

CH2MHILL®

Knowledge Management

A strategic Plan for Utilities



PNWS 
IDAHO • OREGON • WASHINGTON



Lee Odell, PE

Overview

What is Knowledge Management?

Why Manage Knowledge?

What are utilities doing?

How to get started?

What is Knowledge Management?



What is Knowledge Management?



What is Knowledge Management?



What is Knowledge Management?



COURTESY: SAS

What is Knowledge Management?



What is Knowledge Management?



What is Knowledge Management?

- *Knowledge Management is strategy that engages the people, processes and tools used by an organization to systematically collect, store, organize, evaluate, and communicate the data, facts, understandings, and information it needs to sustain or improve its operations.*
 - *Von Zweck and Speranza, 2009*



Information Management – Customer Information Systems

Dashboard Management Action Query

Workplace Dashboard: * My Sales Activity Dashboard ▾

My Work

- Dashboards
- Activities
- Calendar
- Duplicate Detection
- Reports
- Announcements

Customers

- Accounts
- Contacts

Extensions

- Oracle Accounts
- Programs
- Portfolios

Highest value Opportunities (GM)

My Open Opportunities

Opportunity Name	Sum (Gross Margin L.)
New W...	~\$900,000
Parad...	~\$450,000
SPWB ...	~\$450,000
Water...	~\$250,000
Grant...	~\$150,000

Highest value Accounts

My Open Opportunities

Potential Customer	Sum (Gross Margin L.)
City of...	~\$900,000
South F...	~\$550,000
Clark P...	~\$450,000
City of...	~\$250,000
City of...	~\$150,000

Opportunities Closed this Year

My Closed Opportunities in Current Fiscal Year

Opportunity Stage	Sum (Gross Margin GM...)
Contract S...	~\$150,000
Dropped	~\$50,000
Lost	~\$1,000,000

Activities: My Tasks ▾ Search for records

<input type="checkbox"/>	Subject	Regarding	Due Date	Priority
<input type="checkbox"/>	Win Plan Completion Workflow	External Corr	30-Dec-09 1:58...	Normal
<input type="checkbox"/>	Opportunity & Risk Evaluation	External Corr	30-Dec-09 1:58...	Normal
<input type="checkbox"/>	Opportunity & Risk Evaluation	LOTT Bud Inl	30-Dec-09 1:58...	Normal
<input type="checkbox"/>	Win Plan Completion Workflow	LOTT Bud Inl	30-Dec-09 1:58...	Normal
<input type="checkbox"/>	Opportunity & Risk Evaluation	Mint Valley 2	30-Dec-09 1:59...	Normal
<input type="checkbox"/>	Win Plan Completion Workflow	Mint Valley 2	30-Dec-09 1:59...	Normal
<input type="checkbox"/>	Opportunity & Risk Evaluation	GIS Pilot Unit	30-Dec-09 2:05...	Normal
<input type="checkbox"/>	Win Plan Completion Workflow	Water Maste	30-Dec-09 2:05...	Normal
<input type="checkbox"/>	Opportunity & Risk Evaluation	Water Maste	30-Dec-09 2:05...	Normal
<input type="checkbox"/>	Win Plan Completion Workflow	Design and Ir	11-Feb-10 8:30...	Normal
<input type="checkbox"/>	Opportunity & Risk Evaluation	Design and Ir	11-Feb-10 8:30...	Normal
<input type="checkbox"/>	Opportunity & Risk Evaluation	Bellingham V	22-Apr-10 12:5...	Normal
<input type="checkbox"/>	Win Plan Completion Workflow	Bellingham V	22-Apr-10 12:5...	Normal
<input type="checkbox"/>	Win Plan Completion Workflow	P5 Litigation	15-Jun-10 7:50...	Normal

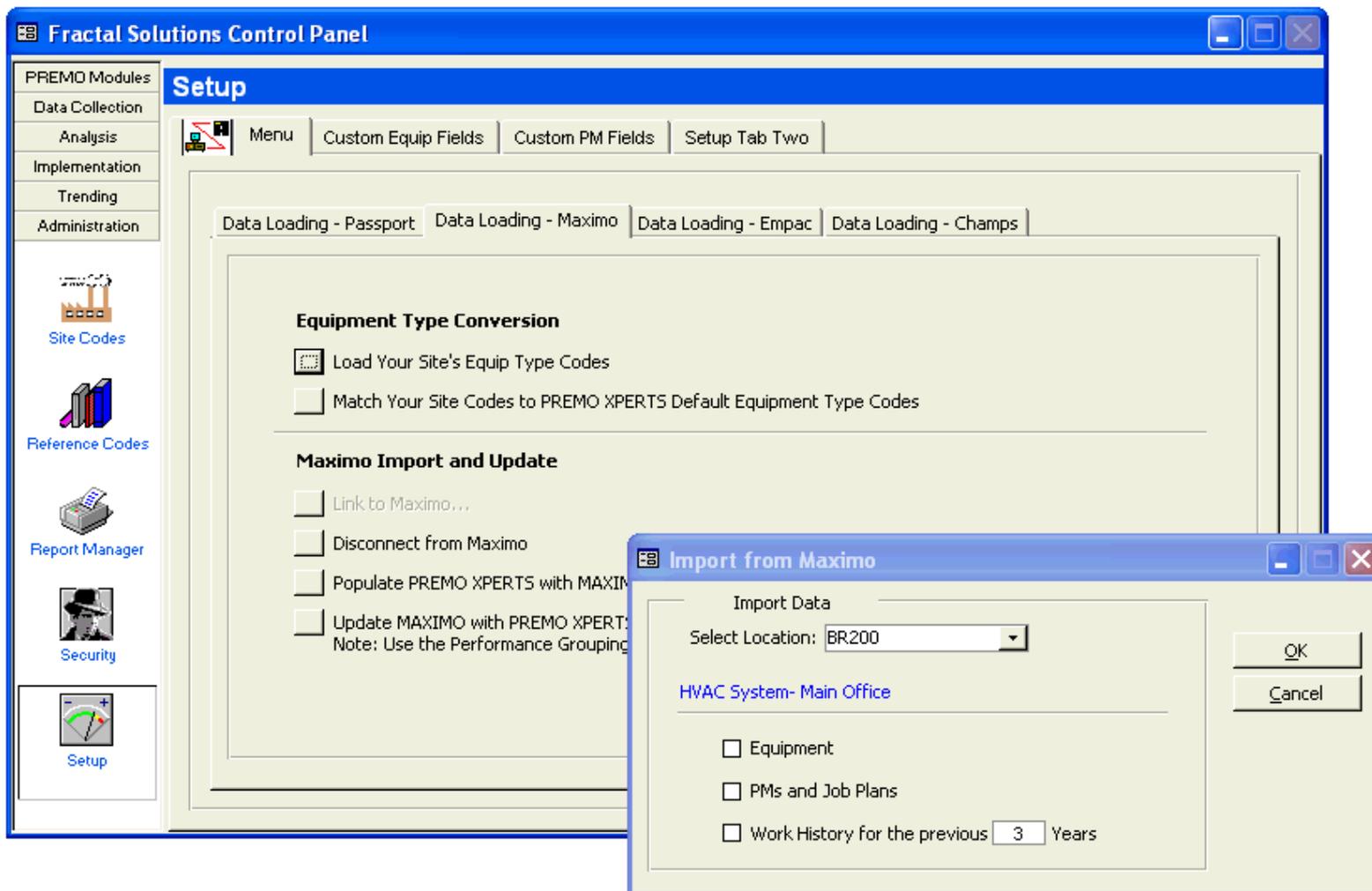
*** Opportunity Stage Sales Funnel - Weighted...**

My Open Opportunities

Stage	Value
01 - Prospect	\$8,750
07 - Selected	\$143,451

Done
Local intranet | Protected Mode: Off
75%

Information Management – Computerized Maintenance Management Systems (CMMS)



Information Management – Geographic Information System



Information Management – Laboratory Information and Management System (LIMS)

VersaLIMS.NET™



Self-Contained

- PC & Operating System
- Database (My SQL)
- VersaLIMS.NET™ Software
- Barcode Printer
- Barcode Reader

Modular Functionality

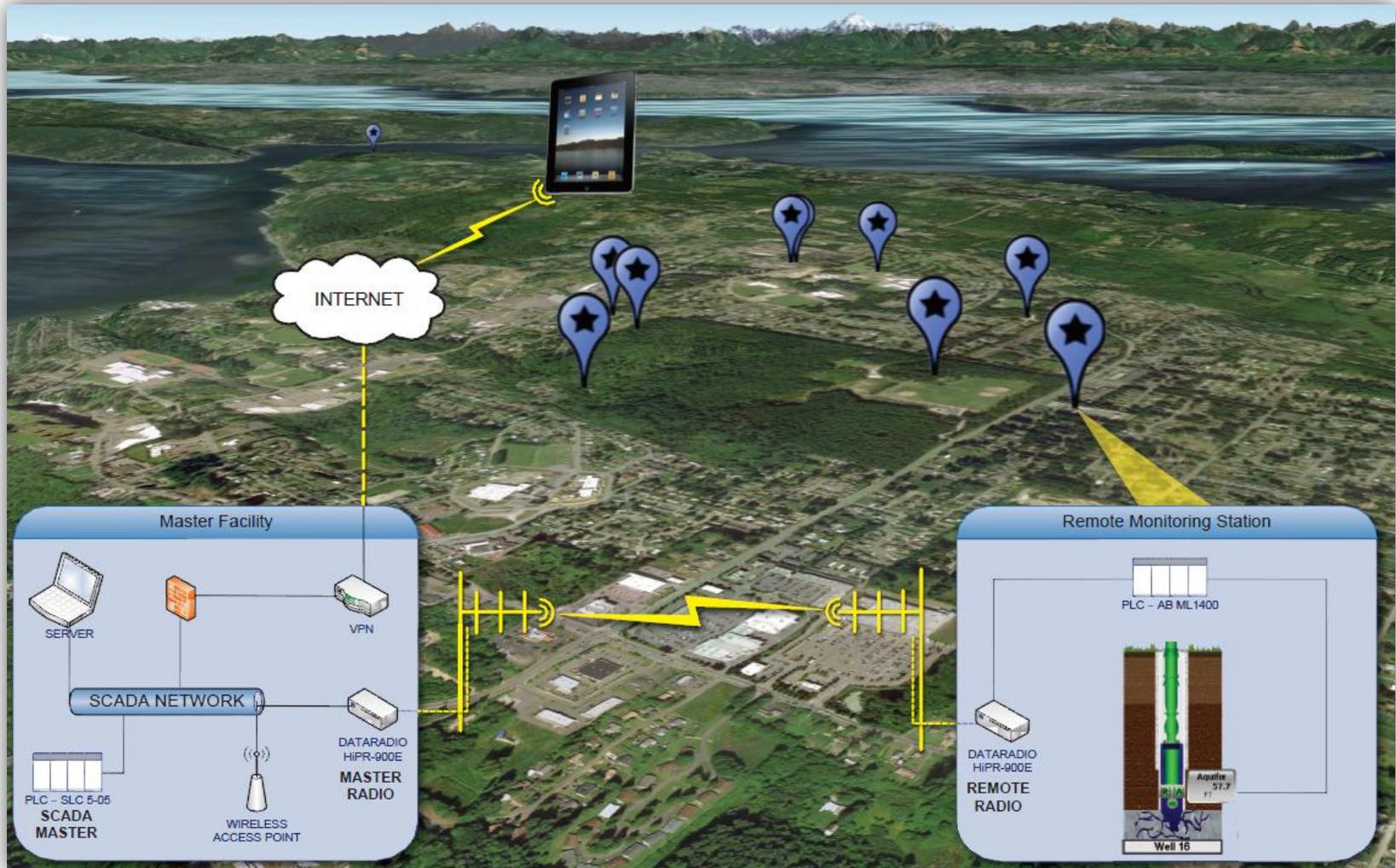
- Sample Tracking (standard)
- Results Entry (standard)
- QA/QC
- Specification Management
- Materials Management
- etc.

