saving Reports and Maps
- Your Model
 - Get familiar with model
 - Exercises
- Model Calibration
- Other Applications
- Software Installation

2

What is a model?

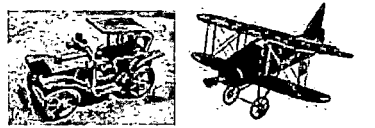
- A model is a simplified representation of something real
- There are many different types of models



3

Types of models - Iconic


Iconic Models – scale models of a physical system constructed out of the same or alternative materials



4

Types of models - Dimensional


Dimensional Models – a physical model of a real system whose results can be translated back to the real system using “dimensional analysis”



5


Types of models - Dimensional

Dimensional Models – a physical model of a real system whose results can be translated back to the real system using “dimensional analysis”



6

Types of models - Dimensional



7

Types of models - Analog

New England Water Works Association
 ORGANIZED 1882.
 Vol. XLVIII. December, 1924. No. 2.
 This Association is a body to be responsible for the promotion of water works in the country.

HYDRAULIC ANALYSIS OF WATER DISTRIBUTION SYSTEMS BY MEANS OF AN ELECTRIC NETWORK ANALYZER*
 THOS. W. CAMPBELL and H. L. HASKEN,†
 (Received July 29, 1924)

The Hydraulic Problem. In the design of new water distribution systems reinforcements to existing systems, it is necessary to select the sizes of the pipes by trial and check them by estimating the pressure drops due to domestic and fire drafts. For a given system, several critical points will emerge during the study at which it appears desirable to investigate the pressure when drawing both domestic and fire flows. Each of these critical points will have its minimum allowable pressure determined by the height of the buildings in the district. If the static pressure is fixed, as in an existing system, each critical point will have its allowable pressure-drop under the worst loading conditions for that point. If the static pressure is not fixed, as for an entirely new system, it may be determined by considering jointly the permissible pressure upon plumbing systems and the maximum pressures.

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Types of models - Analog

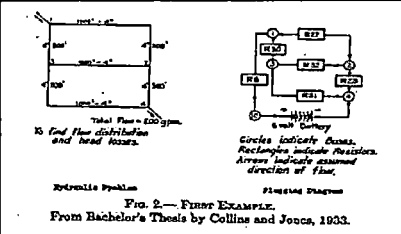
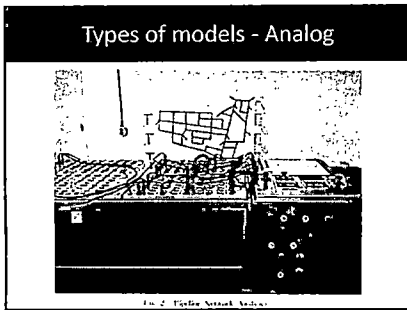
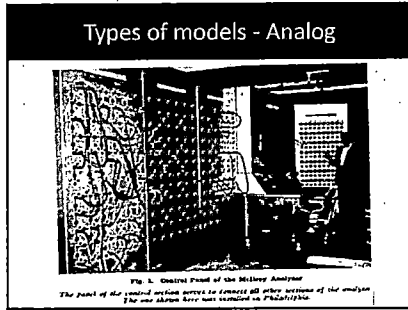


FIG. 2.—FIRST EXAMPLE.
 From Bachelor's Thesis by Collins and Jocco, 1933.

9



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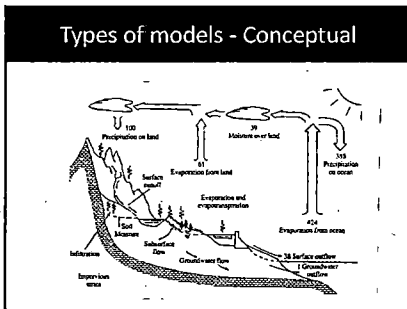


11

Types of models - Conceptual

- A conceptual model is a representation of a system, made of the composition of concepts which are used to help people know, understand, or simulate a subject the model represents.

12



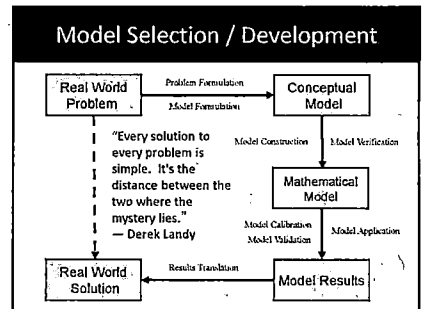
13

Types of models - Mathematical

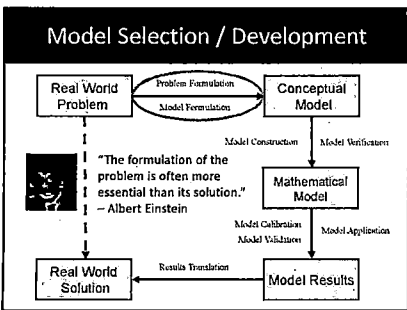
- A mathematical model is a description of a system using mathematical concepts which traditionally contain:
 - Governing Equations
 - Assumptions and Constraints
 - Other equations
 - Defining
 - Constitutive

$$\Delta Q + \Delta S + \Delta C = 0$$

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15



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What type of model are we developing?

- Iconic
- Dimensional
- Analog
- Conceptual
- Mathematical $\Delta Q + \Delta S + \Delta C = 0$

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What's the models purpose?

- A model can help us answer these questions:
 - How does our system currently operate?
 - Pressures and Flows
 - Extended period simulation
 - Water Quality
 - Transients
 - How will our system respond under different conditions?
 - Future demands / adding customers
 - Operational changes
 - Infrastructure upgrades or failures

18

Water Distribution System (WDS) Modeling – How does it work?

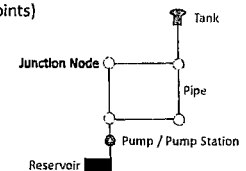
- Steady-State Model
 - The most basic form of WDS modeling is called steady-state modeling, which gives us a glimpse of system pressures and flow rates at a specific moment in time
 - Think snap-shot of your system
 - Example:
 - 8:00 am on Monday morning



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WDS Modeling – How does it work?

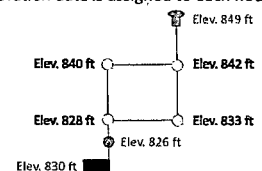
- Each system component is represented by a node (point), or a link (line that connects to points)



20

WDS Modeling – How does it work?


- Nodes and pipes have X/Y coordinates
- Elevation data is assigned to each node



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WDS Modeling – How does it work?

- Tanks and Reservoirs are called Fixed Grade Nodes (FGN) because their grades are fixed or unchanged during the simulation



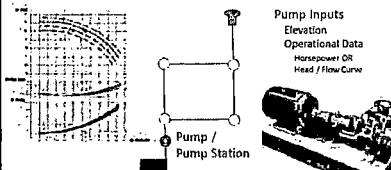
Reservoir Inputs	Elevation Grade (or depth)
Tank Inputs	Elevation Grade for initial grade Volume (or Diameter) Maximum Level Minimum Level

Main Difference between tanks and reservoirs is that tanks have finite volume and reservoirs have infinite volume

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WDS Modeling – How does it work?

- Pumps "push" the water from a low energy state (typically low elevation) to a high energy state

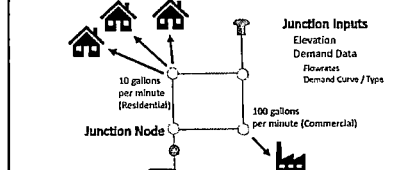


Pump Inputs
Elevation
Operational Data
Horsepower OR
Head / Flow Curve

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WDS Modeling – How does it work?

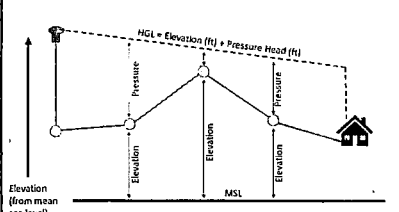
- Customer demand and significant elevation changes are represented at junction nodes



Junction Inputs
Elevation
Demand Data
Flowrate
Demand Curve / Type

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WDS Modeling – How does it work?

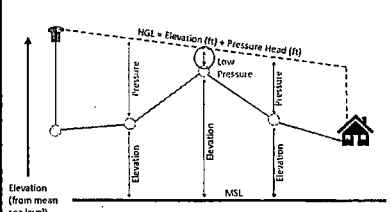


$HGL = Elevation (ft) + Pressure Head (ft)$

Elevation (from mean sea level)

25

WDS Modeling – How does it work?



$HGL = Elevation (ft) + Pressure Head (ft)$

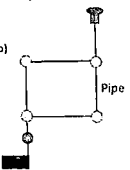
Elevation (from mean sea level)

26

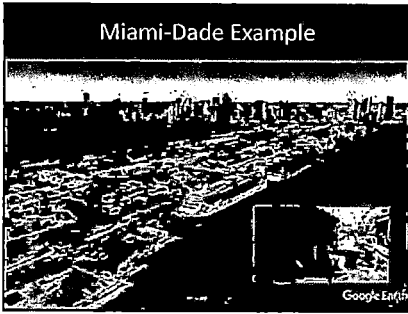
WDS Modeling – How does it work?

- Pipes are links that connect two nodes
- All pipes are links, but not all links are pipes

Pipe Inputs
Start Node / End Node (auto)
Length (auto calculated)
Diameter
Roughness
Material - surrogate



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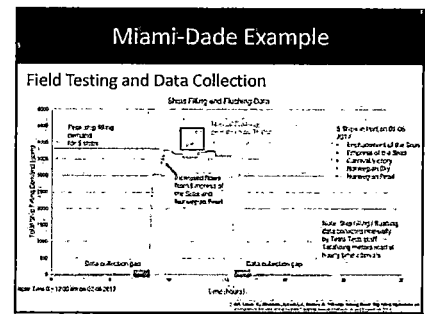
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Miami-Dade Example

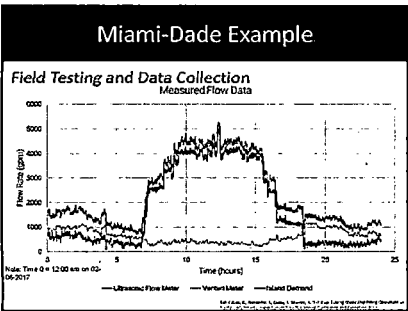
Field Testing and Data Collection

- Pipe locates
- Venturi Meter
- Developed a testing plan
 - Meters
 - Remote pressure recorders
 - Field flushing

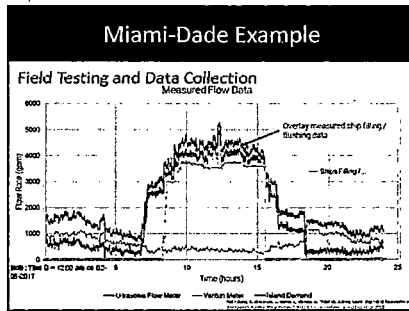
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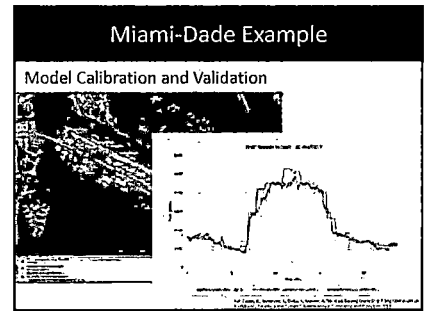
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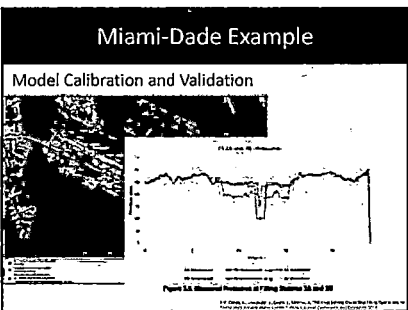
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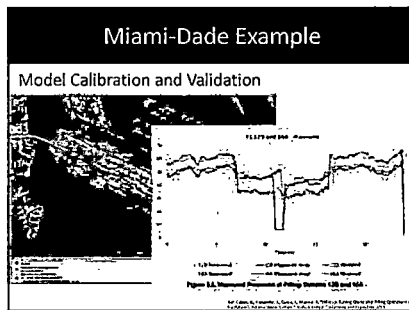
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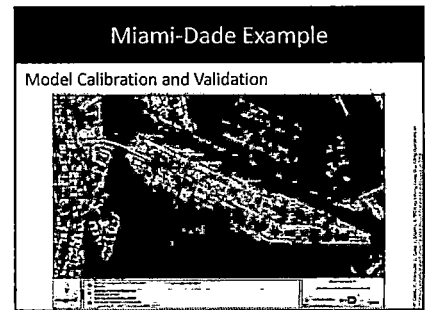
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Miami-Dade Example

Projected Water Demands

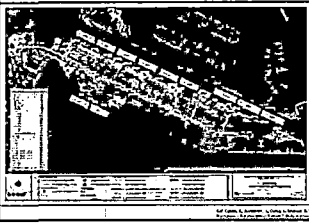


Customers	Projected Demands (gpm)
Tourists	1,000
Ferry Ships	2,000
Cruise Ships	19,000
Fire Flow	3,000
Total	25,000



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Miami-Dade Example

Capital Improvement Program

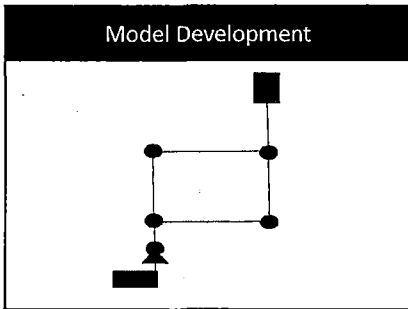




47

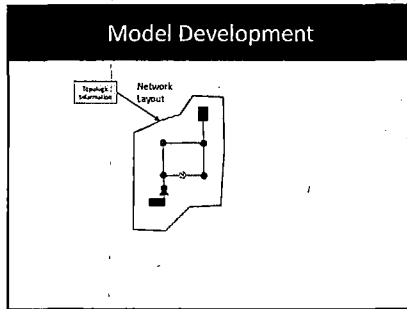
Benefits of Model Development

- Mapped Database of System
- Identification of Data Errors
- Identification of Inefficient Operations
- Identification of Closed Valves
- Identification of Leaking Pipes

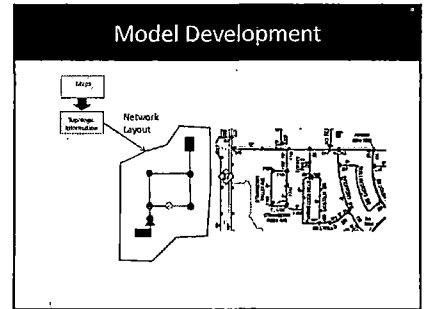
48



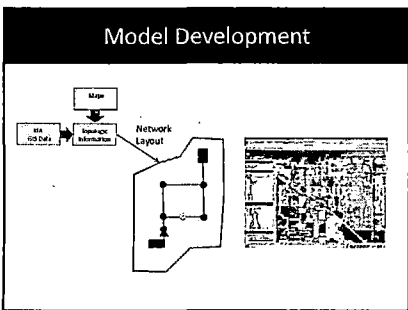
49



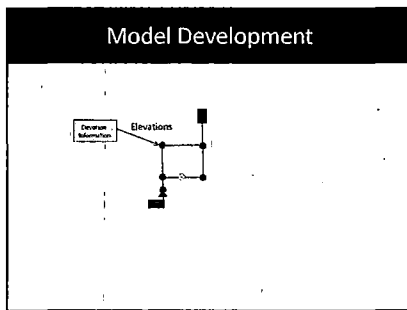
50



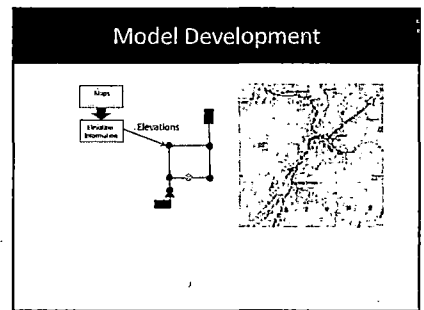
51



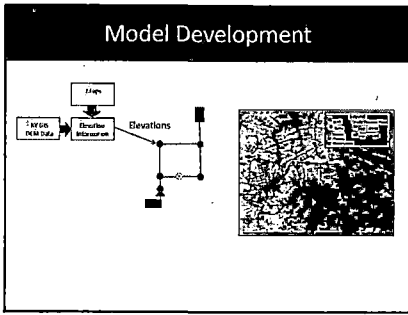
52



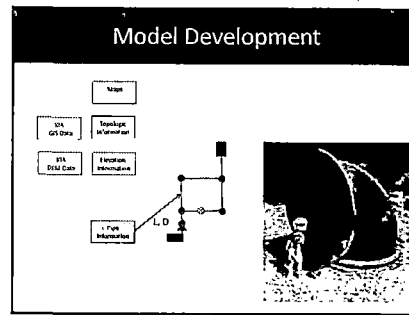
53



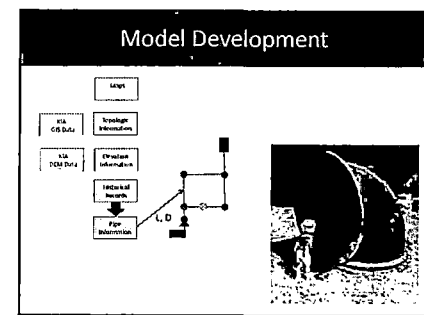
54



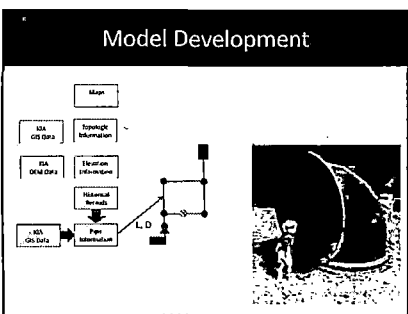
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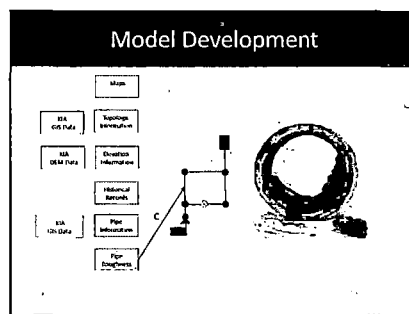
56



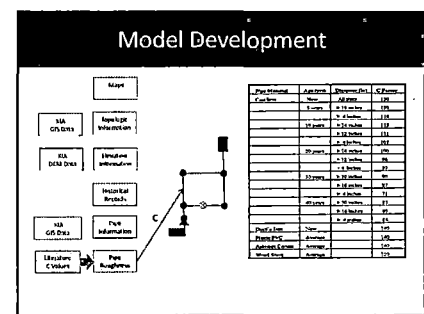
57



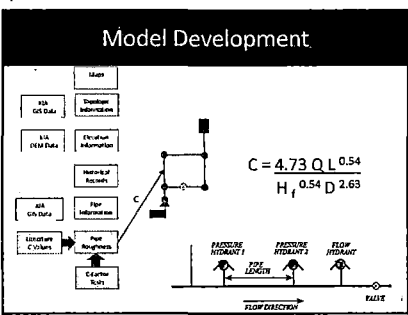
58



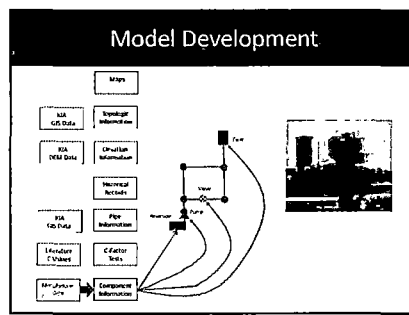
59



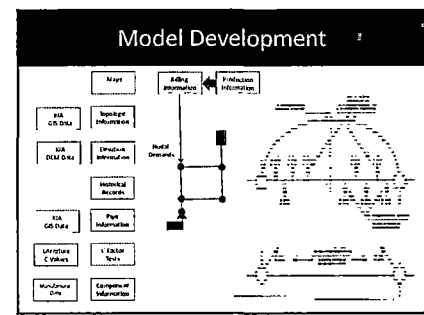
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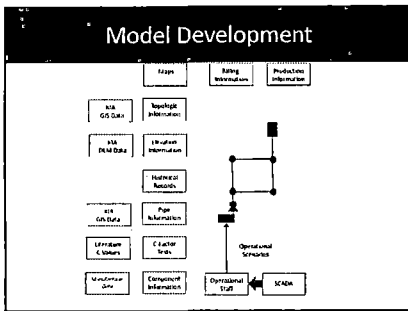
61



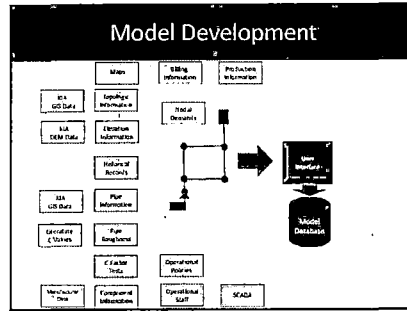
62



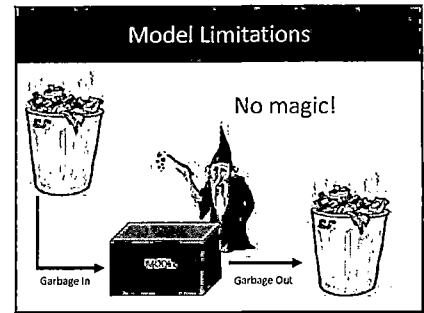
63



64



65



66

Model Limitations

- "All models are wrong, but some are useful."
— George Edward Pelham Box

67

Q & A

68

Overview of Water Distribution Modeling Software

69

Modeling Software

EPANET
<http://www.epa.gov/water-research/epanet>

Bentley Systems
<http://www.bentley.com/en>

Innovyze
<http://www.innovyze.com/en-us>

KYPIPE
<http://kyPIPE.com/>

70

EPANET

- EPANET
 - Developed by the Environmental Protection Agency (19..)
 - Many of the commercial software companies use the EPANET engine
 - Pros
 - Free to download at <http://www.epa.gov/water-research/epanet>
 - Free water quality modeling extensions
 - Able to modify source code
 - Cons
 - No modeling support
 - Graphical interface not user friendly
 - Not as many "bells and whistles"

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Innovyze & Bentley Systems

- ESRI (GIS) Integrated
- More "bells and whistles"
 - Data sets
 - Scenario planning
 - User interface
- Expensive licenses
- These companies typically compete for the largest municipal clients


72

KYPIPE

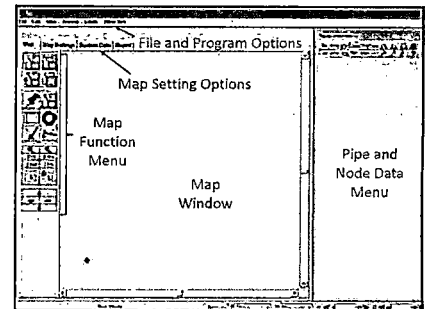
- Developed at the University of Kentucky
- Used to teach engineering students at UK
- Commercial business
- Large systems typically move away from KYPIPE, but it is perfect for small utilities
- Affordable licenses (option for 1-time fee)
- Agreement with UK / KWRRI for FREE Graphical Flow Model (GFM) and Small Utilities Version (SUV)

73

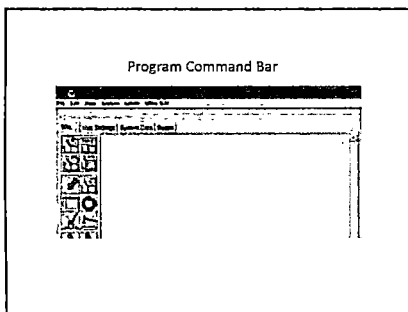
KYPIPE Small Utilities Version (SUV)



74



75




76

Map Function Menu

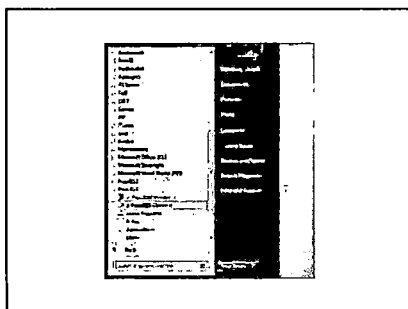
Map Layout Mode	Map Text Mode
Select Multiple Nodes and Pipes	Select Nodes/Pipes using a polyline
Attach a zone to the map	Clear Selections
View data tables	Refresh map
Undo last map change	Redo last map change
Zoom and pan functions	Zoom and pan functions
Shift map window functions	Shift map window functions

77

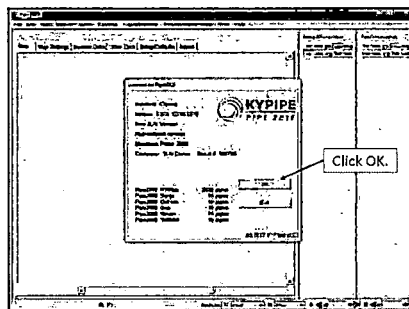
Opening an Existing File



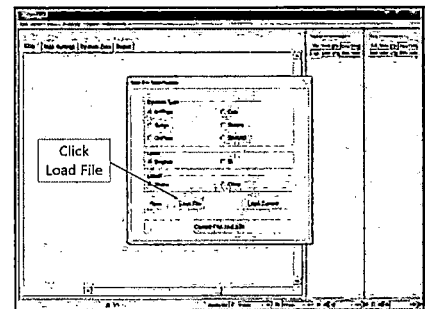
78



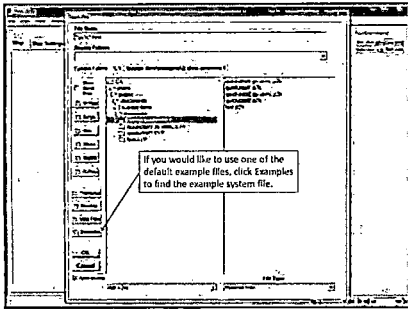
79



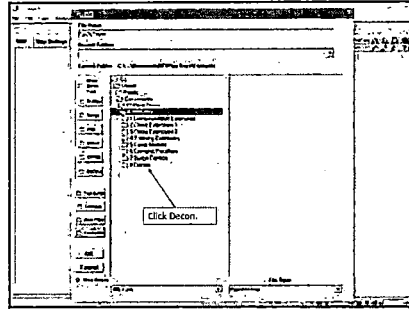
80



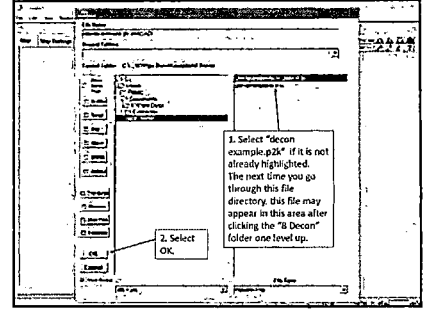
81



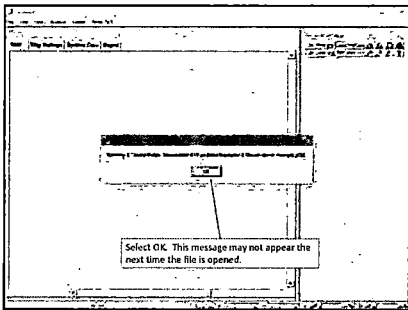
82



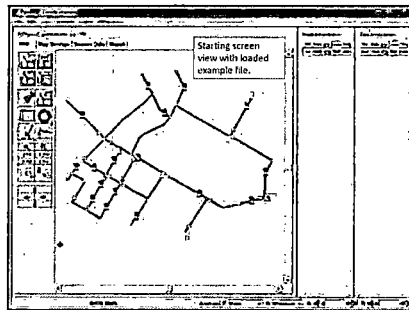
83



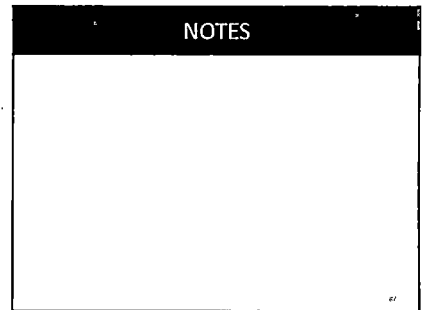
84



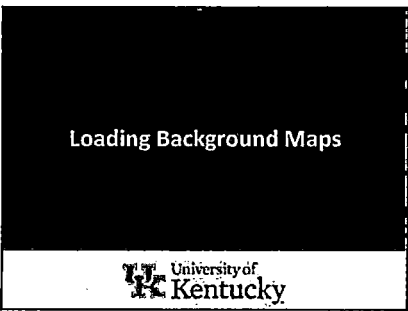
85



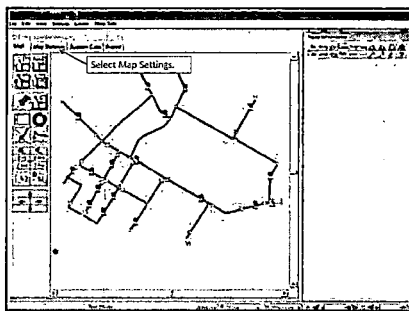
86



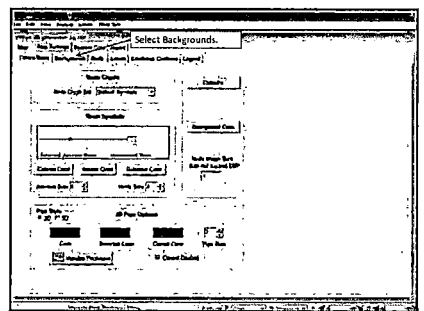
87



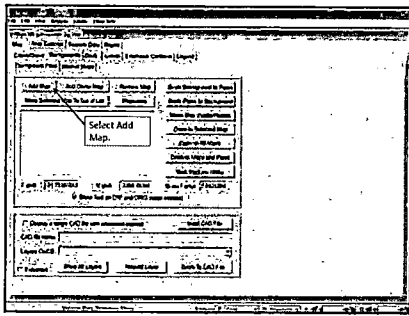
88



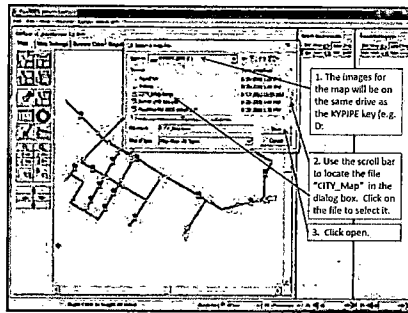
89



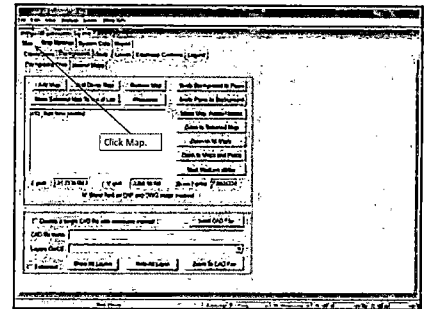
90



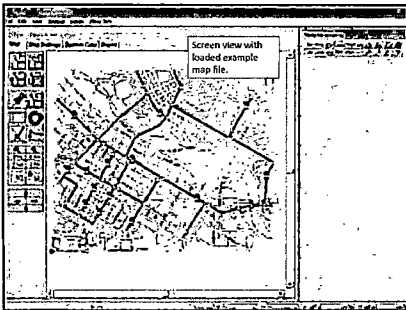
91



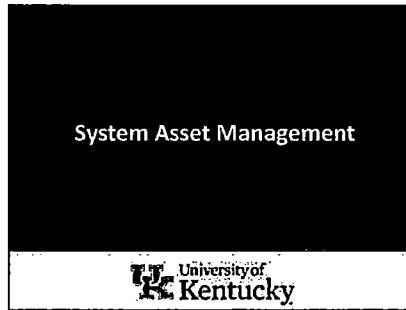
92



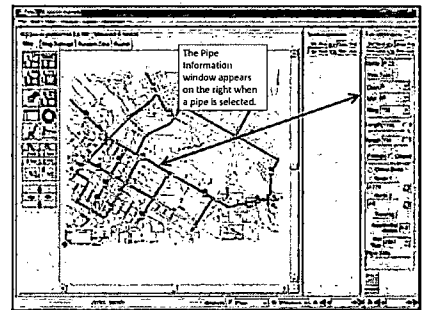
93



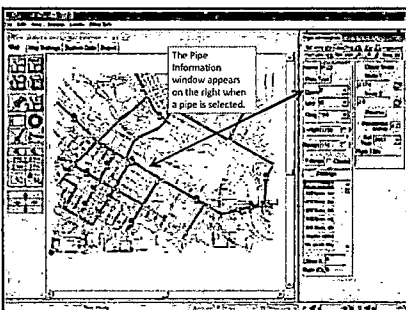
94



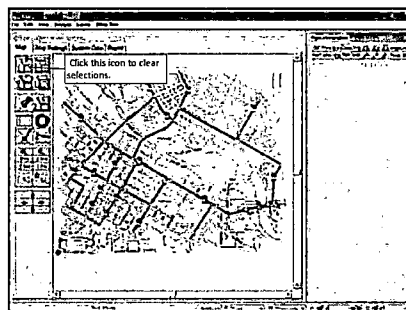
95



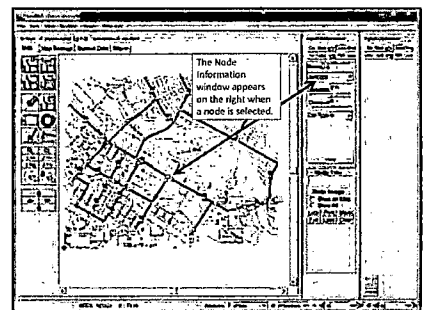
96



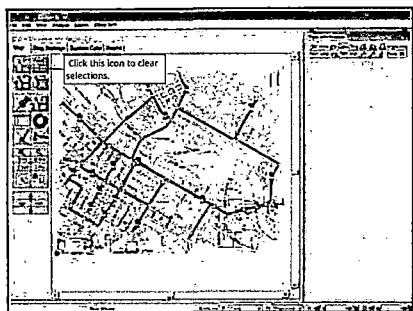
97



98



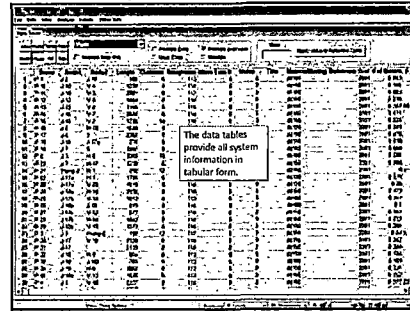
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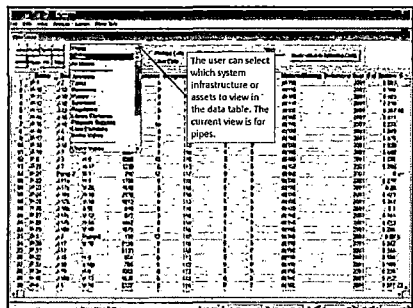
100



