



# Tomorrow's Water Utility

## *Dilemmas and Decisions*

Tom Heikkinen, General Manager

# Our Agenda

**WHAT TO EXPECT TODAY**

**A BIT OF WATER HISTORY**

*FROM ROME'S AQUEDUCTS TO MADISON'S WELLS*

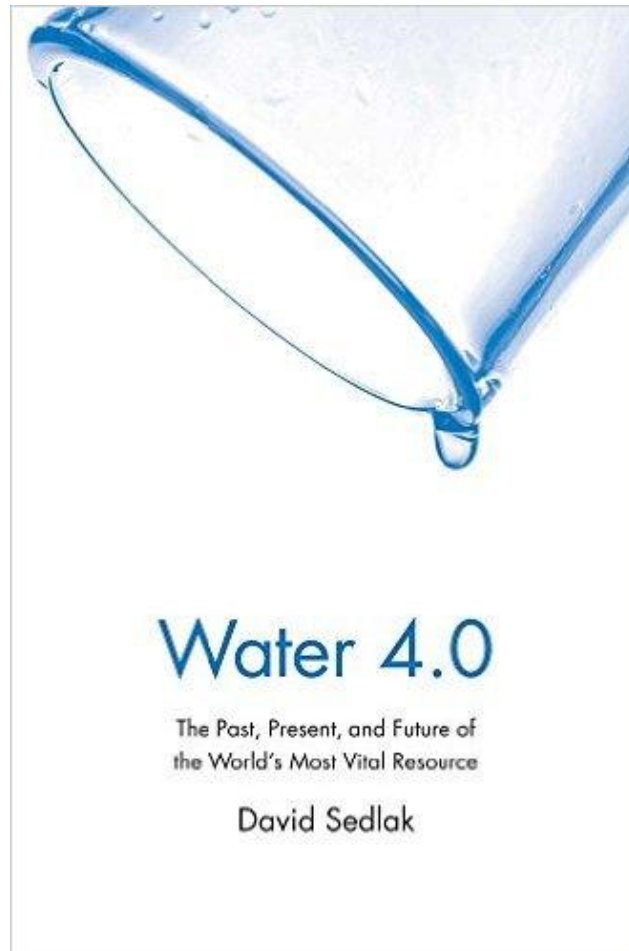
**ASKING THE BIG QUESTIONS**

*COSTS AND...*

*HEALTH, CONSERVATION, GOVERNANCE*

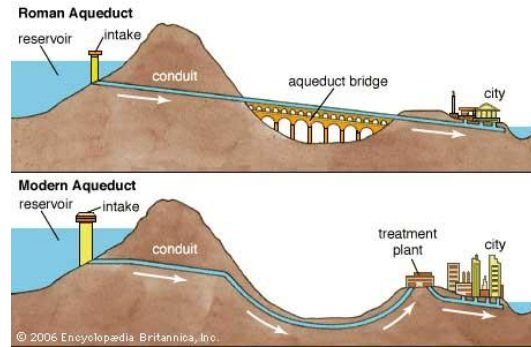
**CLOSING THOUGHTS/ Q & A**

# Highly Recommended



- “With the turn of a tap, clean water flows out....It all seems so simple and obvious. And yet, as David Sedlak explains, such conveniences are really a marvel of engineering, built on centuries of trial and (often) error....Sedlak’s efforts to engage the public on this oft neglected subject is welcome.”
  - Kate Galbraith, *San Francisco Chronicle*
- “The urban water crises [Sedlak] presents – historical and present day – not only run up against prevailing technological possibilities; they also have engaged political debates as to how we run and pay for our cities.”
  - Jeffery Atik, *Los Angeles Review of Books*

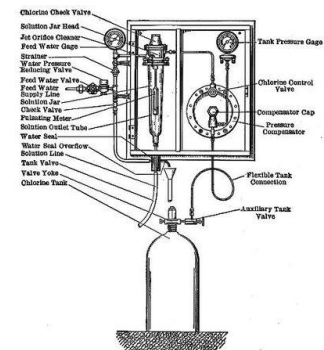
# Water 1.0 (300 BC)





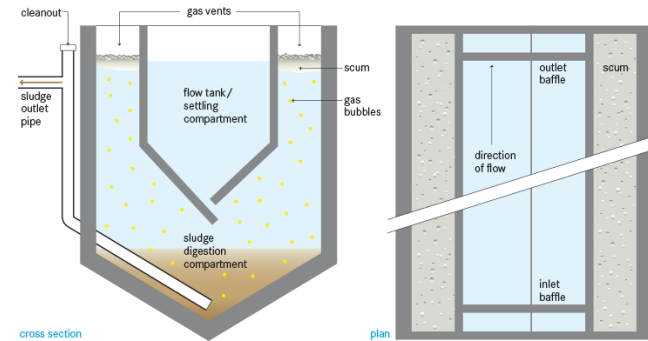
# Water 2.0 (19<sup>th</sup> Century)

- Europe's sewage crisis
- London and Paris
- Sand filtration
- Coagulation/Sedimentation
- Disinfection
  - 1905 Lincoln, England typhoid fever epidemic
  - 1908 Boonton Reservoir, NJ
- George Warren Fuller (1868-1934)