Modular Growth

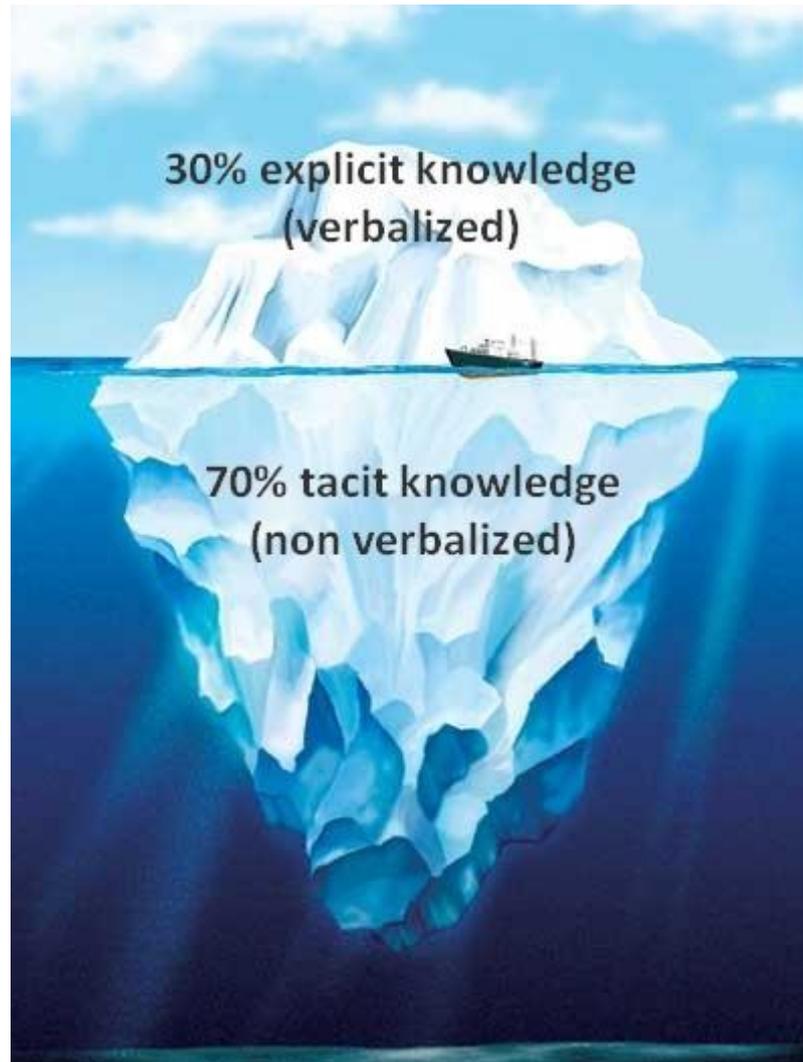
- Single-User
- Multi-User
- Intranet
- Internet

Initial Price Point: **\$10,000 (US)**
\$482 (2 yr lease) - \$340 (3 yr lease)

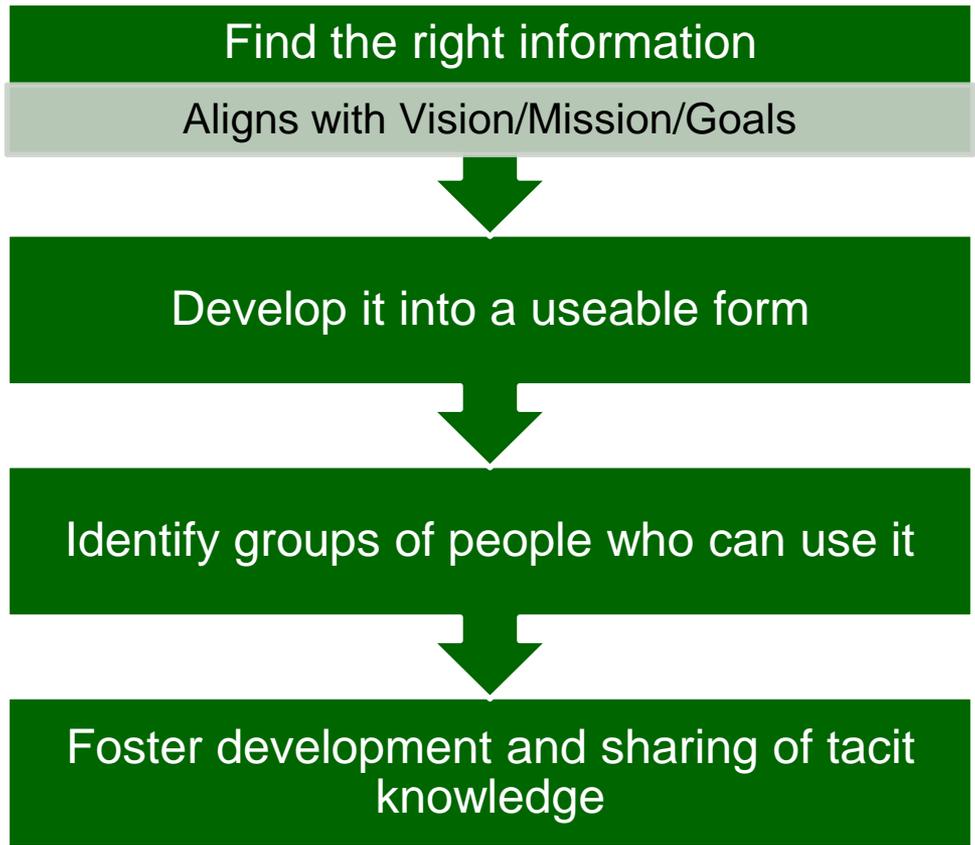
Information Management – Supervisory Control and Data Acquisition



Tacit & Explicit Knowledge

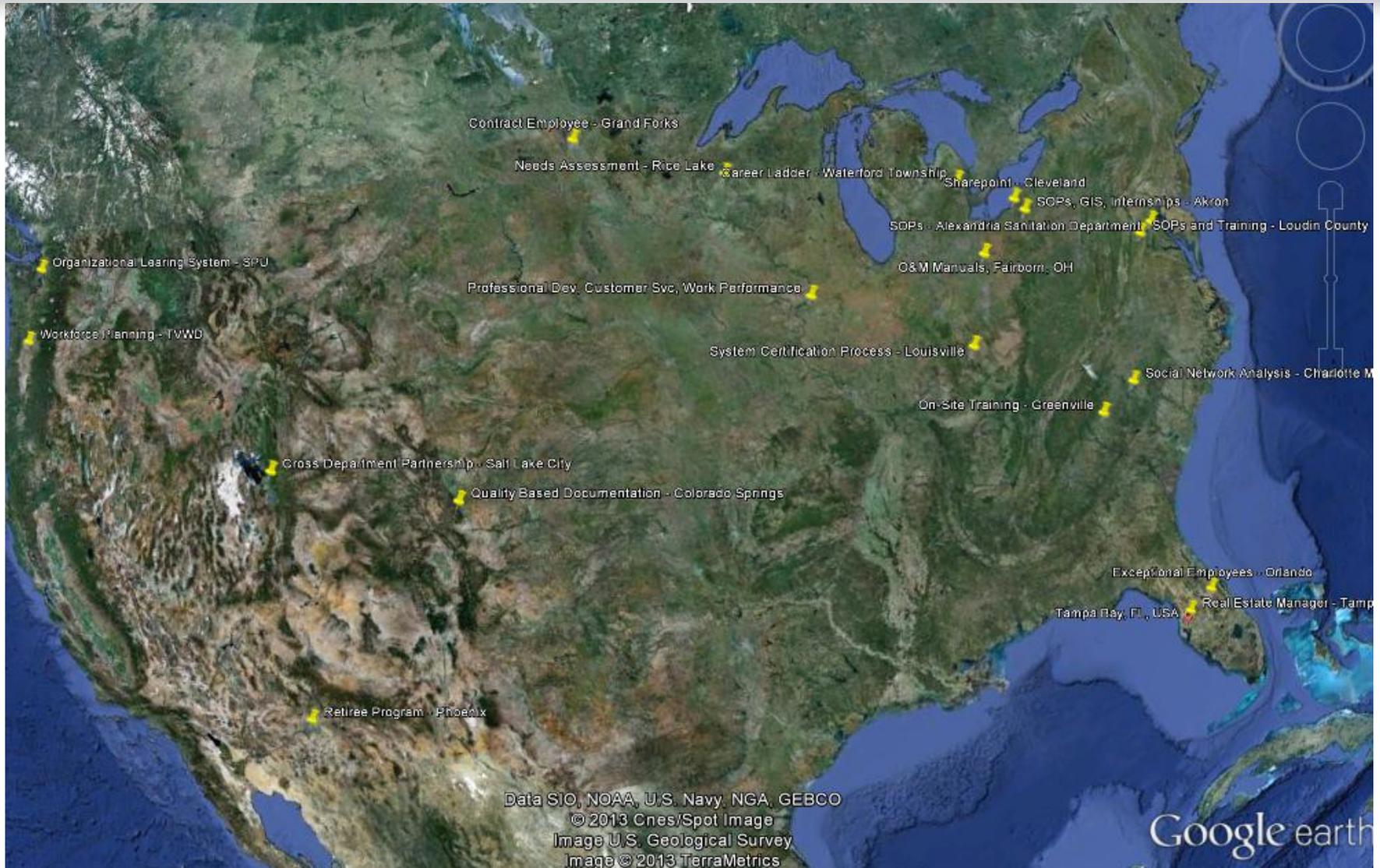


What is Knowledge Management?