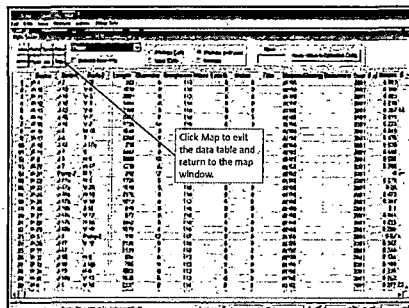
101



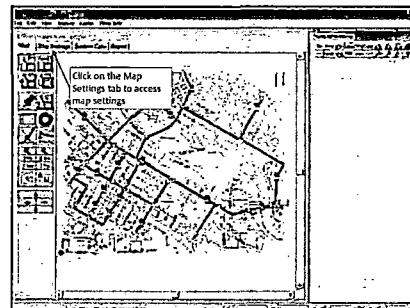
102



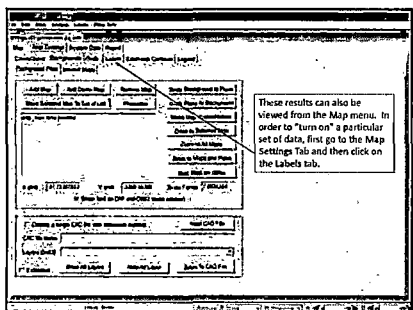
103



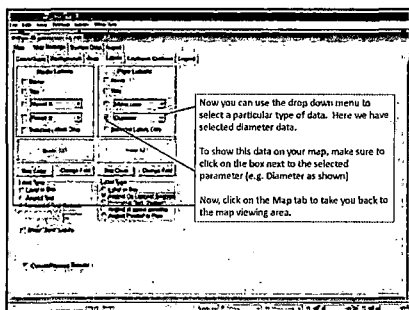
104



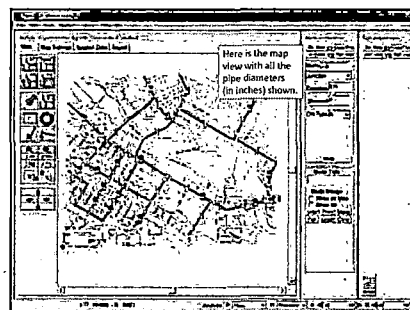
105



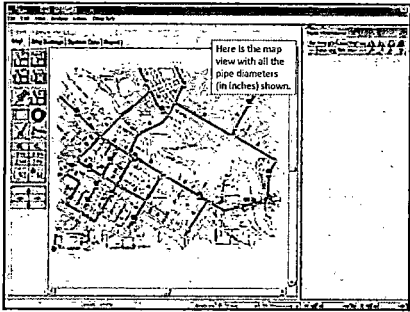
106



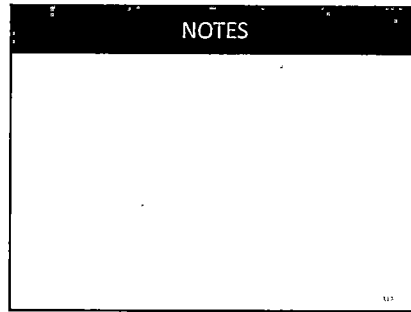
107



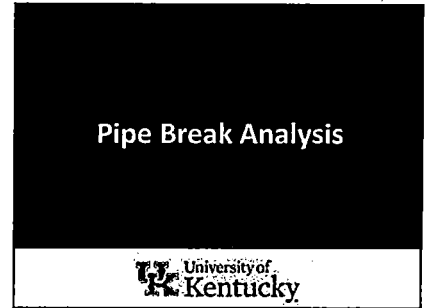
108



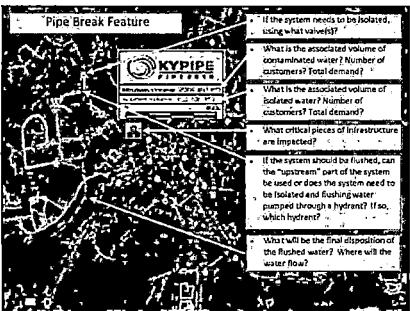
109



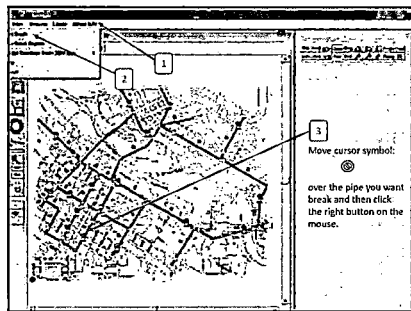
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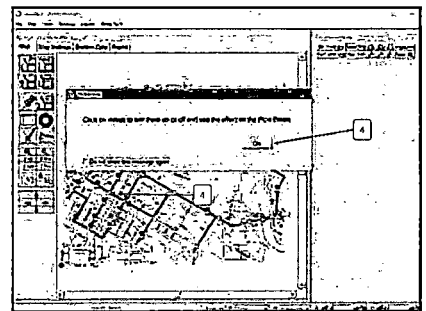
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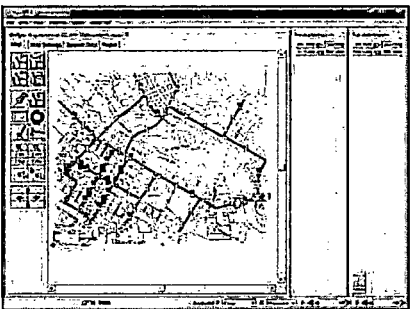
112



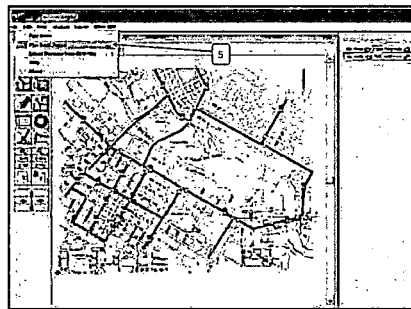
113



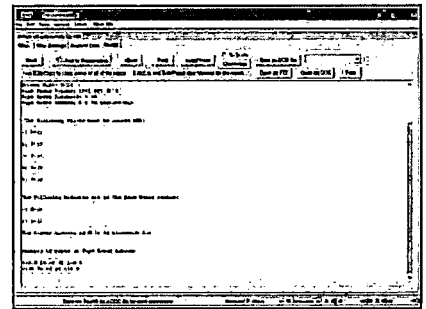
114



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116




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Elements of a Pipe Break Report

1. File name of the network
2. Date that the analysis was performed
3. Name of the pipe that contains the source of the contaminant (this is defined by where the user clicked to insert the point intrusion)
4. List of valve that must be turned off in order to isolate the pipe break
5. List of hydrants that are in the isolated region
6. Name and elevation of the lowest hydrant in the contaminated area (for use in flushing)
7. List of the lengths of all of the types of pipes within the contaminated region; categorized by diameter

118

Adding Valves and Hydrants to an Existing Data File

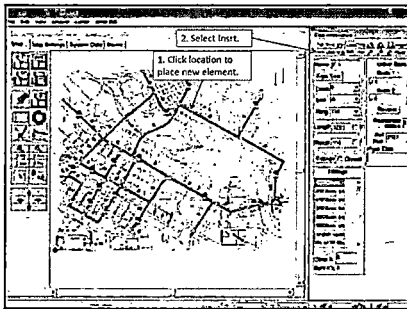


119

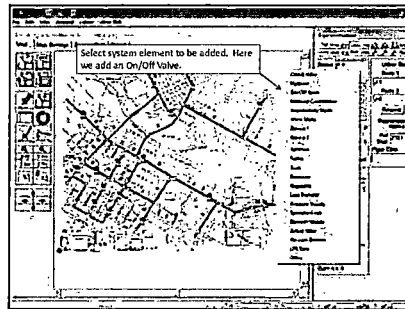
Add Valves and Hydrants to the Network

1. From the Network Map screen, click on a pipe in the location where a valve or hydrant should be.
2. In the Pipe Information panel on the right, click on the Insert ["Insr"] button.
3. In the menu that pops up, select "On/Off Valve" to insert a valve or "Hydrant" to insert a hydrant.

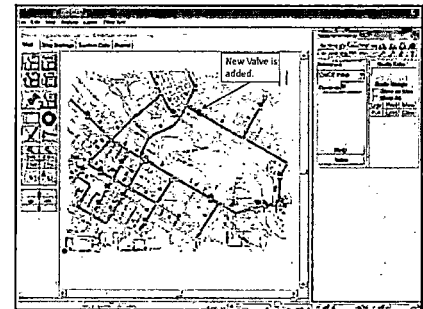
120



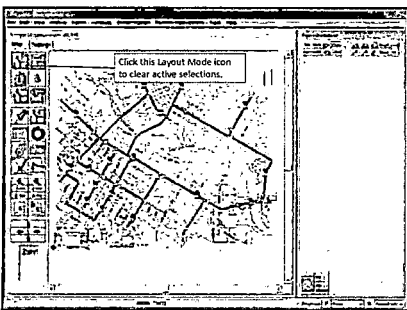
121



122



123




124

Note:

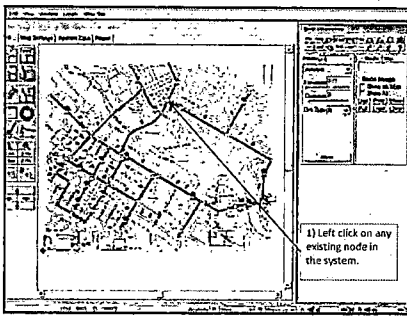
1. Once you place a valve or hydrant, you can move it by clicking and dragging it to the desired location.
2. The valve or hydrant can be deleted by clicking it to select it and then hitting the delete ["Del"] button. The delete button is right above the "On" button used to denote whether the valve is on (open) or off (closed).

125

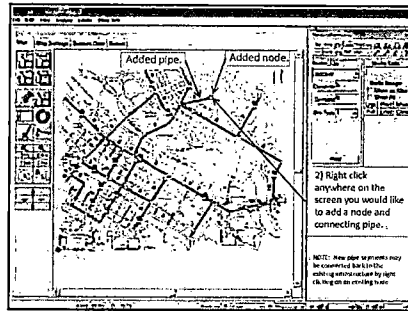
Adding Pipe and Node Elements



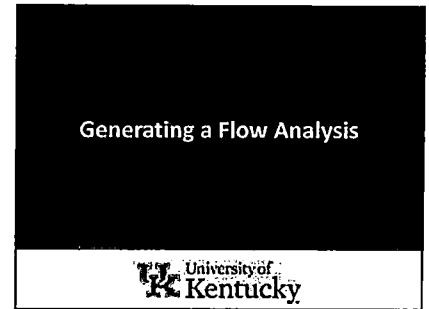
126



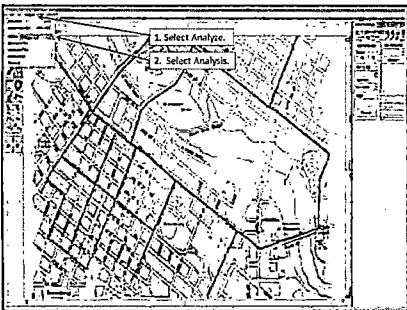
127



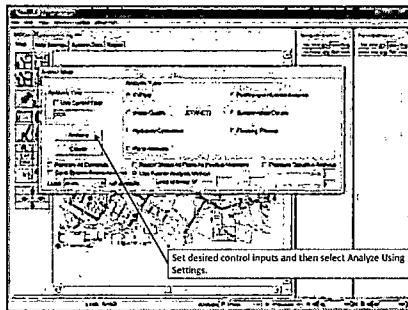
128



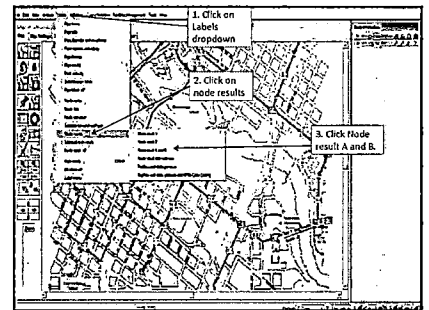
129



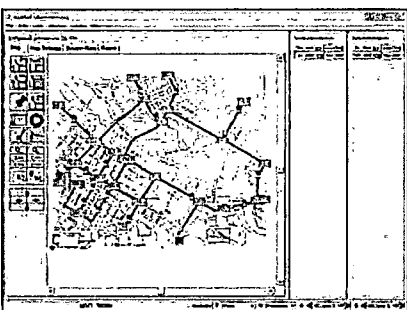
130



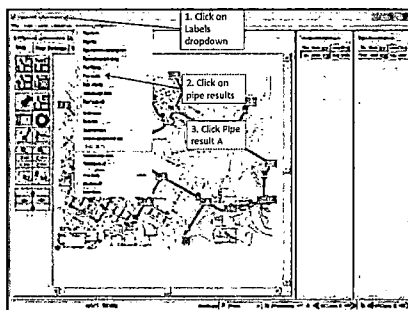
131



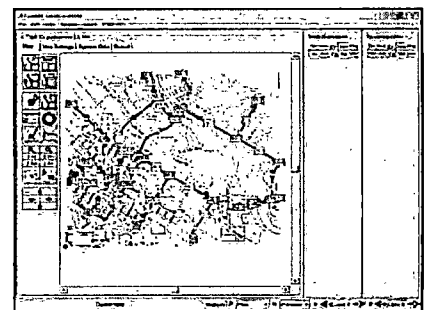
132



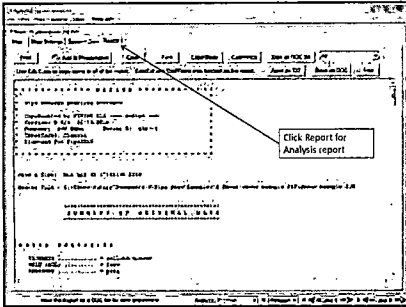
133



134



135

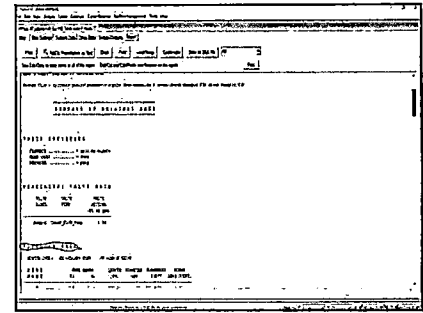


136

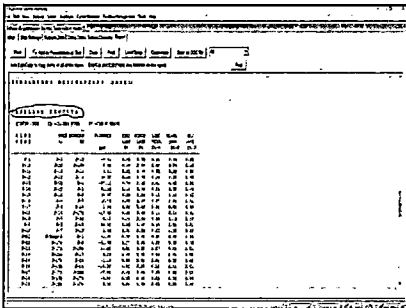
Elements of a Flow Analysis Report

1. File name of the network
2. Regulatory valve data and properties
3. Pipeline data and properties
4. Node data and properties
5. Regulatory valve flow analysis results (upstream and downstream pressure and through flowrate)
6. Pipeline Flow analysis (flowrates)
7. Node flow analysis results (external demand, hydraulic grade, pressure head and node pressure in psi)
8. Summary of system inflows and outflows

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NOTES

A large empty rectangular area intended for user notes.

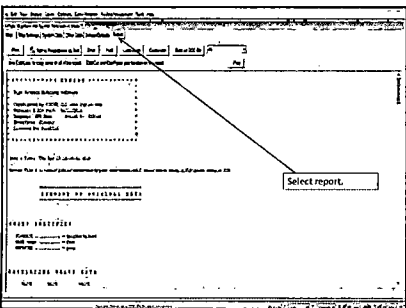
140

Printing/Saving the Analysis Report

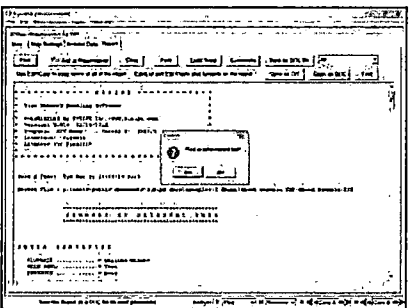
The analysis report can be printed in hard copy form, saved as a PDF, BMP, or JPG file, or added to a presentation as text.

University of Kentucky

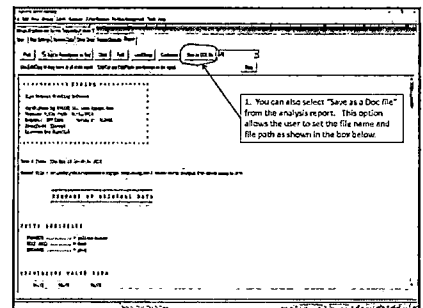
141



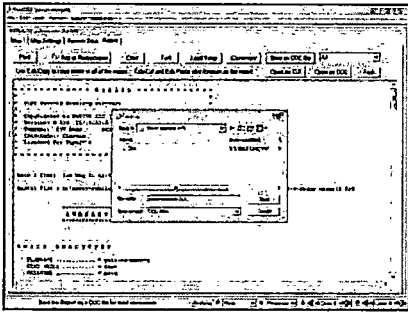
142



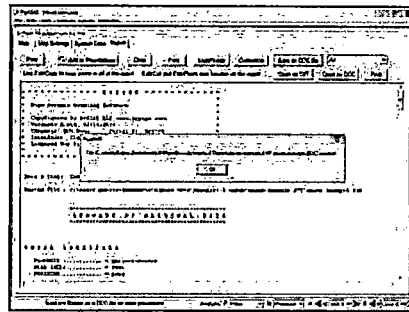
143



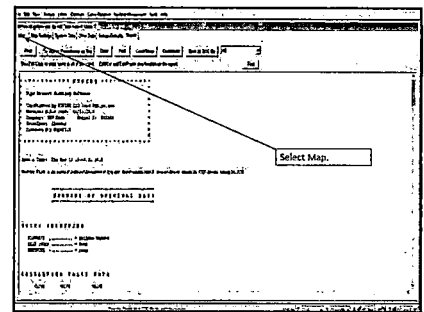
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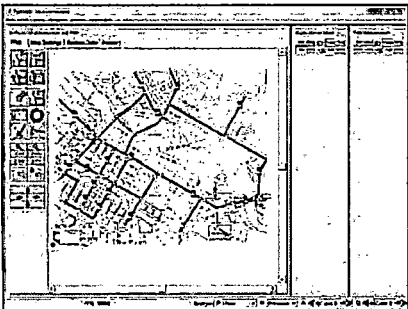
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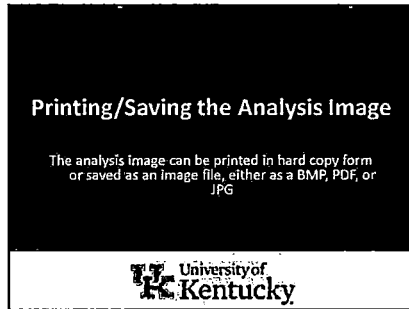
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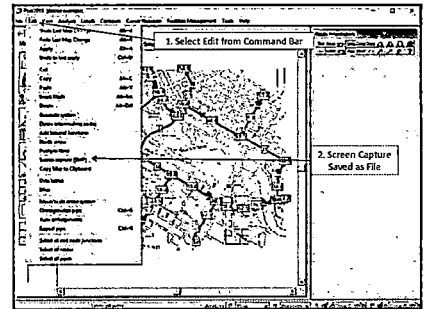
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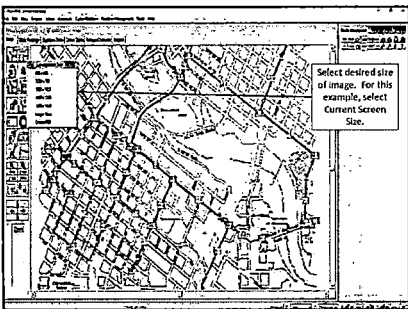
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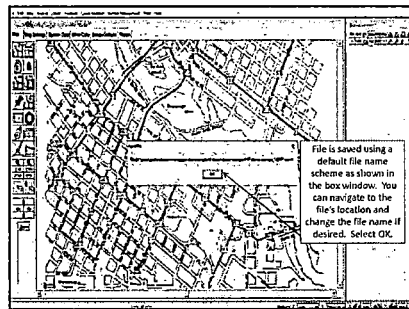
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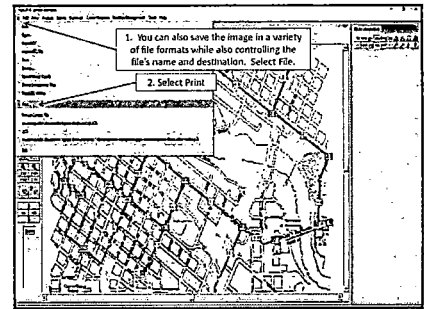
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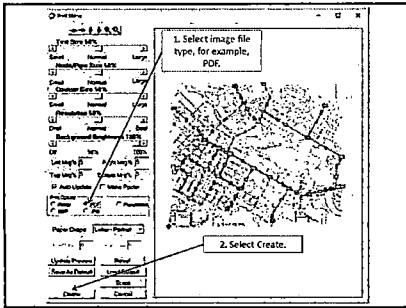
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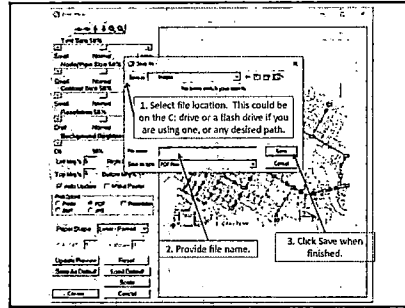
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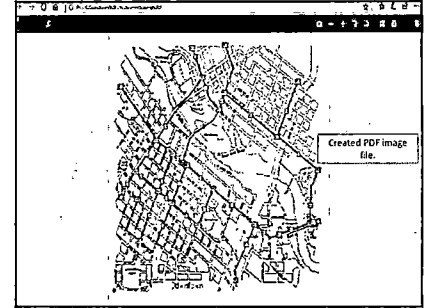
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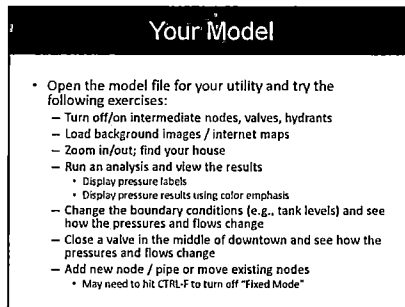
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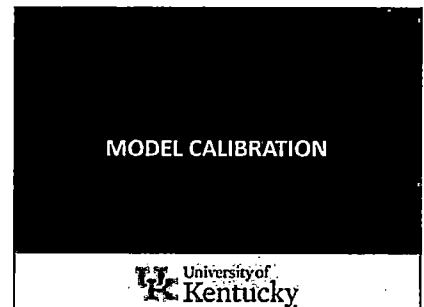
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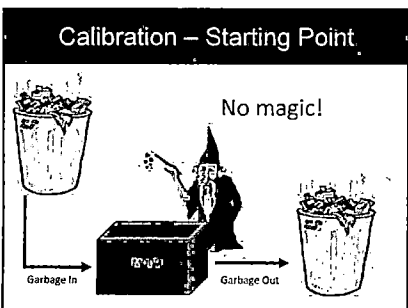
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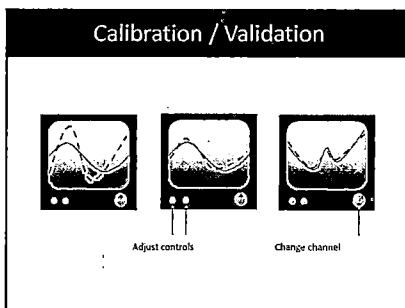
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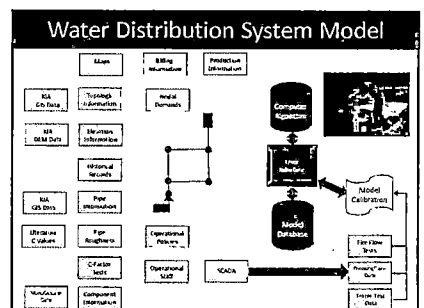
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Types of Calibration

- Macro Level vs. Micro Level
- Steady State vs. Extended Period
- Manual vs. Automated

163

Collect Calibration Data

- Fire Flow Tests
- Telemetry Data
 - Tank levels over time
 - Pressures over time
- Water Quality Data
 - Fluoride Concentration

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Collect Calibration Data

$Q = 29.8 C D^2 P^{0.5}$

where: D (inches), P (psi), Q(gpm)

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General Suggestions

- Use Bourdon Gage with 1 psi increments
- Use pressure snubbers
- Make visual survey of test area
- Consider safety issues
- Use cell phones for coordination

166

Run Model and Check Results

- Steady State Analysis
 - Check fire flow results
 - Pressure (5-10%) of relative pressure gradient
- Extended Period Analyses
 - Check tank level predictions
 - Trajectories (S residuals < 5%)
- Water Quality Analyses
 - Check travel times
 - Travel times (< 5-10%)

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Steady State Marco Level Calibration

- If observed and predict results are significantly different (> 20%) examine:
 - data collection errors
 - closed or partially closed valves
 - inaccurate pumps or PRVs
 - incorrect pipe dimensions
 - incorrect network geometry
 - incorrect pressure zone boundaries

168

Sensitivity Analysis

- Test various model parameters to assess impact on calibration data:
 - pipe roughness
 - pumps
 - tanks
 - demands
- Efforts should be focused on those parameters that have greatest impact

169

Run Model and Check Results

- Steady State Analysis
 - Adjust pipe roughness, pump heads
- Extended Period Analyses
 - Adjust demands, pump curves
- Water Quality Analyses
 - Check for partially closed valves, effective pipe diameters

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Additional Resources

171

Water Distribution System Operations

OPERATIONAL GUIDANCE

www.uky.edu/WDSO/

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Model Calibration

Once a complete model has been developed it is important that it be calibrated prior to use. A calibrated model is used to predict the behavior of the system. The model is calibrated by comparing the model results with field data. The model is calibrated by adjusting the model parameters until the model results match the field data. The model is calibrated by comparing the model results with field data. The model is calibrated by adjusting the model parameters until the model results match the field data.

173

Model Calibration Literature

As prior to a water distribution model to be built, it needs to accurately reflect real operating conditions. This is often achieved by using current parameters and data throughout the system. The first data set is used to calibrate the model. The second data set is used to validate the model. The model is calibrated by comparing the model results with field data. The model is calibrated by adjusting the model parameters until the model results match the field data.

- Comerio, L., and Liguori, S. (2016) Calibrating Hydraulic Network Models. *Journal of the American Water Works Association*, 98(10), 10-15.
- USA EPA (2002) Water Distribution System Assessment. *Water System Assessment and Management: A Collaborative Guide for Utilities*. EPA 833-B-02-001.
- Waller, M., Sawyer, J. (2007) Use of Calibration and Recording (Water Quality Modeling) Equipment for Conducting Water Distribution System Leak Tests. *The Great Lakes and the City: Proceedings of the ASCE Water Congress 2007*.
- Waller, M., Sawyer, J. (2007) Ground Water Flow Models. *Journal of the American Water Works Association*, 99(11), 11-15.
- Waller, M., Sawyer, J., and Sawyer, J. (2007) Calibrating Distribution System Models with Flow Data. *October, April, pp 10-12*.

174

Actual Systems Calibration Case Studies

As part of the research project, hydraulic simulation models were developed for several water distribution systems in Kentucky. A water quality model was also developed for the Louisville water supply. Part of the hydraulic model was first calibrated prior to use. The water quality model was also calibrated to address a large water supply was also calibrated as part of the first case study of the research project. Reports on each of these calibration studies can be obtained from the links below.

- [Water Distribution of Small River City](#)
- [Water Distribution of Louisville Water Supply](#)
- [Water Quality Calibration of Louisville Water Supply](#)
- [Water Quality Calibration of Lexington Water Supply](#)

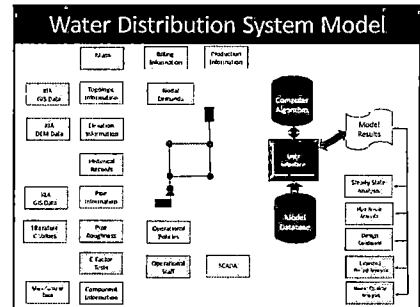
In addition to these studies, the UKU recently completed a water quality study of the Central Kentucky State Agency. The report can be obtained from the link below.

- [Water Quality Study of Central Kentucky State Agency](#)
- [Water Quality Study of Lexington Water Supply](#)

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MODEL APPLICATIONS

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KYPIPE

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Water Quality Analysis

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Water Quality Analysis

- KYPIPE provides a powerful interface to the EPANET program to perform water quality simulations on an existing hydraulic model.
- Through this EPANET interface it is possible to:
 - Calculate chemical concentrations (e.g. chlorine)
 - Calculate water age (residence time)
 - Trace a chemical from a source

181

Calculating Chemical Concentrations

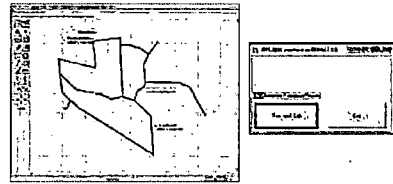
*WQ Simulations are performed over an extended period of time, therefore ensure your system is set up for an EPS prior to the WQ analysis



- 1) Click the tab "Other Data"
- 2) Click the tab "Quality"
- 3) Select which quality parameter you would like to calculate
- 4) Fill in the required parameter tables

182

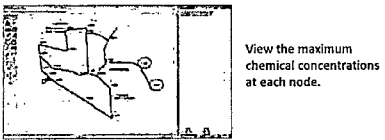
Calculating Chemical Concentrations



- 5) Click "Generate Tabulated Results"
- 6) Click "Run and Exit"

183

Calculating Chemical Concentrations

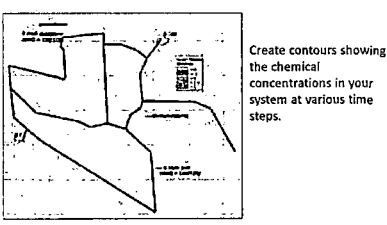


View the maximum chemical concentrations at each node.