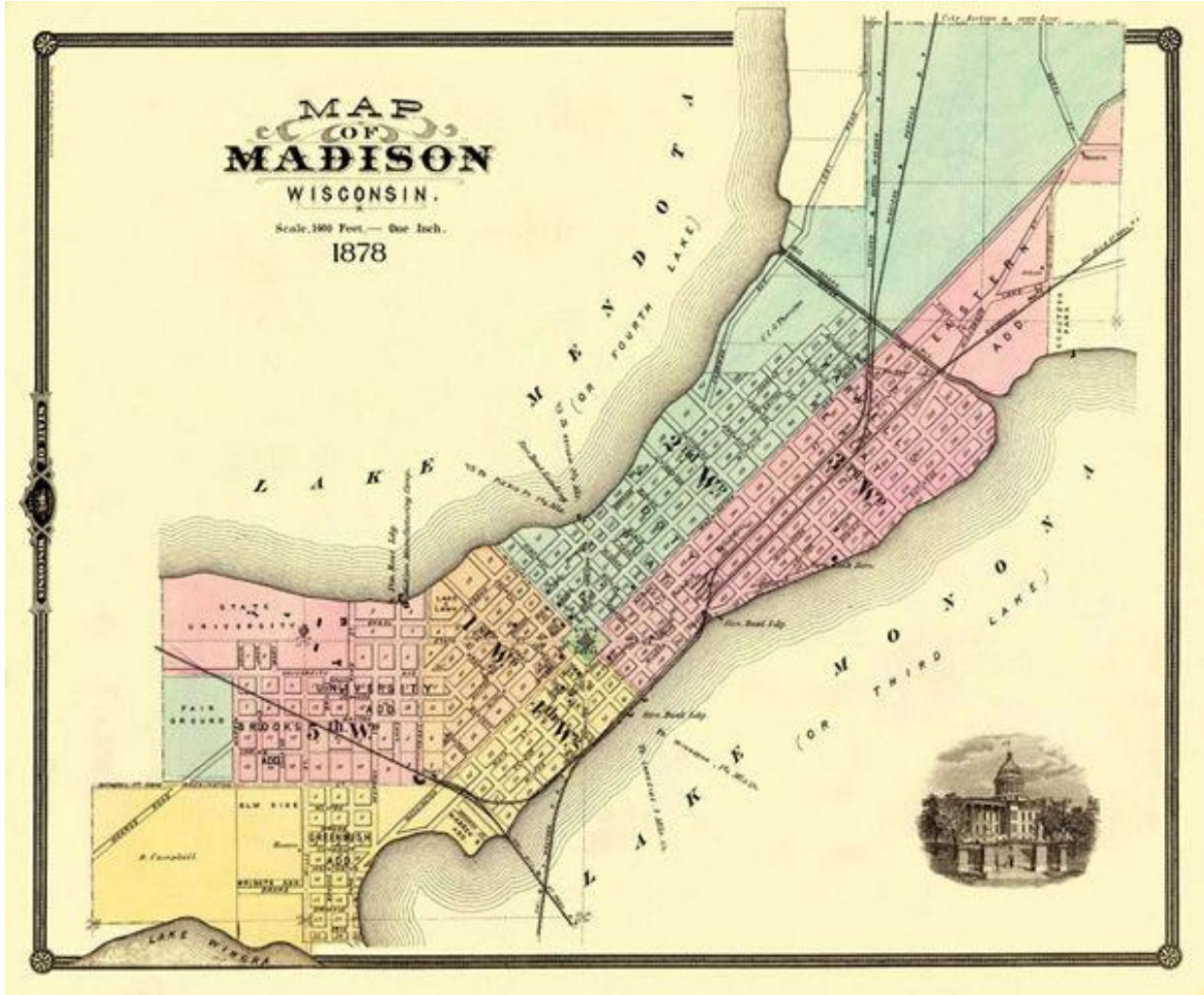
# Water 3.0 (20<sup>th</sup> Century)

- Fouling of water ways brought on by rapid population growth
- Advent of biological treatment systems
  - Imhoff Tank
    - 1893 Manchester, England
    - 1901 Madison (!), WI
  - Trickling Filters
    - 1893 Manchester, England
    - 1901 Madison (!), WI
  - Activated sludge
    - 1913 Manchester



# MAP OF MADISON WISCONSIN.

Scale 100 Feet — One Inch.  
1878





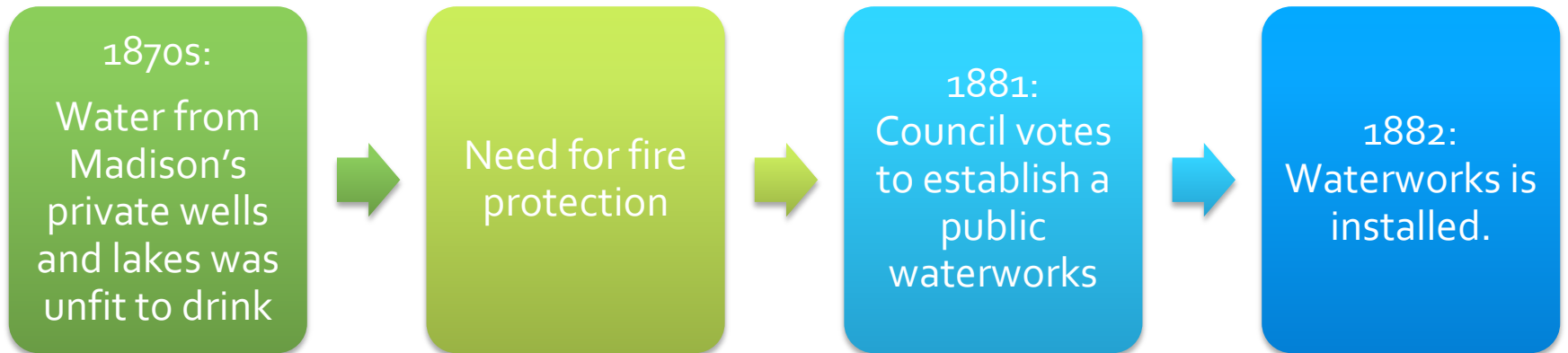


**An artist's rendering of the same period**

Hot air balloon?



# Madison Water Utility *In The Beginning...*



# Our History



# Today: At a Glance

Population served:	250,000
Customer accounts:	68,000 (metered)
Production wells:	22
Annual pumpage (2014):	10 billion gallons
Average daily pumpage:	28 million gal/day
Miles of water main:	830
Employees:	125
Annual revenue:	\$36 million