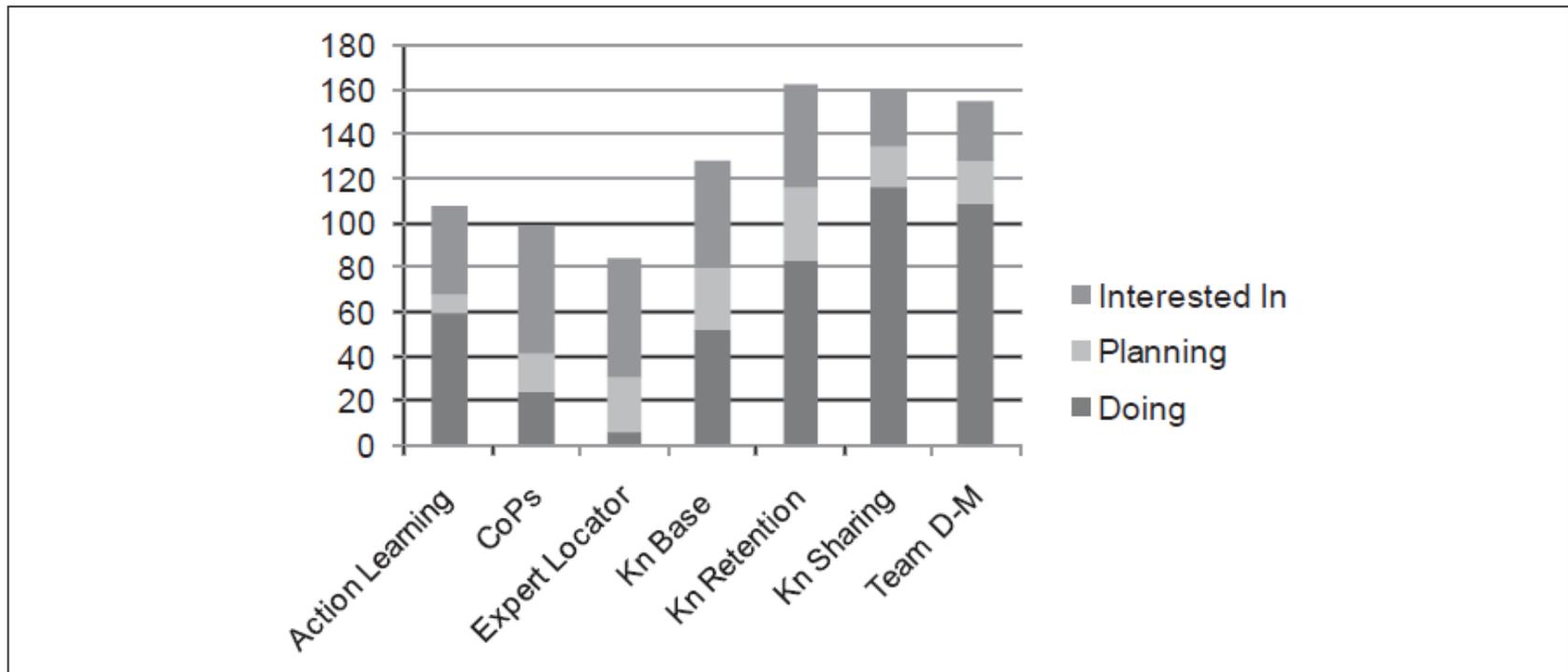
What are utilities doing to manage knowledge?

Source Water Research Foundation Project 4003



What are utilities doing to manage knowledge?

Source Water Research Foundation Project 4003

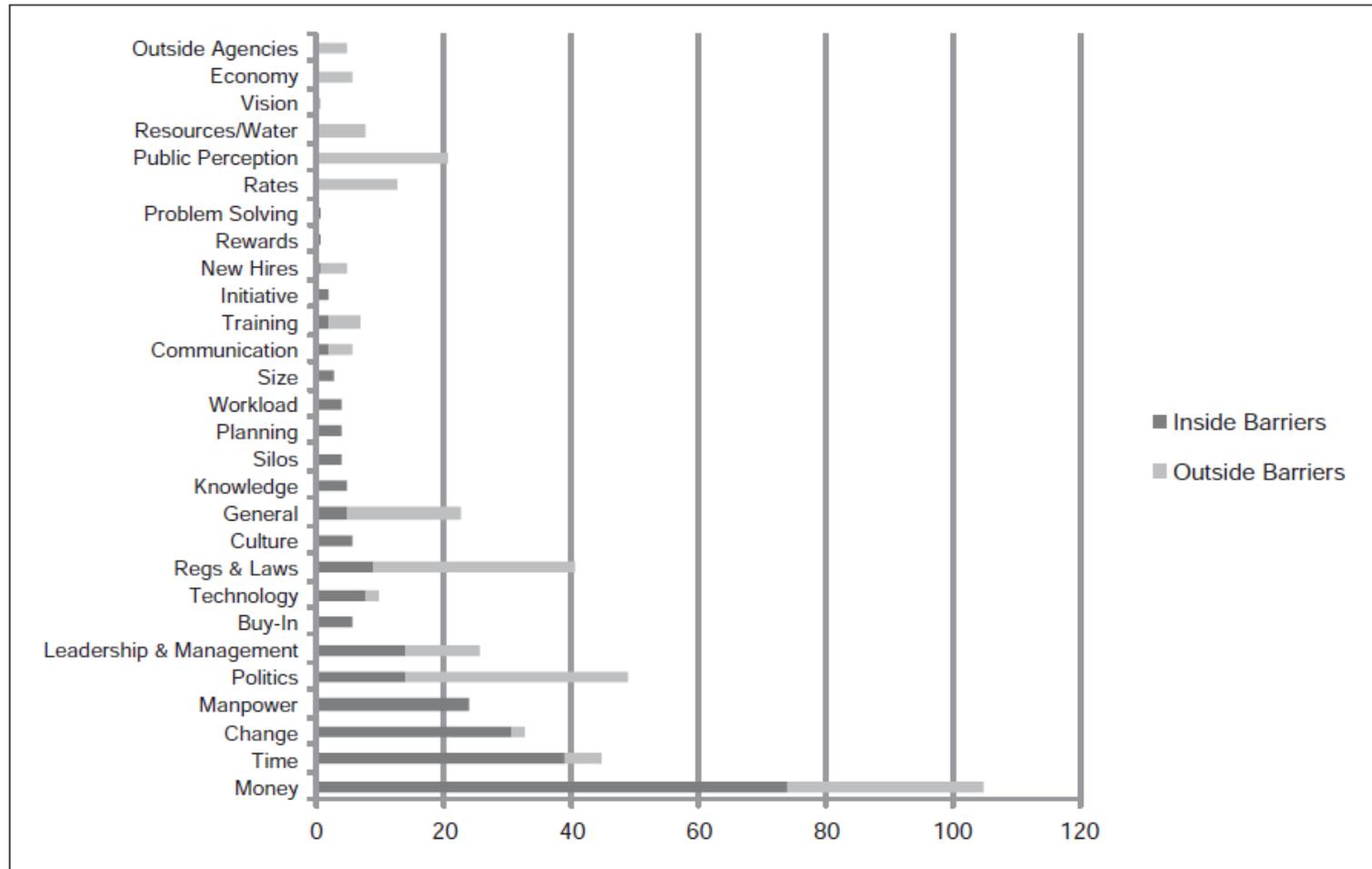


Source: Project 4003 survey process.

Figure 2.1 Breakout of survey responses regarding the number of KM strategies and initiatives in drinking water utilities in terms of those underway, in the Planning stage, or those which have sparked interest

What are utilities doing to manage knowledge?

Source Water Research Foundation Project 4003



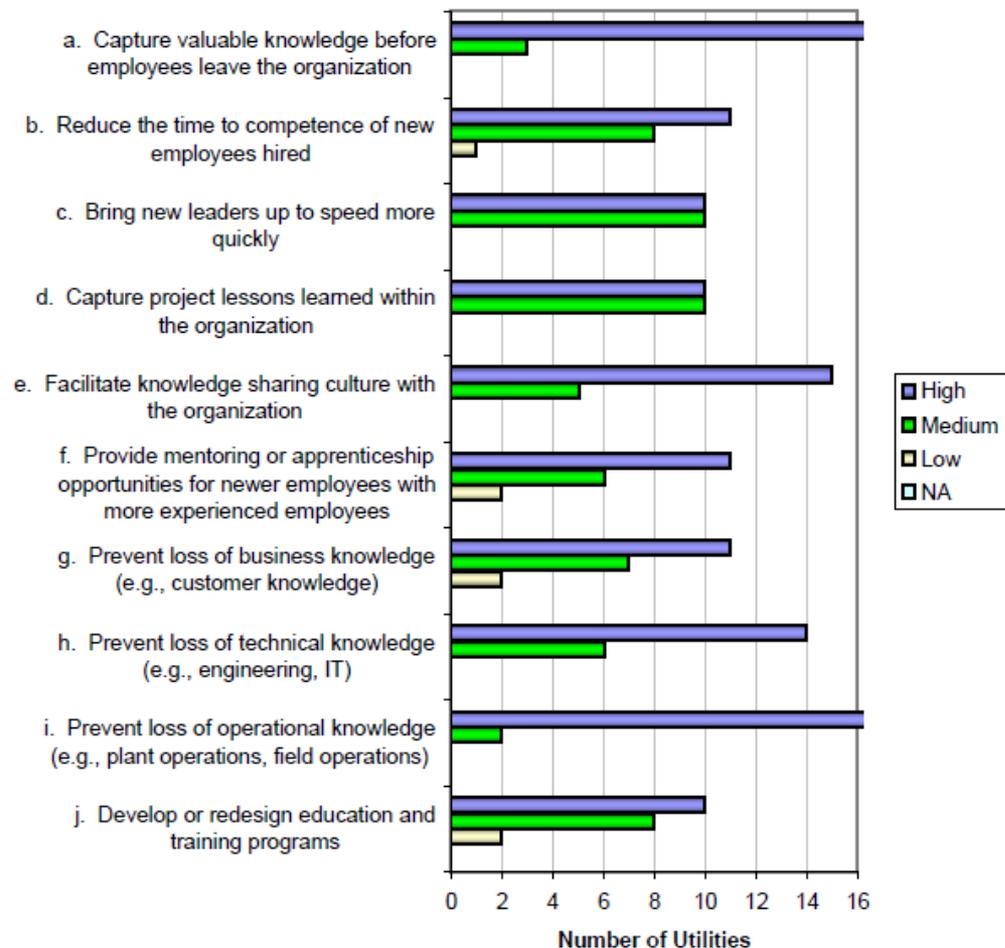
Source: Project 4003 survey response.

Figure 5.2 Barriers in the utility to implementing new initiatives

What are utilities doing to manage knowledge?