Click on any node to view the concentration time series data.

184

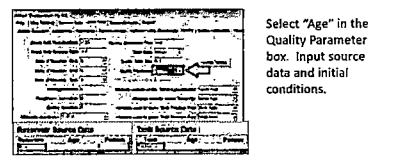
Calculating Chemical Concentrations



Create contours showing the chemical concentrations in your system at various time steps.

185

Residence Time Calculations

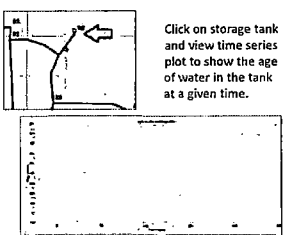


Select "Age" in the Quality Parameter box. Input source data and initial conditions.

Analyze

186

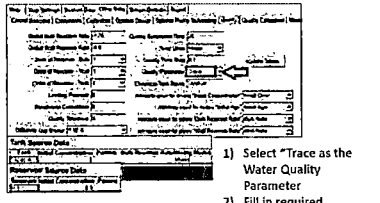
Residence Time Calculations



Click on storage tank and view time series plot to show the age of water in the tank at a given time.

187

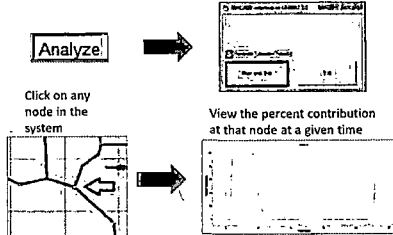
Tracer Analysis



- 1) Select "Trace" as the Water Quality Parameter
- 2) Fill in required parameter tables and initial conditions

188

Tracer Analysis



Analyze

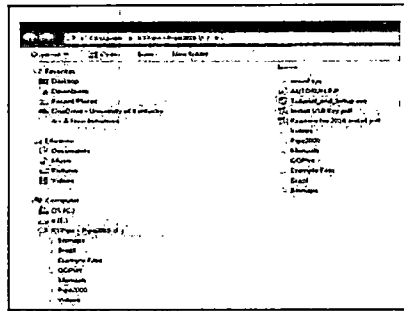
Click on any node in the system

View the percent contribution at that node at a given time

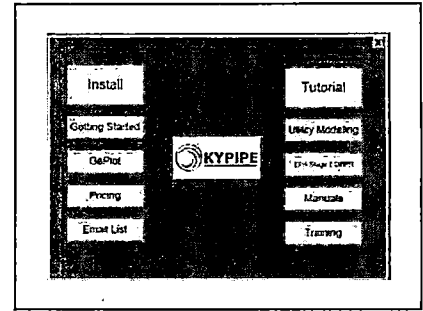
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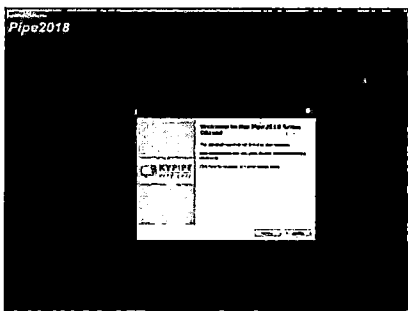
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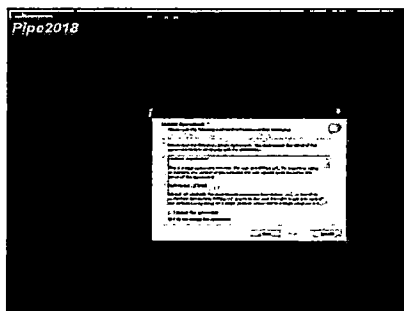
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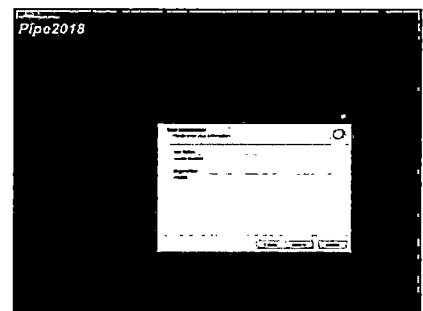
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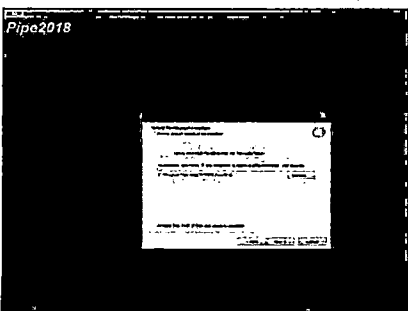
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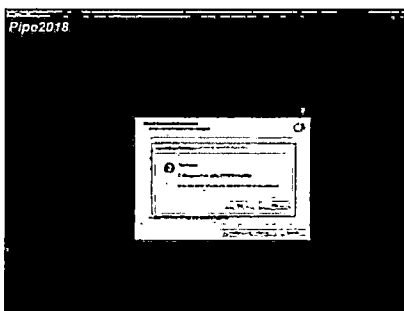
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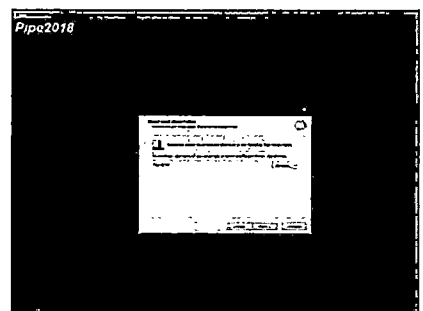
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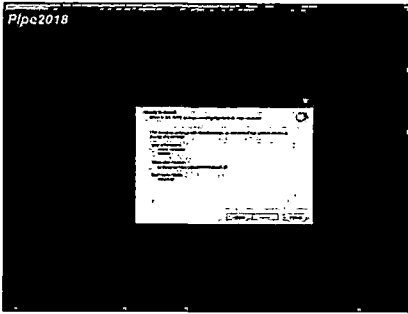
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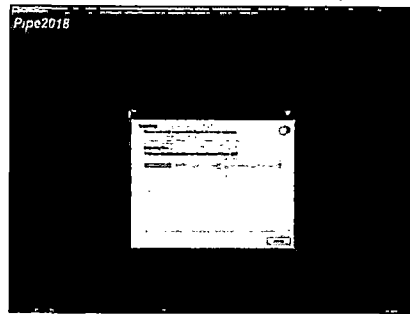
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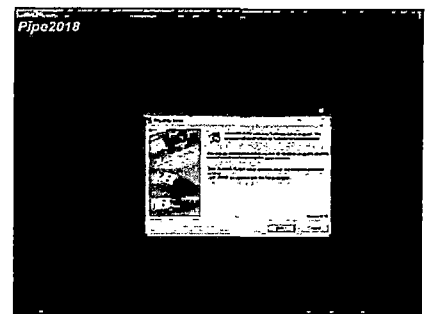
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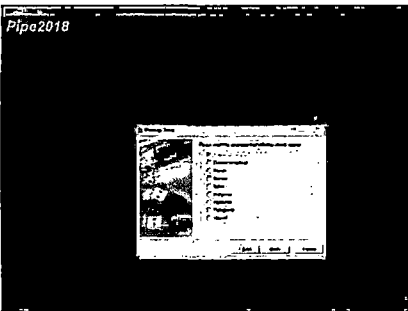
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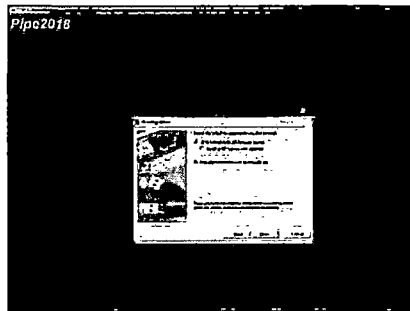
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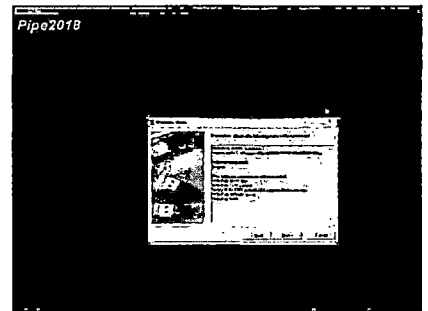
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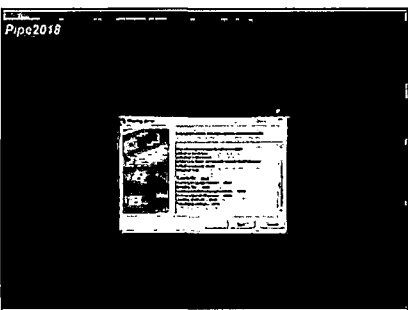
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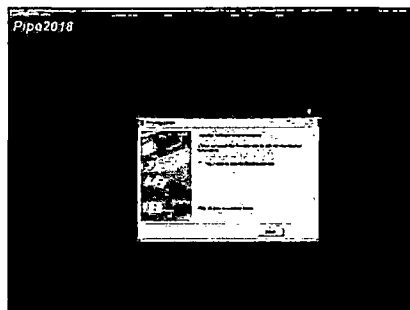
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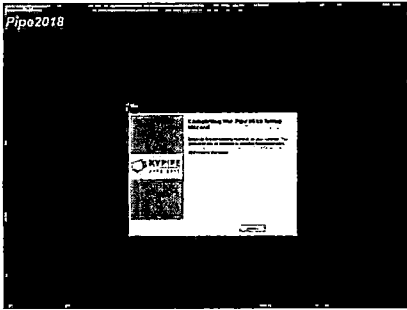
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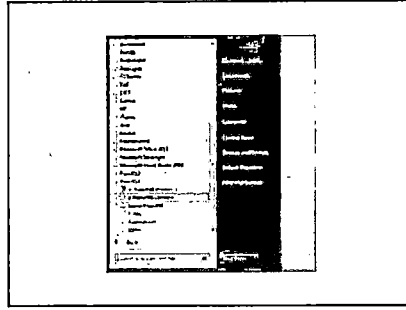
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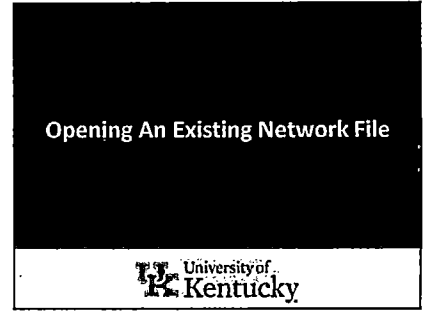
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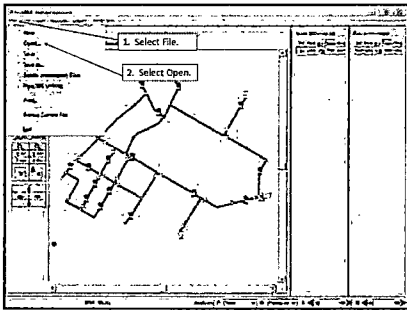
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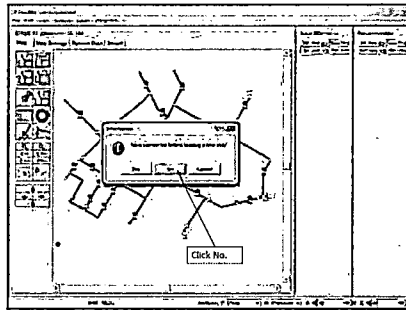
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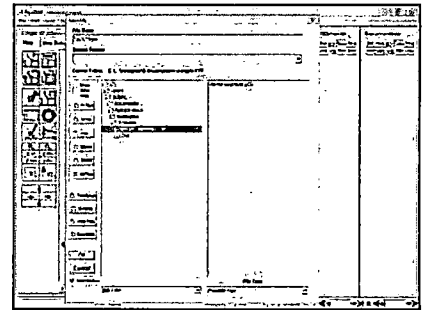
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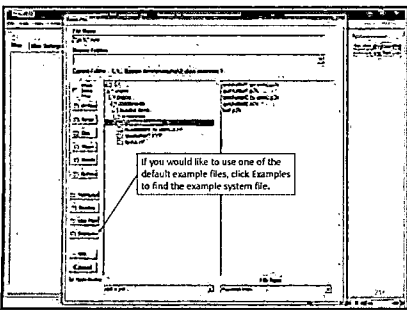
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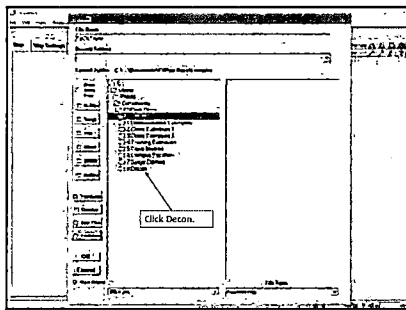
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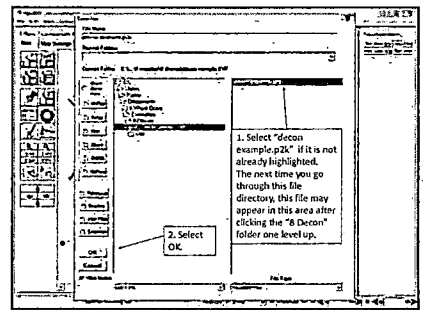
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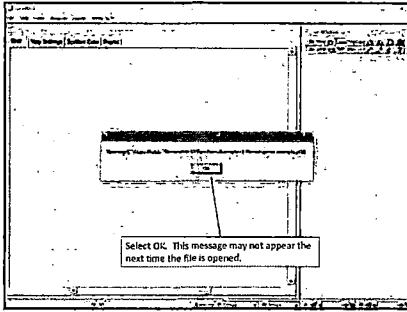
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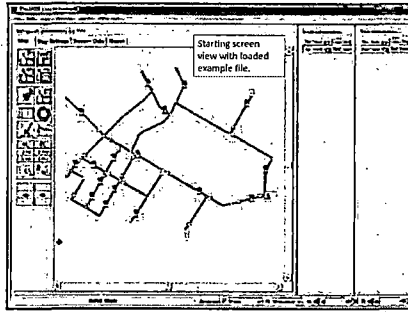
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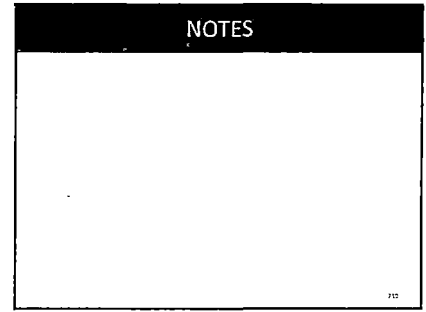
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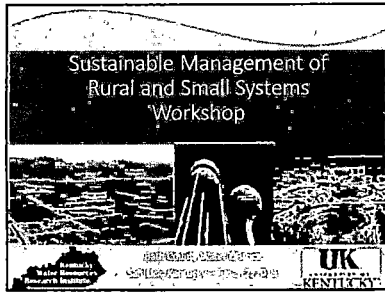
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1

Welcome and Introductions

Moderator: Lindell Ozinsbee

- Welcome
- Purpose of Workshop
- Introduction of Team Members
- Participant Introductions – Name, Community, Role
- Workshop Materials
- Meeting Logistics
- Meeting Agenda

2

Management Process

- Phase I
 - Regional workshops
 - Explain 10 basic management areas
 - Perform general utility assessments
 - Identify possible goals and strategies
- Phase II
 - Individual utility workshops
 - Involve operators, managers, and decision makers
 - Develop feasible goals and strategies
 - Provide technical resources to help support implementation

3

Workshop Participants

• This workshop will focus on management issues but will likely involve a range of participants:

- Operators
- Managers
- Decision makers
 - City Officials
 - Mayors
 - City council members
 - Utility board members
 - County Officials
 - Judges
 - Members of the fiscal court

4

Schedule of Activities

Introduce Key Management Areas
 Perform Self Assessment Exercise
 Discuss Tips for Improving Outcomes
 Improving Outcomes Exercise
 Lunch
 Creating an Action Plan Exercise
 Tools, Guides and other Resources
 Next Steps

5

Public Expectations

Public Water Systems

Provide safe drinking water at most appropriate cost

- ✓ Water Quality
- ✓ Reliability
- ✓ Affordability

6

Common Challenges for Utilities

- Aging infrastructure that needs more intensive repair and replacement.
- Continuing regulatory changes, including the need to often balance priorities among multiple compliance endpoints.
- Workforce challenges, including an aging workforce and difficulties in recruiting and retaining qualified staff.
- Uncertainties about future funding opportunities.
- Competing local priorities and a dwindling resource base in many small communities.
- Uninformed or disengaged board members.

7

Key Utility Personnel

• The effective management of a water utility will require the active participation of a range of individuals:

- Customers
- Operators
- Managers
- Decision makers
 - City Officials
 - Mayors
 - City council members
 - Utility board members
 - County Officials
 - Judges
 - Members of the fiscal court

8


Water Utility Management Involves A Range of Issues

- Managerial** – Clear Roles, Effective Policies, Thorough Planning
- Financial** – Budgeting, Accounting, Planning, Internal Controls
- Technical** – Infrastructure, Source, Standards, Rights, Operations

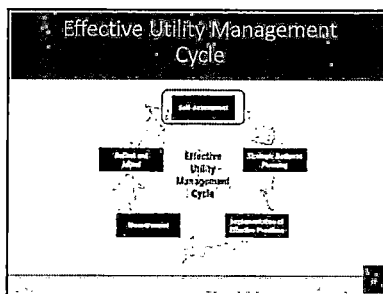
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Keys To Management Success

- Leadership
- Strategic Business Planning
- Knowledge Management
- Measurement
- Continual Improvement Management




10



11

Overview of the Ten Key Management Areas

Outcomes that well-managed utilities strive for



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The Ten Key Management Areas

1. Water Resource Adequacy	6. Financial Viability
2. Product Quality	7. Operational Optimization – Energy and Water Efficiency
3. Customer Satisfaction	8. Infrastructure Stability
4. Community Sustainability & Economic Development	9. Operational Resiliency
5. Employee and Leadership Development	10. Stakeholder Understanding and Support


13

The Well-Managed Utility

- Ten Management Areas are framed as outcomes.
- They serve as building blocks for utility performance improvement:
 - Where to focus.
 - What to strive for.
- Most water and wastewater utilities pay attention to each of these areas and likely perform well in at least some of them.
- They can be used to fit into, draw on, and support asset management, long-term business planning, continual improvement management systems.

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1. Water Resource/Capacity Adequacy



- Ensures water availability consistent with current and future customer needs through:
 - Long-term resource supply and demand analysis
 - Conservation
 - Public education
- Understands the utility role in water availability.
- Manages operations to provide for long-term aquifer and surface water sustainability and replenishment.

15


2. Product Quality



- Produces potable water or treated effluent, along with process residuals that are:
 - In full compliance with regulatory and reliability requirements.
 - Consistent with customer, public health, and ecological needs.
 - Supportive of local economic development and business needs and opportunities.

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3. Customer Satisfaction



- Helps customers understand the value of water and their local utility.
- Knows what their customers expect in terms of service, water quality, and rates.
- Has developed a way to gather feedback from their customers, review the feedback, and then act on it.
- Sets goals to meet these expectations.
- Is able to respond to emergency conditions in a timely and efficient manner.

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4. Community Sustainability & Economic Development



- Is actively engaged in the local community.
 - Is aware of or actively engaged in discussions of community and economic development
 - Is aware of local business needs and opportunities for new residential or business customers
- Aligns Utility goals to be attentive to the impacts that utility decisions will have on current and future community and watershed health.
- Aligns Utility goals to promote community economic vitality and overall improvement.

18

5. Employee & Leadership Development

- Recruits and retains a workforce that is competent, motivated, adaptive, and is concerned about safety.
- Establishes a participatory, collaborative organization.
- Ensures employee institutional knowledge is retained and improved on over time.
- Creates opportunities for professional and leadership development.

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6. Financial Viability

- Understands the full life-cycle costs of the utility and establishes and maintains an effective balance between:
 - Long term debt
 - Asset values
 - Operations and maintenance expenditures
 - Operating revenues
- Establishes predictable rates consistent with community expectations and acceptability – adequate to:
 - Recover costs.
 - Provide for reserves.
 - Address maintenance needs.
 - Plan and invest for future needs.
 - Maintain support from bond rating agencies

20

7. Operational Optimization

- Understands the operational performance factors (e.g., reliability of service, pressure, DBPs, overflows).
- Ensure ongoing, timely, cost-effective, and reliable performance improvements in all facets of operations (i.e., continual improvement culture).
- Minimize resource use, loss, and impacts from day-to-day operations (e.g., energy and chemical use, water loss).
- Maintain awareness of information and operational technology developments to anticipate and support timely adoption of improvements.

21

8. Infrastructure Stability

- Understands the condition and cost of each system component.
- Plans for system component repair, replacement, and enhancement over the long-term at the lowest possible cost.
- Coordinates asset repair, rehabilitation, and replacement within the community to minimize disruptions and other negative consequences.

22

9. Operational Resiliency

- Ensures utility leadership and staff work together to anticipate and avoid problems.
- Identifies threats to the system (legal, financial, non-compliance, environmental, safety, security, and natural disaster) by conducting all hazards vulnerability assessment.
- Establishes acceptable risk levels that support system reliability goals.
- Identifies how to manage risks and how to implement appropriate response actions by developing and using an all-hazards emergency response plan.

23

10. Stakeholder Understanding & Support

- Actively involves stakeholders in the decisions that will affect them:
 - By providing for a structure or protocol to engage stakeholders
 - By seeking to understanding stakeholder needs and interests
 - By promoting the value of clean and safe water
- Creates understanding and support from oversight bodies, community and watershed interests, and regulatory bodies:
 - Service levels
 - Rate structures
 - Operating budgets
 - Capital improvement programs
 - Risk management decisions

24

The Self-Assessment Exercise

Time to go to work!

25

Getting Started (Tab 2)

- Step 1: RATE your system's level of achievement (practice and performance) for each management area
- Step 2: RANK the importance of each area
- Step 3: PLOTTING results
- Step 4: Identify area of focus

26

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

- Use the table to rate your utility's achievement (first blank column) rate in the 10 key management areas: P – poor, F – fair, G-good.
- Use the table to rate the priority (second blank column) of each the 10 key management areas for your utility: L-low, M – medium, H-high.

27

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

Take each management area one at a time:

- 1) Review the definition of the management area.
- 2) Rate the achievement level of the area.
- 3) Rate the priority level of the area.

28

STEP 1: Rating Achievement

Scale from LOW to HIGH achievement

- Select Poor if your system has no workable practices in place for addressing this area – very low capacity and performance.
- Select Fair if your system has some workable practices in place with moderate achievement, but could improve – some capacity in place.
- Select Good if your system has effective, standardized, and accepted practices in place. It either usually or consistently achieves goals – capacity is high and in need of very little or no further development.

29

STEP 2: Ranking Priority

Scale from LOW to HIGH priority

- Review each of the five prioritization elements:
 1. Crisis situations / urgency (near term or long term)
 2. Current or expected challenges
 3. Consequence severity (non-compliance, costs, health, safety)
 4. Customer impacts (water quality, reliability of service)
 5. Community priorities (economic development, quality of life)
- Select High if concerns for most elements (4-5) or a strong concern in several
- Select Medium if concerns for some elements (2-3) or a strong concern for one
- Select Low if concerns for few or none of the elements (0-1) and no strong concerns

30

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

Take each management area one at a time:

- 1) Review the definition of the management area.
- 2) Rate the achievement level of the area.
- 3) Rate the priority level of the area.

31

STEP 3: Plotting Results

Self-Assessment Demonstration

32

STEPS 3 & 4: Plotting Results and Focusing Attention

Self-Assessment Demonstration

- Use the table on Page 5 of Tab 2 to write the two letters corresponding to each management area in the appropriate box that corresponds to intersection of the two ratings (i.e. the achievement rating and the priority rating).
- Example: Consumer Satisfaction (CS):
 - Good – G – Achievement
 - Medium – M – Priority

33

STEPS 3: Plotting Results

Self-Assessment Demonstration

34

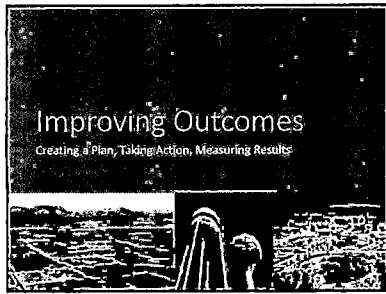
Discuss Self Assessment Results

35

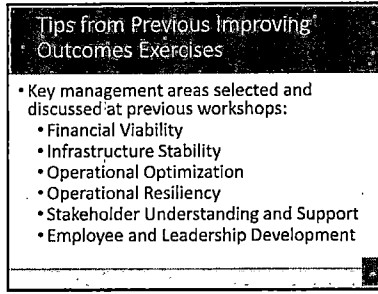
Step 4: Self-Assessment Discussion Questions

- What are your areas of focus (the orange and red areas)?
- Why are they an area of focus?
- Are your areas of focus different or similar to the other utilities at your table?
- What lessons can you learn from the other people at your table that you could use to improve your performance?
- How might your perspective on these priorities change if you are an:
 - Operator
 - Board Member
 - Judge Executive

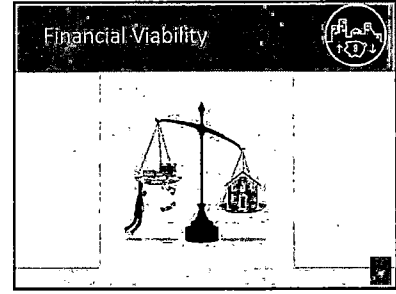
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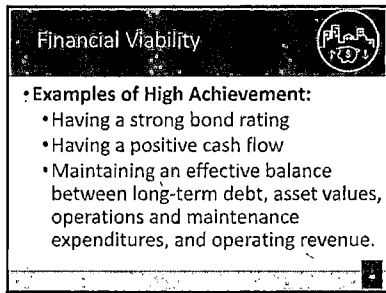
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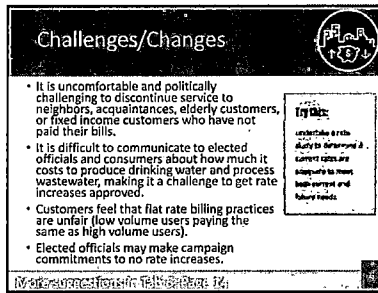
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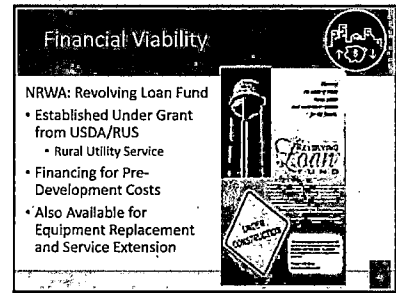
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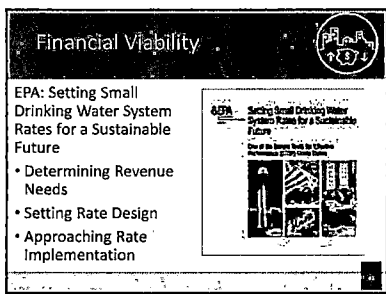
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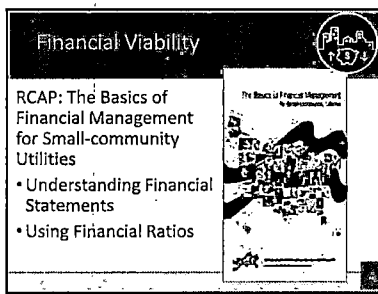
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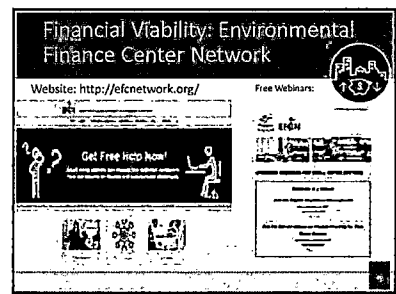
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45

Infrastructure Stability

- Infrastructure Stability Is Dependent Upon
 - Asset management
 - Capital planning



46

Infrastructure Stability

Asset Management

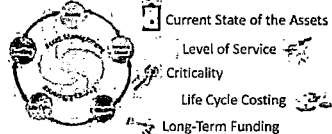
Asset Management is maintaining a desired level of service (what you want your assets to provide)

At the lowest life cycle cost (best appropriate cost – not “no cost”)

47

Infrastructure Stability

Five Core Components of Asset Management




48

Infrastructure Stability

Tips for Capital Improvement Planning

- Set arbitrary minimum price for asset
- Stay realistic
- Five year minimum
- Justify need
- Coordinate with other projects
- Look at broad options
- Detail funding options
- Discuss openly



49

Infrastructure Stability

Examples of High Achievement:

- Having an inventory of system components, location, installation date, and condition.
- Understanding of system operating parameters (e.g., pressure).
- Having a capital improvement plan.

50

Infrastructure Stability

Challenges/Changes

- Planning for repair and maintenance of infrastructure is hampered by a limited knowledge of the condition of existing infrastructure components.
- Many systems are trapped in a reactive repair and maintenance mode leaving little or no time for undertaking the proactive work needed to establish an asset management program.

Try This:


Create an inventory of your assets, even if it is just a spreadsheet. Highlight the biggest assets. Log assets at the time that regular maintenance or emergency repairs are performed.

51

Infrastructure Stability

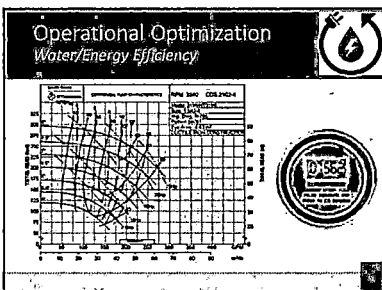
EPA: Check Up Program for Small System (CUPSS)

- Free Asset Management Tool for Small Drinking Water and Wastewater Utilities!
- Tips on How to Develop a Record of Your Assets, an Understanding of Your Financial Situation, and a Tailored Asset Management Plan.



52

Operational Optimization
Water/Energy Efficiency



53

Operational Optimization
Water/Energy Efficiency

Examples of High Achievement:

- Having an optimal energy rate schedule
- Using energy efficient pumps
- Minimizing water loss (i.e. < 15%)
- Maintaining a comprehensive maintenance program
- Proper pressure management

54

Challenges/Changes

OPERATIONAL OPTIMIZATION
 Challenges related to Operational Optimization include:

- High energy bills
- Improper maintenance of equipment
- Excessive water loss

Try this:

- Conduct an energy audit
- Identify locations of water loss
- Insure status of isolation valves
- Monitor pressure regulating valves
- Implement pressure management program
- Replace energy inefficient system components
- Sequence pump schedules with electric rate schedules

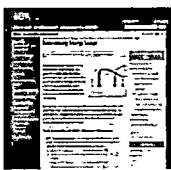
55

Operational Optimization

Water/Energy Efficiency

EPA: Energy Use Tool for Water and Wastewater Systems

- Interactive, Excel-based tool
- Detailed Analysis of All Energy Types
- Provides Summary Report: Statement of Energy Performance




56

Operational Optimization

Water/Energy Efficiency

RCAP: Sustainable Infrastructure for Small System Public Services: A Planning and Resource Guide

- Water Conservation
- Energy Efficiency
- Renewable Energy



57

Operational Resiliency

Operation & Maintenance Plans

Maintain Assets

Operations

- Activities to keep water flowing

Maintenance

- Routine
- Preventative
- Predictive
- Not emergency

Emergency Plan	Maintenance Important 30% of budget	Maintenance Extremely Important 45% of budget
	Maintenance Less Important 15% of budget	Maintenance Important 20% of budget
	Priority of Use	

58



59

Operational Resiliency

Examples of High Achievement:

- Having emergency response plans, operations plans, shut-off checklists for equipment.
- Regular drills of the emergency response plan.
- Certified staff and board members.