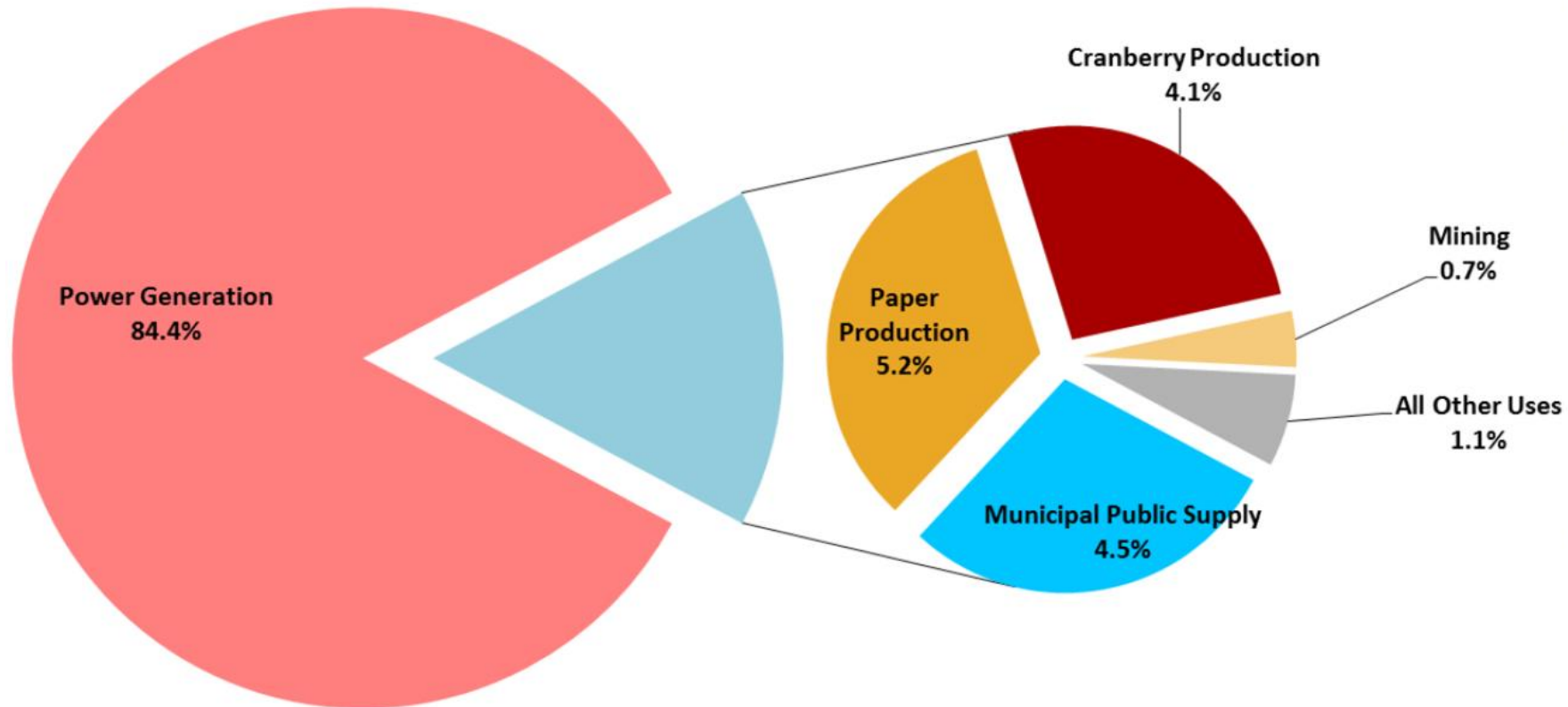




Exploring the regulatory framework in light of the uses of water...

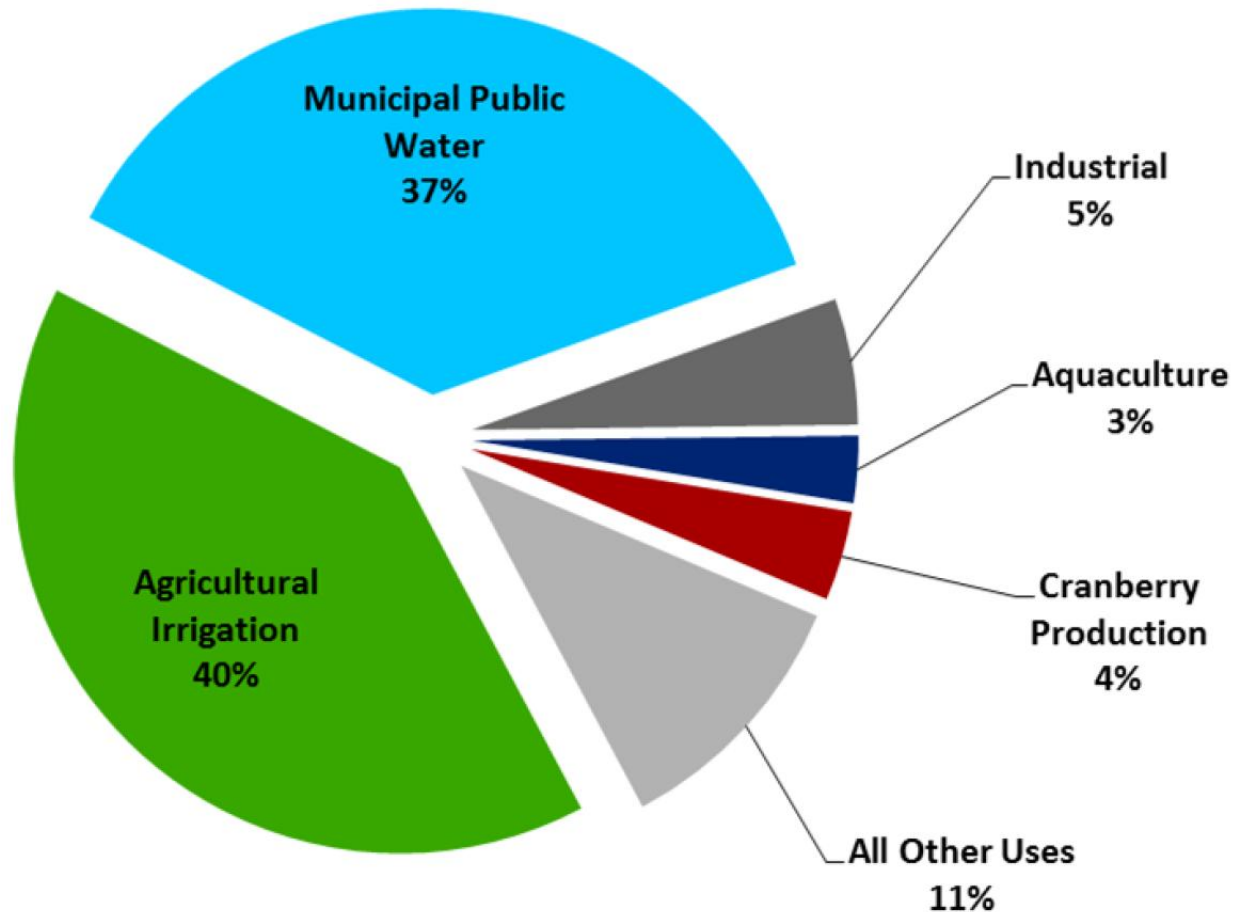
# **WHEN IS DRINKING WATER SAFE ENOUGH?**

# 2013 Total Surface Water Withdrawals by Water Use



Source: Wisconsin Water Use 2013 Expanded Withdrawal Summary, Wisconsin Department of Natural Resources

# 2013 Total Groundwater Withdrawals by Water Use



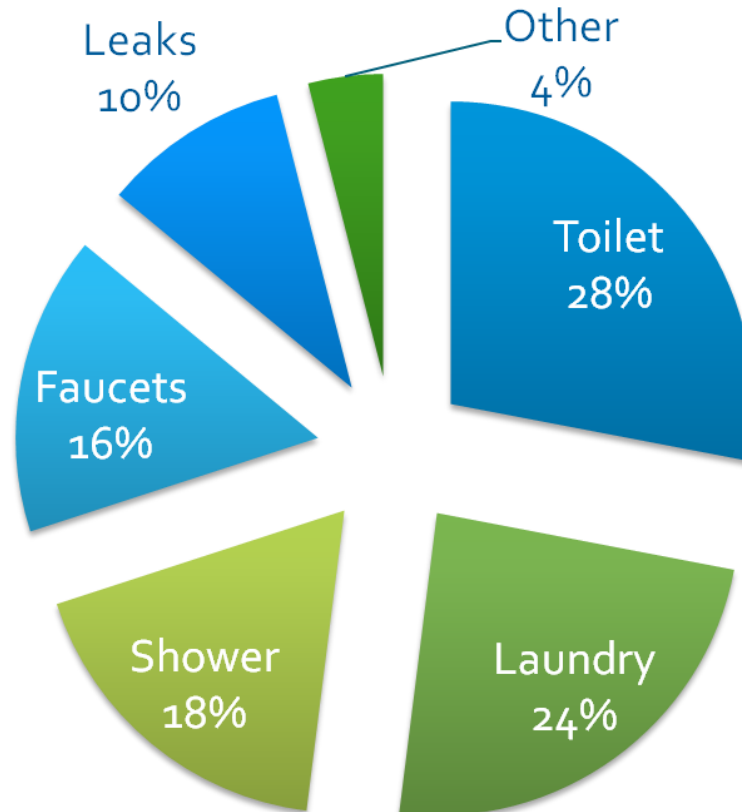
Source: Wisconsin Water Use 2013 Expanded Withdrawal Summary, Wisconsin Department of Natural Resources