Source Water Research Foundation Project 91220

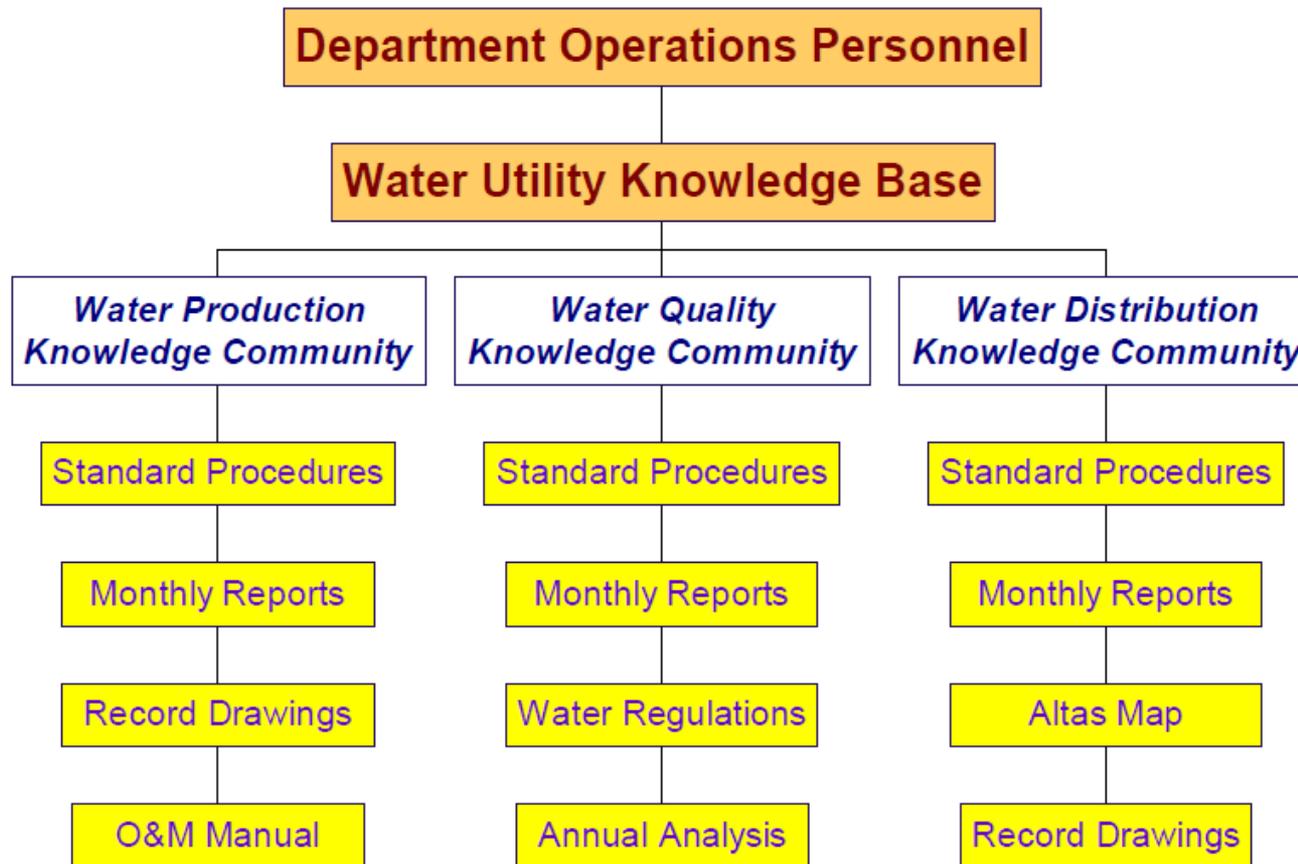
16b. You indicated that you do not currently have a formal (i.e., written) knowledge retention strategy. What would your knowledge retention objectives be?



Knowledge Management – What are Utilities Doing

Source: Baker and Perez, City of North Miami Beach

FIGURE 1: Knowledge Base System Architecture



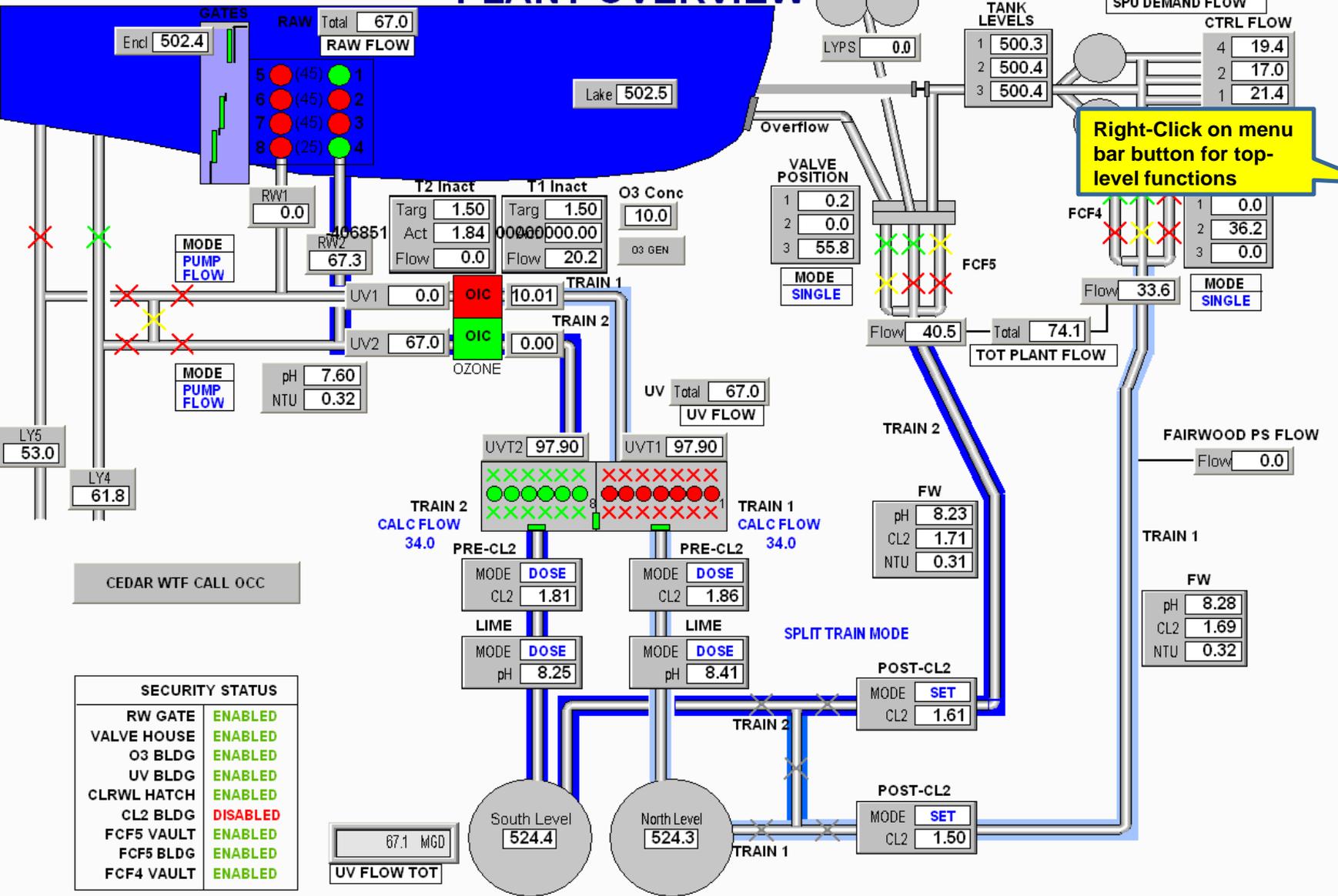
Example 1 - Cedar WTP Electronic O&M Manuals

- O&M Manual Screen Shots



PLANT OVERVIEW

10/25/2011
10:57:58 AM
BILL



Right-Click on menu bar button for top-level functions

- LOG IN
- O&M MANUAL
- PLANT**
- START/STOP
- 15 - DOGLEGS
- 10 - RAW H2O PS
- 21 - OZONE
- 40 - UV
- 50 - CLEAR WELL
- 60 - LIME
- 80 - CHLORINE
- 95 - FCF 4
- 90 - FCF 5
- MISC SYS
- ALARMS
- HISTORICAL
- REPORTS
- COMMS
- BACK

CEDAR WTF CALL OCC

SECURITY STATUS	
RW GATE	ENABLED
VALVE HOUSE	ENABLED
O3 BLDG	ENABLED
UV BLDG	ENABLED
CLRWL HATCH	ENABLED
CL2 BLDG	DISABLED
FCF5 VAULT	ENABLED
FCF5 BLDG	ENABLED
FCF4 VAULT	ENABLED

Date In	Time In	Tagname	Description	Tag Status	Value
10/25/2011	00:06:33.967	CDR_00345_DOHT_DALM	LOG INACTIVATION DAILY ALARM	ALARM	ALAF
10/24/2011	23:43:27.295	CDR_13000_COMM_ALARM	PLC13 COMMUNICATIONS CONTROLS	FAIL	FA
10/24/2011	23:37:40.712	CDR_41012_POIT_LOS	TRAIN 2 UV STRAINER DIFF PRESSURE	LO	



PLANT OVERVIEW

10/25/2011
11:00:58 AM
BILLC

LOG IN

O&M MANUAL

PLANT

START/STOP

15 - DOGGLEGS

10 - RAW H2O PS

21 - OZONE

40 - UV

50 - CLEAR WELL

60 - LIME

80 - CHLORINE

95 - FCF 4

90 - FCF 5

MISC SYS

ALARMS

HISTORICAL

REPORTS

COMMS

BACK

GATES

Encl 502.4

RAW Total 68.0

RAW FLOW

5 (45) 1
6 (45) 2
7 (45) 3
8 (25) 4

LY5 53.1

LY4 61.2

MODE PUMP FLOW

MODE PUMP FLOW

MODE PUMP FLOW

pH 7.60
NTU 0.32

LYPS 0.0

VALVE

Overflow

LYPS 0.0

TANK LEVELS

1 500.6
2 500.7
3 500.7

DEMAND Total 69.2

CTRL FLOW

4 19.4
2 16.6
1 20.5
3 12.8
Tot 69.3

VALVE POSITION

1 0.0
2 36.2
3 0.0

MODE SINGLE

FCF4

Flow 33.5

FAIRWOOD PS FLOW

Flow 0.0

TRAIN 1

FW

pH 8.28
CL2 1.68
NTU 0.33

UV FLOW TOT 67.1

CEGAR WTF CALL OCC

SECURITY STATUS

RW GATE	ENABLED
VALVE HOUSE	ENABLED
O3 BLDG	ENABLED
UV BLDG	ENABLED
CLRWL HATCH	ENABLED
CL2 BLDG	DISABLED
FCF5 VAULT	ENABLED
FCF5 BLDG	ENABLED
FCF4 VAULT	ENABLED

Query string

O & M Information for CDR

Cedar Water Treatment Facility O & M Information

OMI

Safety Information

- OMI Safety Manual
- MSDS's
- JSA's

Operations Information

- SOP's
- UPCP's
- Facility Plans

Lab Information

- OPERATOR 10
- Operator 10 Water

Maintenance Information

- CMMS System
- ACES

Service Agreement

- Service Agreement

Additional Information

- Photos
- Scada Information
- Other Documents
- Meeting Notes
- Monthly Reports

Design Information

- Design Criteria
- Design Drawings
- Functional Descriptions

Date In	Time In	Tagname	Description	Tag Status	Value
10/25/2011	00:06:33.967	CDR_00345_DOHT_DALM	LOG INACTIVATION DAILY ALARM	ALARM	ALAF
10/24/2011	23:43:27.295	CDR_13000_COMM_ALARM	PLC13 COMMUNICATIONS CONTROLS	FAIL	FA
10/24/2011	23:37:40.712	CDR_41012_PDIT_LOS	TRAIN 2 UV STRAINER DIFF PRESSURE	LO	I