60

Challenges/Changes

- A lack of system documentation.
- Insufficient time to conduct training and exercises on the emergency response plan.
- Employee and board member turnover makes it difficult to maintain familiarity with emergency response procedures and materials.

Try this:

- Use an annual board meeting as an opportunity to update staff and the new 911 emergency procedures.

(More suggestions in the 100 Days 100)

61


Stakeholder Understanding and Support

Communicating with Customers

- Bill posters
- Billboards
- Classes
- Consumer Confidence Reports
- Mailers
- Newspapers
- Phone Calls
- Posters
- Radio/TV
- Social Media
- Special Interest Groups
- Surveys

Don't let the water lobby be your community's best kept secret.

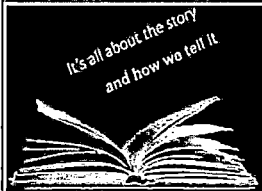
Think of customers as partners



62

Stakeholder Understanding and Support

It's all about the story and how we tell it



- Customers
- Regulators
- Board Members
- Managers
- Operators

63

Stakeholder Understanding and Support

64

Stakeholder Understanding and Support

65

Stakeholder Understanding and Support

...the message will frame you

66

Stakeholder Understanding and Support

...the message will frame you

67

Stakeholder Understanding and Support

- Examples of High Achievement:
 - Having a **Capital improvement plan** or other document that summarizes utility priorities and can be shared with utility board.
 - Having standard **operating procedures** for utility staff that address communication.

68

Challenges/Changes

Customers and stakeholders display a lack of interest in gaining a better understanding of utility needs.

Customer resistance to paying water bills or supporting rate increases.

Try This

- Host an annual open house or neighborhood meeting
- Hold a "water audit" for customers
- Offer tours of the facility or treatment plant
- Offer to be a part of the event.

69

Stakeholder Understanding and Support

NRWA: Quality on Tap!

- Nationwide, Grassroots Campaign for Public Awareness
- Hands On Guide to Engagement and Communication for Better Community Support

70

Stakeholder Understanding and Support

RCAP: The Big Guide for Small Systems: A Resource for Board Members

- Water and Wastewater Treatment Basics
- Regulatory Responsibilities
- Board Business
- Financial Duties and Responsibilities

71

Stakeholder Understanding and Support

EPA: Talking to Your Decision Makers – A Best Practices Guide

- Role of Community Decision Makers in Small Systems
- Tips on How to Communicate Needs to Decision Makers

72

Employee and Leadership Development

73

Employee and Leadership Development

- **Examples of High Achievement:**
 - Having written job descriptions.
 - Providing clear performance expectations.
 - Making sure staff are cross-trained.

74

Challenges/Changes

- Employee motivation and opportunities for development can be hampered by lack of resources.
- Limited access to training opportunities can prevent personal and professional development.
- Lack of written job responsibilities can lead to uncertainty about management expectations and a lack of recognition for the work that is done.
- Time constraints on employees.

75

Table Activity

- Using the Improving Outcomes Worksheet provided at your table (also a copy in Tab 3) each participant should complete an improvement worksheet for one of the low achievement/high priority management areas identified by one of your table members. The worksheet has four questions to answer.
- After picking a management area, share perspectives on:
 - What will constitute 'high achievement' in this management area?
 - What are potential causes for the achievement gaps?
 - What changes will the utility need to make to improve performance?
 - What will be the biggest challenges to performance improvement?

76

Table Activity
Using **IMPROVING OUTCOMES WORKSHEET**

Tab 3 in your notebook

Examples in Tab 6 in your notebook (pages 13-17)

77

Creating an Action Plan

Where do we go from here?

78

Action Plan Worksheet

Tab 4 in your notebook

79

Action Plan Worksheet

Step 1: Have each person fill out their top three priority management areas from the Self Assessment exercise and then pick one to work on.

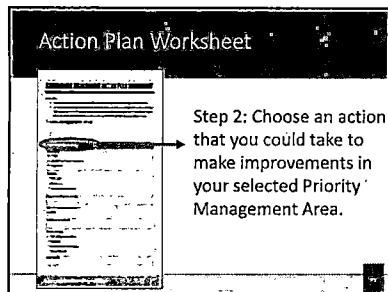
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For Example...

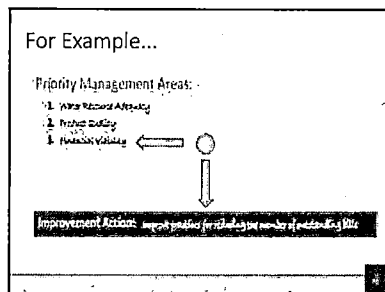
Priority Management Areas:

1. Water Resource Adequacy
2. Product Quality
3. Financial Viability ← Select One

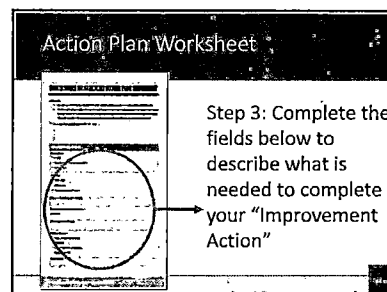
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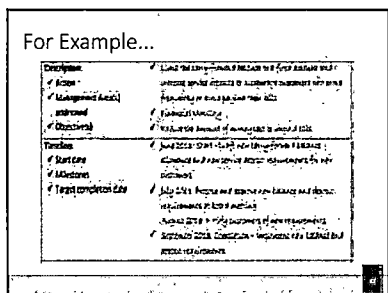
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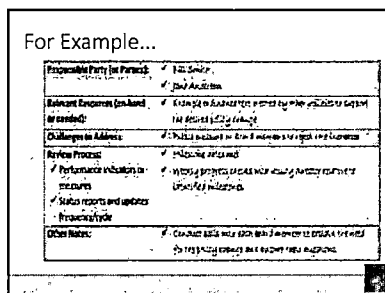
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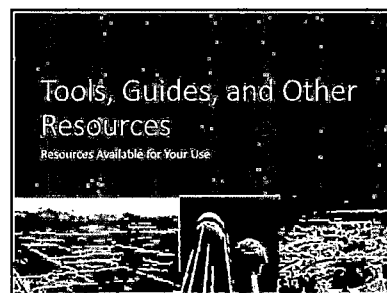
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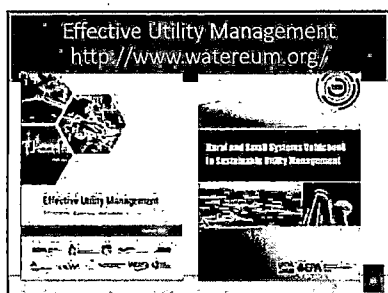
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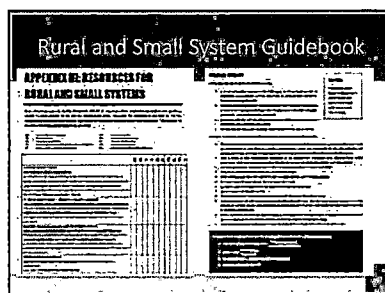
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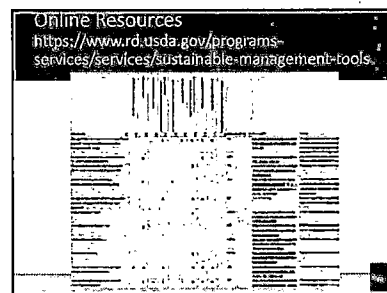
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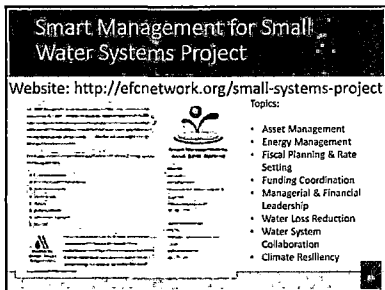
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Smart Management for Small Water Systems Project

Website: <http://efcnetwork.org/small-systems-project>

Topics:

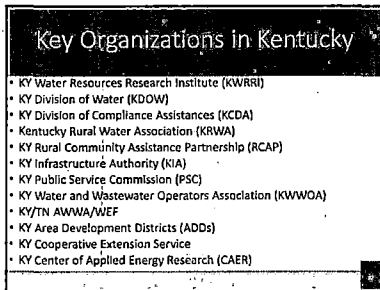
- Asset Management
- Energy Management
- Fiscal Planning & Rate Setting
- Funding Coordination
- Managerial & Financial Leadership
- Water Loss Reduction
- Water System Collaboration
- Climate Resiliency



91

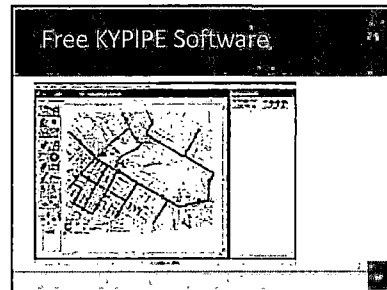
Key Organizations in Kentucky

- KY Water Resources Research Institute (KWRII)
- KY Division of Water (KDOW)
- Kentucky Division of Compliance Assurances (KCDA)
- Kentucky Rural Water Association (KRWA)
- KY Rural Community Assistance Partnership (RCAP)
- KY Infrastructure Authority (KIA)
- KY Public Service Commission (PSC)
- KY Water and Wastewater Operators Association (KWWOA)
- KY/TN AWWA/WEF
- KY Area Development Districts (ADDs)
- KY Cooperative Extension Service
- KY Center of Applied Energy Research (CAER)



92

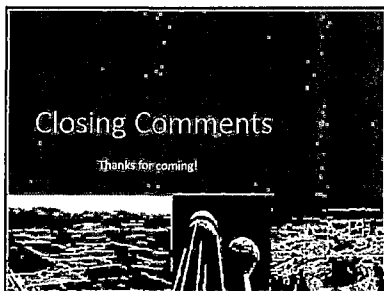
Free KYPIPE Software



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Closing Comments

Thanks for coming!



94



Kentucky Water Resources Research Institute
Steven J. Evans, Assistant Director

RECEIVED

MAY 03 2019

PUBLIC SERVICE
COMMISSION

May 3, 2019

Ms. Gwen Pinson
Executive Director
Kentucky Public Service Commission
P.O. Box 615, 211 Sower Blvd.
Frankfort, KY 40602-0615

RE: Application for Approval of Training Course for Continuing Education Credit

Dear Ms. Pinson:

The Kentucky Water Resources Research Institute and has scheduled an individual utility training event at West Liberty STP in West Liberty, Kentucky on June 24, 2019. The training event includes material from the "Sustainable Management of Rural and Small Systems Workshop," which was developed by the US EPA and the USDA and focuses on ten key management areas for small drinking water and wastewater utilities. The workshop is being offered at no cost to the participants through financial support provided by USDA.

We have enclosed the following materials in support of this application:

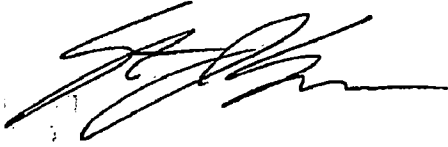
- 1) The name and address of the application (included in this transmittal letter).
- 2) The name and sponsor of the program and the subject matter covered by the program (included in this transmittal letter).
- 3) A summary of the content of the program (training summary/timed agenda is attached)
- 4) The number of credit hours requested by the program: 4.25
- 5) The name and relevant qualifications and credentials of each instructor presenting the program: Steven J. Evans, and Steven W. Hoagland, resumes and curriculum vitae are attached.
- 6) A copy of written materials given to attendees (class PowerPoint slides are attached)

We respectfully request that the training be approved for 4.25 hours of continuing education credits as management training for commissioners of water districts as referenced in 807 KAR 5:070. The sustainable management workshop has previously been approved by the PSC and DCA for training events held in 2017 and 2018.

If you have any questions or require any further documentation, please do not hesitate to contact me.

Sincerely,

see blue.



Steven J. Evans, Assistant Director
Kentucky Water Resources Research Institute

<https://www.research.uky.edu/kwrri>

see blue.

233 Mining and Minerals Building | 504 Rose Street | Lexington, KY 40506 | P: 859-257-1832 | www.uky.edu

An Equal Opportunity University

SUSTAINABLE MANAGEMENT OF RURAL AND SMALL SYSTEMS WORKSHOP AGENDA

June 24, 2019

West Liberty STP, 600 West Hills Ln, West Liberty, KY 42501

8:30 am – 3:00 pm

FACILITATOR(S): Steven Hoagland, Engineer, Kentucky Water Resources Research Institute;
Steven Evans, Assistant Director, Kentucky Water Resources Research Institute

Time	Session
8:30	Sign-in/Registration (30 minutes)
9:00	Introductions and Workshop Objectives (15 minutes) [Steven H.]
9:15	Session 1: Overview of Key Management Areas – Presentation (30 minutes) [Steven E.] <ul style="list-style-type: none">• Presentation of Key Management Areas• Group Discussion: Other Important Management Areas for Sustainability
9:45	Session 2: Utility ‘Self-Assessment’ Exercise (60 minutes) [Steven H., Steven E.] <ul style="list-style-type: none">• Explain “Sustainable Management Self Assessment” (5 minutes)• Participants Conduct Self-Assessment (20 minutes)• Explain Plotting of Results: achievements vs. priorities (5 minutes)• Participants Plot Results (10 minutes)• Table Discussion (20 minutes)<ul style="list-style-type: none">○ What are your areas of focus (the orange and red areas)?○ Why are they an area of focus?○ What are the commonalities and differences among table participants’ achievements, priorities, and challenges?○ What lessons can you learn from the other utilities at your table that you could use to improve your performance?○ How might your perspective on these priorities change if you are an:<ul style="list-style-type: none">▪ Operator▪ Manager▪ Board Member▪ Judge Executive
10:45	Break (15 minutes)

- 11:00** **Session 3: Plenary Discussion – Self Assessment Results (45 minutes)**
- Tables Report Out (30 minutes) [Steven H.]
 - Synthesize Results by Plotting Entire Group (15 minutes) [Steven E.]
- 11:45** **Lunch (75 minutes)**
- 1:00** **Session 4: Improving Outcomes (60 minutes)**
- Tips from previous Improving Outcomes Exercises (15 minutes) [Steven H.]
 - Each participant completes an improvement worksheet for one low achievement/high priority management area (30 minutes) [Steven E., Steven H.]
 - Discussion Questions:
 - What will constitute ‘**high achievement**’ in this management area and what are the causes of your achievement gaps?
 - What changes will the utility need to make to **improve performance** and who will need to be involved for these changes to take place?
 - How could you track your performance progress?
 - What will be the **biggest challenges** to performance improvement?
 - Participants share improvement worksheet results at their tables (15 minutes)
- 2:00** **Session 5: Plenary Discussion – Practices, Tools, and Measures: Results (15 minutes)**
- Tables Report Out [Steven H.]
 - General Discussion of Findings [Steven E.]
- 2:15** **Break (15 minutes)**
- 2:30** **Session 6: Creating an Action Plan (30 minutes) [Steven H.]**
- Discuss Utility Management Improvement Plan
 - Complete a Sustainable Management Action Plan Worksheet
 - Next Steps
 - Feedback
- 3:00** **Adjourn**

Steven J. Evans, Assistant Director

Kentucky Water Resources Research Institute
233 Mining and Mineral Resources Building
University of Kentucky, Lexington, KY 40506-0107

Telephone: 859-257-1299
Fax: 859-323-1049
Email: steve.evans@uky.edu

EDUCATION

M.A. (Education), Georgetown College, 2004
B.S. (Biology), University of Kentucky, 2001

PROFESSIONAL EMPLOYMENT

2017 – Present: Assistant Director, Kentucky Water Resources Research Institute, Lexington, KY.
2010 – 2017: Project Manager, Third Rock Consultants, Lexington, KY.
2006 – 2017: Environmental Scientist, Third Rock Consultants, Lexington, KY.
2005 – 2006: Lab Director and Quality Assurance Director, EnviroData Group, Lexington, KY.
2004 – 2005: Biology and Inorganic Chemistry Laboratory Section Manager, EnviroData Group, Lexington, KY.
2002 – 2004: Lab Technician, EnviroData Group, Lexington, KY.

RESEARCH INTERESTS

Watershed management and planning, water quality monitoring and analysis, stormwater management with emphasis on illicit discharge detection and identification and public involvement and low impact development, stakeholder involvement and education, geospatial mapping and analysis, and environmental permitting.

PROFESSIONAL SERVICE ACTIVITIES

2017-Present: Interagency Technical Advisory Committee on Groundwater, Chair
2017-Present: Lexington Stormwater Stakeholders Advisory Committee
2017-Present: Watershed Water of Kentucky, Science Advisor
2017-Present: Kentucky River Watershed Water, Board Member
2018-Present: Friends of Cane Run, Vice President
2018-Present: University of Kentucky MS4 Working Group
2018: American Society of Civil Engineers – Kentucky Section: 2018 Infrastructure Report Card: Drinking Water Working Group

PROFESSIONAL MEMBERSHIPS

Kentucky Stormwater Association
Kentucky Academy of Science

PUBLICATIONS/PRESENTATIONS

1. S. Evans. 2018. Water in Kentucky: How things are flowing at KWRRRI. October 5, 2018. Kentucky Geological Survey Seminar Series.
2. Curl, Douglas C. and Steven J. Evans. 2018. Kentucky Water Quality Report Cards: Interactive Mapping Tools and Grading Algorithms to Communicate Science to the General Public. Geological Society of America Abstracts with Programs. Vol. 50, No. 6 doi: 10.1130/abs/2018AM-319377
3. Evans, S.J., M. McAlister. 2018. "The Clean Water Act." Kentucky Watershed Academy Watershed Coordinator Training Series: Module 1. Full day workshop developed for Kentucky Division of Water and U.S. EPA. Presented on August 16, 2018.

4. Ormsbee, L. and S.J. Evans. 2018. "Sustainable Management of Rural and Small Systems Workshop." Workshop held July 9, 2018 at Fountain Run Water Utility. Kentucky Water Resources Research Institute in cooperation with West Virginia University.
5. Koyagi, E., S.J. Evans, and L. Ormsbee. 2018. Kentucky Water Resources Research Institute University of Kentucky Program Evaluation Report Fiscal Years 2011-2015. Office of External Research Water Resources Discipline U.S. Geological Survey. 118 p.
6. Evans, S.J. and Ormsbee, L. 2018. "Kentucky Water Resources Research Institute Annual Technical Report FY 2017." U.S. Geological Survey 104B Research Program Final Report. 121 p.
7. Koyagi, E. and S.J. Evans. 2018. "Kentucky Water Resources Annual Symposium Proceedings." Symposium held March 19, 2018 at Marriott Griffin Gate Resort, Lexington, KY
8. Gilbert, L. and S.J. Evans. "Watershed Organizations of Kentucky." Poster. Produced for Kentucky Division of Water and U.S. EPA.
9. Evans, S.J. 2018. "Communicating through Citizen Science: The Watershed Watch of Kentucky Experience." Invited speaker at Kentucky Geological Survey Annual Seminar 2019. Kentucky Geological Survey Core Library.
10. McAlister, M and S.J. Evans. 2017. "Kentucky River Watershed Watch: Summary of 2017 Sampling Results." Report produced by Kentucky Water Resources Research Institute. Funded by Kentucky River Authority.
11. Ormsbee, L; S.J. Evans, and K. Peterson. 2017. "Watershed Supply Report: Beam-Suntory, Loretto, KY." Kentucky Water Resources Research Institute. Project Report for Beam-Suntory Maker's Mark Facility.
12. Ormsbee, L; S.J. Evans, and L. Pacholik. 2017. "Watershed Sustainability Report: Beam-Suntory, Clermont, KY." Kentucky Water Resources Research Institute. Project Report for Beam-Suntory Jim Beam Facility.
13. Evans, S. J. and J. Shelby. 2017. "Combined Water Quality / Quality Assurance Project Report for Cane Run Comprehensive Watershed Based Plan." Third Rock Consultants. Project Technical Report for Kentucky Division of Water.
14. Evans, S. J.; J. Carey; D. Price; R. Walker; K. Miller; R. Lamey; L. Hicks; A. Rains. 2017. "Quality Assurance Project Plan: Lexington-Fayette Urban County Government Municipal Separate Storm Sewer System (MS4) Monitoring Plan." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality. Revision 2.
15. Evans, S. J.; J. Carey; D. Price; R. Walker; R. Lamey; L. Hicks; A. Rains. 2017. "Quality Assurance Project Plan: Lexington-Fayette Urban County Government Watershed-Focused Monitoring Plan." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality. Revision 2.
16. Olson, W.C. and S.J. Evans. 2016. "Severe Erosion Survey: Cane Run Watershed, Fayette and Scott County Kentucky." Third Rock Consultants. Project Technical Report for Kentucky Division of Water.
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Curriculum Vitae (Abridged)

Steven W. Hoagland, EIT

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712 Vermillion Peak Pass
Lexington, KY 40515

EDUCATION

- MS** University of Kentucky, Civil Engineering (2016)
Emphasis: Hydraulics, Water Resources Engineering
Committee Members: Lindell Ormsbee,* PhD; Scott Yost, PhD; James Fox, PhD
**Advisor*
- BS** University of Kentucky, Civil Engineering (2014)
Emphasis: Water Resources Engineering
Undergraduate Research Advisors: Lindell Ormsbee, PhD; Scott Yost, PhD

PROFESSIONAL EXPERIENCE

Kentucky Water Resources Research Institute, Lexington, KY (Sep. 2018 - Present)

Civil Engineer

- Responsible for planning, coordinating, and conducting training workshops for rural water and wastewater utilities in Kentucky's Appalachian region; and developing hydraulic models for rural water utilities and training utility employees on model use.
- Reviewed funding proposals for USGS 104b and 104g research grant programs.
- Lead and participated in laboratory exercises to determine the variability and accuracy of field kits when testing for Phosphorus and Nitrogen concentrations.

Tetra Tech, Inc., Lexington, KY (Jan. 2016 – Sep. 2018)

Civil Engineer

- Responsible for balancing a multi-project workload, coordinating with co-workers and clients in other states, responding to clients in a timely manner, meeting deliverable deadlines, and delegating project work to engineering interns.
- Project work includes civil site design, construction administration, hydrologic and hydraulic modeling, and municipal program management.

Civil Site Design and Construction

1. Blue Grass Airport, Lexington, KY
2. West Hickman Wastewater Treatment Plant, Lexington, KY
3. Wolf Run WWS Facility, Lexington, KY

Municipal Program Management

1. Blue Grass Airport, Environmental Management Program
2. LFUCG, Municipal Separate Storm Sewer System (MS4) Program

Hydrologic and Hydraulic Modeling

1. City of Cape Coral, FL – Irrigation
2. City of Gateway, FL – Irrigation
3. City of Grand Rapids, MI – Storm
4. City of Port St. Lucie, FL – Potable
5. City of Tampa, FL – Combined Sewer
6. Genoa-Osceola, MI – Sanitary Sewer
7. GLWA, MI – Combined Sewer
8. Miami-Dade County, Potable
9. Miami Int'l Airport, FL – Potable
10. Westover Air Reserve Base, MA – Potable

Curriculum Vitae (Abridged)

PUBLICATIONS

Journal Publications

1. Hoagland, S., Hernandez, E., and Ormsbee, L., "Hydraulic Model Database for Applied Water Distribution Systems Research," *in preparation*.
2. Ormsbee, L., Peterson, K., and Hoagland, S., "Is It Time to Revise the Curve Number Method: Especially for Urban Applications?" *in preparation*.

Conference Proceedings

1. Hernandez, E. Hoagland, S., and Ormsbee, L., "Water Distribution Database for Research Applications," Proceedings of World Environmental and Water Resources Congress, West Palm Beach, FL, May 22-26, 2016, pp. 465-474.
2. Hoagland, S., Schal, S. Ormsbee, L., and Bryson, S., "Classification of Water Distribution Systems for Research Applications," Proceedings of World Environmental and Water Resources Congress, Austin, TX, May 17-21, 2015, pp. 696-702.

Thesis

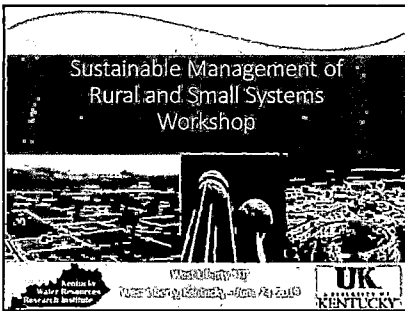
1. Hoagland, S., "Transient-Based Risk Analysis of Water Distribution Systems," Civil Engineering Theses and Dissertations, University of Kentucky, 2016. https://uknowledge.uky.edu/ce_etds/39.

Technical Reports

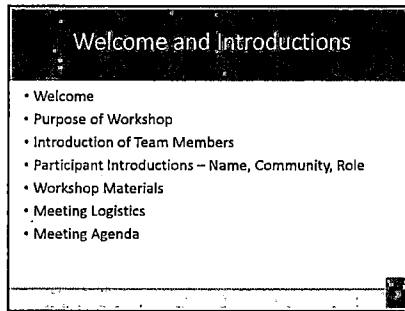
1. "Monitoring of Post-Construction Stormwater Controls," Lexington-Fayette Urban County Government, June 2018.
2. "WQV and RRV Analysis of Existing Stormwater Controls for the Hope Center Apartments at 1518 Versailles Road," Lexington-Fayette Urban County Government, August 2017.
3. "Hydrologic / Hydraulic Analysis of Residential Detention Basin WH+61+A1 at 109 Hidden Woods Court," Lexington-Fayette Urban County Government, June 2017.

PRESENTATIONS AND WORKSHOPS

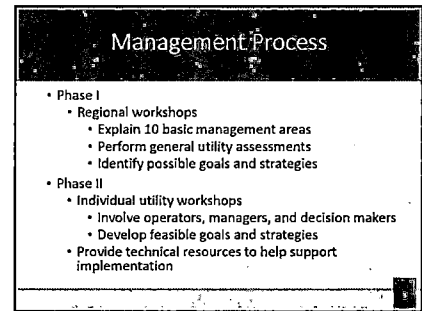
1. "Introduction to Water Distribution Systems Modeling Workshop," Martin County Water District, Inez, Kentucky, March 5, 2019.
2. "Erosion and Sediment Control Plan Preparation Workshop," Developers, Contractors, and Consultants, Lexington-Fayette Urban County Government MS4 Program, March 20, 2018.
3. "Erosion and Sediment Control Plan Review Workshop," Municipal Staff and Fayette Construction Site Inspectors, Lexington-Fayette Urban County Government MS4 Program, March 1, 2018.
4. "Challenges and Perspective from an EIT," Water Professionals Student Chapter, University of Kentucky, November 30, 2017.
5. "Classification of Water Distribution Systems for Research Applications," World Environmental and Water Resources Congress, Austin, TX, May 20, 2015.



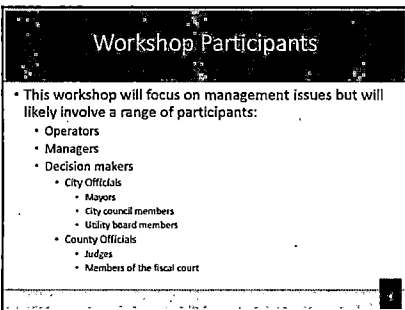
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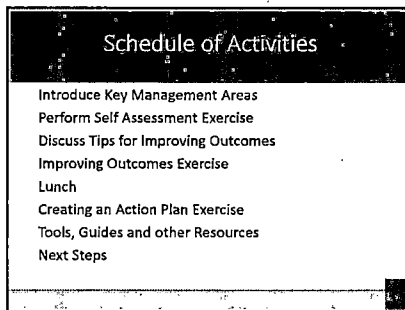
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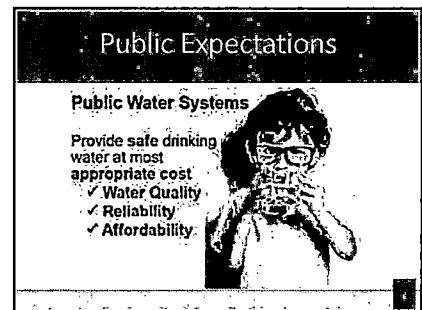
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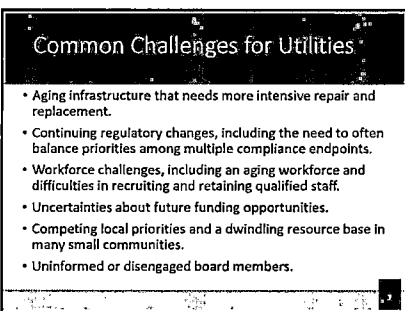
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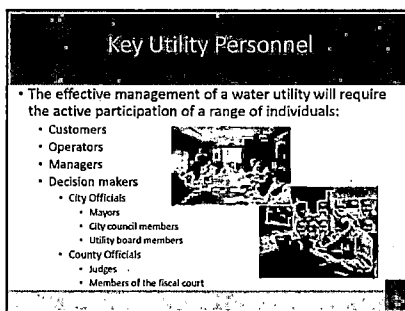
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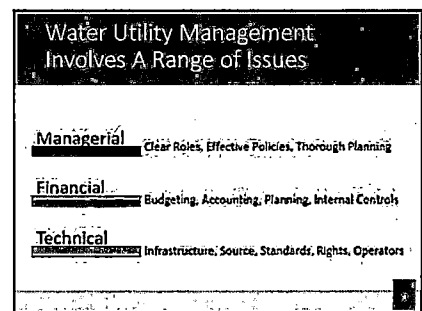
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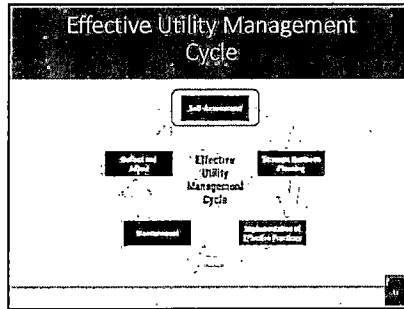
9

Keys To Management Success

- Leadership
- Strategic Business Planning
- Knowledge Management
- Measurement
- Continual Improvement Management




10



11

Overview of the Ten Key Management Areas

Outcomes that well-managed utilities strive for



12

The Ten Key Management Areas

1. Water Resource Adequacy	6. Financial Viability
2. Product Quality	7. Operational Optimization – Energy and Water Efficiency
3. Customer Satisfaction	8. Infrastructure Stability
4. Community Sustainability & Economic Development	9. Operational Resiliency
5. Employee and Leadership Development	10. Stakeholder Understanding and Support


13

The Well-Managed Utility

- Ten Management Areas are framed as outcomes.
- They serve as building blocks for utility performance improvement:
 - Where to focus.
 - What to strive for.
- Most water and wastewater utilities pay attention to each of these areas and likely perform well in at least some of them.
- They can be used to fit into, draw on, and support asset management, long-term business planning, continual improvement management systems.

14


1. Water Resource/Capacity Adequacy



- Ensures water availability consistent with current and future customer needs through:
 - Long-term resource supply and demand analysis
 - Conservation
 - Public education
- Understands the utility role in water availability.
- Manages operations to provide for long-term aquifer and surface water sustainability and replenishment.

15


2. Product Quality



- Produces potable water or treated effluent, along with process residuals that are:
 - In full compliance with regulatory and reliability requirements.
 - Consistent with customer, public health, and ecological needs.
 - Supportive of local economic development and business needs and opportunities.

16


3. Customer Satisfaction



- Helps customers understand the value of water and their local utility.
- Knows what their customers expect in terms of service, water quality, and rates.
- Has developed a way to gather feedback from their customers, review the feedback, and then act on it.
- Sets goals to meet these expectations.
- Is able to respond to emergency conditions in a timely and efficient manner.

17


4. Community Sustainability & Economic Development



- Is actively engaged in the local community.
 - Is aware of or actively engaged in discussions of community and economic development
 - Is aware of local business needs and opportunities for new residential or business customers
- Aligns Utility goals to be attentive to the impacts that utility decisions will have on current and future community and watershed health.
- Aligns Utility goals to promote community economic vitality and overall improvement.