# What is a public water system for?

- Carrying away wastes (residential and C/I)
- Fighting fires
- Watering plants (indoor and outdoor)
- Cooling (industrial and commercial)
- Drinking (directly or through processed foods/beverages)



# Indoor Water Uses





**28%**

**of indoor use**

# National Primary Drinking Water Regulations

Class of Contaminant (#)	Examples (MCL/MCLG in mg/L)
• Inorganics (16)	• Arsenic (0.010/0)
• Organics	•
– Synthetic (32)	– 2,3,7,8-TCDD (0.00000003/0)
– Volatile (21)	– Chlorobenzene (0.1/0.1)
• Disinfectants and DBPs (15)	• Haloacetic Acids (0.060)
• Microbiological (9)	• Cryptosporidium (TT/0)
• Radionuclides (4)	• Uranium (0.030/0)

# Distribution System Issues

- Water loss
- Lead
  - Service lines; solder; brass fixtures
  - Uniform corrosion
  - Fe and Mn scales and adsorption
- Biofilms
  - Microbially influenced corrosion



Exploring the competing objectives of the current pricing model...

**IS WATER A COMMODITY TO BE  
SUPPLIED, OR A NATURAL  
RESOURCE TO BE CONSERVED?**



MADISON MUNICIPAL SERVICES

BILLING INFORMATION (608) 266-4641  
 STORMWATER INFORMATION (608) 266-4761

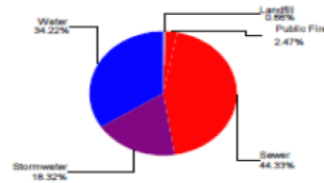
www.madisonwater.org • 119 East Olin Avenue • Madison, WI 53713-1431

BILL NUMBER 7415340

CUSTOMER NAME	SERVICE LOCATION	CUSTOMER NUMBER	ACCOUNT NUMBER
THOMAS & PEI PEI HEIKKINEN	634 ONDOSSAGON WAY	07157907	00056244

PREV. READ DATE	PREV. READ DATE	METER #	SERVICE	DAYS	PREV. READ	PREV. READ	USAGE IN GAL	TYPE
May 11, 2015	Apr 10, 2015	0013430043	Water	31	165009	159220	5789	REG

Your water meets federal and state standards for health and safety. A report containing important information about the source and quality of your drinking water is available at [www.MadisonWater.org/QualityReport](http://www.MadisonWater.org/QualityReport). Call 261-9299 for a paper copy.



Previous Balance	\$64.21
Payment - Thank You	\$64.21CR
<b>Balance Forward</b>	<b>\$0.00CR</b>
<b>Water</b>	
Water Base Charge 5/8" Meter	4.50
Water Consumption	5789 gallons at 0.00281 16.27
	Sub Total Water \$20.77
<b>Sewer</b>	
Sewer Base Charge 5/8" Meter	12.30
Sewer Based On Water Use	5789 gallons at 0.00252 14.61
	Sub Total Sewer \$26.91
Landfill Remediation	\$0.40
Public Fire Protection Charge	\$1.60
<b>Stormwater Phone # (608) 266-4761</b>	
Stormwater Base Charge	1.30
Stormwater Impervious	3,418 sqf at 0.00222 7.59
Stormwater Pervious	13,954 sqf at 0.00016 2.23
	Sub Total Stormwater \$11.12
<b>CURRENT CHARGES</b>	<b>\$60.70</b>
<b>TOTAL AMOUNT DUE</b>	<b>\$60.70</b>

You may pay your bill online at <a href="http://www.cityofmadison.com/maupayment">www.cityofmadison.com/maupayment</a>	TOTAL CURRENT CHARGES	\$60.70
	BALANCE FORWARD	\$0.00CR
PARCEL # 070826309118	TOTAL AMOUNT DUE	\$60.70
	DUE DATE	06/15/2015

CUSTOMER NAME	SERVICE LOCATION	CUSTOMER NUMBER	ACCOUNT NUMBER
THOMAS & PEI PEI HEIKKINEN	634 ONDOSSAGON WAY	07157907	00056244

MAKE CHECKS PAYABLE & MAIL TO:  
 CITY TREASURER  
 P.O. BOX 2997  
 MADISON, WISCONSIN 53701

DUE DATE	PAY THIS AMOUNT	ENTER AMOUNT PAID
06/15/2015	\$60.70	

1% LATE CHARGE IS ADDED AFTER 6/15/2015

THOMAS & PEI PEI HEIKKINEN  
 634 ONDOSSAGON WAY  
 MADISON WI 53718

PLEASE MAIL THIS PORTION WITH PAYMENT


BILLING INFORMATION (608) 266-4641  
 STORMWATER INFORMATION (608) 266-4761

Regular Bill

03 1 071579070005624400000607000000612320150615

# Water Portion

- “base charge” according to meter size.
- “consumption charge” based on gallons used