RAW WATER PUMP STATION

POWER FILTER STATUS

POWER FILTER 1 ON
POWER FILTER 2 ON

SECURITY

FLOW MODE

66.9 MGD

UV FLOW TOT

RAW WATER

66.0 MGD

FT30022

TRAIN 2 OIC

TRAIN 1 OIC

0.0 MGD

Right-Click on Area Button for area-level popup

10/25/2010
11:03:22 AM
BILLC

LOG IN

O&M MANUAL

PLANT

START/STOP

15 - DOGLEGS

10 - RAW H2O PS

21 - OZONE

40 - UV

50 - CLEAR WELL

60 - LIME

80 - CHLORINE

95 - FCF 4

90 - FCF 5

MISC SYS

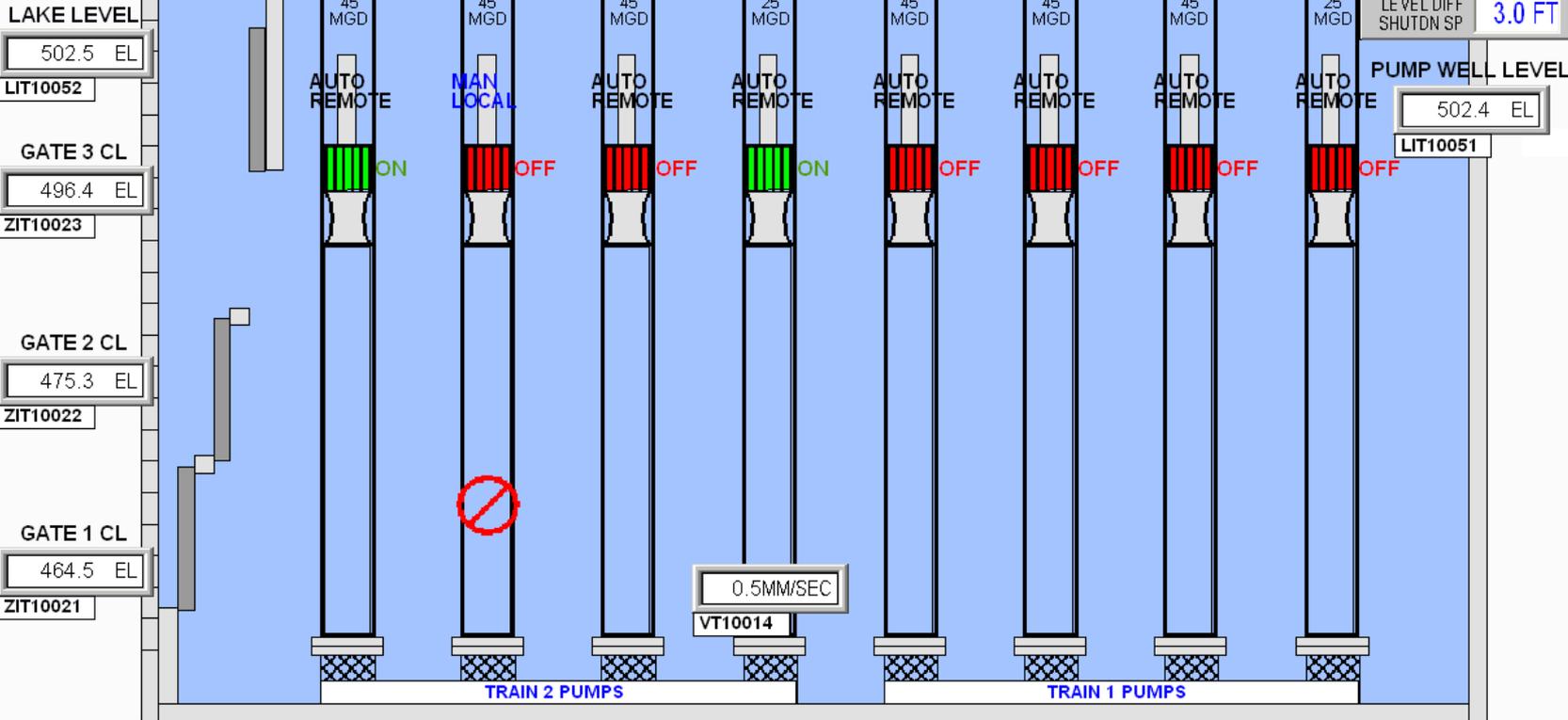
ALARMS

HISTORICAL

REPORTS

COMMS

BACK



ck	Date In	Time In	Tagname	Description	Tag Status	Value
✓	10/25/2010	00:06:33.967	CDR_00345_DOHT_DALM	LOG INACTIVATION DAILY ALARM	ALARM	ALAF
✓	10/24/2010	23:43:27.295	CDR_13000_COMM_ALARM	PLC13 COMMUNICATIONS CONTROLS	FAIL	FA
✓	10/24/2010	23:37:40.712	CDR_41012_PDIT_LOS	TRAIN 2 UV STRAINER DIFF PRESSURE	LO	



RAW WATER PUMP STATION

POWER FILTER STATUS

POWER FILTER 1 ON
POWER FILTER 2 ON

SECURITY

FLOW MODE: 66.8 MGD (UV FLOW TOT)

RAW WATER: 68.0 MGD (FIT30022)

TRAIN 2 OIC

TRAIN 1 OIC

10/25/2010
2:45:29 PM
JWEST

LOG IN

O&M MANUAL

PLANT

START/STOP

15 - DOGLEGS

10 - RAW H2O PS

21 - OZONE

40 - UV

50 - CLEAR WELL

60 - LIME

80 - CHLORINE

95 - FCF 4

90 - FCF 5

MISC SYS

ALARMS

HISTORICAL

REPORTS

COMMS

BACK

Query string

O & M Information for CDR_10

Cedar Water Treatment Facility O & M Information



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[Monthly Reports](#)

Design Information

[Design Criteria](#)

[Design Drawings](#)

[Functional Descriptions](#)

LAKE LEVEL

502.6 EL

LIT10052

GATE 3 CL

496.4 EL

ZIT10023

GATE 2 CL

475.3 EL

ZIT10022

GATE 1 CL

464.5 EL

ZIT10021

PMP10011

1

PMP10012

2

45 MGD
AUTO REMOTE
ON

45 MGD
MAN LOCAL
OFF



VT10014

TRAIN 2 PUMPS

TRAIN 1 PUMPS

PMP10018

8

25 MGD
AUTO REMOTE
OFF

PUMP WELL LEVEL
502.5 EL

LIT10051

LEVEL DIFF SHUTDN SP
3.0 FT

0.0 MGD

FIT30021

FLOW MODE

0.0 MGD

UV FLOW TOT

Ack	Date In	Time In	Tagname	Description	Tag Status	Value
✓	10/25/2010	14:28:06.792	CDR_40140_SEC_DISABLS	UV DOOR SECURITY	DISABL	DISA
✓	10/25/2010	11:49:34.258	CDR_20030_SEC_ALARM	OZONE GENERATOR BUILDING	ALARM	ALAF
✓	10/25/2010	00:06:33.967	CDR_00345_DOHT_DALM	LOG INACTIVATION DAILY ALARM	ALARM	ALAF
✓	10/24/2010	13:43:27.205	CDR_13000_COMM_ALARM	PLC13 COMMUNICATIONS CONTROLS	FAIL	



RAW WATER PUMP STATION

POWER FILTER STATUS

POWER FILTER 1 ON
POWER FILTER 2 ON

SECURITY

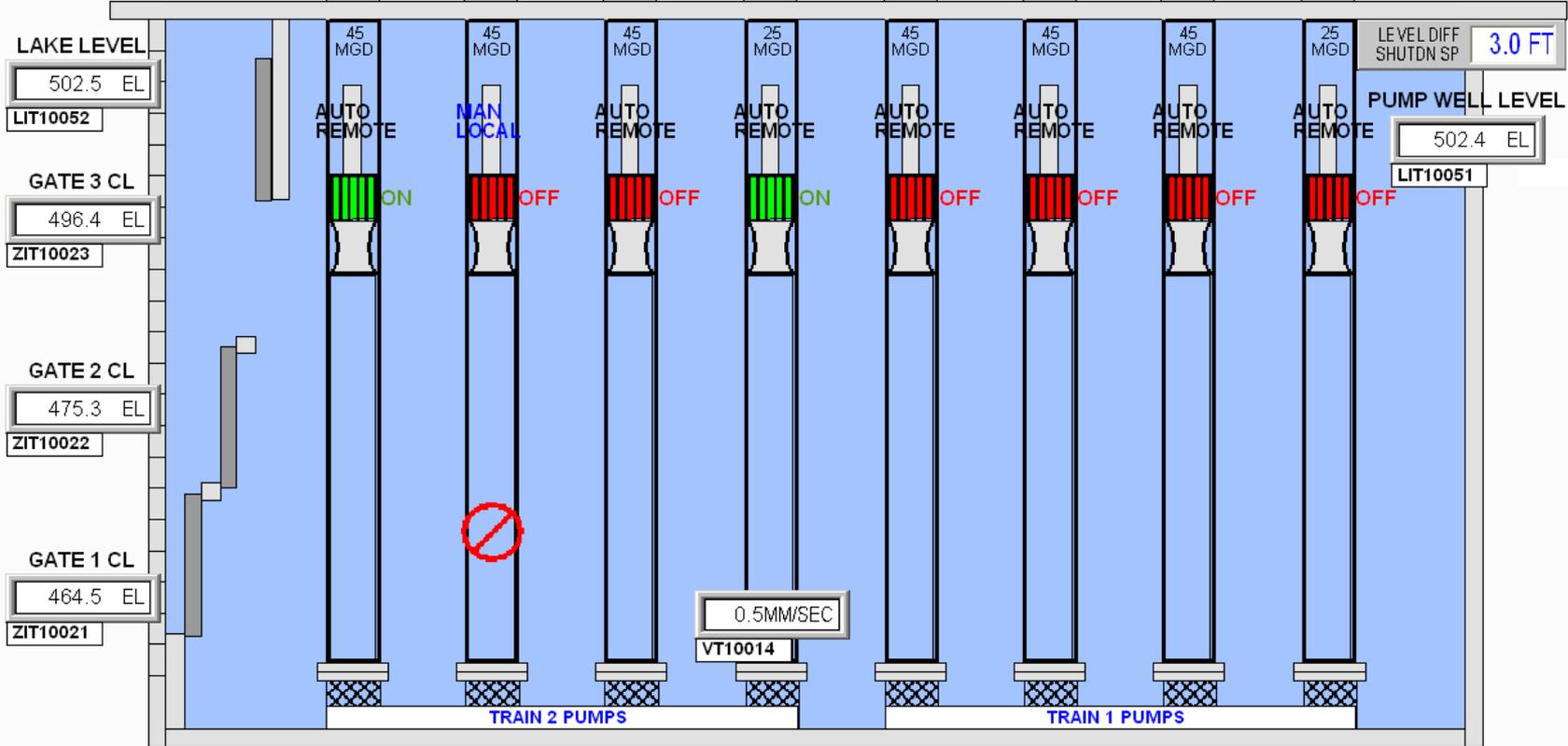
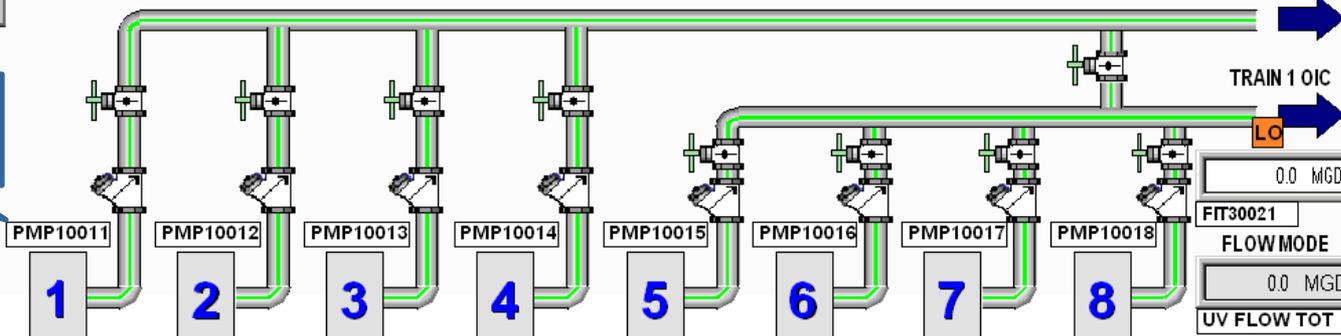
FLOW MODE: 66.9 MGD
UV FLOW TOT: 66.0 MGD