18


5. Employee & Leadership Development



- Recruits and retains a workforce that is competent, motivated, adaptive, and is concerned about safety.
- Establishes a participatory, collaborative organization.
- Ensures employee institutional knowledge is retained and improved on over time.
- Creates opportunities for professional and leadership development.

19


6. Financial Viability



- Understands the full life-cycle costs of the utility and establishes and maintains an effective balance between:
 - Long term debt
 - Asset values
 - Operations and maintenance expenditures
 - Operating revenues
- Establishes predictable rates consistent with community expectations and acceptability – adequate to:
 - Recover costs.
 - Provide for reserves.
 - Address maintenance needs.
 - Plan and invest for future needs.
 - Maintain support from bond rating agencies

20


7. Operational Optimization



- Understands the operational performance factors (e.g., reliability of service, pressure, DBPs, overflows).
- Ensure ongoing, timely, cost-effective, and reliable performance improvements in all facets of operations (i.e., continual improvement culture).
- Minimize resource use, loss, and impacts from day-to-day operations (e.g., energy and chemical use, water loss).
- Maintain awareness of information and operational technology developments to anticipate and support timely adoption of improvements.

21


8. Infrastructure Stability



- Understands the condition and cost of each system component.
- Plans for system component repair, replacement, and enhancement over the long-term at the lowest possible cost.
- Coordinates asset repair, rehabilitation, and replacement within the community to minimize disruptions and other negative consequences.

22


9. Operational Resiliency



- Ensures utility leadership and staff work together to anticipate and avoid problems.
- Identifies threats to the system (legal, financial, non-compliance, environmental, safety, security, and natural disaster) by conducting all hazards vulnerability assessment.
- Establishes acceptable risk levels that support system reliability goals.
- Identifies how to manage risks and how to implement appropriate response actions by developing and using an all-hazards emergency response plan.

23

10. Stakeholder Understanding & Support

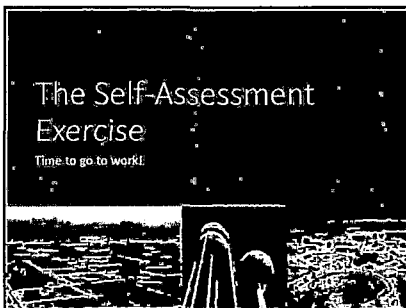


- Actively involves stakeholders in the decisions that will affect them:
 - By providing for a structure or protocol to engage stakeholders
 - By seeking to understand stakeholder needs and interests
 - By promoting the value of clean and safe water
- Creates understanding and support from oversight bodies, community and watershed interests, and regulatory bodies:
 - Service levels
 - Rate structures
 - Operating budgets
 - Capital improvement programs
 - Risk management decisions

24

The Self-Assessment Exercise

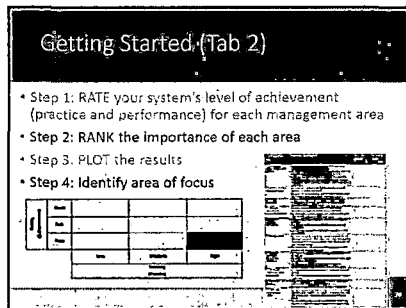
Time to go to work!



25

Getting Started (Tab 2)

- Step 1: RATE your system's level of achievement (practice and performance) for each management area
- Step 2: RANK the importance of each area
- Step 3: PLOT the results
- Step 4: Identify area of focus

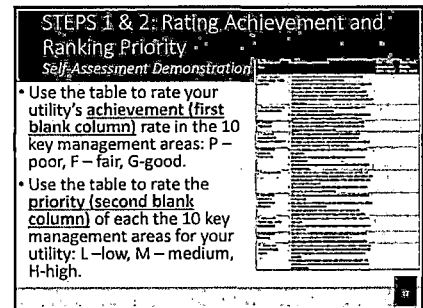


26

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

- Use the table to rate your utility's achievement (first blank column) rate in the 10 key management areas: P – poor, F – fair, G – good.
- Use the table to rate the priority (second blank column) of each the 10 key management areas for your utility: L – low, M – medium, H – high.



27

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

Take each management area one at a time:

- 1) Review the definition of the management area.
- 2) Rate the achievement level of the area.
- 3) Rate the priority level of the area.

28

STEP 1: Rating Achievement

Scale from LOW to HIGH achievement

- Select Poor if your system has no workable practices in place for addressing this area – very low capacity and performance.
- Select Fair if your system has some workable practices in place with moderate achievement, but could improve – some capacity in place.
- Select Good if your system has effective, standardized, and accepted practices in place. It either usually or consistently achieves goals – capacity is high and in need of very little or no further development.

29

STEP 2: Ranking Priority

Scale from LOW to HIGH priority

- Review each of the five prioritization elements:
 1. Crisis situations / urgency (near term or long term)
 2. Current or expected challenges
 3. Consequence severity (non-compliance, costs, health, safety)
 4. Customer impacts (water quality, reliability of service)
 5. Community priorities (economic development, quality of life)
- Select High if concerns for most elements (4-5) or a strong concern in several
- Select Medium if concerns for some elements (2-3) or a strong concern for one
- Select Low if concerns for few or none of the elements (0-1) and no strong concerns

30

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

Take each management area one at a time:

- 1) Review the definition of the management area.
- 2) Rate the achievement level of the area.
- 3) Rate the priority level of the area.

31

STEP 3: Plotting Results

Self-Assessment Demonstration

32

STEPS 3 & 4: Plotting Results and Focusing Attention

Self-Assessment Demonstration

- Use the table on Page 5 of Tab 2 to write the two letters corresponding to each management area in the appropriate box that corresponds to intersection of the two ratings (i.e. the achievement rating and the priority rating).
- Example: Consumer Satisfaction (CS):
 - Good – G – Achievement
 - Medium – M – Priority

33

STEPS 3: Plotting Results

Self-Assessment Demonstration

34

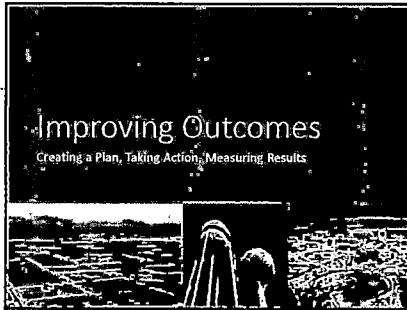
Discuss Self Assessment Results

35

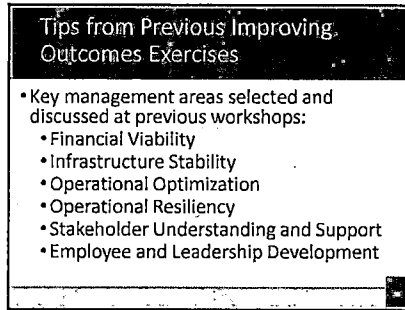
Step 4: Self-Assessment Discussion Questions

- What are your areas of focus (the orange and red areas)?
- Why are they an area of focus?
- Are your areas of focus different or similar to the other utilities at your table?
- What lessons can you learn from the other people at your table that you could use to improve your performance?
- How might your perspective on these priorities change if you are an:
 - Operator
 - Board Member
 - Judge Executive

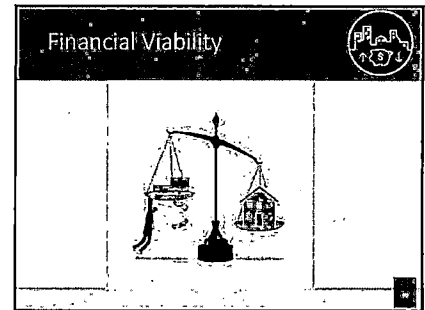
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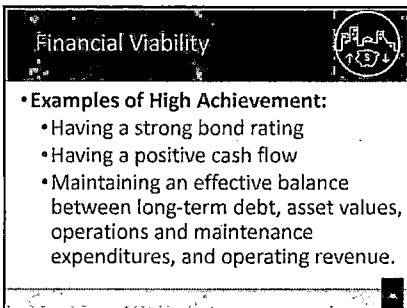
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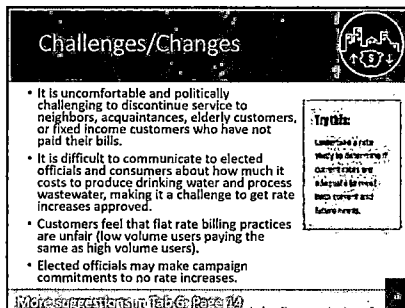
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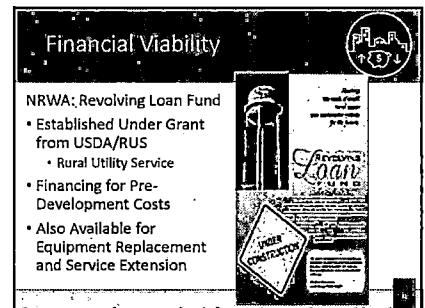
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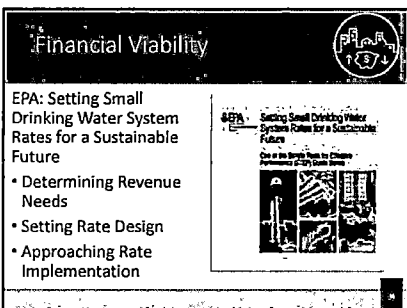
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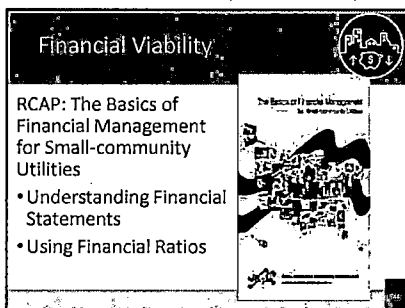
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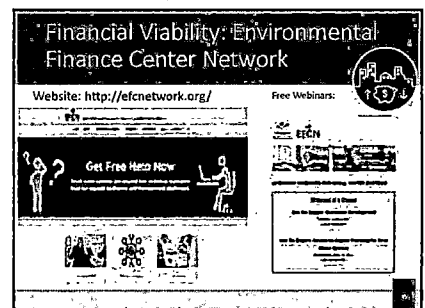
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43




44




45

Infrastructure Stability

- Infrastructure Stability Is Dependent Upon
 - Asset management
 - Capital planning



If you fail to plan, you are planning to fail.



46

Infrastructure Stability

Asset Management

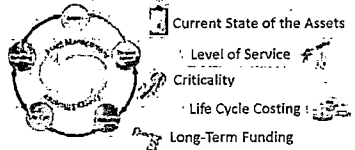
Asset Management is maintaining a desired level of service (what you want your assets to provide)

At the lowest life cycle cost (best appropriate cost – not “no cost”)

47

Infrastructure Stability

Five Core Components of Asset Management




- Current State of the Assets
- Level of Service
- Criticality
- Life Cycle Costing
- Long-Term Funding

48

Infrastructure Stability

Tips for Capital Improvement Planning

- Set arbitrary minimum price for asset
- Stay realistic
- Five year minimum
- Justify need
- Coordinate with other projects
- Look at bond options
- Detail funding options
- Discuss openly



49

Infrastructure Stability

Examples of High Achievement:

- Having an inventory of system components, location, installation date, and condition.
- Understanding of system operating parameters (e.g., pressure).
- Having a capital improvement plan.

50

Infrastructure Stability

Challenges/Changes

- Planning for repair and maintenance of infrastructure is hampered by a limited knowledge of the condition of existing infrastructure components.
- Many systems are trapped in a reactive repair and maintenance mode leaving little or no time for undertaking the proactive work needed to establish an asset management program.

Try This:

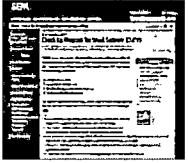
• Create an inventory of your assets now. Time by setting up a template for "age" of assets. The strategy of the time that regular maintenance or emergency repairs are performed.

51

Infrastructure Stability

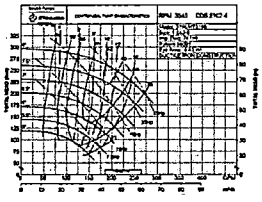

EPA: Check Up Program for Small System (CUPSS)

- Free Asset Management Tool for Small Drinking Water and Wastewater Utilities!
- Tips on How to Develop a Record of Your Assets, an Understanding of Your Financial Situation, and a Tailored Asset Management Plan.



52

Operational Optimization
Water/Energy Efficiency

53

Operational Optimization
Water/Energy Efficiency

Examples of High Achievement:

- Having an optimal energy rate schedule
- Using energy efficient pumps
- Minimizing water loss (i.e. < 15%)
- Maintaining a comprehensive maintenance program
- Proper pressure management

54

Challenges/Changes

OPERATIONAL OPTIMIZATION
Challenges related to Operational Optimization include:

- High energy bills
- Improper maintenance of equipment
- Excessive water loss

Try this:

- Conduct an energy audit
- Identify locations of water loss
- Insure status of isolation valves
- Monitor pressure regulating valves
- Implement pressure management program
- Replace energy inefficient system components
- Sequence pump schedules with electric rate schedules

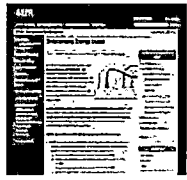
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Operational Optimization

Water/Energy Efficiency

EPA: Energy Use Tool for Water and Wastewater Systems

- Interactive, Excel-based tool
- Detailed Analysis of All Energy Types
- Provides Summary Report: Statement of Energy Performance




56

Operational Optimization

Water/Energy Efficiency

RCAP: Sustainable Infrastructure for Small System Public Services: A Planning and Resource Guide

- Water Conservation
- Energy Efficiency
- Renewable Energy



57

Operational Resiliency

Operation & Maintenance Plans

Maintain Assets

Operations

- Activities to keep water flowing

Maintenance

- Routine
- Preventative
- Predictive
- Not emergency

Dimension of Plan	Maintenance - Important 30% of budget	Maintenance - Extremely Important 45% of budget
	Maintenance Loss - Important 1% of budget	Maintenance - Important 20% of budget
	Probability of Failure	

58



59

Operational Resiliency

Examples of High Achievement:

- Having emergency response plans, operations plans, shut-off checklists for equipment.
- Regular drills of the emergency response plan.
- Certified staff and board members

60

Challenges/Changes

- A lack of system documentation.
- Insufficient time to conduct training and exercises on the emergency response plan.
- Employee and board member turnover makes it difficult to maintain familiarity with emergency response procedures and materials.

Try this:

- Use a vendor third party to do emergency response documentation.

More questions in Tab # Page 45

61

Stakeholder Understanding and Support

Communicating with Customers

- Bill shufflers
- Classes
- Consumer Confidence Reports
- Meetings
- Newsletters
- Phone Calls
- Posters
- Radio/TV
- Social media
- Special Meetings
- Surveys


Don't let the water utility be your community's best kept secret

Think of customers as partners

62

Stakeholder Understanding and Support

It's all about the story and how we tell it



- Customers
- Board Officers
- Board Members
- Manager
- Operators

63

Stakeholder Understanding and Support

64

Stakeholder Understanding and Support

The damage beyond the spill

If you don't frame the message....

65

Stakeholder Understanding and Support

...the message will frame you

66

Stakeholder Understanding and Support

...the message will frame you

67

Stakeholder Understanding and Support

- Examples of High Achievement:
 - Having a **Capital improvement plan** or other document that summarizes utility priorities and can be shared with utility board.
 - Having standard **operating procedures** for utility staff that address communication.

68

Challenges/Changes

Customers and stakeholders display a lack of interest in gaining a better understanding of utility needs.

Customer resistance to paying water bills or supporting rate increases.

Try This:
 Hold an annual open house or workshop of your facility. Invite stakeholders and community members. Offer tours of the facility to address their needs. Make it a part of the event.

69

Stakeholder Understanding and Support

NRWA: Quality on Tap!

- Nationwide, Grassroots Campaign for Public Awareness
- Hands On Guide to Engagement and Communication for Better Community Support

70

Stakeholder Understanding and Support

RCAP: The Big Guide for Small Systems: A Resource for Board Members

- Water and Wastewater Treatment Basics
- Regulatory Responsibilities
- Board Business
- Financial Duties and Responsibilities

71

Stakeholder Understanding and Support

EPA: Talking to Your Decision Makers – A Best Practices Guide

- Role of Community Decision Makers in Small Systems
- Tips on How to Communicate Needs to Decision Makers

72

Employee and Leadership Development

73

Employee and Leadership Development

- Examples of High Achievement:
 - Having written job descriptions.
 - Providing clear performance expectations.
 - Making sure staff are cross-trained.

74

Challenges/Changes:

- Employee motivation and opportunities for development can be hampered by lack of resources.
- Limited access to training opportunities can prevent personal and professional development.
- Lack of written job responsibilities can lead to uncertainty about management expectations and a lack of recognition for the work that is done.
- Time constraints on employees.

More suggestions in Tab 6: Page 44.

75

Table Activity

- Using the Improving Outcomes Worksheet provided at your table (also a copy in Tab 3) each participant should complete an improvement worksheet for one of the low achievement/high priority management areas identified by one of your table members. The worksheet has four questions to answer.
- After picking a management area, share perspectives on:
 - What will constitute 'high achievement' in this management area?
 - What are potential causes for the achievement gaps?
 - What changes will the utility need to make to improve performance?
 - What will be the biggest challenges to performance improvement?

76

Table Activity
Using IMPROVING OUTCOMES WORKSHEET

Tab 3 in your notebook

Examples in Tab 6 in your notebook (pages 13-17)

77

Creating an Action Plan

Where do we go from here?

78

Action Plan Worksheet

Tab 4 in your notebook

79

Action Plan Worksheet

Step 1: Have each person fill out their top three priority management areas from the Self Assessment exercise and then pick one to work on.

80

For Example...

Priority Management Areas:

1. Water Resource Adequacy
2. Product Quality
3. Financial Viability ← Select One

81

Action Plan Worksheet

Step 2: Choose an action that you could take to make improvements in your selected Priority Management Area.

82

For Example...

Priority Management Areas:

1. Water Resource Availability
2. Product Quality
3. Production Reliability

Improvement Action: *improve production reliability by the number of successful years*

83

Action Plan Worksheet

Step 3: Complete the fields below to describe what is needed to complete your "Improvement Action"

84

For Example...

Description:	✓ Check and verify financial records of crop insurance and
✓ Action:	verify financial records to determine if insurance is the best
✓ Management Detail:	insurance or avoid paying more than
✓ Reference:	✓ Financial statements
✓ Objectives:	✓ Reduce the amount of money left to be paid back
✓ Timeline:	✓ June 2018. Done in 1-2 weeks. Use crop insurance expert
✓ Start date:	✓ Identify and select the best insurance option for the
✓ Milestones:	✓ Milestones
✓ Target completion date:	✓ July 2018. Prepare and review the financial and report
	✓ requirements in local markets
	✓ Analyze costs and benefits of each option based
	✓ on local data. Consideration of insurance and related and
	✓ other requirements

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For Example...

Responsible Party (or Parties):	✓ Self, family
✓ Relevant Resources (available or needed):	✓ Financial statements, expert advice, insurance to help
✓ Challenges to Address:	✓ Reduce financial stress associated with crop insurance
✓ Review Process:	✓ Multiple steps
✓ Performance Indicators or Measures:	✓ Identify progress steps with a clearly defined timeline to
✓ Status reports and updates:	✓ Identify milestones
✓ Frequency:	
✓ Other Notes:	✓ I would like to see your report regarding the status of the
	✓ by the policy change and ensure that everything

86

Tools, Guides, and Other Resources

Resources Available for Your Use

87

Effective Utility Management

<http://www.watereum.org/>

88

Rural and Small System Guidebook

APPENDIX B: RESOURCES FOR RURAL AND SMALL SYSTEMS

89

Online Resources

<https://www.rd.usda.gov/programs-services/services/sustainable-management-tools>


90

Smart Management for Small Water Systems Project

Website: <http://efcnetwork.org/small-systems-project>

Topics:

- Asset Management
- Energy Management
- Fiscal Planning & Rate Setting
- Funding Coordination
- Managerial & Financial Leadership
- Water Loss Reduction
- Water System Collaboration
- Climate Resiliency



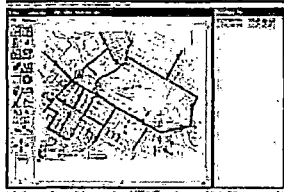
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Key Organizations in Kentucky

- KY Water Resources Research Institute (KWRII)
- KY Division of Water (KDOW)
- KY Division of Compliance Assurances (KCDA)
- Kentucky Rural Water Association (KRWA)
- KY Rural Community Assistance Partnership (RCAP)
- KY Infrastructure Authority (KIA)
- KY Public Service Commission (PSC)
- KY Water and Wastewater Operators Association (KWWOA)
- KY/TN AWWA/WEF
- KY Area Development Districts (ADDs)
- KY Cooperative Extension Service
- KY Center of Applied Energy Research (CAER)

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Free KYPIPE Software



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Closing Comments

Thanks for coming!



94



Kentucky Water Resources Research Institute
Steven J. Evans, Assistant Director

RECEIVED

MAY 03 2019

PUBLIC SERVICE
COMMISSION

May 3, 2019

Ms. Gwen Pinson
Executive Director
Kentucky Public Service Commission
P.O. Box 615, 211 Sower Blvd.
Frankfort, KY 40602-0615

RE: Application for Approval of Training Course for Continuing Education Credit

Dear Ms. Pinson:

The Kentucky Water Resources Research Institute and has scheduled a training event at Whitesburg Water Works in Whitesburg, Kentucky on June 18, 2019. The training event includes material from the "Sustainable Management of Rural and Small Systems Workshop," which was developed by the US EPA and the USDA and focuses on ten key management areas for small drinking water and wastewater utilities. The training event also includes material from the "Fundamentals of AWWA Water Auditing and Loss Estimation Workshop," which was developed by faculty and staff at the University of Kentucky. The workshop is being offered at no cost to the participants through financial support provided by USDA.

We have enclosed the following materials in support of this application:

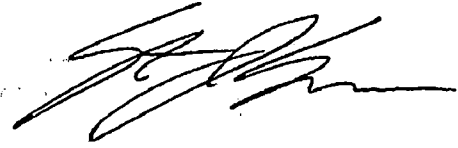
- 1) The name and address of the application (included in this transmittal letter).
- 2) The name and sponsor of the program and the subject matter covered by the program (included in this transmittal letter).
- 3) A summary of the content of the program (training summary/timed agenda is attached)
- 4) The number of credit hours requested by the program: 6
- 5) The name and relevant qualifications and credentials of each instructor presenting the program: Steven J. Evans and Steven W. Hoagland, resumes and curriculum vitae are attached.
- 6) A copy of written materials given to attendees (class PowerPoint slides are attached)

We respectfully request that the training be approved for 6 hours of continuing education credits as management training for commissioners of water districts as referenced in 807 KAR 5:070. The sustainable management workshop has previously been approved by the PSC and DCA for training events held in 2017 and 2018.

If you have any questions or require any further documentation, please do not hesitate to contact me.

see blue.

Sincerely,

A handwritten signature in black ink, appearing to read 'S. J. Evans', with a long horizontal flourish extending to the right.

Steven J. Evans, Assistant Director
Kentucky Water Resources Research Institute

<https://www.research.uky.edu/kwrri>

seeblue.

233 Mining and Minerals Building | 504 Rose Street | Lexington, KY 40506 | P: 859-257-1832 | www.uky.edu

An Equal Opportunity University

SUSTAINABLE MANAGEMENT OF RURAL AND SMALL SYSTEMS AND AWWA WATER AUDITING WORKSHOP AGENDA

June 18, 2019

Whitesburg Water System, 240 River Park Dr, Whitesburg, KY 41858

8:30 am – 4:15 pm

FACILITATOR(S): Steven Hoagland, Engineer, Kentucky Water Resources Research Institute;
Steven Evans, Assistant Director, Kentucky Water Resources Research Institute

Time	Session
8:30	Set Up/Sign-in/Registration (15 minutes)
8:45	Sustainable Management Workshop Objectives (10 minutes) [Steven H.]
8:55	Session 1: Overview of Key Management Areas (20 minutes) [Steven E.] <ul style="list-style-type: none">• Presentation of Key Management Areas• Group Discussion: Other Important Management Areas for Sustainability
9:15	Session 2: Utility 'Self-Assessment' Exercise (50 minutes) [Steven H. / Steven E.] <ul style="list-style-type: none">• Explain "Sustainable Management Self-Assessment" (5 minutes)• Participants Conduct Self-Assessment (15 minutes)• Explain Plotting of Results: achievements vs. priorities (5 minutes)• Participants Plot Results (10 minutes)• Table Discussion (15 minutes)<ul style="list-style-type: none">○ What are your areas of focus (the orange and red areas)?○ Why are they an area of focus?○ What are the commonalities and differences among table participants' achievements, priorities, and challenges?○ How might your perspective on these priorities change if you are an:<ul style="list-style-type: none">▪ Operator▪ Manager▪ Board Member▪ Judge Executive
10:05	Break (15 minutes)

- 10:20** **Session 3: Improving Outcomes (50 minutes) [Steven H., Steven E.]**
- Tips from previous Improving Outcomes Exercises (5 minutes)
 - Each participant completes an improvement worksheet for one low achievement/high priority management area (25 minutes)
 - Discussion Questions:
 - What will constitute **'high achievement'** in this management area and what are the causes of your achievement gaps?
 - What changes will the utility need to make to **improve performance** and who will need to be involved for these changes to take place?
 - How could you track your performance progress?
 - What will be the **biggest challenges** to performance improvement?
 - Participants share improvement worksheet results at their tables (20 minutes)
- 11:10** **Session 4: Creating an Action Plan (50 minutes) [Steven H., Steven E.]**
- Discuss Utility Management Improvement Plan
 - Complete a Sustainable Management Action Plan Worksheet
- 12:00** **Lunch**
- 1:00** **Session 5: Fundamentals of AWWA Water Auditing (60 minutes) [Steven H.]**
- Introduction
 - Identifying the Problem
 - The Water Audit
 - Terminology and Breakdowns
- 2:00** **Session 6: Conducting the Water Audit (60 minutes) [Steven H.]**
- Overview of the Top-Down Water Audit
 - Excel Worksheet
 - Data Validity Scores
 - Step-by-Step Process
- 3:00** **Break (15 minutes)**
- 3:15** **Session 7: Available Resources and Example Walkthrough (60 minutes) [Steven H., Steven E.]**
- Overview of Available Resources
 - Example Walkthrough Using Whitesburg's System and AWWA's Audit Software
- 4:15** **Adjourn**

Steven J. Evans, Assistant Director

Kentucky Water Resources Research Institute
233 Mining and Mineral Resources Building
University of Kentucky, Lexington, KY 40506-0107

Telephone: 859-257-1299
Fax: 859-323-1049
Email: steve.evans@uky.edu

EDUCATION

M.A. (Education), Georgetown College, 2004
B.S. (Biology), University of Kentucky, 2001

PROFESSIONAL EMPLOYMENT

2017 – Present: Assistant Director, Kentucky Water Resources Research Institute, Lexington, KY.
2010 – 2017: Project Manager, Third Rock Consultants, Lexington, KY.
2006 – 2017: Environmental Scientist, Third Rock Consultants, Lexington, KY.
2005 – 2006: Lab Director and Quality Assurance Director, EnviroData Group, Lexington, KY.
2004 – 2005: Biology and Inorganic Chemistry Laboratory Section Manager, EnviroData Group, Lexington, KY.
2002 – 2004: Lab Technician, EnviroData Group, Lexington, KY.

RESEARCH INTERESTS

Watershed management and planning, water quality monitoring and analysis, stormwater management with emphasis on illicit discharge detection and identification and public involvement and low impact development, stakeholder involvement and education, geospatial mapping and analysis, and environmental permitting.

PROFESSIONAL SERVICE ACTIVITIES

2017-Present: Interagency Technical Advisory Committee on Groundwater, Chair
2017-Present: Lexington Stormwater Stakeholders Advisory Committee
2017-Present: Watershed Water of Kentucky, Science Advisor
2017-Present: Kentucky River Watershed Water, Board Member
2018-Present: Friends of Cane Run, Vice President
2018-Present: University of Kentucky MS4 Working Group
2018: American Society of Civil Engineers – Kentucky Section: 2018 Infrastructure Report Card: Drinking Water Working Group

PROFESSIONAL MEMBERSHIPS

Kentucky Stormwater Association
Kentucky Academy of Science

PUBLICATIONS/PRESENTATIONS

1. S. Evans. 2018. Water in Kentucky: How things are flowing at KWRRI. October 5, 2018. Kentucky Geological Survey Seminar Series.
2. Curl, Douglas C. and Steven J. Evans. 2018. Kentucky Water Quality Report Cards: Interactive Mapping Tools and Grading Algorithms to Communicate Science to the General Public. Geological Society of America Abstracts with Programs. Vol. 50, No. 6 doi: 10.1130/abs/2018AM-319377
3. Evans, S.J., M. McAlister. 2018. "The Clean Water Act." Kentucky Watershed Academy Watershed Coordinator Training Series: Module 1. Full day workshop developed for Kentucky Division of Water and U.S. EPA. Presented on August 16, 2018.

4. Ormsbee, L. and S.J. Evans. 2018. "Sustainable Management of Rural and Small Systems Workshop." Workshop held July 9, 2018 at Fountain Run Water Utility. Kentucky Water Resources Research Institute in cooperation with West Virginia University.
5. Koyagi, E., S.J. Evans, and L. Ormsbee. 2018. Kentucky Water Resources Research Institute University of Kentucky Program Evaluation Report Fiscal Years 2011-2015. Office of External Research Water Resources Discipline U.S. Geological Survey. 118 p.
6. Evans, S.J. and Ormsbee, L. 2018. "Kentucky Water Resources Research Institute Annual Technical Report FY 2017." U.S. Geological Survey 104B Research Program Final Report. 121 p.
7. Koyagi, E. and S.J. Evans. 2018. "Kentucky Water Resources Annual Symposium Proceedings." Symposium held March 19, 2018 at Marriott Griffin Gate Resort, Lexington, KY
8. Gilbert, L. and S.J. Evans. "Watershed Organizations of Kentucky." Poster. Produced for Kentucky Division of Water and U.S. EPA.
9. Evans, S.J. 2018. "Communicating through Citizen Science: The Watershed Watch of Kentucky Experience." Invited speaker at Kentucky Geological Survey Annual Seminar 2019. Kentucky Geological Survey Core Library.
10. McAlister, M and S.J. Evans. 2017. "Kentucky River Watershed Watch: Summary of 2017 Sampling Results." Report produced by Kentucky Water Resources Research Institute. Funded by Kentucky River Authority.
11. Ormsbee, L; S.J. Evans, and K. Peterson. 2017. "Watershed Supply Report: Beam-Suntory, Loretto, KY." Kentucky Water Resources Research Institute. Project Report for Beam-Suntory Maker's Mark Facility.
12. Ormsbee, L; S.J. Evans, and L. Pacholik. 2017. "Watershed Sustainability Report: Beam-Suntory, Clermont, KY." Kentucky Water Resources Research Institute. Project Report for Beam-Suntory Jim Beam Facility.
13. Evans, S. J. and J. Shelby. 2017. "Combined Water Quality / Quality Assurance Project Report for Cane Run Comprehensive Watershed Based Plan." Third Rock Consultants. Project Technical Report for Kentucky Division of Water.
14. Evans, S. J.; J. Carey; D. Price; R. Walker; K. Miller; R. Lamey; L. Hicks; A. Rains. 2017. "Quality Assurance Project Plan: Lexington-Fayette Urban County Government Municipal Separate Storm Sewer System (MS4) Monitoring Plan." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality. Revision 2.
15. Evans, S. J.; J. Carey; D. Price; R. Walker; R. Lamey; L. Hicks; A. Rains. 2017. "Quality Assurance Project Plan: Lexington-Fayette Urban County Government Watershed-Focused Monitoring Plan." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality. Revision 2.
16. Olson, W.C. and S.J. Evans. 2016. "Severe Erosion Survey: Cane Run Watershed, Fayette and Scott County Kentucky." Third Rock Consultants. Project Technical Report for Kentucky Division of Water.
17. Evans, S. J. and J. Shelby. 2016. Technical Memorandum on Illicit Discharge Detection and Elimination Chemical Fingerprint Library. Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality.
18. Evans, S.J. et al. 2016. "Chestnut Creek Watershed Based Plan, Marshall County, KY." Third Rock Consultants. Project Report for Friends of Clarks River National Wildlife Refuge. US EPA Section 319(h) Grant No. C999486-1-12.
19. Evans, S.J. and W.C. Olson. 2015. "Lexington-Fayette Urban County Government 2014 Annual Monitoring Report, Lexington, Kentucky." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality.
20. Olson, W.C. and S.J. Evans. 2014. "North Elkhorn Creek Watershed Assessment, Lexington, Kentucky." Third Rock Consultants. Prepared for Lexington-Fayette Urban County Government Division of Water Quality.