		www.madisonwater.org • 119 East Olin Avenue • Madison, WI 53713-1431				BILL NUMBER 7455360		
CUSTOMER NAME		SERVICE LOCATION		CUSTOMER NUMBER		ACCOUNT NUMBER		
THOMAS & PEI PEI HEIKKINEN		634 ONDOSSAGON WAY		07157907		00056244		
PRES. READ DATE	PREV. READ DATE	METER #	SERVICE	DAYS	PRES. READ	PREV. READ	USAGE IN GAL	TYPE
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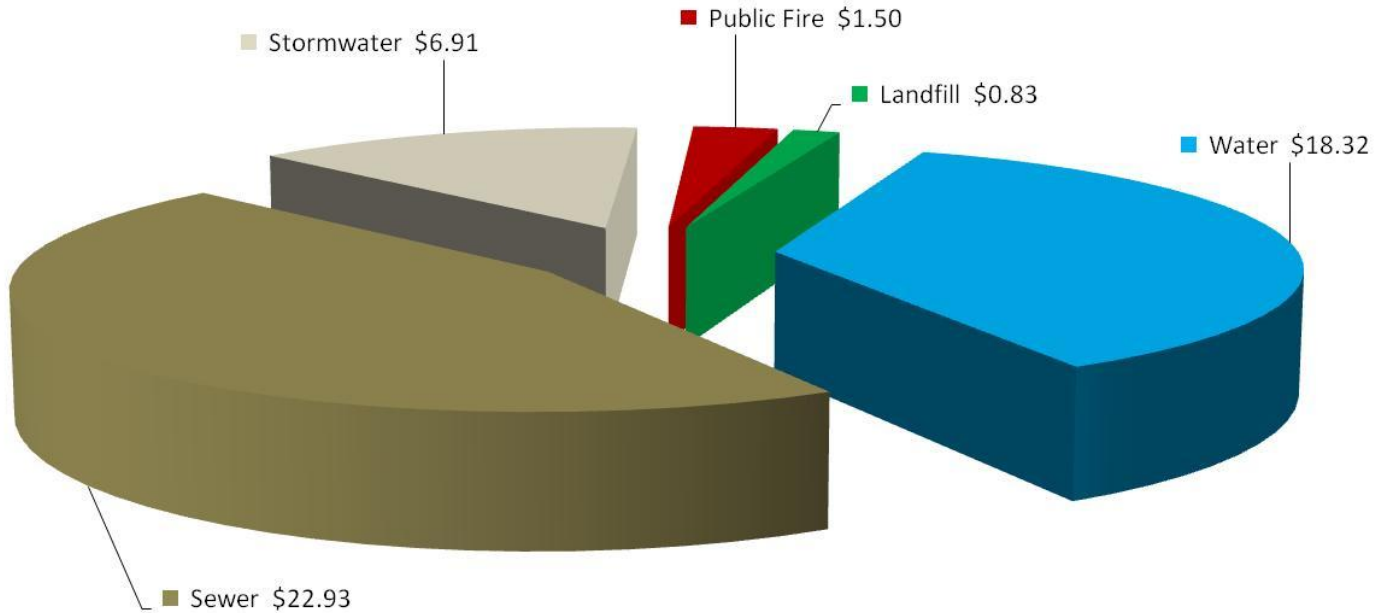
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Water Base Charge 5/8" Meter	4.50														
Water Consumption	5789 gallons at 0.00281 16.27														
	<b>Sub Total Water \$20.77</b>														

# Sewer Portion

- \$12.30 vs. \$4.50 base charge.
- Reflects different ratemaking authority

Sewer		
Sewer Base Charge 5/8" Meter		12.30
Sewer Based On Water Use	5789 gallons at 0.00252	14.61
	<b>Sub Total Sewer</b>	<b>\$26.91</b>

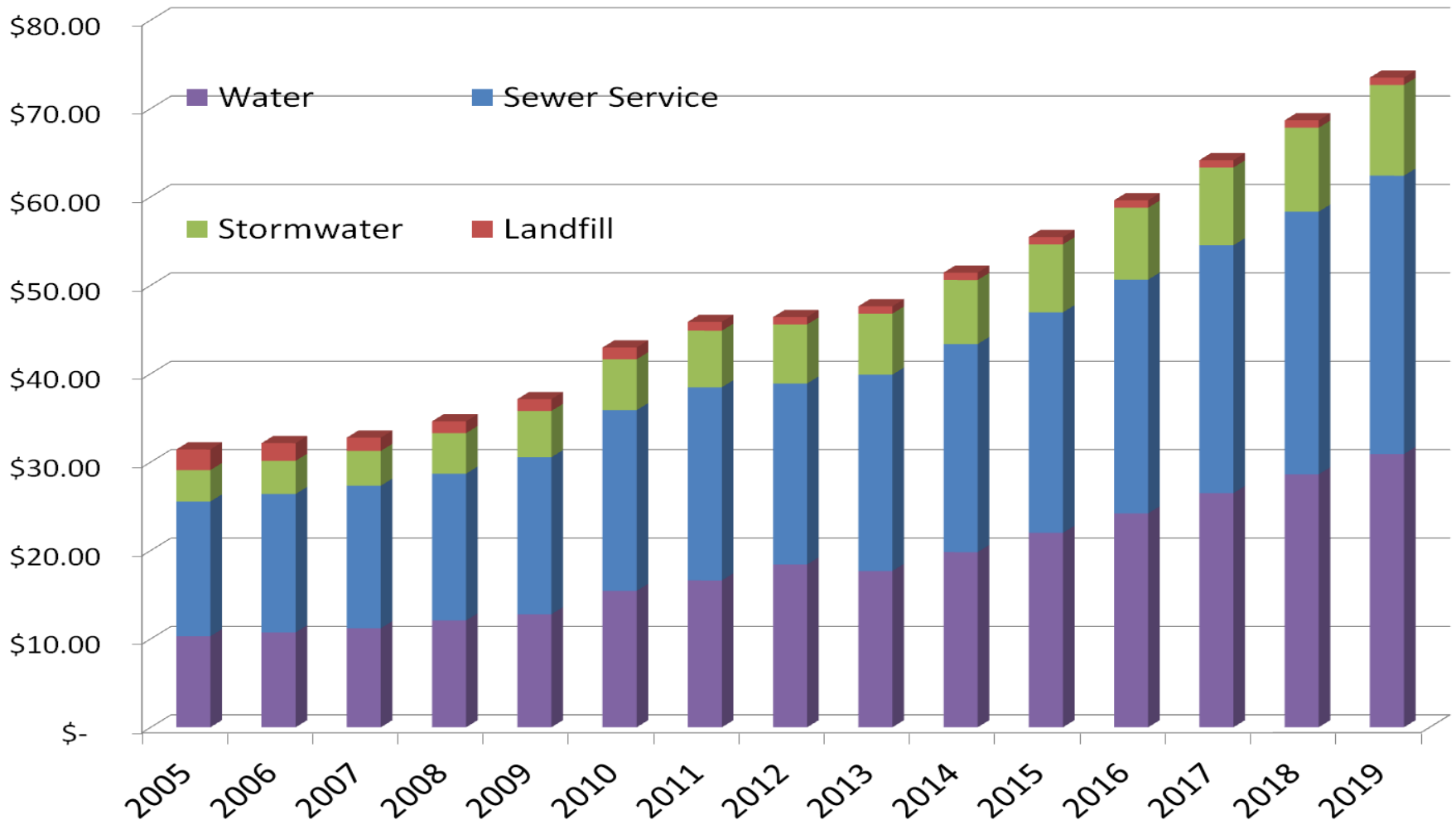
# Madison Municipal Services Bill Average Residential Monthly Costs