RAW WATER: 66.0 MGD
FIT30022

TRAIN 2 OIC: 0.0 MGD
FIT30021

TRAIN 1 OIC: 0.0 MGD
FLOW MODE: 0.0 MGD
UV FLOW TOT

Right-Click on equipment Tag for device-level popup



10/25/2010
11:03:22 AM
BILLC

LOG IN

O&M MANUAL

PLANT

START/STOP

15 - DOGLEGS

10 - RAW H2O PS

21 - OZONE

40 - UV

50 - CLEAR WELL

60 - LIME

80 - CHLORINE

95 - FCF 4

90 - FCF 5

MISC SYS

ALARMS

HISTORICAL

REPORTS

COMMS

BACK

ck	Date In	Time In	Tagname	Description	Tag Status	Value
✓	10/25/2010	00:06:33.967	CDR_00345_DOHT_DALM	LOG INACTIVATION DAILY ALARM	ALARM	ALAF
✓	10/24/2010	23:43:27.295	CDR_13000_COMM_ALARM	PLC13 COMMUNICATIONS CONTROLS	FAIL	FA
✓	10/24/2010	23:37:40.712	CDR_41012_PDIT_LOS	TRAIN 2 UV STRAINER DIFF PRESSURE	LO	



RAW WATER PUMP STATION

POWER FILTER STATUS

POWER FILTER 1 ON
POWER FILTER 2 ON

SECURITY

FLOW MODE: 66.7 MGD (UV FLOW TOT)
 RAW WATER: 67.1 MGD (FIT30022)
 TRAIN 2 OIC
 TRAIN 1 OIC

10/25/2010
11:04:25 AM
BILLC

LOG IN

O&M MANUAL

PLANT

START/STOP

15 - DOGLEGS

10 - RAW H2O PS

21 - OZONE

40 - UV

50 - CLEAR WELL

60 - LIME

80 - CHLORINE

95 - FCF 4

90 - FCF 5

MISC SYS

ALARMS

HISTORICAL

REPORTS

COMMS

BACK

Query string

O & M Information for CDR_10011_PMP

Cedar Water Treatment Facility O & M Information



Safety Information

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[Operator 10 Water](#)

Maintenance Information

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[ACES](#)

LAKE LEVEL

502.5 EL

LIT10052

GATE 3 CL

496.4 EL

ZIT10023

GATE 2 CL

475.3 EL

ZIT10022

GATE 1 CL

464.5 EL

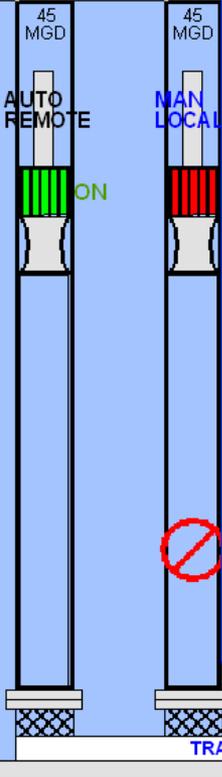
ZIT10021

PMP10011

1

PMP10012

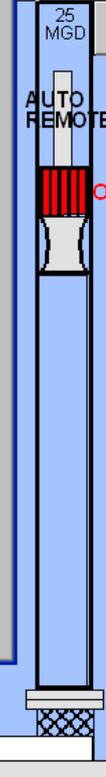
2



TRAIN 2 PUMPS

PMP10018

8



TRAIN 1 PUMPS

0.0 MGD (FIT30021)
 FLOW MODE: 0.0 MGD
 UV FLOW TOT

25 MGD
 LEVEL DIFF SHUTDN SP: 3.0 FT
 PUMP WELL LEVEL: 502.4 EL (LIT10051)

ck	Date In	Time In	Tagname	Description	Tag Status	Value
✓	10/25/2010	00:06:33.967	CDR_00345_DOHT_DALM	LOG INACTIVATION DAILY ALARM	ALARM	ALAF
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✓	10/24/2010	23:37:40.712	CDR_41012_PDIT_LOS	TRAIN 2 UV STRAINER DIFF PRESSURE	LO	



TRAIN 2 UV SYSTEM

UV GBL AUTO

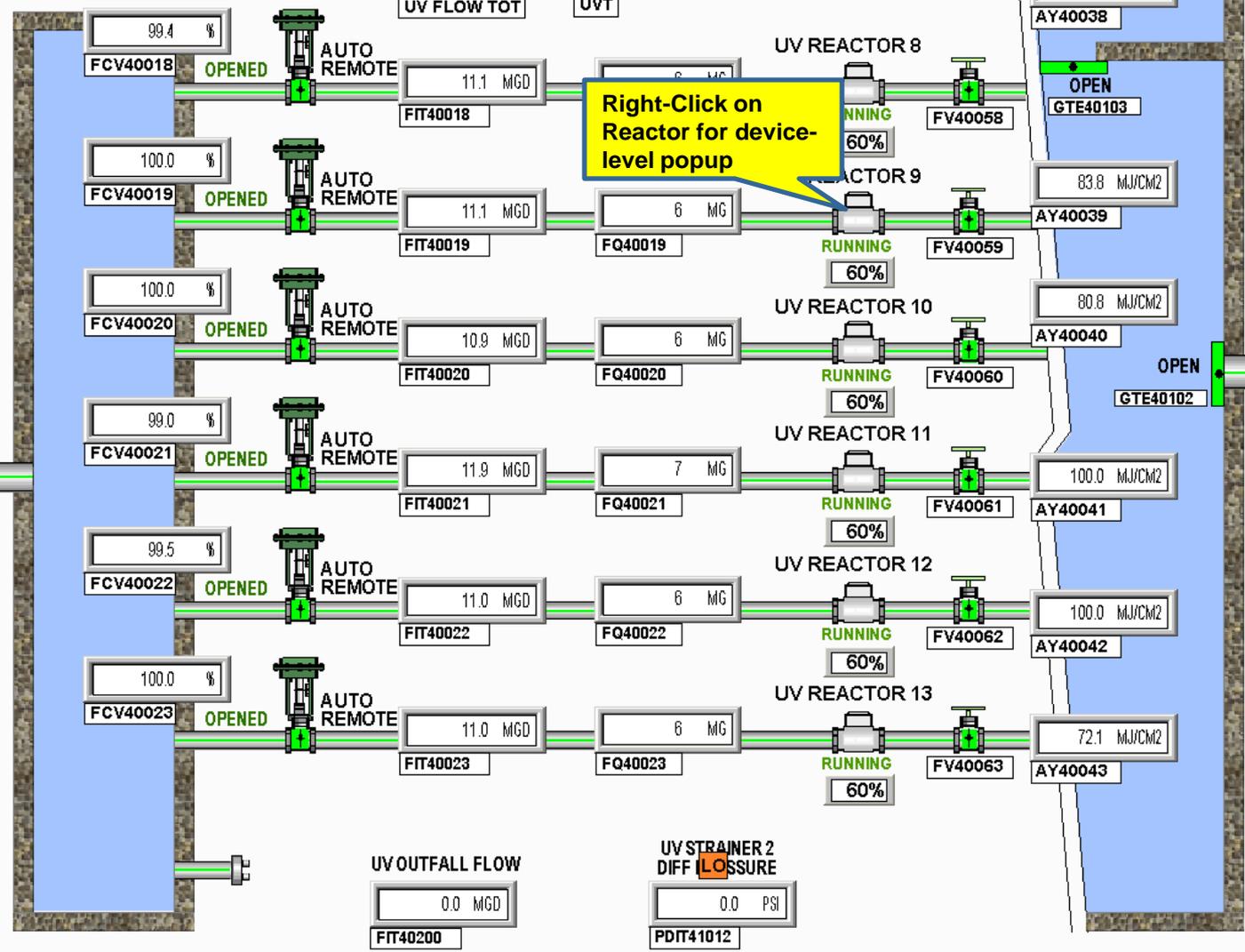
SECURITY

66.0 MGD
FIT30022
FLOW MODE
66.9 MGD
UV FLOW TOT

66.9 MGD
UV FLOW TOT
97.60
UVT

UV CT

71.5 MJ/CM2
AY40038



LOG IN

- O&M MANUAL
- PLANT
- START/STOP
- 15 - DOGLEGS
- 10 - RAW H2O PS
- 21 - OZONE
- 40 - UV
- 50 - CLEAR WELL
- 60 - LIME
- 80 - CHLORINE
- 95 - FCF 4
- 90 - FCF 5
- MISC SYS
- ALARMS
- HISTORICAL
- REPORTS
- COMMS
- BACK

FROM SODIUM BISULFITE

FROM OZONE INJECTION

TO SOUTH CLEAR-WELL

TO TRAIN 1

UV OUTFALL FLOW
0.0 MGD
FIT40200

UV STRAINER 2 DIFF LOSSURE
0.0 PSI
PDIT41012

Ack	Date In	Time In	Tagname	Description	Tag Status	Value
✓	10/25/2010	14:28:06.792	CDR_40140_SEC_DISABLS	UV DOOR SECURITY	DISABL	DISA
✓	10/25/2010	11:49:34.258	CDR_20030_SEC_ALARM	OZONE GENERATOR BUILDING	ALARM	ALAF
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✓	10/24/2010	13:43:27.205	CDR_13000_COMM_ALARM	PLC13 COMMUNICATIONS CONTROLS	FAIL	5/