Curriculum Vitae (Abridged)

Steven W. Hoagland, EIT

Phone: (859) 433-0475
steven.hoagland2@gmail.com

712 Vermillion Peak Pass
Lexington, KY 40515

EDUCATION

- MS** University of Kentucky, Civil Engineering (2016)
Emphasis: Hydraulics, Water Resources Engineering
Committee Members: Lindell Ormsbee,* PhD; Scott Yost, PhD; James Fox, PhD
**Advisor*
- BS** University of Kentucky, Civil Engineering (2014)
Emphasis: Water Resources Engineering
Undergraduate Research Advisors: Lindell Ormsbee, PhD; Scott Yost, PhD

PROFESSIONAL EXPERIENCE

Kentucky Water Resources Research Institute, Lexington, KY (Sep. 2018 - Present)

Civil Engineer

- Responsible for planning, coordinating, and conducting training workshops for rural water and wastewater utilities in Kentucky's Appalachian region; and developing hydraulic models for rural water utilities and training utility employees on model use.
- Reviewed funding proposals for USGS 104b and 104g research grant programs.
- Lead and participated in laboratory exercises to determine the variability and accuracy of field kits when testing for Phosphorus and Nitrogen concentrations.

Tetra Tech, Inc., Lexington, KY (Jan. 2016 – Sep. 2018)

Civil Engineer

- Responsible for balancing a multi-project workload, coordinating with co-workers and clients in other states, responding to clients in a timely manner, meeting deliverable deadlines, and delegating project work to engineering interns.
- Project work includes civil site design, construction administration, hydrologic and hydraulic modeling, and municipal program management.

Civil Site Design and Construction

1. Blue Grass Airport, Lexington, KY
2. West Hickman Wastewater Treatment Plant, Lexington, KY
3. Wolf Run WWS Facility, Lexington, KY

Municipal Program Management

1. Blue Grass Airport, Environmental Management Program
2. LFUCG, Municipal Separate Storm Sewer System (MS4) Program

Hydrologic and Hydraulic Modeling

1. City of Cape Coral, FL – Irrigation
2. City of Gateway, FL – Irrigation
3. City of Grand Rapids, MI – Storm
4. City of Port St. Lucie, FL – Potable
5. City of Tampa, FL – Combined Sewer
6. Genoa-Osceola, MI – Sanitary Sewer
7. GLWA, MI – Combined Sewer
8. Miami-Dade County, Potable
9. Miami Int'l Airport, FL – Potable
10. Westover Air Reserve Base, MA – Potable

Curriculum Vitae (Abridged)

PUBLICATIONS

Journal Publications

1. Hoagland, S., Hernandez, E., and Ormsbee, L., "Hydraulic Model Database for Applied Water Distribution Systems Research," *in preparation*.
2. Ormsbee, L., Peterson, K., and Hoagland, S., "Is It Time to Revise the Curve Number Method: Especially for Urban Applications?" *in preparation*.

Conference Proceedings

1. Hernandez, E. Hoagland, S., and Ormsbee, L., "Water Distribution Database for Research Applications," Proceedings of World Environmental and Water Resources Congress, West Palm Beach, FL, May 22-26, 2016, pp. 465-474.
2. Hoagland, S., Schal, S. Ormsbee, L., and Bryson, S., "Classification of Water Distribution Systems for Research Applications," Proceedings of World Environmental and Water Resources Congress, Austin, TX, May 17-21, 2015, pp. 696-702.

Thesis

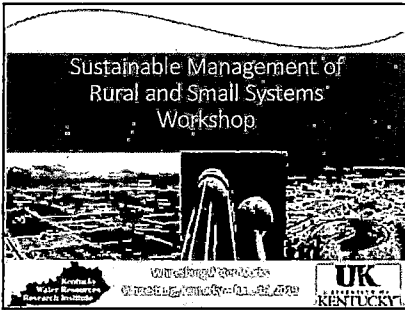
1. Hoagland, S., "Transient-Based Risk Analysis of Water Distribution Systems," Civil Engineering Theses and Dissertations, University of Kentucky, 2016. https://uknowledge.uky.edu/ce_etds/39.

Technical Reports

1. "Monitoring of Post-Construction Stormwater Controls," Lexington-Fayette Urban County Government, June 2018.
2. "WQV and RRV Analysis of Existing Stormwater Controls for the Hope Center Apartments at 1518 Versailles Road," Lexington-Fayette Urban County Government, August 2017.
3. "Hydrologic / Hydraulic Analysis of Residential Detention Basin WH+61+A1 at 109 Hidden Woods Court," Lexington-Fayette Urban County Government, June 2017.

PRESENTATIONS AND WORKSHOPS

1. "Introduction to Water Distribution Systems Modeling Workshop," Martin County Water District, Inez, Kentucky, March 5, 2019.
2. "Erosion and Sediment Control Plan Preparation Workshop," Developers, Contractors, and Consultants, Lexington-Fayette Urban County Government MS4 Program, March 20, 2018.
3. "Erosion and Sediment Control Plan Review Workshop," Municipal Staff and Fayette Construction Site Inspectors, Lexington-Fayette Urban County Government MS4 Program, March 1, 2018.
4. "Challenges and Perspective from an EIT," Water Professionals Student Chapter, University of Kentucky, November 30, 2017.
5. "Classification of Water Distribution Systems for Research Applications," World Environmental and Water Resources Congress, Austin, TX, May 20, 2015.



1

Welcome and Introductions

Moderator: Lindell Ormsbee

- Welcome
- Purpose of Workshop
- Introduction of Team Members
- Participant Introductions – Name, Community, Role
- Workshop Materials
- Meeting Logistics
- Meeting Agenda

2

Management Process

- Phase I
 - Regional workshops
 - Explain 10 basic management areas
 - Perform general utility assessments
 - Identify possible goals and strategies
- Phase II
 - Individual utility workshops
 - Involve operators, managers, and decision makers
 - Develop feasible goals and strategies
 - Provide technical resources to help support implementation

3

Workshop Participants

- This workshop will focus on management issues but will likely involve a range of participants:
 - Operators
 - Managers
 - Decision makers
 - City Officials
 - Mayors
 - City council members
 - Utility board members
 - County Officials
 - Judges
 - Members of the fiscal court

4

Schedule of Activities

- Introduce Key Management Areas
- Perform Self Assessment Exercise
- Discuss Tips for Improving Outcomes
- Improving Outcomes Exercise
- Lunch
- Creating an Action Plan Exercise
- Tools, Guides and other Resources
- Next Steps


5

Public Expectations

Public Water Systems

Provide safe drinking water at most appropriate cost

- ✓ Water Quality
- ✓ Reliability
- ✓ Affordability



6

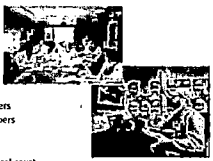
Common Challenges for Utilities

- Aging infrastructure that needs more intensive repair and replacement.
- Continuing regulatory changes, including the need to often balance priorities among multiple compliance endpoints.
- Workforce challenges, including an aging workforce and difficulties in recruiting and retaining qualified staff.
- Uncertainties about future funding opportunities.
- Competing local priorities and a dwindling resource base in many small communities.
- Uninformed or disengaged board members.

7

Key Utility Personnel

- The effective management of a water utility will require the active participation of a range of individuals:
 - Customers
 - Operators
 - Managers
 - Decision makers
 - City Officials
 - Mayors
 - City council members
 - Utility board members
 - County Officials
 - Judges
 - Members of the fiscal court



8


Water Utility Management Involves A Range of Issues

- Managerial** Clear Roles, Effective Policies, Thorough Planning
- Financial** Budgeting, Accounting, Planning, Internal Controls
- Technical** Infrastructure, Source, Standards, Rights, Operators

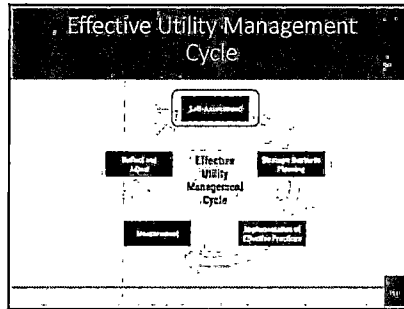
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Keys To Management Success

- Leadership
- Strategic Business Planning
- Knowledge Management
- Measurement
- Continual Improvement Management




10



11

Overview of the Ten Key Management Areas

Outcomes that well-managed utilities strive for



12

The Ten Key Management Areas

1. Water Resource Adequacy	6. Financial Viability
2. Product Quality	7. Operational Optimization – Energy and Water Efficiency
3. Customer Satisfaction	8. Infrastructure Stability
4. Community Sustainability & Economic Development	9. Operational Resiliency
5. Employee and Leadership Development	10. Stakeholder Understanding and Support


13

The Well-Managed Utility

- Ten Management Areas are framed as outcomes.
- They serve as building blocks for utility performance improvement:
 - Where to focus.
 - What to strive for.
- Most water and wastewater utilities pay attention to each of these areas and likely perform well in at least some of them.
- They can be used to fit into, draw on, and support asset management, long-term business planning, continual improvement management systems.

14


1. Water Resource/Capacity Adequacy



- Ensures water availability consistent with current and future customer needs through:
 - Long-term resource supply and demand analysis
 - Conservation
 - Public education
- Understands the utility role in water availability.
- Manages operations to provide for long-term aquifer and surface water sustainability and replenishment.

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2. Product Quality



- Produces potable water or treated effluent, along with process residuals that are:
 - In full compliance with regulatory and reliability requirements.
 - Consistent with customer, public health, and ecological needs.
 - Supportive of local economic development and business needs and opportunities.

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3. Customer Satisfaction



- Helps customers understand the value of water and their local utility.
- Knows what their customers expect in terms of service, water quality, and rates.
- Has developed a way to gather feedback from their customers, review the feedback, and then act on it.
- Sets goals to meet these expectations.
- Is able to respond to emergency conditions in a timely and efficient manner.

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4. Community Sustainability & Economic Development



- Is actively engaged in the local community.
 - Is aware of or actively engaged in discussions of community and economic development
 - Is aware of local business needs and opportunities for new residential or business customers
- Aligns Utility goals to be attentive to the impacts that utility decisions will have on current and future community and watershed health.
- Aligns Utility goals to promote community economic vitality and overall improvement.

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5. Employee & Leadership Development



- Recruits and retains a workforce that is competent, motivated, adaptive, and is concerned about safety.
- Establishes a participatory, collaborative organization.
- Ensures employee institutional knowledge is retained and improved on over time.
- Creates opportunities for professional and leadership development.

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6. Financial Viability



- Understands the full life-cycle costs of the utility and establishes and maintains an effective balance between:
 - Long term debt
 - Asset values
 - Operations and maintenance expenditures
 - Operating revenues
- Establishes predictable rates consistent with community expectations and acceptability – adequate to:
 - Recover costs.
 - Provide for reserves.
 - Address maintenance needs.
 - Plan and invest for future needs.
 - Maintain support from bond rating agencies

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7. Operational Optimization



- Understands the operational performance factors (e.g., reliability of service, pressure, DBPs, overflows).
- Ensure ongoing, timely, cost-effective, and reliable performance improvements in all facets of operations (i.e., continual improvement culture).
- Minimize resource use, loss, and impacts from day-to-day operations (e.g., energy and chemical use, water loss).
- Maintain awareness of information and operational technology developments to anticipate and support timely adoption of improvements.

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8. Infrastructure Stability



- Understands the condition and cost of each system component.
- Plans for system component repair, replacement, and enhancement over the long-term at the lowest possible cost.
- Coordinates asset repair, rehabilitation, and replacement within the community to minimize disruptions and other negative consequences.

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9. Operational Resiliency



- Ensures utility leadership and staff work together to anticipate and avoid problems.
- Identifies threats to the system (legal, financial, non-compliance, environmental, safety, security, and natural disaster) by conducting all hazards vulnerability assessment.
- Establishes acceptable risk levels that support system reliability goals.
- Identifies how to manage risks and how to implement appropriate response actions by developing and using an all-hazards emergency response plan.

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10. Stakeholder Understanding & Support

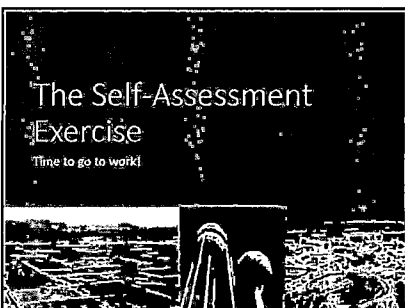


- Actively involves stakeholders in the decisions that will affect them:
 - By providing for a structure or protocol to engage stakeholders
 - By seeking to understand stakeholder needs and interests
 - By promoting the value of clean and safe water
- Creates understanding and support from oversight bodies, community and watershed interests, and regulatory bodies:
 - Service levels
 - Rate structures
 - Operating budgets
 - Capital improvement programs
 - Risk management decisions

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The Self-Assessment Exercise

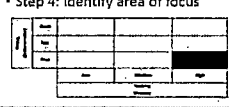
Time to go to work!



25

Getting Started (Tab 2)

- Step 1: RATE your system's level of achievement (practice and performance) for each management area
- Step 2: RANK the importance of each area
- Step 3: FLAG the results
- Step 4: Identify area of focus

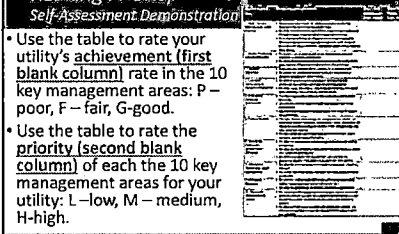


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STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

- Use the table to rate your utility's achievement (first blank column) rate in the 10 key management areas: P – poor, F – fair, G – good.
- Use the table to rate the priority (second blank column) of each the 10 key management areas for your utility: L – low, M – medium, H – high.



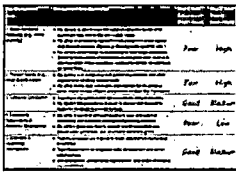
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STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

Take each management area one at a time:

- 1) Review the definition of the management area.
- 2) Rate the achievement level of the area.
- 3) Rate the priority level of the area.




Management Area	Achievement	Priority
Asset Management	Poor	High
Customer Satisfaction	Fair	High
Financial Health	Good	Medium
Human Resources	Poor	Low
Information Technology	Fair	Medium

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STEP 1: Rating Achievement

Scale from LOW to HIGH achievement

- Select Poor if your system has no workable practices in place for addressing this area – very low capacity and performance.
- Select Fair if your system has some workable practices in place with moderate achievement, but could improve – some capacity in place.
- Select Good if your system has effective, standardized, and accepted practices in place. It either usually or consistently achieves goals – capacity is high and in need of very little or no further development.



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STEP 2: Ranking Priority

Scale from LOW to HIGH priority

- Review each of the five prioritization elements:
 1. Crisis situations / urgency (near term or long term)
 2. Current or expected challenges
 3. Consequence severity (non-compliance, costs, health, safety)
 4. Customer impacts (water quality, reliability of service)
 5. Community priorities (economic development, quality of life)
- Select High if concerns for most elements (4-5) or a strong concern in several
- Select Medium if concerns for some elements (2-3) or a strong concern for one
- Select Low if concerns for few or none of the elements (0-1) and no strong concerns

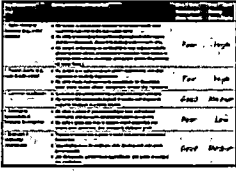
30

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

Take each management area one at a time:

- 1) Review the definition of the management area.
- 2) Rate the achievement level of the area.
- 3) Rate the priority level of the area.

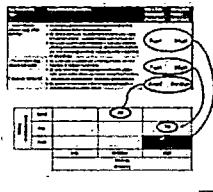


Management Area	Achievement	Priority
Asset Management	Poor	High
Customer Satisfaction	Fair	High
Financial Health	Good	Medium
Human Resources	Poor	Low
Information Technology	Fair	Medium

31

STEP 3: Plotting Results

Self-Assessment Demonstration



Legend:

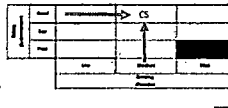
- AA: Asset Management
- PC: Public Safety
- OC: Customer Satisfaction
- CS: Community Leadership & Economic Development
- HR: Human Resources
- IT: Information Technology
- FD: Financial Health
- CE: Compliance & Regulatory

32

STEPS 3 & 4: Plotting Results and Focusing Attention

Self-Assessment Demonstration

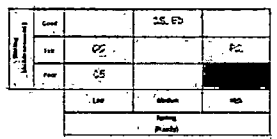
- Use the table on Page 5 of Tab 2 to write the two letters corresponding to each management area in the appropriate box that corresponds to intersection of the two ratings (i.e. the achievement rating and the priority rating).
- Example: Consumer Satisfaction (CS):
 - Good – G – Achievement
 - Medium – M – Priority



33

STEPS 3: Plotting Results


Self-Assessment Demonstration



Management Area	Achievement	Priority	Result
Asset Management	Poor	High	PH
Customer Satisfaction	Fair	High	GH
Financial Health	Good	Medium	GM
Human Resources	Poor	Low	PL
Information Technology	Fair	Medium	FM

34

Discuss Self Assessment Results

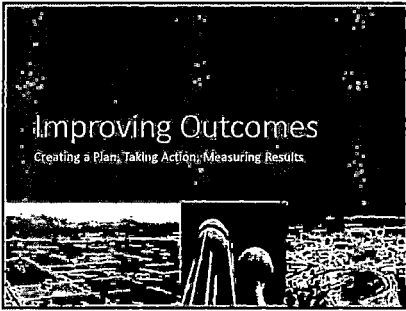


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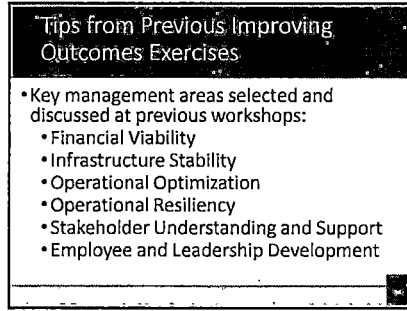
Step 4: Self-Assessment Discussion Questions

- What are your areas of focus (the orange and red areas)?
- Why are they an area of focus?
- Are your areas of focus different or similar to the other utilities at your table?
- What lessons can you learn from the other people at your table that you could use to improve your performance?
- How might your perspective on these priorities change if you are an:
 - Operator
 - Board Member
 - Judge Executive

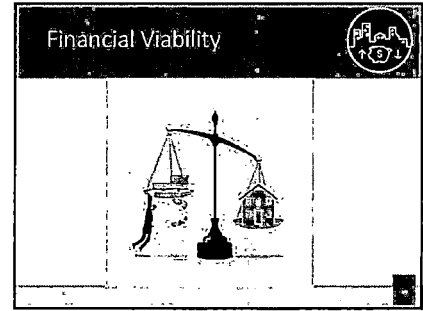
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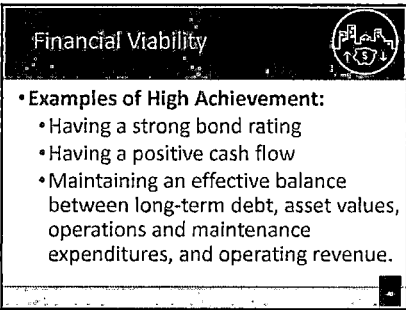
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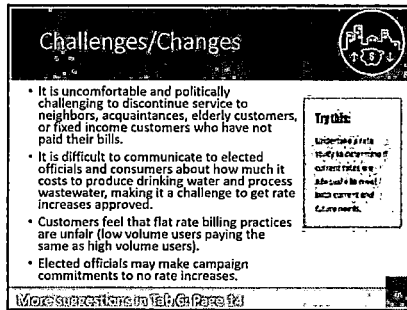
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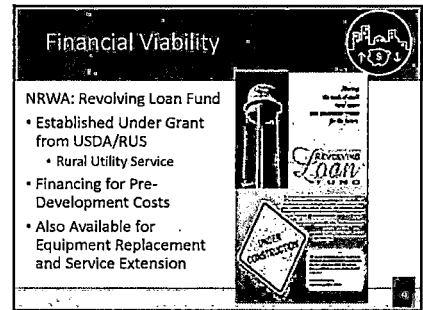
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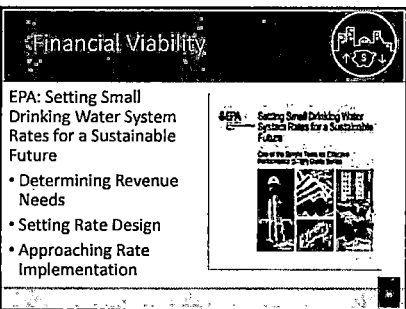
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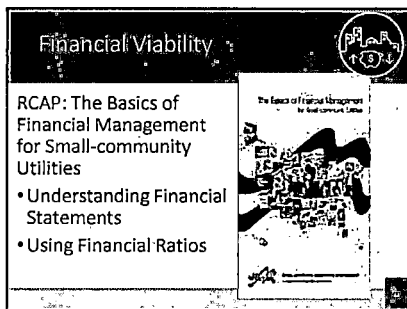
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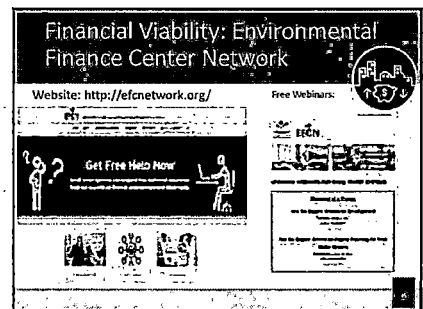
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43



44



45

Infrastructure Stability

- Infrastructure Stability Is Dependent Upon
 - Asset management
 - Capital planning

If you fail to plan, you are planning to fail.

46

Infrastructure Stability

Asset Management

Asset Management is maintaining a desired level of service (what you want your assets to provide)

At the lowest life cycle cost (best appropriate cost – not 'no cost')

47

Infrastructure Stability

Five Core Components of Asset Management

- Current State of the Assets
- Level of Service
- Criticality
- Life Cycle Costing
- Long-Term Funding

48

Infrastructure Stability

Tips for Capital Improvement Planning

- Set arbitrary minimum price for asset
- Stay realistic
- Five year minimum
- Justify need
- Coordinate with other projects
- Look at broad options
- Detail funding options
- Discuss openly

49

Infrastructure Stability

Examples of High Achievement:

- Having an inventory of system components, location, installation date, and condition.
- Understanding of system operating parameters (e.g., pressure).
- Having a capital improvement plan.

50

Challenges/Changes

- Planning for repair and maintenance of infrastructure is hampered by a limited knowledge of the condition of existing infrastructure components.
- Many systems are trapped in a reactive repair and maintenance mode leaving little or no time for undertaking the proactive work needed to establish an asset management program.

Try This:
Create an inventory of your assets and then by setting up a template for long-term assets. Log status of the tools and regular maintenance or emergency repairs are performed.

Infrastructure Stability at Page 10

51

Infrastructure Stability

EPA: Check Up Program for Small System (CUPSS)

- Free Asset Management Tool for Small Drinking Water and Wastewater Utilities!
- Tips on How to Develop a Record of Your Assets, an Understanding of Your Financial Situation, and a Tailored Asset Management Plan.

52

Operational Optimization
Water/Energy Efficiency

53

Operational Optimization
Water/Energy Efficiency

- Examples of High Achievement:
 - Having an optimal energy rate schedule
 - Using energy efficient pumps
 - Minimizing water loss (i.e. < 15%)
 - Maintaining a comprehensive maintenance program
 - Proper pressure management

54

Challenges/Changes

OPERATIONAL OPTIMIZATION
 Challenges related to Operational Optimization Include:

- High energy bills
- Improper maintenance of equipment
- Excessive water loss

Try this:

- Conduct an energy audit
- Identify locations of water loss
- Insure status of isolation valves
- Monitor pressure regulating valves
- Implement pressure management program
- Replace energy inefficient system components
- Sequence pump schedules with electric rate schedules

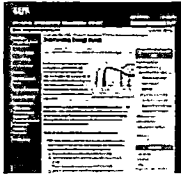
55

Operational Optimization

Water/Energy Efficiency

EPA: Energy Use Tool for Water and Wastewater Systems

- Interactive, Excel-based tool
- Detailed Analysis of All Energy Types
- Provides Summary Report: Statement of Energy Performance




56

Operational Optimization

Water/Energy Efficiency

RCAP: Sustainable Infrastructure for Small System Public Services: A Planning and Resource Guide

- Water Conservation
- Energy Efficiency
- Renewable Energy



57

Operational Resiliency

Operation & Maintenance Plans

Maintain Assets

Operations

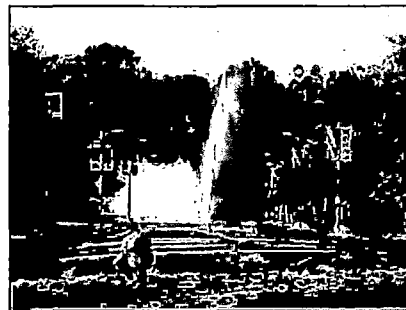
- Activities to keep water flowing

Maintenance

- Routine
- Preventative
- Predictive
- Not emergency

Emergency Plan	Maintenance Important 30% of budget	Maintenance Extremely Important 45% of budget
	Maintenance Less Important 15% of budget	Maintenance Important 20% of budget
Priority of Work		

58



59

Operational Resiliency

Examples of High Achievement:

- Having emergency response plans, operations plans, shut-off checklists for equipment.
- Regular drills of the emergency response plan.
- Certified staff and board members.

60

Challenges/Changes

- A lack of system documentation.
- Insufficient time to conduct training and exercises on the emergency response plan.
- Employee and board member turnover makes it difficult to maintain familiarity with emergency response procedures and materials.

Try this:

- Use an emergency plan audit to identify areas for improvement and review key emergency documents.


More suggestions on Table Page 16

61

Stakeholder Understanding and Support

Communicating with Customers

- BA Updates
- Emails
- Classes
- Consumer Confidence Reports
- Lists
- Newsletters
- Press releases
- Radio/TV
- Social media
- Special meetings
- Surveys




Don't let the water utility be your community's best kept secret

Think of customers as partners

62

Stakeholder Understanding and Support

It's all about the story and how we tell it



- Customers
- Board Officials
- Board Members
- Manager
- Operators

63

Stakeholder Understanding and Support

64

Stakeholder Understanding and Support

65

Stakeholder Understanding and Support

...the message will frame you

66

Stakeholder Understanding and Support

...the message will frame you

67

Stakeholder Understanding and Support

- Examples of High Achievement:
 - Having a **Capital improvement plan** or other document that summarizes utility priorities and can be shared with utility board.
 - Having standard **operating procedures** for utility staff that address communication.

68

Challenges/Changes

Customers and stakeholders display a lack of interest in gaining a better understanding of utility needs.

Customer resistance to paying water bills or supporting rate increases.

Try This:

Send an annual open house or backyard party for water conservation and efficiency. Consider other topics along with water bills and rate increases as a part of the event.

69

Stakeholder Understanding and Support

NRWA: Quality on Tap!

- Nationwide, Grassroots Campaign for Public Awareness
- Hands On Guide to Engagement and Communication for Better Community Support

70

Stakeholder Understanding and Support

RCAP: The Big Guide for Small Systems: A Resource for Board Members

- Water and Wastewater Treatment Basics
- Regulatory Responsibilities
- Board Business
- Financial Duties and Responsibilities

71

Stakeholder Understanding and Support

EPA: Talking to Your Decision Makers – A Best Practices Guide

- Role of Community Decision Makers in Small Systems
- Tips on How to Communicate Needs to Decision Makers

72

Employee and Leadership Development

73

Employee and Leadership Development

- **Examples of High Achievement:**
 - Having written job descriptions.
 - Providing clear performance expectations.
 - Making sure staff are cross-trained.

74

Challenges/Changes

- Employee motivation and opportunities for development can be hampered by lack of resources.
- Limited access to training opportunities can prevent personal and professional development.
- Lack of written job responsibilities can lead to uncertainty about management expectations and a lack of recognition for the work that is done.
- Time constraints on employees.

Try This:
Develop a plan to improve the following areas by sharing training resources.

More suggestions in Tab 6 Page 161

75

Table Activity

- Using the Improving Outcomes Worksheet provided at your table (also a copy in Tab 3) each participant should complete an improvement worksheet for one of the low achievement/high priority management areas identified by one of your table members. The worksheet has four questions to answer.
- After picking a management area, share perspectives on:
 - What will constitute "high achievement" in this management area?
 - What are potential causes for the achievement gaps?
 - What changes will the utility need to make to improve performance?
 - What will be the biggest challenges to performance improvement?

76

Table Activity
Using IMPROVING OUTCOMES WORKSHEET

IMPROVING OUTCOMES WORKSHEET

Management Area	High Achievement	Causes	Changes	Challenges

Tab 3 in your notebook

Examples in Tab 6 in your notebook (pages 13-17)

77

Creating an Action Plan
Where do we go from here?

78

Action Plan Worksheet

Tab 4 in your notebook

79

Action Plan Worksheet

Step 1: Have each person fill out their top three priority management areas from the Self Assessment exercise and then pick one to work on.

80

For Example...

Priority Management Areas:

1. Water Resource Adequacy
2. Product Quality
3. Financial Viability ← Select One

81

Action Plan Worksheet

Step 2: Choose an action that you could take to make improvements in your selected Priority Management Area.

82

For Example...

Priority Management Areas:

1. Water Resource Allocation
2. Product Quality
3. Production Efficiency

Improvement Action: *Improve product quality by the number of production lots*

83

Action Plan Worksheet

Step 3: Complete the fields below to describe what is needed to complete your "Improvement Action"

84

For Example...

Objective:	✓ Establish and manage a water conservation program to reduce water consumption and improve water efficiency.
Action:	✓ Implement water conservation measures in all buildings and operations.
Management Area:	✓ Production Efficiency
Addressed:	✓ Production Efficiency
Objective:	✓ Reduce the amount of water used in all buildings.
Timeline:	✓ June 2018 - Q3 2018 are being performed. Review and evaluate results and determine the next steps.
Start Date:	✓ July 2018
Completion Date:	✓ July 2018
Target completion date:	✓ July 2018

85

For Example...

Responsible Party (or Parties):	✓ Production Efficiency
Relevant Resources (on-hand or needed):	✓ Existing water conservation program and equipment.
Challenges to Address:	✓ Limited water availability in some areas.
Review Process:	✓ Performance indicators or metrics
Frequency:	✓ Quarterly
Other Notes:	✓ Contact with water utility regarding water conservation program.