Total \$50.48 per month

# Utility Bill History/Forecast

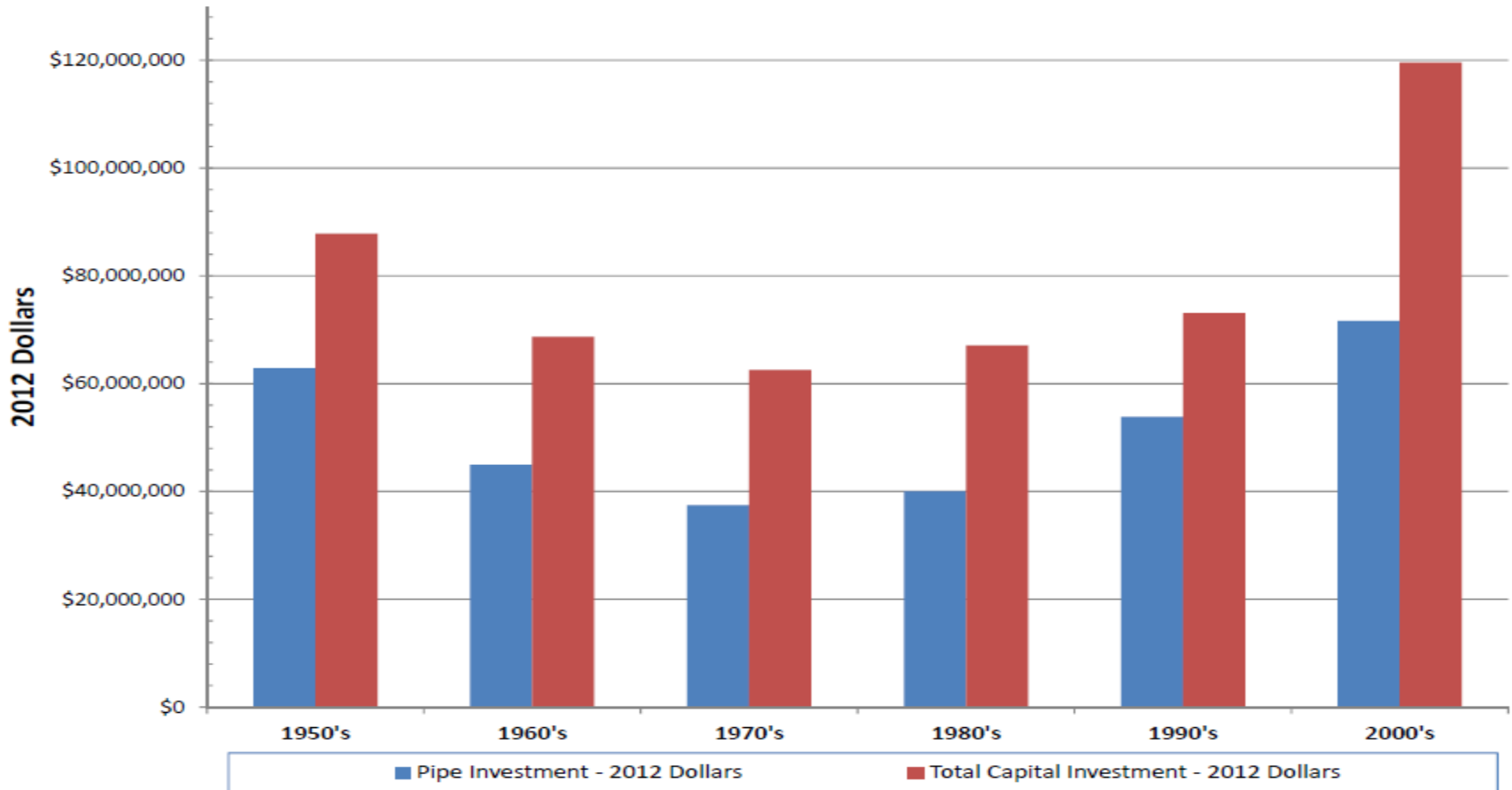
Average Customer Perspective  
*Monthly Billing*