TRAIN 2 UV SYSTEM

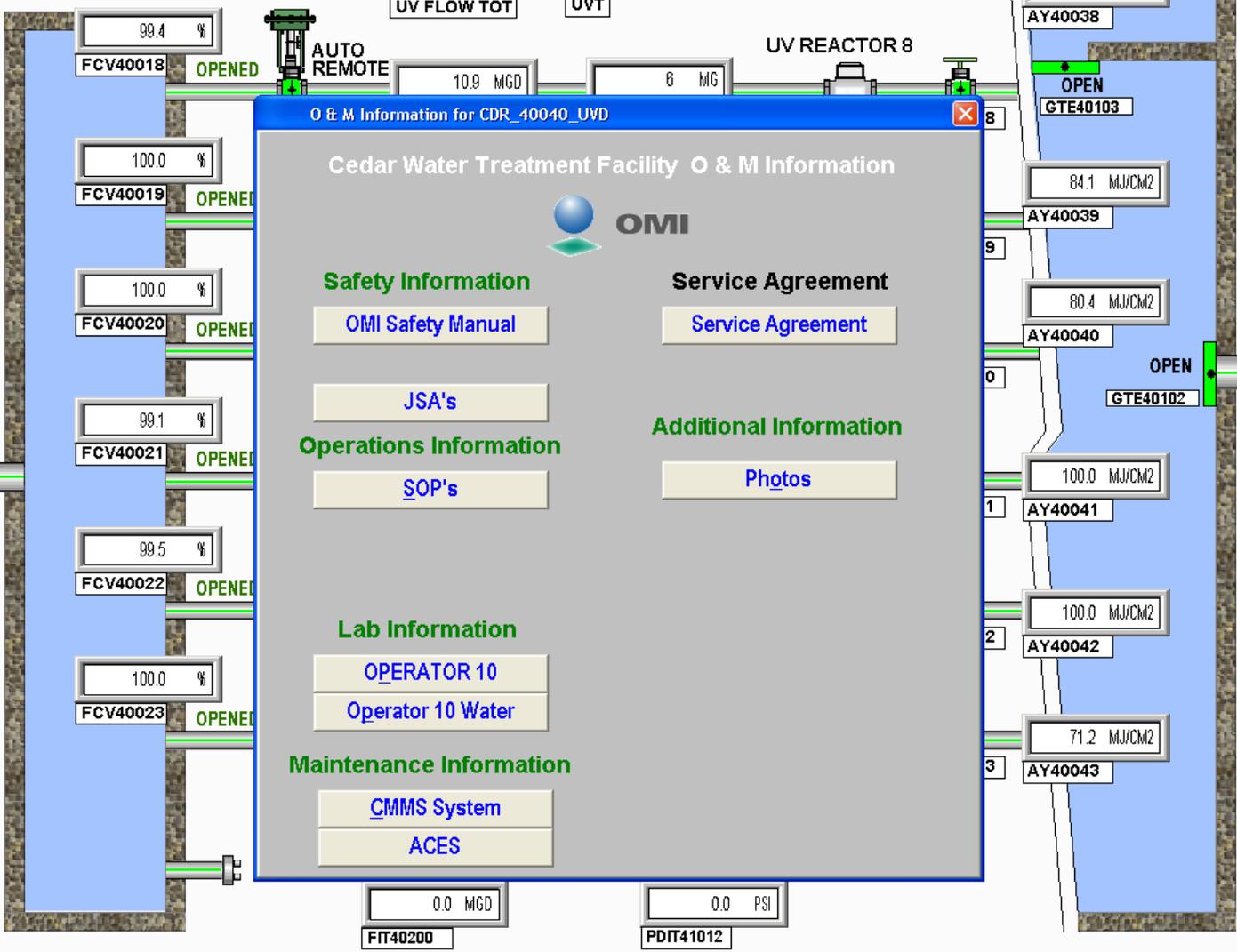
UV GBL AUTO

SECURITY

UV CT

66.8 MGD
FIT30022
FLOW MODE
66.8 MGD
UV FLOW TOT

66.9 MGD
UV FLOW TOT
97.60
UVT



O & M Information for CDR_40040_UVD

Cedar Water Treatment Facility O & M Information

OMI

Safety Information

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FROM SODIUM BISULFITE

FROM OZONE INJECTION

↑
TO TRAIN 1

TO SOUTH CLEAR WELL

LOG IN

- O&M MANUAL
- PLANT
- START/STOP
- 15 - DOGLEGS
- 10 - RAW H2O PS
- 21 - OZONE
- 40 - UV
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- COMMS
- BACK

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✓	10/25/2010	11:49:34.258	CDR_20030_SEC_ALARM	OZONE GENERATOR BUILDING	ALARM	ALAF
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✓	10/24/2010	13:43:27.205	CDR_13000_COMM_ALARM	PLC13 COMMUNICATIONS CONTROLS	FAIL	5/

Electronic O&M Manuals

Untitled Document - Microsoft Internet Explorer

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Back Forward Stop Home Search Favorites History

Address <file:///C:/NWS/propose/Track.Htm> Go Links

RM 2530 Pumping Station to Horizon Ridge Res.

Operating Procedures

- [Normal Operation](#)
- [Horizon Ridge Reservoir Level Control](#)
- [Abnormal Operation](#)
- [Emergency Procedures](#)
- [Safety Procedures](#)
- [Emergency Call-Out List](#)

Drawings

- [South Valley Lateral Strip Map 7](#)
- [South Valley Lateral Strip Map 8](#)
- [P&ID RM 2530 Pumping Station](#)
- [P&ID Horizon Ridge Res. Instrumentation](#)
- [Mechanical Plan RM 2530 Pumping Station](#)
- [Electrical Plan RM 2530 Pumping Station](#)
- [Figures List](#)

Maintenance Procedures

- [Isolating Line Sections](#)
- [Cleaning/Pigging Procedures](#)
- [Pressure Testing](#)
- [SCADA Pump Shutdown Procedures](#)
- [Manual Pump Shut Down Procedures](#)
- [Horizon Ridge Res. Isolation](#)
- [Line Specifications](#)
- [Emergency Notification Lists](#)
- [Location Maps and Drawings](#)
- [HR Reservoir Inspection](#)

CMMS Data

Nameplate Data		Work Order History	
1. RM PS Pump #1	2. RM PS Motor #1	1. RM PS Pump #1	2. RM PS Motor #1
3. RM PS Pump #2	4. RM PS Motor #2	3. RM PS Pump #2	4. RM PS Motor #2
5. RM PS Pump #3	6. RM PS Motor #3	5. RM PS Pump #3	6. RM PS Motor #3
7. RM PS Pump #4	8. RM PS Motor #4	7. RM PS Pump #4	8. RM PS Motor #4
9. RM PS Pump #5	10. RM PS Motor #5	9. RM PS Pump #5	10. RM PS Motor #5
11. RM PS Pump #6		11. RM PS Pump #6	

My Computer

Example 1 – Electronic O&M Manuals

Electronic Manual Elements

	Portable Web Design	User Interface Design	HTML	JavaScript	Graphic Design	Animated Graphic Design	Elec. Document Management	Document Conversion	CD ROM/DVD Mastering	Meters and Interties	Reservoirs	Pump Stations	PRVs
Albany, OR - WTP	X	X	X	X	X	X	X	X	X	X		X	X
Alexandria (VA) Sanitation Authority–WWTP		X	X	X	X	X	X	X				X	
Anacortes, , City of–WWTP	X	X	X	X	X	X	X					X	
Anchorage, –Eagle River WWTP		X					X	X				X	
Ann Arbor, MI–WTP SDC	X	X	X		X	X	X	X				X	
Atlanta, – and Intrenchment Creek WWTPs	X	X	X	X	X	X	X	X	X			X	
Aurora, , City of– Griswold WTP O&M	X	X	X	X	X	X		X	X	X		X	X
Bellingham,		X			X	X	X	X				X	
Broward County, –WTP													
Catoma WPCP, –Catoma WPCP Operations Guide	X	X	X	X	X	X	X	X	X	X		X	X
Centralia, , City of	X	X	X	X	X	X	X	X	X	X		X	X
Clark County, –Salmon Creek WWTP	X	X	X	X	X	X	X	X	X	X		X	X
Clean Water Services–Rock Creek Facilities			X		X			X	X	X		X	X
Corvallis, –H.D. Taylor WTP	X	X	X	X	X	X	X	X	X	X	X	X	X
Denver, CO–Water Reuse Plant O&M	X	X	X	X	X	X		X	X	X	X	X	X
East Bay Municipal Utility District ()–4 WRPs		X			X		X	X				X	
Eastern Municipal Water District ()–Simpson Pumping Plant	X	X	X	X	X	X	X	X	X	X		X	X
El Paso, –J.W. Rogers WTP		X			X			X	X	X	X	X	X
Houston, –Almeda SIMS WWTP		X			X			X	X				
Key West, FL–WWTP	X	X	X		X	X		X	X	X		X	

Example 1 – Electronic O&M Manuals

Electronic Manual Elements

	Portable Web Design	User Interface Design	HTML	JavaScript	Graphic Design	Animated Graphic Design	Elec. Document Management	Document Conversion	CD ROM/DVD Mastering	Meters and Interties	Reservoirs	Pump Stations	PRVs
Key West, FL–WWTP	X	X	X		X	X		X	X	X		X	
Mass. Water Resources Authority–ICC Ops Manual, startup and training													
McMinnville, –WWTP O&M	X	X	X		X	X		X	X	X		X	X
Milwaukee Metropolitan Sewerage District–Deep Tunnel O&M		X			X			X	X			X	
Milwaukee Drying and Dewatering Facility		X			X			X	X			X	
Milwaukee Metropolitan Sewerage District–Milorganite Storage O&M		X			X			X	X				
Orlando Utility Commission–5 WTPs	X	X	X	X	X	X	X		X	X	X	X	X
Redmond, WA–Water Transmission System O&M	X	X	X	X	X	X	X	X	X				
Roseburg Urban Sanitary Authority–WWTP O&M		X					X	X	X			X	
San Antonio, , City of–4 WWTPs		X					X	X	X			X	
San Francisco, City of–Oceanside WWTP		X			X		X	X	X			X	
Santa Rosa, , City of–Laguna WRP		X					X	X	X			X	
Spokane, WA - WWTP	X	X	X	X	X				X			X	X
St. Charles Township, –Duckett Creek Sanitary District WWTP	X	X	X	X	X	X		X	X	X		X	X

Example 1 – Electronic O&M Manuals

Electronic Manual Elements

	Portable Web Design	User Interface Design	HTML	JavaScript	Graphic Design	Animated Graphic Design	Elec. Document Management	Document Conversion	CD ROM/DVD Mastering	Meters and Interties	Reservoirs	Pump Stations	PRVs
Tahoe Truckee Sanitation Agency–Truckee Meadows FIM		X					X	X	X	X		X	X
Tampa Water Department– River WTP	X	X	X	X	X		X	X	X		X	X	
Thousand Oaks, Hill Canyon WWTP	X	X	X	X	X	X	X	X	X	X		X	X
Tulsa, , City of–AB Jewell WTP		X				X	X	X	X				
Tuscaloosa, , City of–WWTP		X			X	X	X	X	X				
Vancouver, and Westside Treatment Facilities	X	X	X	X	X	X	X	X	X	X		X	X

Example 2 – Hilton Head PSD



- Vision
- Mission
- Goals
 - Financial Management
 - Water Quality

Hilton Head Water Quality Initiative

■ Rates/Financial Planning

- Goals
 - Had previously relied on externally developed rate studies
 - Wanted to develop in house expertise
- New Rate Model
- Community of Practice (3 people)
- Training
- 1 Year Review

■ Water Quality

- Goals
 - Improve understanding of WQ goals
 - Optimize Treatment
 - Improve Water Quality
- Develop Key Indicators
- Community of Practice
 - Operations
 - Laboratory
- Annual Review/Benchmarking
- Expanded to WWTP