86

Tools, Guides, and Other Resources

Resources Available for Your Use

87

Effective Utility Management

<http://www.watereum.org/>

88

Rural and Small System Guidebook

APPENDIX: RESOURCES FOR RURAL AND SMALL SYSTEMS

89

Online Resources

<https://www.rd.usda.gov/programs-services/services/sustainable-management-tools>

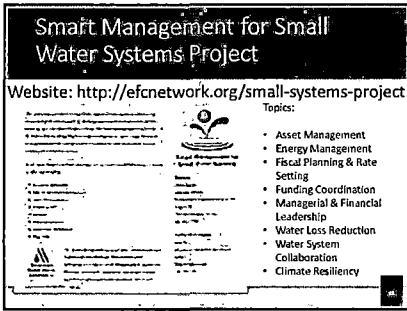
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Smart Management for Small Water Systems Project

Website: <http://efcnetwork.org/small-systems-project>

Topics:

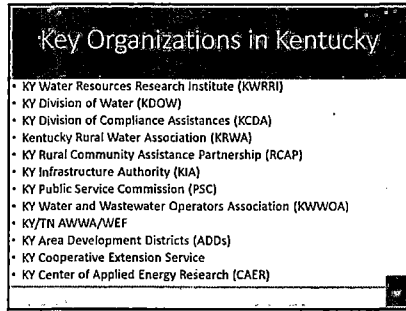
- Asset Management
- Energy Management
- Fiscal Planning & Rate Setting
- Funding Coordination Managerial & Financial Leadership
- Water Loss Reduction
- Water System Collaboration
- Climate Resiliency



91

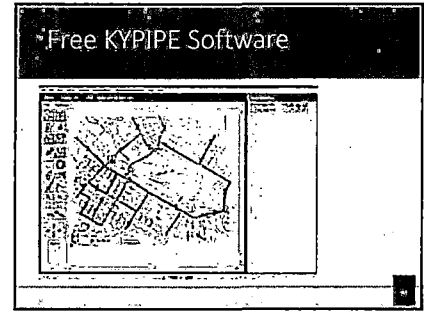
Key Organizations in Kentucky

- KY Water Resources Research Institute (KWRII)
- KY Division of Water (KDOW)
- KY Division of Compliance Assurances (KCDA)
- Kentucky Rural Water Association (KRWA)
- KY Rural Community Assistance Partnership (RCAP)
- KY Infrastructure Authority (KIA)
- KY Public Service Commission (PSC)
- KY Water and Wastewater Operators Association (KWWOA)
- KY/TN AWWA/WEF
- KY Area Development Districts (ADDs)
- KY Cooperative Extension Service
- KY Center of Applied Energy Research (CAER)



92

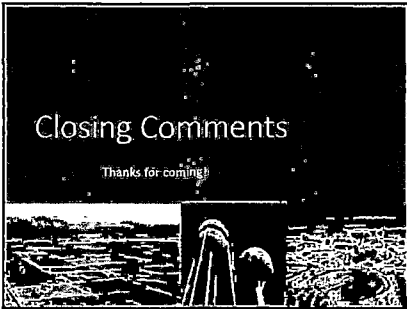
Free KYPIPE Software



93

Closing Comments

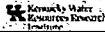
Thanks for coming!



94

Fundamentals of AWWA Water Auditing and Loss Estimation

Utility of 1981, 1983, 1985, 1987
June 1987 - 1989
by Stephen Haggland



1

Presentation Outline

- Identifying the Problem
- The Water Audit
- Terminology and Definitions
 - M36 Breakdown
 - Simplified Water Balance
- Conducting the Top-Down Water Audit
 - Overview
 - Step-by-Step
- Free Software and Other Resources
 - Audit Worksheet
 - M36 Manual (3rd Edition)
- Example Walkthrough

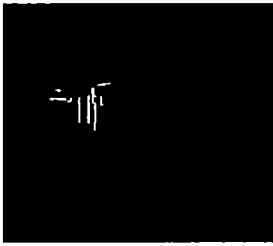
2

Identifying the Problem

3

The Ivory Tower


Richard L. Armstrong
Distribution and Audit by
Munich & Johnson
1983



4

What's driving this analysis?

- Water Resources Supply
- Financial Losses
- Operational Stressors
- Stakeholder Perceptions
- System Integrity



Multiple Interrelated Issues

5


The Known / Unknown Matrix

1. Known Knowns We know that region "A" has 20% water loss based on last month's flow and billing data.	2. Known Unknowns We know that region "A" has the most active leaks, but we don't know what is causing them.
3. Unknown Knowns We don't know our possible water loss savings, but we do understand the effects of pressure management.	4. Unknown Unknowns We don't know if region "A" has residential meter errors, the extent of the possible error, or the system effects.

6

Estimating water loss is all about gathering information and identifying problems.

Once the problems are clearly identified, the appropriate next steps will become more apparent.



7

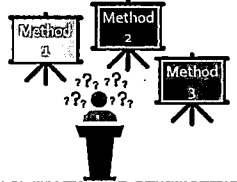
The Water Audit

8

• Most methods are essentially the same!

• Pay special attention to terminology and definitions.

Which Auditing Method Should I Use?



9

Accounting process typically involves volumetrically balancing the water produced, stored, consumed, and lost.

Makes sure you understand exactly what it means when the term "water loss" is used.

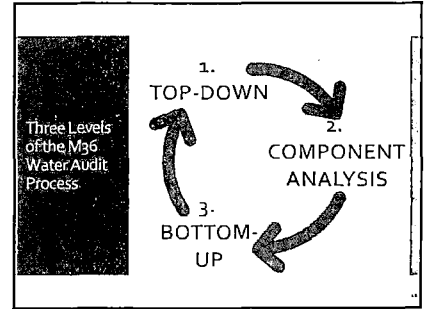
10

AWWA's M36 Methodology

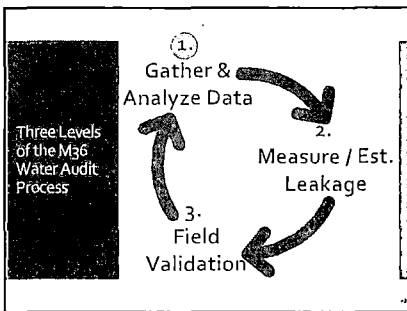
- Worksheet
- Terms & Definitions
- Apparent Losses
- Data Confidence
- System Data
- Cost Calculations

Water Audits and Loss Control Programs

11



12



13

Terminology and Definitions

14

M36 Terms and Definitions

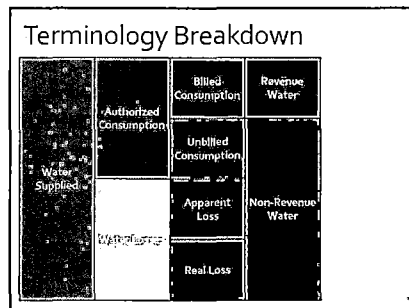
System Boundaries			Internal System		
Water From Own Sources (includes the urban areas)	System Total Volume	Water Exported	Authorized Consumption	Billed Authorized Consumption	Billed Water Expired
		Water Supplied	Unauthorized Consumption	Unbilled Authorized Consumption	Billed Unauthorized Consumption on Revenue Water
Water Imported	Water Losses	Real Losses	Apparent Losses	Unbilled Unauthorized Consumption	Unbilled Unauthorized Consumption on Non-revenue Water
				Unauthorized Consumption	Unbilled Unauthorized Consumption on Non-revenue Water
				Customer Metering Inaccuracy	
				Systemic Data Handling Errors	
				Leakage on Transmission and Distribution Mains	
				Leakage and Overflow at Utility Storage Tanks	
				Leakage on Service Connections Up to Point of Customer Metering	

15

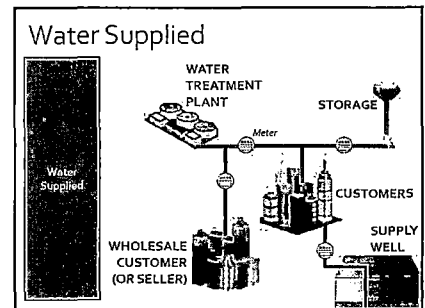
M36 Terms Simplified

Water From Own Sources (includes the urban areas)	System Total Volume	Water Exported	Water Supplied	Water Losses	Revenue Water	Non-revenue Water
		Billed Water Expired	Authorized Consumption	Unauthorized Consumption	Billed Authorized Consumption	Billed Unauthorized Consumption on Revenue Water
		Real Losses	Apparent Losses	Unauthorized Consumption	Unbilled Authorized Consumption	Unbilled Unauthorized Consumption on Non-revenue Water
				Customer Metering Inaccuracy		
				Systemic Data Handling Errors		
				Leakage on Transmission and Distribution Mains		
				Leakage and Overflow at Utility Storage Tanks		
				Leakage on Service Connections Up to Point of Customer Metering		

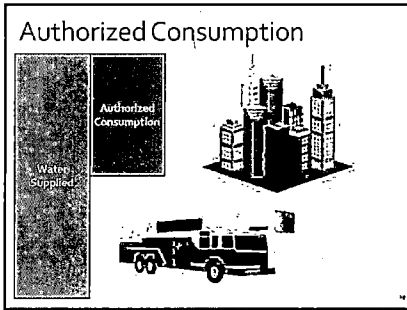
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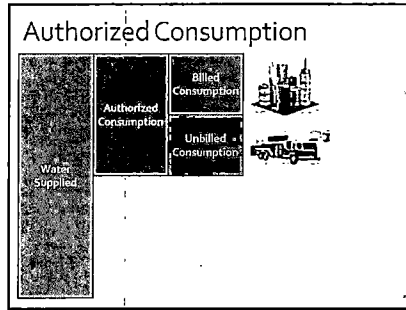
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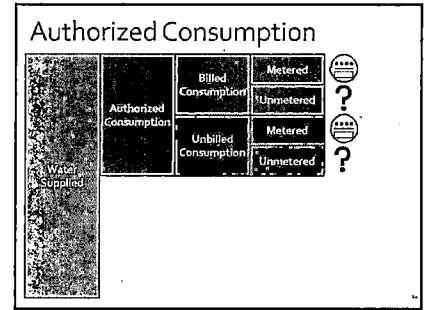
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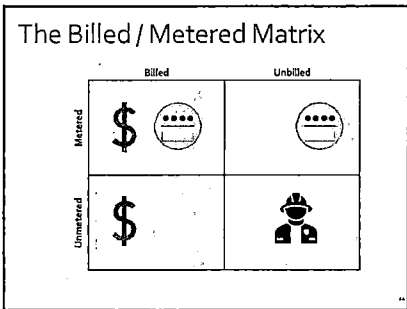
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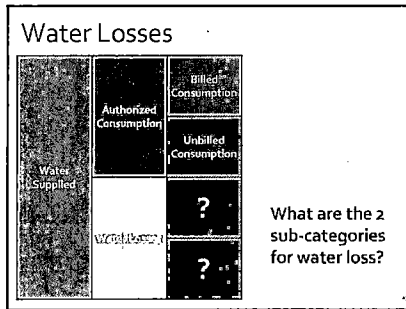
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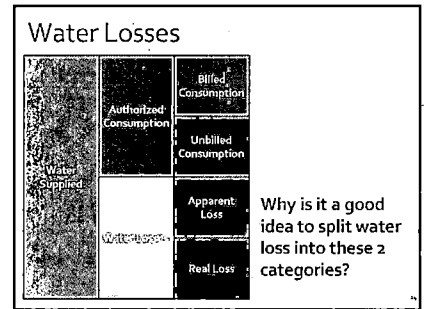
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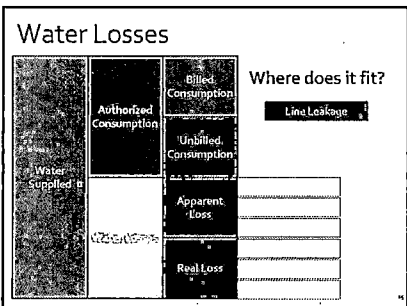
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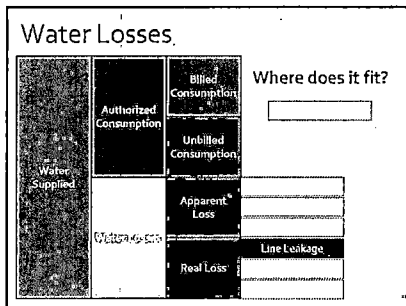
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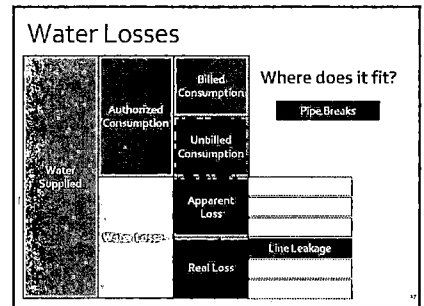
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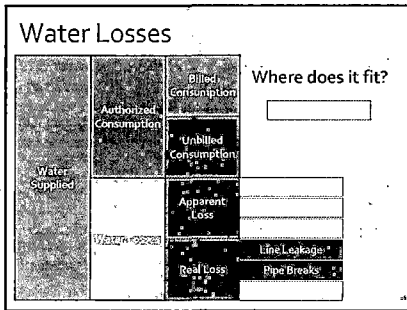
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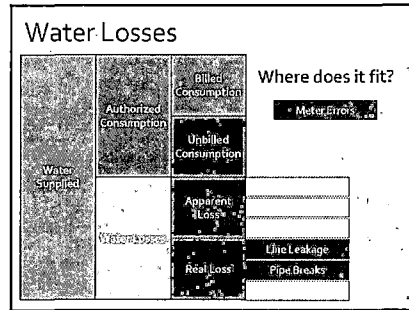
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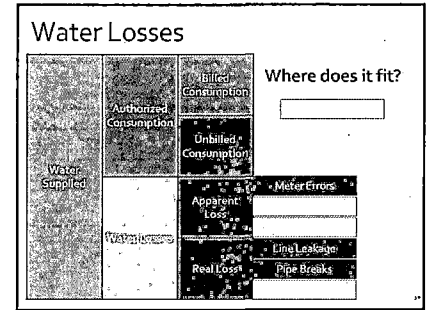
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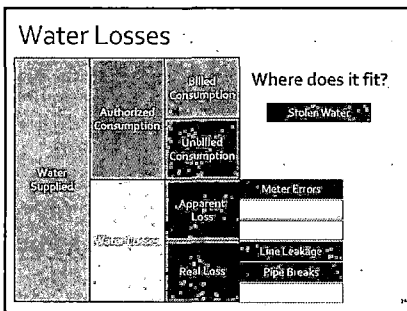
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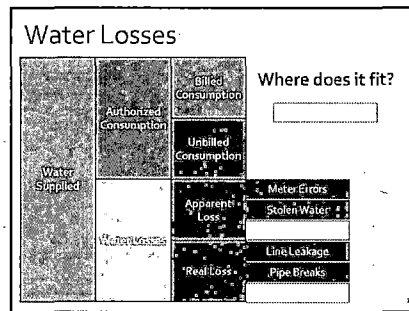
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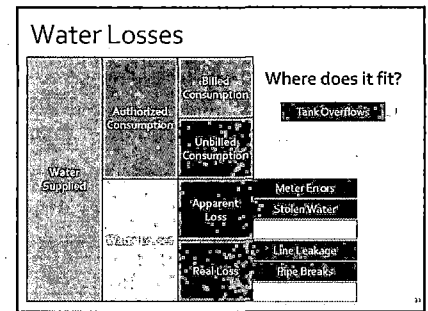
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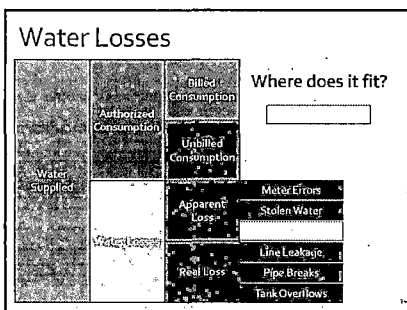
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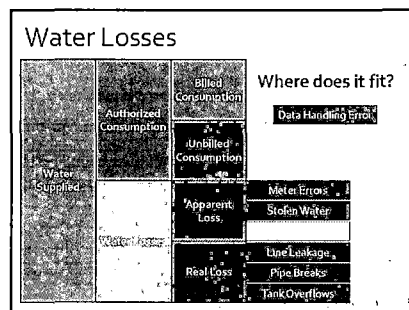
32



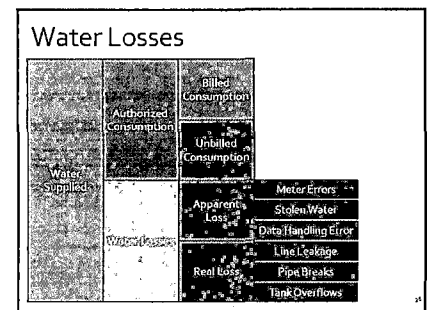
33



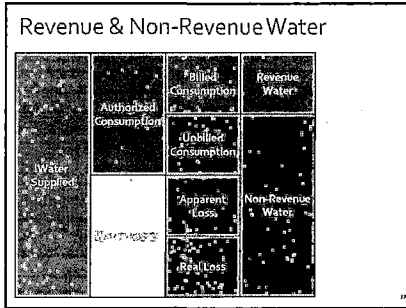
34



35



36



37

PUBLIC SERVICE COMMISSION
Monthly Water Loss Report

The form includes sections for 'Billed Use', 'Unbilled Use', and 'Real Loss'. It contains various input fields for data entry.

38

Conducting the Water Audit

39

-
- Level 1 (Top-Down): Step-by-Step**
- Step 1: Preliminary Decisions
 - System Boundaries, Time Frame, Units, Data
 - Step 2: Collect Distribution System Information
 - Step 3: Measure Water Supplied to Distribution System
 - Step 4: Quantify Authorized Consumption
 - Billed vs. Unbilled
 - Metered vs. Unmetered
 - Step 5: Calculate Water Losses
 - Step 6: Quantify Apparent and Real Water Losses
 - Step 7: Input Price and Costs Data
 - Retail, variable production, annual operations
 - Step 8: Review Audit Results
 - Dashboard, performance indicators, priority areas

40

Ms36 Excel Workbook

A screenshot of an Excel spreadsheet showing various data tables and formulas used in the water audit process.

41

Ms36 Excel Workbook

- Use the worksheet to enter values for water balance values, system data, and cost information.
- Use the worksheet to assess the quality of your data with "data validity scores"

Enter Values Here ---
Enter Data Validity Scores Here ---

AUTHORIZED CONSUMPTION

Billed Consumption	6,781,200	MGD
Unbilled Consumption	1,000	MGD
Unbilled Consumption	27,750	MGD
Unbilled Consumption	157,500	MGD
Unbilled Consumption	4,961,700	MGD

Unbilled Consumption value entered is greater than the recommended default value.

42

Data Validity Scores 1

- Numbers between 1 and 10 to grade the data:
 - How "good" is the data?
 - How confident are you in this data?
- The larger the volume, the more important the data validity score is in the final grade
- Final grade (out of 100) at the bottom
- Should 100 be my goal? No!

Look up definition --- Enter data validity score
Add comment --- Enter values

VOLUME NON-REVENUE WATER SUPPLIED

Volume Non-revenue	0.000	MGD
Water Imported	0.000	MGD
Water Exported	0.000	MGD
WATER SUPPLIED	0.000	MGD

YOUR SCORE IS 72 out of 100

43

Data Validity Scores 2

- Hover your mouse over the scoring box and a grading guide will appear
- Ex. below for length of water mains data

1. Verify boundaries and production data in that region of billing and use the apparent volume data as a percentage of authorized volume (AV) for that distribution system. The AV is the authorized volume divided by the AV. The AV is the authorized volume divided by the AV. The AV is the authorized volume divided by the AV.

44

Preliminary Decisions

- Identify System Boundaries
 - Source Water Treatment
 - Wholesale Customers
 - Purchase Meters
- Set a Time Period for the Study
 - 1 - 6 months is too short
 - 12 months recommended
 - Update every month
- Determine Units of Measure
 - English vs. SI Units
 - CFS, GPM, MGD
- Identify Records and Data Sources
 - SCADA
 - Billing
 - Meter Readings

45

Collect Distribution System Information

- Cost data should be easy to pull together
- May be able to work with KIA or local ADD district to help pull together System Data

Enter Values Here

Enter Data Validity Scores Here

46

Measure Water Supplied to Distribution System

Water Supplied	Authorized Consumption	Billed Consumption	Revenue Water
	Unbilled Consumption	Apparent Loss	Non-Revenue Water
Water Losses	Real Loss		

47

Water Supplied

- Step 3-1: Compile volumes from own water sources (including net storage), import / purchase sources, and exports.
- Step 3-2: Adjust supply numbers based on meter inaccuracies and internal storage changes
- Step 3-3: Calculate total volume of water supplied to the distribution system

48

Making Data Adjustments

- Net Storage
 - Significant change in storage
 - Result in over-reported water loss
- Meter Accuracy
 - Choose to report a Percentage or Value of under or over-estimated water
 - Worksheet will incorporate these numbers into the total water supplied calculation

49

Quantity Authorized Consumption

Water Supplied	Authorized Consumption	Billed Consumption	Revenue Water
	Unbilled Consumption	Apparent Loss	Non-Revenue Water
Water Losses	Real Loss		

50

Water Supplied

- Compile Billed Consumption Data
 - Metered
 - Unmetered (estimate of water usage)
 - Adjust billed data as needed to account for lag time in meter readings (see next slide)
- Compile Unbilled Consumption Estimates
 - Metered data (if available)
 - Unmetered (estimate of water usage)
 - Can use percentage value for unbilled unmetered consumption (default value 1.25%)

51

Adjust Billed Data for Meter Lags

- What if your supply meters are read on the 1st of each month and your billing meters are read on the 10th of each month?
- Prorate the billing data for a monthly total
- Example:

Monthly Meter Readings	
Jan. 10 Meter Reading (Dec. 11 – Jan. 10):	33,204 MG
Feb. 10 Meter Reading (Jan. 11 – Feb. 10):	36.66 MG
$33,204 \text{ MG} \times \frac{10 \text{ days}}{31 \text{ days}} = 10,711 \text{ MG}$	
$36.66 \text{ MG} \times \frac{21 \text{ days}}{31 \text{ days}} = 24.83 \text{ MG}$	
January Total = 10,711 + 24.83 = 35,541 MG	

52

Calculate Water Losses

Water Supplied	Authorized Consumption	Billed Consumption	Revenue Water
	Unbilled Consumption	Apparent Loss	Non-Revenue Water
Water Losses	Real Loss		

53

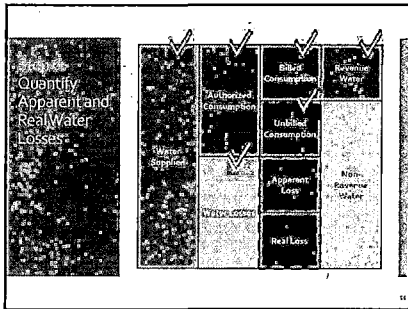
The worksheet automatically calculates the total water loss value by subtracting authorized consumption from the water supplied

Water Supplied

— Authorized Consumption

Water Losses

54



55

Because we know our total water loss, we can calculate the real water loss value by estimating apparent loss and subtracting it from the total.

Water Losses

— **Apparent Loss**

— **Real Loss**

WATER LOSSES (Water Supplied - Authorized Consumption)	\$ 875,000
Real Losses = Water Losses - Apparent Losses	\$ 650,000

56

Estimating Apparent Loss

- Estimate the following:
 - Unauthorized Consumption (default 0.15%)
 - Customer Meter Inaccuracies
 - Systematic Data Handling Error (default 0.25%)

Unauthorized Consumption	0.15%
Customer Meter Inaccuracies	0.25%
Systematic Data Handling Error	0.25%
Apparent Loss	21,500

Real Loss Automatically Calculated

57

Input Price and Costs Data

- Total Annual Costs
 - Used to automatically calculate % NRW
- Customer Retail Unit Cost
 - Used to calculate lost revenue from apparent loss
- Production Cost
 - Used to calculate cost of real losses
 - What about potential revenue loss?

Total Annual Costs	\$ 1,000,000
Customer Retail Unit Cost	\$ 2.00
Production Cost	\$ 500,000

58

Review Audit Results

- Non-Revenue Water
 - Calculated in the middle of your reporting worksheet
 - Sum of Water Losses and Unbilled Consumption
- Performance Indicators Tab
 - Summarizes water loss numbers and calculates unavoidable annual real loss (UARL) for comparison
 - NRW % by volume and by cost
 - Breaks down losses per service connection and per length of main
- Water Balance
 - Generates the water balance categories table with numbers
- Dashboard
 - Generates graphs that show % of volumes and % of costs
- Data Validity Scores and Priority Areas
 - Weighted score out of 100
 - Suggests areas for focused improvement

59

Performance Indicators

The dashboard displays several key performance indicators, including water loss percentages, unbilled consumption, and a summary of water balance categories. It includes a bar chart showing the distribution of losses across different categories.

60

Water Balance Results

Category	Value	Percentage
Water Supplied	10,000,000	100%
Authorized Consumption	9,500,000	95%
Unbilled Consumption	500,000	5%
Billed Consumption	9,000,000	90%
Apparent Loss	1,000,000	10%
Real Loss	650,000	6.5%
Non-Revenue Water	350,000	3.5%

61

Results Dashboard

The dashboard provides a comprehensive overview of water loss results, including a summary table and a bar chart showing the breakdown of losses by category. It also includes a section for data validity and priority areas.

62

Data Validity Score & Priority Areas

WATER AUDIT DATA VALIDITY SCORE

YOUR SCORE IS: 88 out of 100

A weighted scale for the components of consumption and water loss is included in the calculation.

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, next accuracy can be improved by addressing the following components:

- Customer metering inaccuracies
- Volume from new sources
- Billed meters

What does my data validity score mean? →

63

Water Loss Control Planning Guide

AWWA Free Water Audit Software: Determining Water Loss Standings

These Audit Reports for: Of: Please enter system ID#s and contact information on the first page of the report.

Reporting Year:

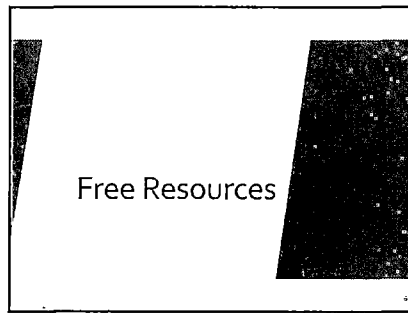
Data Validity Score:

Water Loss Control Planning Guide

Water Audit Data Validity Levels

Functional Focus Area	Level 1 (A-C)	Level 2 (D-G)	Level 3 (H-J)
Audit Data Collection	Search existing and new control meters without production metering adjustments.	Identify business process for production metering and name. Identify and name major components. Identify pipe size.	Identify, name, pipe size and IP structure for all production meters.
Water Audit Data Validity	Review all data for accuracy. Identify and name major components. Identify pipe size.	Collect data from all production meters. Identify and name major components. Identify pipe size.	Identify and name major components. Identify pipe size.

64



65

<https://www.awwa.org/Resources-Tools/Resources/Water-Loss-Control>

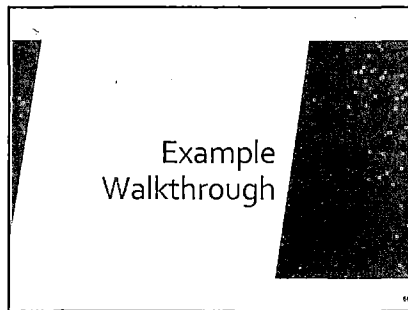
M36 Audit Software (v5.0)

66

AWWA M36 Manual

- 4th Edition (\$375 USD)
- 3rd Edition (FREE)
- <http://awwa-manuals.org/content/uploads/2018/07/AWWA-M36-Water-Audits-and-Loss-Control-Programs-3rd-Ed-2009-3.pdf>

67



68



Kentucky Water Resources Research Institute
Steven J. Evans, Assistant Director

RECEIVED

MAY 03 2019

**PUBLIC SERVICE
COMMISSION**

May 3, 2019

Ms. Gwen Pinson
Executive Director
Kentucky Public Service Commission
P.O. Box 615, 211 Sower Blvd.
Frankfort, KY 40602-0615

RE: Application for Approval of Training Course for Continuing Education Credit

Dear Ms. Pinson:

The Kentucky Water Resources Research Institute and has scheduled a multi-utility training event at Somerset Community College in Somerset, Kentucky on June 20, 2019. The training event includes material from the "Sustainable Management of Rural and Small Systems Workshop," which was developed by the US EPA and the USDA and focuses on ten key management areas for small drinking water and wastewater utilities. The workshop is being offered at no cost to the participants through financial support provided by USDA.

We have enclosed the following materials in support of this application:

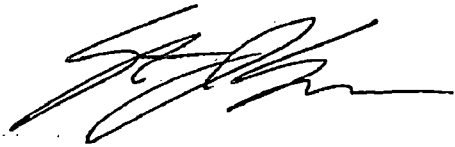
- 1) The name and address of the application (included in this transmittal letter).
- 2) The name and sponsor of the program and the subject matter covered by the program (included in this transmittal letter).
- 3) A summary of the content of the program (training summary/timed agenda is attached)
- 4) The number of credit hours requested by the program: 6
- 5) The name and relevant qualifications and credentials of each instructor presenting the program: Greg Heitzman, and Steven W. Hoagland, resumes and curriculum vitae are attached.
- 6) A copy of written materials given to attendees (class PowerPoint slides are attached)

We respectfully request that the training be approved for 6 hours of continuing education credits as management training for commissioners of water districts as referenced in 807 KAR 5:070. The sustainable management workshop has previously been approved by the PSC and DCA for training events held in 2017 and 2018.

If you have any questions or require any further documentation, please do not hesitate to contact me.

Sincerely,

see blue.



Steven J. Evans, Assistant Director
Kentucky Water Resources Research Institute

<https://www.research.uky.edu/kwrri>

see blue.

233 Mining and Minerals Building | 504 Rose Street | Lexington, KY 40506 | P: 859-257-1832 | www.uky.edu

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SUSTAINABLE MANAGEMENT OF RURAL AND SMALL SYSTEMS WORKSHOP AGENDA

June 20, 2019

Richard Cooper Bldg, Rm #100, Somerset Community College, 808 Monticello St, Somerset, KY 42501

8:30 am – 4:30 pm

FACILITATOR(S): Steven Hoagland, Engineer, Kentucky Water Resources Research Institute;
Greg Heitzman, PE, MBA, BlueWater Kentucky

Time	Session
8:30	Sign-in/Registration (30 minutes)
9:00	Introductions and Workshop Objectives (15 minutes) [Steven]
9:15	Session 1: Overview of Key Management Areas – Presentation (30 minutes) [Greg] <ul style="list-style-type: none">• Presentation of Key Management Areas• Group Discussion: Other Important Management Areas for Sustainability
9:45	Session 2: Utility ‘Self-Assessment’ Exercise (60 minutes) [Steven, Greg] <ul style="list-style-type: none">• Explain “Sustainable Management Self Assessment” (5 minutes)• Participants Conduct Self-Assessment (20 minutes)• Explain Plotting of Results: achievements vs. priorities (5 minutes)• Participants Plot Results (10 minutes)• Table Discussion (20 minutes)<ul style="list-style-type: none">○ What are your areas of focus (the orange and red areas)?○ Why are they an area of focus?○ What are the commonalities and differences among table participants’ achievements, priorities, and challenges?○ What lessons can you learn from the other utilities at your table that you could use to improve your performance?○ How might your perspective on these priorities change if you are an:<ul style="list-style-type: none">▪ Operator▪ Manager▪ Board Member▪ Judge Executive
10:45	Break (15 minutes)

- 11:00** **Session 3: Plenary Discussion – Self Assessment Results (60 minutes)**
- Tables Report Out (30 minutes) [Steven]
 - *Guest Speaker: TBD (20 minutes)*
 - Synthesize Results by Plotting Entire Group (10 minutes) [Greg]
- 12:00** **Lunch (60 minutes)**
- 1:00** **Session 4: Improving Outcomes (45 minutes)**
- Tips from previous Improving Outcomes Exercises (10 minutes) [Steven]
 - Each participant completes an improvement worksheet for one low achievement/high priority management area (25 minutes) [Greg, Steven]
 - Discussion Questions:
 - What will constitute '**high achievement**' in this management area and what are the causes of your achievement gaps?
 - What changes will the utility need to make to **improve performance** and who will need to be involved for these changes to take place?
 - How could you track your performance progress?
 - What will be the **biggest challenges** to performance improvement?
 - Participants share improvement worksheet results at their tables (10 minutes)
- 1:45** **Session 5: Plenary Discussion – Practices, Tools, and Measures: Results (30 minutes)**
- Tables Report Out [Steven]
 - General Discussion of Findings [Greg]
- 2:15** **Break (15 minutes)**
- 2:30** **Session 6: Tools, Guides and Other Resources (40 minutes) [Greg]**
- Presentation of Additional Tools, Guides and Other Resources
 - *Guest Speaker: TBD (20 minutes)*
- 3:10** **Session 7: Creating an Action Plan (40 minutes) [Steven]**
- Discuss Utility Management Improvement Plan
 - Complete a Sustainable Management Action Plan Worksheet
- 3:50** **Session 8: Sharing Success Stories (20 minutes) [Greg]**
- 4:10** **Session 9: Next Steps (10 minutes) [Greg]**
- 4:20** **Session 10: Feedback Session (10 minutes) [Steven]**
- 4:30** **Adjourn**

Greg Heitzman, P.E., MBA

Greg Heitzman is President of BlueWater Kentucky, a management consulting firm serving the water and wastewater industry. From 2011 to 2015, he served as Executive Director/CEO of the Louisville Metropolitan Sewer District (MSD). Prior to MSD, he worked 31 years with the Louisville Water Company serving as Chief Engineer from 1991 to 2007 and President/CEO from 2007 to 2013.