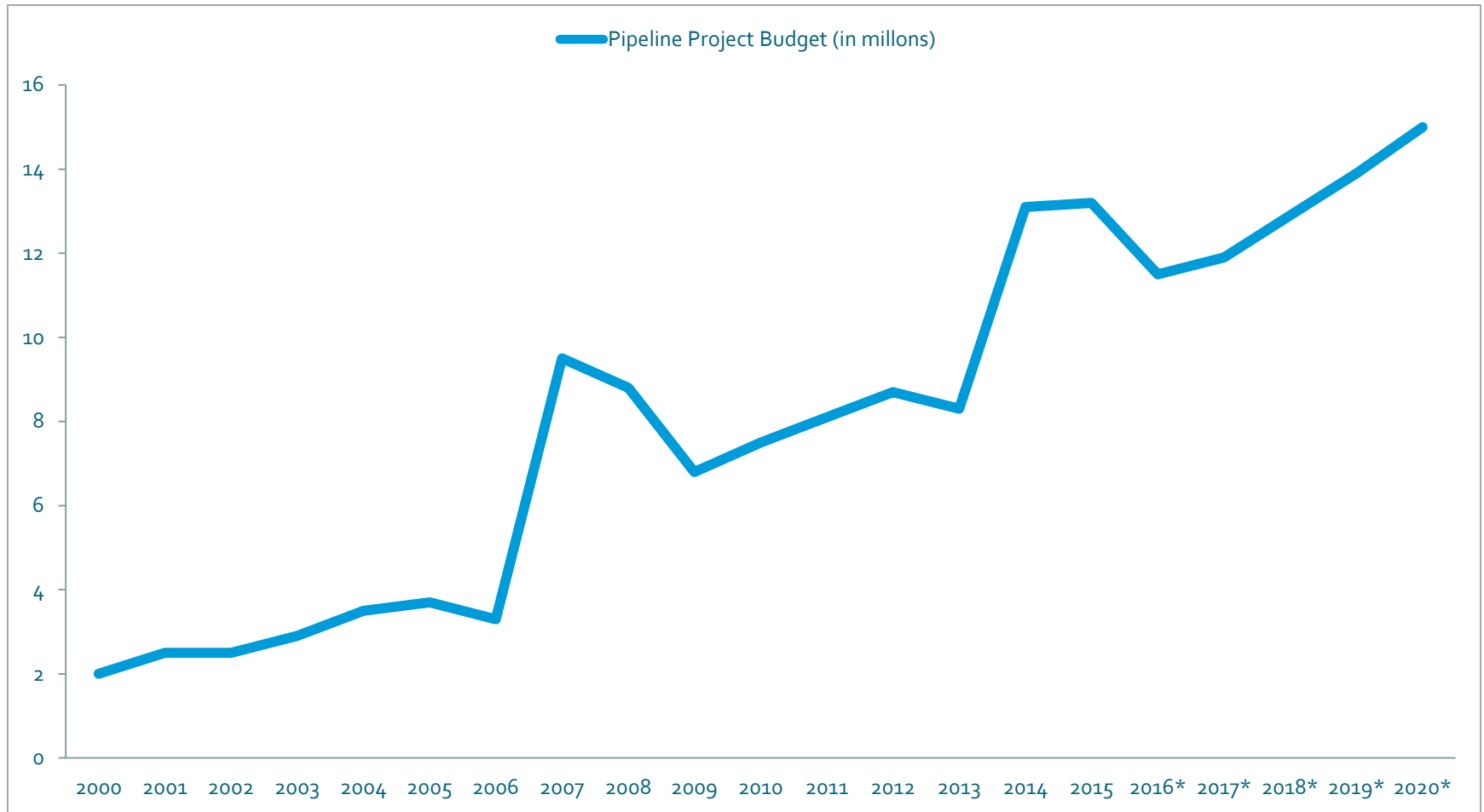


# 2000-2010 -- Rapid Increase in Water Utility Investment

**Madison Water Utility  
Capital Investment by Decade**  
(2012 Dollars)

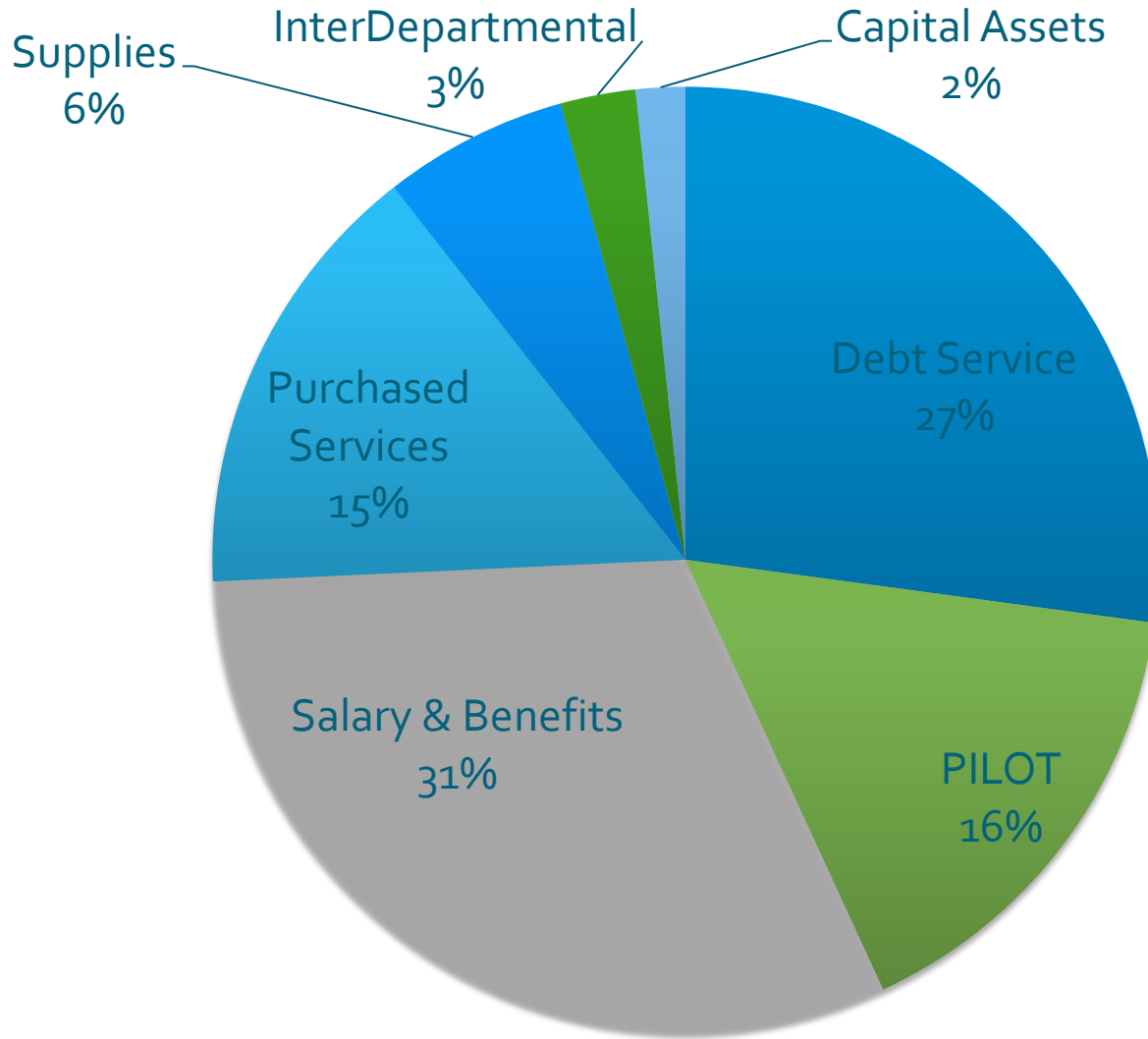


# Rebuilding and renewing



\*projected budget

# Water Rate Allocation



# Ratemaking 101

## Objectives

- Cost Recovery
  - Revenue requirement
    - Operation and Maintenance
    - Depreciation
    - Rate of return on investment
- Equity
  - Similarly situated customers pay the same rate; recover cost of service (related to peak demands)
- NEW – Water Conservation

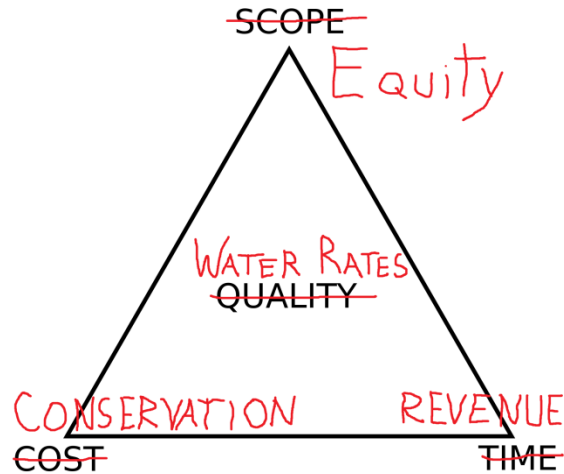
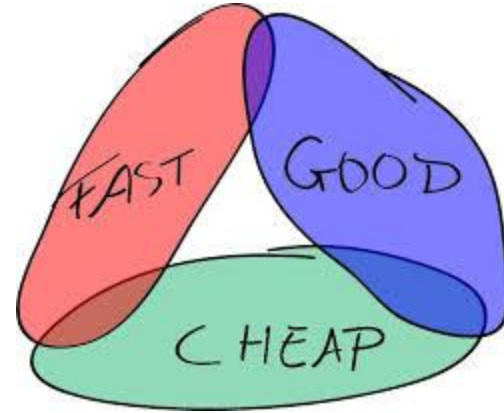
## MWU example: 2015 rate case

- Revenue Required: \$35.8M

Customer Class	Revenue	Rate (\$/1000 gal)
Residential	\$13.7M	See below
Multifamily	\$5.6M	\$2.60
Commercial	\$5.3M	\$2.68
Industrial	\$1.5M	\$2.50
Public Authority	\$4.7M	\$3.31
Fire Protection	\$4.6M	N/A
Wholesale	\$0.3M	varies