Hilton Head PSD – Rate Model

	Total	Water	Residential	Multifamily
Net Revenue Requirement, Base plus Demand	7,926,284	4,811,918	2,879,737	1,668,359
Net Revenue Requirement, Direct Assignment				
Total Revenue Requirement	7,926,284	4,811,918	2,879,737	1,668,359
COS Base Charge, \$/Cust/Mo Customers	\$	\$	\$	\$
		16.05	16.05	16.05
		16,616	9,944	5,761
COS Base Revenue	\$ 5,896,305	\$ 3,200,619	\$ 1,915,441	\$ 1,109,700
Net Revenue Requirement, Demand	\$ 2,029,979	\$ 1,611,298	\$ 964,297	\$ 558,660
Units, Annual 1000 gal		1,931,331	1,158,327	445,240
Volume Charge, \$/1000 gal	\$	0.83	\$ 0.83	\$ 1.25
Existing Base Rate, \$/Cu/Mo		\$ 10.00	\$ 10.00	\$ 10.00
Existing Base Revenues	\$ 4,103,532	\$ 2,048,580	\$ 1,193,280	\$ 691,320
Net Revenue Requirement, Demand		\$ 2,763,338	\$ 1,686,457	\$ 977,039
Block Volume Charge, \$/1000 gal				
Block 1: 1st 5,000 gal		651,958	563,939	58,157
Revenue \$	1,084,715	\$ 814,947	\$ 704,924	\$ 72,697
Units, 1,000 gal				
Block 1 Volume Charge, \$/1000 gal		\$ 1.25	\$ 1.25	\$ 1.25
Block 2: 5,000 - 17,000gal		620,349	513,789	71,987
Revenue \$	1,577,966	\$ 930,523	\$ 770,683	\$ 107,980
Units, 1,000 gal				
Block 2 Volume Charge, \$/1,000 gal		\$ 1.50	\$ 1.50	\$ 1.50
Block 3: 17,000 - 32,000 gal		87,643	46,274	20,671
Revenue \$	984,588	\$ 175,285	\$ 92,547	\$ 41,342
Units, 1,000 gal				
Block 3 Volume Charge, \$/1,000 gal		\$ 2.00	\$ 2.00	\$ 2.00
Block 4: Over 32,000 gal		330,803	34,997	160,854
Revenue \$	744,307	\$ 744,307	\$ 78,743	\$ 361,922
Units, 1,000 gal				
Block 4 Volume Charge, \$/1,000 gal		\$ 2.25	\$ 2.25	\$ 2.25
Total Revenue Projection	8,495,108	4,713,643	2,840,177	1,275,260

Hilton Head PSD

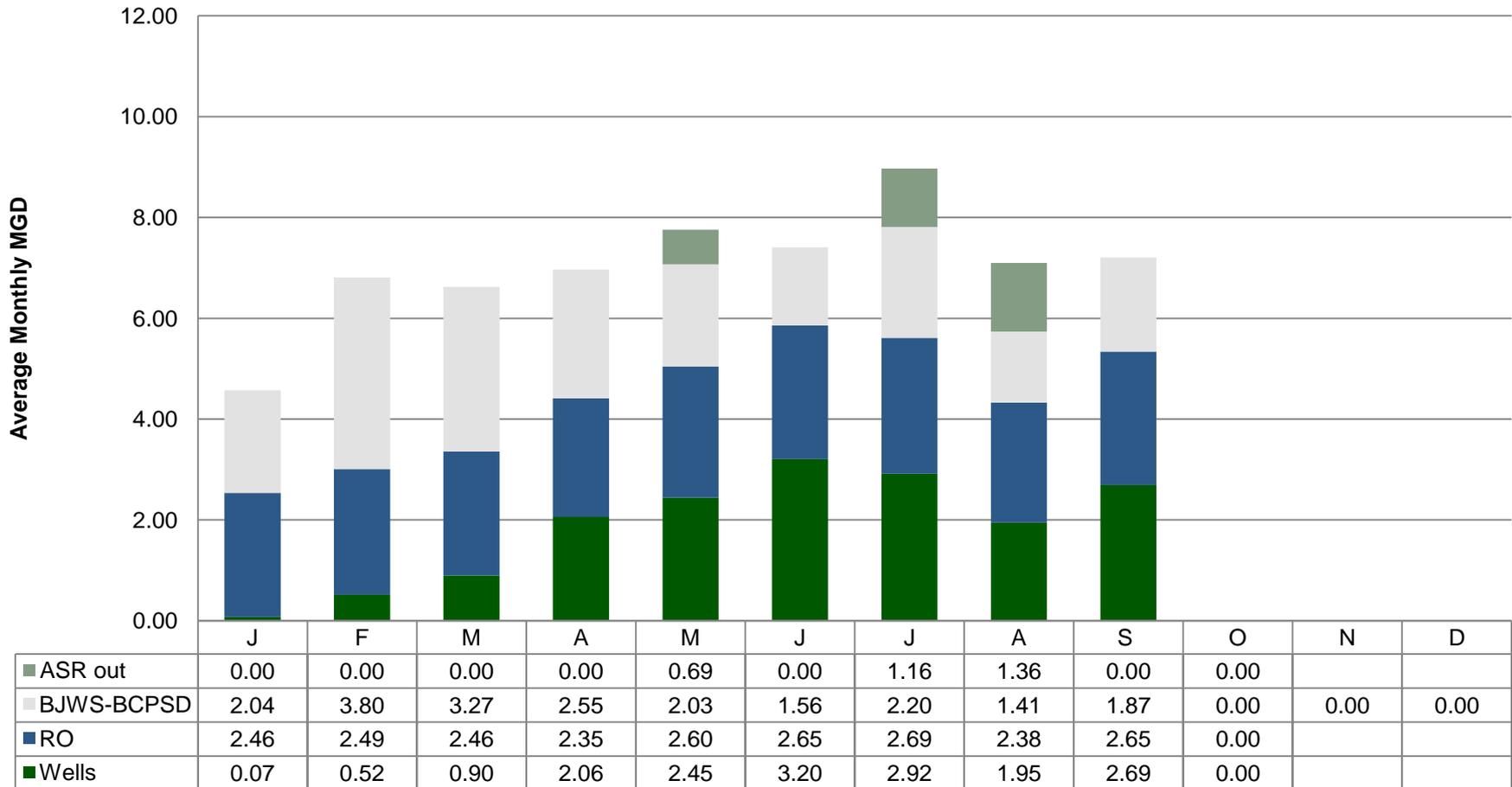
- Externally Developed Rate Model
- Extensive Training with Finance Staff
- Simplified Model for District Use
- In House Adoption - Continued use today

TABLE OF CONTENTS

<u>Name of Schedule</u>	<u>Worksheet</u>	<u>Schedule No.</u>
<u>SUMMARY</u>		
SUMMARY OF WATER REVENUE REQUIREMENTS UNIT COSTS	Summary	1.1
SUMMARY OF RATE BASE UNIT COSTS	Summary	1.2
SUMMARY OF WASTEWATER REVENUE REQUIREMENTS	Summary	1.3
SUMMARY OF RATE BASE UNIT COSTS	Summary	1.4
	Summary	1.5
	Summary	1.6
	Summary	1.7
	Summary	1.8
	Summary	1.9
	Summary	1.10
<u>UNIT COST</u>		
SUMMARY OF REVENUE REQUIREMENT UNIT COSTS	Unit Cost	2.1
SUMMARY OF RATE BASE UNIT COST	Unit Cost	2.2
<u>REVENUE REQUIREMENT</u>		
INPUT REVENUE REQUIREMENT PROJECTED REVENUE REQUIREMENTS	Rev Req	3.1
REVENUE REQUIREMENT COST ALLOCATION FUNCTIONALIZATION AND CLASSIFICATION	Rev Req	3.2
REVENUE REQUIREMENT COST ALLOCATION CLASSIFICATION BY CUSTOMER	Rev Req	3.3
REVENUE REQUIREMENT COST ALLOCATION DIRECT ASSIGNMENT BY CUSTOMER	Rev Req	3.4
	Rev Req	3.5
<u>RATE BASE</u>		
INPUT RATE BASE	Rate Base	4.1
RATE BASE FOR COST ALLOCATION FUNCTIONALIZATION AND CLASSIFICATION	Rate Base	4.2
RATE BASE COST ALLOCATION CLASSIFICATION BY CUSTOMER	Rate Base	4.3
RATE BASE COST ALLOCATION DIRECT ASSIGNMENT BY CUSTOMER	Rate Base	4.4

Hilton Head Water Quality Initiative

Water Supply



Hilton Head Water Quality Initiative

Drinking Water Quality Regulation	2009	2010	2011	2012 Through October
Primary Drinking Water Standards				
• Inorganic Chemicals	√	√	√	√
• Synthetic Organic Chemicals	√	√	√	√
• Volatile Organic Chemicals	√	√	√	√
Lead and Copper Rule(1)	√	No Samples	No Samples	√
Arsenic Rule	√	√	√	√
Disinfectant and Disinfection By-Products Rules	√	√	√	√
Total Coliform Rule (2)	√ (0 Pos TC)	(2 Pos TC), Tier 3 violation in May 2010	√ (1 Pos TC)	√ (1 Pos TC, Repeat were Negative)
Groundwater Rule		√	√	√
Radionuclide's Rule	√	√	√	No Samples
Additional Monitoring (Not Required) (3)				
• Secondary Drinking Water Standards	Partial	Partial	Partial	Partial
• Unregulated Contaminant Monitoring	√	√	√	√
Consumer Confidence Report	√	√	√	√

Hilton Head Water Quality Initiative

Treatment Ratings	2010	2011	2012
Treatment Effectiveness <ul style="list-style-type: none"> Chloride Disinfection Corrosion Control 	Objectives Met, Improved Chlorine Residuals	Objectives Met, Improved Chlorine Residuals	Objectives Met, Improved Chlorine Residuals
Operations <ul style="list-style-type: none"> Labor less than 37% of treatment cost 	32%	29.7%	29.2%
Treatment Process Monitoring	Well and Distribution Residuals and pH on SCADA	Well and Distribution Residuals and pH on SCADA	Well and Distribution Residuals and pH on SCADA
Process Optimization	RO Cleaning Optimized, RO Pressure issue resolved	Chlorine to ammonia ratio optimized	Chlorine to ammonia ratio optimized
Total Cost for delivered Water	\$1.53	\$1.46	\$1.22 per 1000 gal

Hilton Head Water Quality Initiative

Distribution Category	2010	2011	2012
Microbiological quality	2 Positive TC	1 Positive TC	1 Positive TC
Corrosion	Phosphate addition and monitoring	Phosphate addition and monitoring	Phosphate addition and monitoring
Unaccounted for Water	-8.9%	+1.3%	-6.4%
Water Age	<3 Days Average	<3 Days Average	<3 Days Average
Reservoir Operations	Expanded Monitoring. Good, except Pembroke, Marshland	Good, except Pembroke*, Marshland, Pembroke Addressed	Good
Disinfectant Residual	3.1% below 0.2 mg/L in routine monitoring, began monitoring 8 reservoirs	0% below 0.2 mg/L in routine monitoring, Began Monitoring Tanks	0% below 0.2 mg/L in routine monitoring, Continued Monitoring Tanks
Cross Connection and Back Flow Prevention	All Connections have BFP Device Testable Devices Tracked in Work Order System	All Connections have BFP Device All testable devices included in Work Order System	All Connections have BFP Device All testable devices included in Work Order System
Flushing of Mains Construction and inspection practices	Began Flushing Again All passed, Added AWWA Disinfection Standard	Flushing Continued All passed	Flushing Continued All passed

Hilton Head Water Quality Initiative

Customer Inquiries	2008	2009	2010	2011	2012
Complaints Received	120	73	88	48	35
per 1000 connections	10.9	6.6	8.0	4.4	3.2
Follow Up Completed	113	66	82	45	35
% Completed (1)	94%	90%	93%	94%	100%

- Lead and Copper
- Aesthetic WQ Monitoring
- Customer Satisfaction (Survey)

How to get started

- 1. Align initiatives to the organization's overall mission and goals.**
- 2. Identify the 'real' knowledge needed to support the success of the organization.**
- 3. Setup the people, processes and tools needed to collect, store, organize, analyze, and**
- 4. share the knowledge.**



Questions?

Lee Odell, PE

Water Treatment Global Technology Lead