In his executive roles for Louisville MSD and Louisville Water, Greg provided leadership for Mayor Fischer's One Water Partnership to consolidate water services and administrative functions of Louisville MSD and Louisville Water. Greg also led strategic initiatives to expand water and wastewater services in the region, develop high performance teams, establish model programs for corporate controls (policy, procedures and work instructions), and develop new lines of business and technology to enhance revenue and reduce costs.

Greg obtained his Bachelor and Master's degrees in Civil Engineering from the University of Kentucky and an MBA from the University of Louisville. He is a licensed Professional Engineer in Kentucky and recipient of AWWA George Warren Fuller Award. He is an active member in both AWWA and the Water Environment Federation/Association. He currently serves on the following industry and community Boards: Water Research Foundation; Water Information Sharing and Analysis Center (Water ISAC); Louisville Water Foundation; Better Business Bureau; and Tree Louisville Commission.



Curriculum Vitae (Abridged)

Steven W. Hoagland, EIT

Phone: (859) 433-0475
steven.hoagland2@gmail.com

712 Vermillion Peak Pass
Lexington, KY 40515

EDUCATION

- MS** University of Kentucky, Civil Engineering (2016)
Emphasis: Hydraulics, Water Resources Engineering
Committee Members: Lindell Ormsbee,* PhD; Scott Yost, PhD; James Fox, PhD
**Advisor*
- BS** University of Kentucky, Civil Engineering (2014)
Emphasis: Water Resources Engineering
Undergraduate Research Advisors: Lindell Ormsbee, PhD; Scott Yost, PhD

PROFESSIONAL EXPERIENCE

Kentucky Water Resources Research Institute, Lexington, KY (Sep. 2018 - Present)
Civil Engineer

- Responsible for planning, coordinating, and conducting training workshops for rural water and wastewater utilities in Kentucky's Appalachian region; and developing hydraulic models for rural water utilities and training utility employees on model use.
- Reviewed funding proposals for USGS 104b and 104g research grant programs.
- Lead and participated in laboratory exercises to determine the variability and accuracy of field kits when testing for Phosphorus and Nitrogen concentrations.

Tetra Tech, Inc., Lexington, KY (Jan. 2016 – Sep. 2018)

Civil Engineer

- Responsible for balancing a multi-project workload, coordinating with co-workers and clients in other states, responding to clients in a timely manner, meeting deliverable deadlines, and delegating project work to engineering interns.
- Project work includes civil site design, construction administration, hydrologic and hydraulic modeling, and municipal program management.

Civil Site Design and Construction

1. Blue Grass Airport, Lexington, KY
2. West Hickman Wastewater Treatment Plant, Lexington, KY
3. Wolf Run WWS Facility, Lexington, KY

Municipal Program Management

1. Blue Grass Airport, Environmental Management Program
2. LFUCG, Municipal Separate Storm Sewer System (MS4) Program

Hydrologic and Hydraulic Modeling

1. City of Cape Coral, FL – Irrigation
2. City of Gateway, FL – Irrigation
3. City of Grand Rapids, MI – Storm
4. City of Port St. Lucie, FL – Potable
5. City of Tampa, FL – Combined Sewer
6. Genoa-Osceola, MI – Sanitary Sewer
7. GLWA, MI – Combined Sewer
8. Miami-Dade County, Potable
9. Miami Int'l Airport, FL – Potable
10. Westover Air Reserve Base, MA – Potable

Curriculum Vitae (Abridged)

PUBLICATIONS

Journal Publications

1. Hoagland, S., Hernandez, E., and Ormsbee, L., "Hydraulic Model Database for Applied Water Distribution Systems Research," *in preparation*.
2. Ormsbee, L., Peterson, K., and Hoagland, S., "Is It Time to Revise the Curve Number Method: Especially for Urban Applications?" *in preparation*.

Conference Proceedings

1. Hernandez, E. Hoagland, S., and Ormsbee, L., "Water Distribution Database for Research Applications," Proceedings of World Environmental and Water Resources Congress, West Palm Beach, FL, May 22-26, 2016, pp. 465-474.
2. Hoagland, S., Schal, S. Ormsbee, L., and Bryson, S., "Classification of Water Distribution Systems for Research Applications," Proceedings of World Environmental and Water Resources Congress, Austin, TX, May 17-21, 2015, pp. 696-702.

Thesis

1. Hoagland, S., "Transient-Based Risk Analysis of Water Distribution Systems," Civil Engineering Theses and Dissertations, University of Kentucky, 2016.
https://uknowledge.uky.edu/ce_etds/39.

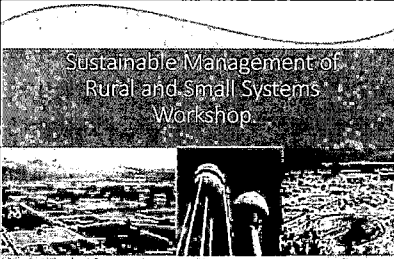
Technical Reports

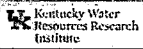
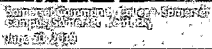
1. "Monitoring of Post-Construction Stormwater Controls," Lexington-Fayette Urban County Government, June 2018.
2. "WQV and RRV Analysis of Existing Stormwater Controls for the Hope Center Apartments at 1518 Versailles Road," Lexington-Fayette Urban County Government, August 2017.
3. "Hydrologic / Hydraulic Analysis of Residential Detention Basin WH+61+A1 at 109 Hidden Woods Court," Lexington-Fayette Urban County Government, June 2017.

PRESENTATIONS AND WORKSHOPS

1. "Introduction to Water Distribution Systems Modeling Workshop," Martin County Water District, Inez, Kentucky, March 5, 2019.
2. "Erosion and Sediment Control Plan Preparation Workshop," Developers, Contractors, and Consultants, Lexington-Fayette Urban County Government MS4 Program, March 20, 2018.
3. "Erosion and Sediment Control Plan Review Workshop," Municipal Staff and Fayette Construction Site Inspectors, Lexington-Fayette Urban County Government MS4 Program, March 1, 2018.
4. "Challenges and Perspective from an EIT," Water Professionals Student Chapter, University of Kentucky, November 30, 2017.
5. "Classification of Water Distribution Systems for Research Applications," World Environmental and Water Resources Congress, Austin, TX, May 20, 2015.

Sustainable Management of Rural and Small Systems Workshop



1

Welcome and Introductions

- Welcome
- Purpose of Workshop
- Introduction of Team Members
- Participant Introductions – Name, Community, Role
- Workshop Materials
- Meeting Logistics
- Meeting Agenda

2

Management Process

- Phase I
 - Regional workshops
 - Explain 10 basic management areas
 - Perform general utility assessments
 - Identify possible goals and strategies
- Phase II
 - Individual utility workshops
 - Involve operators, managers, and decision makers
 - Develop feasible goals and strategies
 - Provide technical resources to help support implementation

3

Workshop Participants

- This workshop will focus on management issues but will likely involve a range of participants:
 - Operators
 - Managers
 - Decision makers
 - City Officials
 - Mayors
 - City council members
 - Utility board members
 - County Officials
 - Judges
 - Members of the fiscal court

4

Schedule of Activities

- Welcome and Introductions
- Workshop Objectives
- Key Management Areas
- Self Assessment Exercise
- Lunch, Invited Presentations, Networking
- Improving Outcomes
- Practices, Tools, and Measures
- Creating an Action Plan
- Next Steps
- Feedback Session


5

Public Expectations

Public Water Systems

Provide safe drinking water at most appropriate cost

- ✓ Water Quality
- ✓ Reliability
- ✓ Affordability



6



Common Challenges for Utilities

- Aging infrastructure that needs more intensive repair and replacement.
- Continuing regulatory changes, including the need to often balance priorities among multiple compliance endpoints.
- Workforce challenges, including an aging workforce and difficulties in recruiting and retaining qualified staff.
- Uncertainties about future funding opportunities.
- Competing local priorities and a dwindling resource base in many small communities.
- Uninformed or disengaged board members.

7

Key Utility Personnel

- The effective management of a water utility will require the active participation of a range of individuals:
 - Customers
 - Operators
 - Managers
 - Decision makers
 - City Officials
 - Mayors
 - City council members
 - Utility board members
 - County Officials
 - Judges
 - Members of the fiscal court

8


Water Utility Management Involves A Range of Issues

- Managerial** Clear Roles, Effective Policies, Thorough Planning
- Financial** Budgeting, Accounting, Planning, Internal Controls
- Technical** Infrastructure, Source, Standards, Rights, Operators

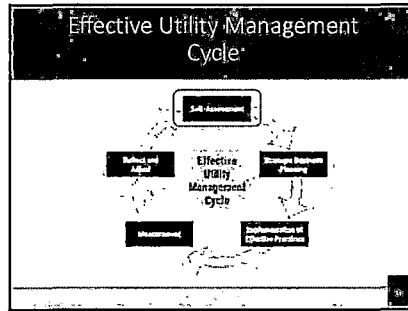
9

Keys To Management Success

- Leadership
- Strategic Business Planning
- Knowledge Management
- Measurement
- Continual Improvement Management




10



11

Overview of the Ten Key Management Areas

Outcomes that well-managed utilities strive for



12

The Ten Key Management Areas

1. Water Resource Adequacy	6. Financial Viability
2. Product Quality	7. Operational Optimization – Energy and Water Efficiency
3. Customer Satisfaction	8. Infrastructure Stability
4. Community Sustainability & Economic Development	9. Operational Resiliency
5. Employee and Leadership Development	10. Stakeholder Understanding and Support


13

The Well-Managed Utility

- Ten Management Areas are framed as outcomes.
- They serve as building blocks for utility performance improvement:
 - Where to focus.
 - What to strive for.
- Most water and wastewater utilities pay attention to each of these areas and likely perform well in at least some of them.
- They can be used to fit into, draw on, and support asset management, long-term business planning, continual improvement management systems.

14


1. Water Resource/Capacity Adequacy



- Ensures water availability consistent with current and future customer needs through:
 - Long-term resource supply and demand analysis
 - Conservation
 - Public education
- Understands the utility role in water availability.
- Manages operations to provide for long-term aquifer and surface water sustainability and replenishment.

15


2. Product Quality



- Produces potable water or treated effluent, along with process residuals that are:
 - In full compliance with regulatory and reliability requirements.
 - Consistent with customer, public health, and ecological needs.
 - Supportive of local economic development and business needs and opportunities.

16


3. Customer Satisfaction



- Helps customers understand the value of water and their local utility.
- Knows what their customers expect in terms of service, water quality, and rates.
- Has developed a way to gather feedback from their customers, review the feedback, and then act on it.
- Sets goals to meet these expectations.
- Is able to respond to emergency conditions in a timely and efficient manner.

17


4. Community Sustainability & Economic Development



- Is actively engaged in the local community.
 - Is aware of or actively engaged in discussions of community and economic development
 - Is aware of local business needs and opportunities for new residential or business customers
- Aligns Utility goals to be attentive to the impacts that utility decisions will have on current and future community and watershed health.
- Aligns Utility goals to promote community economic vitality and overall improvement.

18


5. Employee & Leadership Development



- Recruits and retains a workforce that is competent, motivated, adaptive, and is concerned about safety.
- Establishes a participatory, collaborative organization.
- Ensures employee institutional knowledge is retained and improved on over time.
- Creates opportunities for professional and leadership development.

19


6. Financial Viability



- Understands the full life-cycle costs of the utility and establishes and maintains an effective balance between:
 - Long term debt
 - Asset values
 - Operations and maintenance expenditures
 - Operating revenues
- Establishes predictable rates consistent with community expectations and acceptability – adequate to:
 - Recover costs.
 - Provide for reserves.
 - Address maintenance needs.
 - Plan and invest for future needs.
 - Maintain support from bond rating agencies

20


7. Operational Optimization



- Understands the operational performance factors (e.g., reliability of service, pressure, DBPs, overflows).
- Ensure ongoing, timely, cost-effective, and reliable performance improvements in all facets of operations (i.e., continual improvement culture).
- Minimize resource use, loss, and impacts from day-to-day operations (e.g., energy and chemical use, water loss).
- Maintain awareness of information and operational technology developments to anticipate and support timely adoption of improvements.

21


8. Infrastructure Stability



- Understands the condition and cost of each system component.
- Plans for system component repair, replacement, and enhancement over the long-term at the lowest possible cost.
- Coordinates asset repair, rehabilitation, and replacement within the community to minimize disruptions and other negative consequences.

22


9. Operational Resiliency



- Ensures utility leadership and staff work together to anticipate and avoid problems.
- Identifies threats to the system (legal, financial, non-compliance, environmental, safety, security, and natural disaster) by conducting all hazards vulnerability assessment.
- Establishes acceptable risk levels that support system reliability goals.
- Identifies how to manage risks and how to implement appropriate response actions by developing and using an all-hazards emergency response plan.

23

10. Stakeholder Understanding & Support

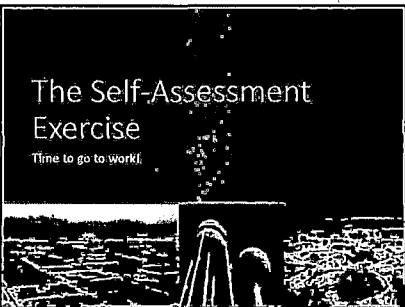


- Actively involves stakeholders in the decisions that will affect them:
 - By providing for a structure or protocol to engage stakeholders
 - By seeking to understand stakeholder needs and interests
 - By promoting the value of clean and safe water
- Creates understanding and support from oversight bodies, community and watershed interests, and regulatory bodies:
 - Service levels
 - Rate structures
 - Operating budgets
 - Capital improvement programs
 - Risk management decisions

24

The Self-Assessment Exercise

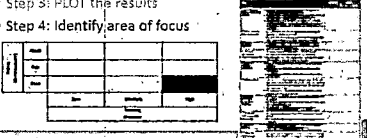
Time to go to work!



25

Getting Started (Tab 2)

- Step 1: RATE your system's level of achievement (practice and performance) for each management area
- Step 2: RANK the importance of each area
- Step 3: PLOT the results
- Step 4: Identify area of focus

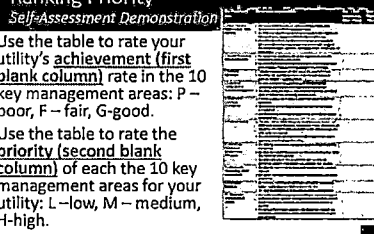


26

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

- Use the table to rate your utility's achievement (first blank column) rate in the 10 key management areas: P – poor, F – fair, G – good.
- Use the table to rate the priority (second blank column) of each the 10 key management areas for your utility: L – low, M – medium, H – high.



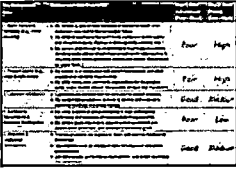
27

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

Take each management area one at a time:

- 1) Review the definition of the management area.
- 2) Rate the achievement level of the area.
- 3) Rate the priority level of the area.




28

STEP 1: Rating Achievement

Scale from LOW to HIGH achievement

- Select Poor if your system has no workable practices in place for addressing this area – very low capacity and performance.
- Select Fair if your system has some workable practices in place with moderate achievement, but could improve – some capacity in place.
- Select Good if your system has effective, standardized, and accepted practices in place. It either usually or consistently achieves goals – capacity is high and in need of very little or no further development.



29

STEP 2: Ranking Priority

Scale from LOW to HIGH priority

- Review each of the five prioritization elements:
 1. Crisis situations / urgency (near term or long term)
 2. Current or expected challenges
 3. Consequence severity (non-compliance, costs, health, safety)
 4. Customer impacts (water quality, reliability of service)
 5. Community priorities (economic development, quality of life)
- Select High if concerns for most elements (4-5) or a strong concern in several
- Select Medium if concerns for some elements (2-3) or a strong concern for one
- Select Low if concerns for few or none of the elements (0-1) and no strong concerns

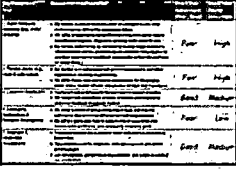
30

STEPS 1 & 2: Rating Achievement and Ranking Priority

Self-Assessment Demonstration

Take each management area one at a time:

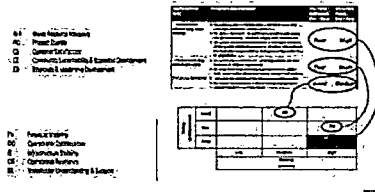
- 1) Review the definition of the management area.
- 2) Rate the achievement level of the area.
- 3) Rate the priority level of the area.



31

STEP 3: Plotting Results

Self-Assessment Demonstration

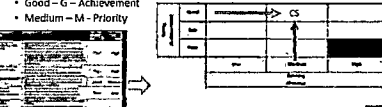


32

STEPS 3 & 4: Plotting Results and Focusing Attention

Self-Assessment Demonstration

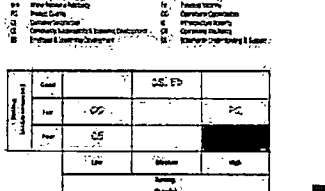
- Use the table on Page 5 of Tab 2 to write the two letters corresponding to each management area in the appropriate box that corresponds to intersection of the two ratings (i.e. the achievement rating and the priority rating).
- Example: Consumer Satisfaction (CS):
 - Good – G – Achievement
 - Medium – M – Priority



33

STEP 3: Plotting Results

Self-Assessment Demonstration




34

Step 4: Self-Assessment Discussion Questions

- What are your areas of focus (the orange and red areas)?
- Why are they an area of focus?
- Are your areas of focus different or similar to the other utilities at your table?
- What lessons can you learn from the other people at your table that you could use to improve your performance?
- How might your perspective on these priorities change if you are an:
 - Operator
 - Board Member
 - Judge Executive

35

10 Minute Break



36

Plotting Results On the Wall

- Using the provided stickers for your utility, place a sticker on each of the 10 Key Management Boards located around the room in each of the same boxes that you recorded on your own plot.

Your Utility Plot One of 10 boards located around the room (e.g. Consumer Service)

37

Lunch

Working Lunch: Guest Speakers

38

Improving Outcomes

Creating a Plan, Taking Action, Measuring Results

39

Tips from Previous Improving Outcomes Exercises

- Key management areas selected and discussed at previous workshops:
 - Financial Viability
 - Infrastructure Stability
 - Operational Optimization
 - Operational Resiliency
 - Stakeholder Understanding and Support
 - Employee and Leadership Development

40

Financial Viability

41

Financial Viability

- Examples of High Achievement:**
 - Having a strong bond rating
 - Having a positive cash flow
 - Maintaining an effective balance between long-term debt, asset values, operations and maintenance expenditures, and operating revenue.

42

Challenges/Changes

- It is uncomfortable and politically challenging to discontinue service to neighbors, acquaintances, elderly customers, or fixed income customers who have not paid their bills.
- It is difficult to communicate to elected officials and consumers about how much it costs to produce drinking water and process wastewater, making it a challenge to get rate increases approved.
- Customers feel that flat rate billing practices are unfair (low volume users paying the same as high volume users).
- Elected officials may make campaign commitments to no rate increases.

Try This:
 Understand a rate increase. Study the difference between what you already pay and what you need to pay.

More questions in Table Page 34

43

Infrastructure Stability

- Infrastructure Stability is Dependent Upon
 - Asset management
 - Capital planning

If you fail to plan, you are planning to fail.

44

Infrastructure Stability

Asset Management

Asset Management is maintaining a desired level of service (what you want your assets to provide)

At the lowest life cycle cost (best appropriate cost...not no cost)

45

Infrastructure Stability

Five Core Components of Asset Management

- Current State of the Assets
- Level of Service
- Criticality
- Life Cycle Costing
- Long-Term Funding

46

Infrastructure Stability

Tips for Capital Improvement Planning

- Set arbitrary minimum price for asset
- Stay realistic
- Five year minimum
- Justify need
- Coordinate with other projects
- Look at broad options
- Detail funding options
- Discuss openly

47

Infrastructure Stability

Examples of High Achievement:

- Having an inventory of system components, location, installation date, and condition.
- Understanding of system operating parameters (e.g., pressure).
- Having a capital improvement plan.

48

Challenges/Changes

- Planning for repair and maintenance of infrastructure is hampered by a limited knowledge of the condition of existing infrastructure components.
- Many systems are trapped in a reactive repair and maintenance mode leaving little or no time for undertaking the proactive work needed to establish an asset management program.

Try this:

Create an inventory of plant assets to know how by setting up a "response list" of assets, tag them at the time of regular maintenance so that you know what assets are performing.

(More resources in Table Page 15)

49

Operational Optimization

Water/Energy Efficiency

50

Operational Optimization

Water/Energy Efficiency

Examples of High Achievement:

- Having an optimal energy rate schedule
- Using energy efficient pumps
- Minimizing water loss (i.e. < 15%)
- Maintaining a comprehensive maintenance program
- Proper pressure management

51

Challenges/Changes

OPERATIONAL OPTIMIZATION

Challenges related to Operational Optimization include:

- High energy bills
- Improper maintenance of equipment
- Excessive water loss

Try this:

- Conduct an energy audit
- Identify locations of water loss
- Insure status of isolation valves
- Monitor pressure regulating valves
- Implement pressure management program
- Replace energy inefficient system components
- Sequence pump schedules with electric rate schedules

52

Operational Resiliency

Operation & Maintenance Plans

Maintain Assets

- Operations
 - Activities to keep water flowing
- Maintenance
 - Routine
 - Preventative
 - Predictive
 - Not emergency

Maintenance Importance: 30% of budget	Maintenance Extremely Important: 65% of budget
Maintenance Less Important: 5% of budget	Maintenance Important: 20% of budget

Probability of failure

53



54

Operational Resiliency

- **Examples of High Achievement:**
 - Having emergency response plans, operations plans, shut-off checklists for equipment.
 - Regular drills of the emergency response plan.
 - Certified staff and board members.

55

Challenges/Changes

- A lack of system documentation.
- Insufficient time to conduct training and exercises on the emergency response plan.
- Employee and board member turnover makes it difficult to maintain familiarity with emergency response procedures and materials.

Try this:


- Use a common shared meeting to discuss emergency response documents.

56

Stakeholder Understanding and Support

Communicating with Customers

- 800 numbers
- E-mail
- Chat
- Consumer Confidence Reports
- News
- Newspapers
- Phone calls
- Press
- Radio
- Social media
- Special meetings
- Surveys




Don't let the water utility be your community's best kept secret!

Think of customers as partners

57

Stakeholder Understanding and Support


It's all about the story and how we tell it



- Customers
- General Public
- Board Members
- Managers
- Operators


58

Stakeholder Understanding and Support



59

Stakeholder Understanding and Support




The damage beyond the spill

If you don't frame the message....

60

Stakeholder Understanding and Support

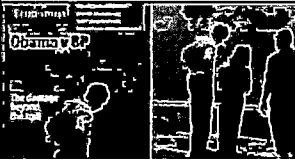
....the message will frame you



61

Stakeholder Understanding and Support


....the message will frame you



62

Stakeholder Understanding and Support

....the message will frame you



63

Stakeholder Understanding and Support

- Examples of High Achievement:
 - Having a **Capital improvement plan** or other document that summarizes utility priorities and can be shared with utility board.
 - Having standard **operating procedures** for utility staff that address communication.

64

Challenges/Changes


Customers and stakeholders display a lack of interest in gaining a better understanding of utility needs.

Customer resistance to paying water bills or supporting rate increases.

Try this:
 Work to get all employees on the same page of your facility by encouraging and community members. Offer tours of the facility to visitors and let it make an part of the event.

65

Employee and Leadership Development



66

Employee and Leadership Development

- Examples of High Achievement:
 - Having written job descriptions.
 - Providing clear performance expectations.
 - Making sure staff are cross-trained.

67

Challenges/Changes

- Employee motivation and opportunities for development can be hampered by lack of resources.
- Limited access to training opportunities can prevent personal and professional development.
- Lack of written job responsibilities can lead to uncertainty about management expectations and a lack of recognition for the work that is done.
- Time constraints on employees.

Try this:
 Develop and implement a training program for employees to share training resources.

More suggestions in Table 6 on 13.

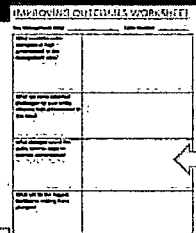
68

Table Activity

- Using the Improving Outcomes Worksheet provided at your table (also a copy in Tab 3) each participant should complete an improvement worksheet for one of the low achievement/high priority management areas identified by one of your table members. The worksheet has four questions to answer.
- After picking a management area, share perspectives on:
 - What will constitute 'high achievement' in this management area?
 - What are potential causes for the achievement gaps?
 - What changes will the utility need to make to improve performance?
 - What will be the biggest challenges to performance improvement?

69

Table Activity
 Using IMPROVING OUTCOMES WORKSHEET




Tab 3 in your notebook

Examples in Tab 6 in your notebook (pages 13-17)


70

15 Minute Break



71

Tools, Guides, and Other Resources
 Resources Available for Your Use



72

Effective Utility Management
<http://www.watereum.org/>

Effective Utility Management
 Rural and Small Systems Handbook
 to Sustainable Utility Management

73

Rural and Small System Guidebook

APPENDIX H: RESOURCES FOR RURAL AND SMALL SYSTEMS

74

Online Resources
<https://www.rd.usda.gov/programs-services/services/sustainable-management-tools>

75

Smart Management for Small Water Systems Project

Website: <http://efcnetwork.org/small-systems-project>

Topics:

- Asset Management
- Energy Management
- Fiscal Planning & Rate Setting
- Funding Coordination
- Managerial & Financial Leadership
- Water Loss Reduction
- Water System Collaboration
- Climate Resiliency

76

Financial Viability

NRWA: Revolving Loan Fund

- Established Under Grant from USDA/RUS
- Rural Utility Service
- Financing for Pre-Development Costs
- Also Available for Equipment Replacement and Service Extension

77

Financial Viability

EPA: Setting Small Drinking Water System Rates for a Sustainable Future

- Determining Revenue Needs
- Setting Rate Design
- Approaching Rate Implementation

78

Financial Viability

RCAP: The Basics of Financial Management for Small-community Utilities

- Understanding Financial Statements
- Using Financial Ratios

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Financial Viability: Environmental Finance Center Network

Website: <http://efcnetwork.org/>

Free Webinars:

80

Infrastructure Stability

EPA: Check Up Program for Small System (CUPSS)

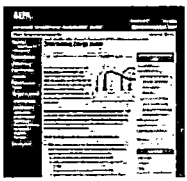
- Free Asset Management Tool for Small Drinking Water and Wastewater Utilities!
- Tips on How to Develop a Record of Your Assets, an Understanding of Your Financial Situation, and a Tailored Asset Management Plan.

81

Operational Optimization
Water/Energy Efficiency

EPA: Energy Use Tool for Water and Wastewater Systems

- Interactive, Excel-based tool
- Detailed Analysis of All Energy Types
- Provides Summary Report: Statement of Energy Performance




82

Operational Optimization
Water/Energy Efficiency

RCAP: Sustainable Infrastructure for Small System Public Services: A Planning and Resource Guide

- Water Conservation
- Energy Efficiency
- Renewable Energy




83

Stakeholder Understanding and Support

NRWA: Quality on Tap!

- Nationwide, Grassroots Campaign for Public Awareness
- Hands On Guide to Engagement and Communication for Better Community Support




84

Stakeholder Understanding and Support

RCAP: The Big Guide for Small Systems: A Resource for Board Members

- Water and Wastewater Treatment Basics
- Regulatory Responsibilities
- Board Business
- Financial Duties and Responsibilities

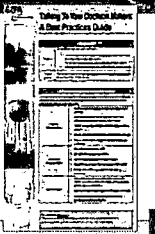


85

Stakeholder Understanding and Support

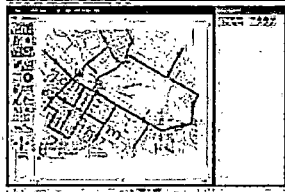
EPA: Talking to Your Decision Makers – A Best Practices Guide

- Role of Community Decision Makers in Small Systems
- Tips on How to Communicate Needs to Decision Makers



86

Free KYPIPE Software



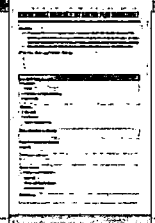
87

Creating an Action Plan
Where do we go from here?



88

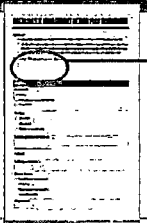
Action Plan Worksheet



Tab 4 in your notebook

89

Action Plan Worksheet



Step 1: Have each person fill out their top three priority management areas from the Self Assessment exercise and then pick one to work on.

90

For Example...

Priority Management Areas:

1. Water Resource Adequacy
2. Product Quality
3. Financial Viability ← Select One

91

Action Plan Worksheet

Step 2: Choose an action that you could take to make improvements in your selected Priority Management Area.

92

For Example...

Priority Management Areas:

1. Water Resource Adequacy
2. Product Quality
3. Financial Viability

Improvement Action: Upgrade product for providing the secondary distribution zone.

93

Action Plan Worksheet

Step 3: Complete the fields below to describe what is needed to complete your "Improvement Action"

94

For Example...

Description:	• Link up the ground water to a pipe network and install the necessary equipment to increase the water pressure to the high pressure zone.
Action:	• Upgrade the water pressure zone.
Management Area:	• Financial Viability
Objective:	• Reduce the amount of money lost to water loss.
Timeline:	• June 2018 - 2020 - 12 months
Start Date:	• 6/1/2018
Completion Date:	• 5/31/2020

95

For Example...

Responsible Party (or Parties):	• The Utility
Referenced Resources (on-hand or needed):	• Existing infrastructure needed for the project to support the project.
Challenges to Address:	• The utility has limited resources to support the project.
Review Process:	• Monthly progress reports to the board.
Performance Indicators or Metrics:	• Monthly progress reports to the board.
Status reports and updates frequency:	• Monthly progress reports to the board.
Other Notes:	• Contact the water utility manager to discuss the need for the utility and the water utility.

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Next Steps

97

Next Steps for Your Utility

- Next Steps for Judge Executive/Mayor/Board Member.
- Next Steps For Utility Manager/Superintendent.
- Next Steps For Operator.

98

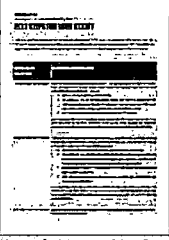
Next Steps for Utility Leadership

- Next Steps for Judge Executive/Mayor/Board Member
- Share what you have learned with other board members or utility manager/operators
- Determine what actions may be needed to help implement the goals of your management improvement plan

99

Next Steps for Utility Manager

- Begin to implement your own workplan.



Tab 5 in your notebook.

100

Next Steps for Utility Operator

- Next Steps for Operator
 - Share what you have learned with your utility's other operators.
 - Apply the assessment process you just went through to address your own operational issues.
 - Identify your operational issues
 - Assess the issues (priority and performance)
 - Identify key area(s) to focus on
 - Develop and implement an action plan

101

Key Organizations in Kentucky

- KY Water Resources Research Institute (KWRII)
- KY Division of Water (KDOW)
- KY Division of Compliance Assistance (KCDA)
- Kentucky Rural Water Association (KRWA)
- KY Rural Community Assistance Partnership (RCAP)
- KY Infrastructure Authority (KIA)
- KY Public Service Commission (PSC)
- KY Water and Wastewater Operators Association (KWWOA)
- KY/TN AWWA/WEF
- KY Area Development Districts (ADDs)
- KY Cooperative Extension Service
- KY Center of Applied Energy Research (CAER)

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Feedback Session

Please complete your evaluation forms.

Thank you!



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