Monthly Residential Water Use (Gallons)	Rate (\$/1000 gal)
First 3,000	\$2.84
Next 3,000	\$3.26
Next 3,000	\$3.60
Next 5,000	\$4.50
Over 14,000	\$5.07

# The Conundrum



# Points to Consider

- We charge for water by the gallon, but the majority of the costs are fixed
- Customers really 'rent' water, not buy
- We pay for the delivery service, not the product
- Fire fighting drives system capital requirements
- The public's perception of what is fair conflicts with actual cost-of-service model



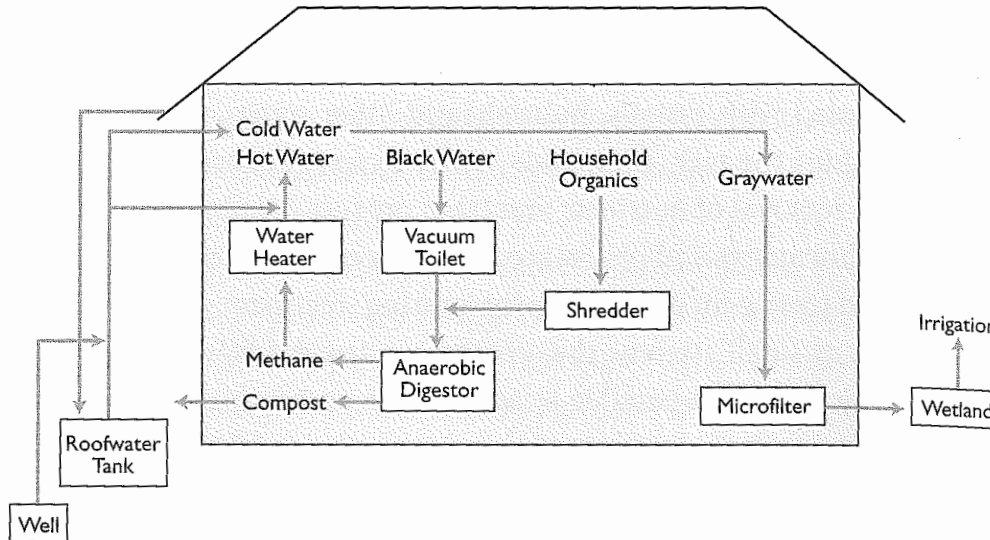
Exploring Integrated 'One' Water Management in light of existing governance models...

## **WATER 3.1 OR 4.0?**

# Beginning a New Era?

- Water 3.1 -- continues the centralized status quo with:
  - Replacement of aging infrastructure
  - Upgrades to deal with emerging contaminants (endocrine disruptors – pharmaceuticals and personal care products), new regulations
  - Capacity expansion for growth and incremental conservation
- Water 4.0 – a radical reimagining of water systems based on decentralization, resource recovery, habitat improvement, cost efficiency:
  - Requires a new way of thinking
  - Greater public understanding
  - ‘One Water’
  - Leadership

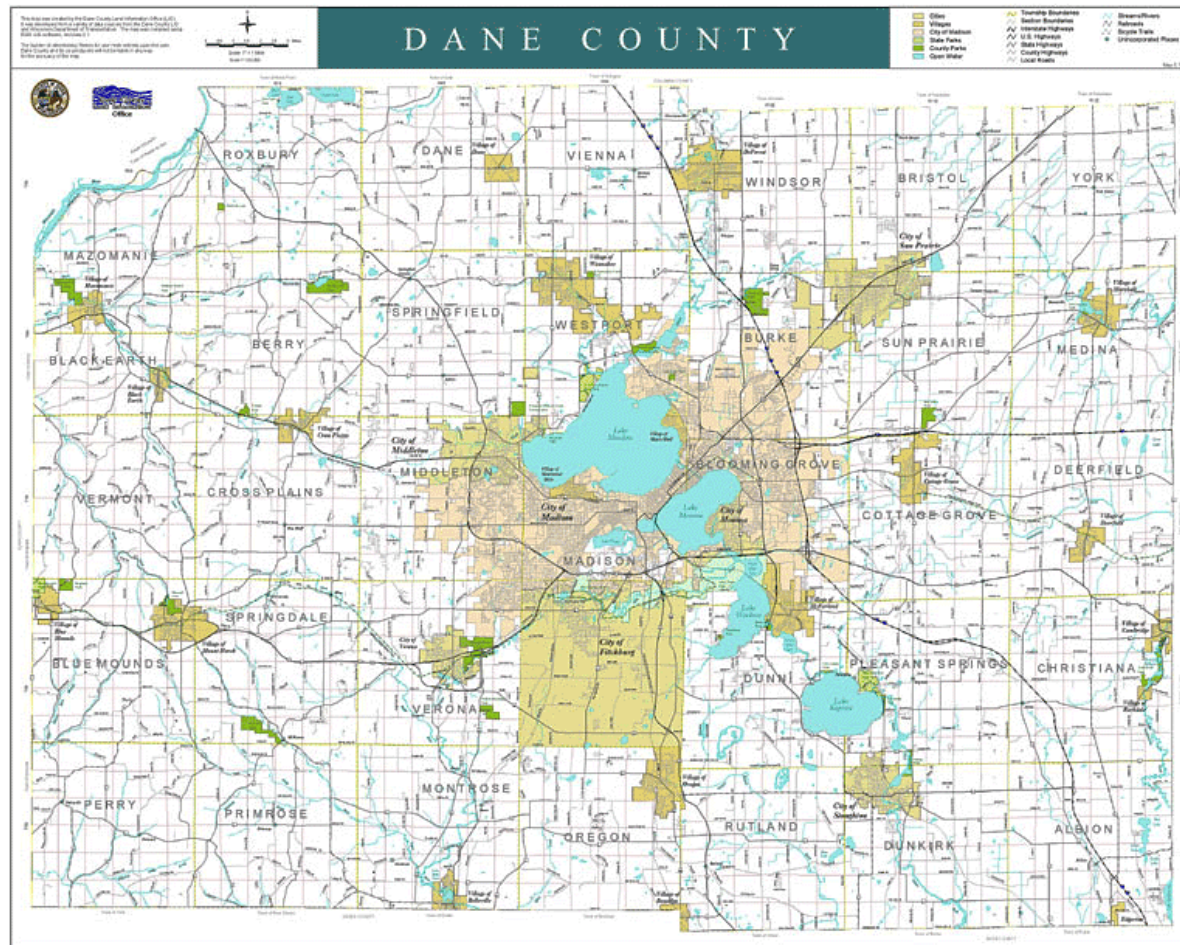
# Water 4.0 in a nutshell



A possible configuration of an off-the-water-grid home. Separating the blackwater from the graywater may provide a more effective means of recovering energy and water from household wastes.

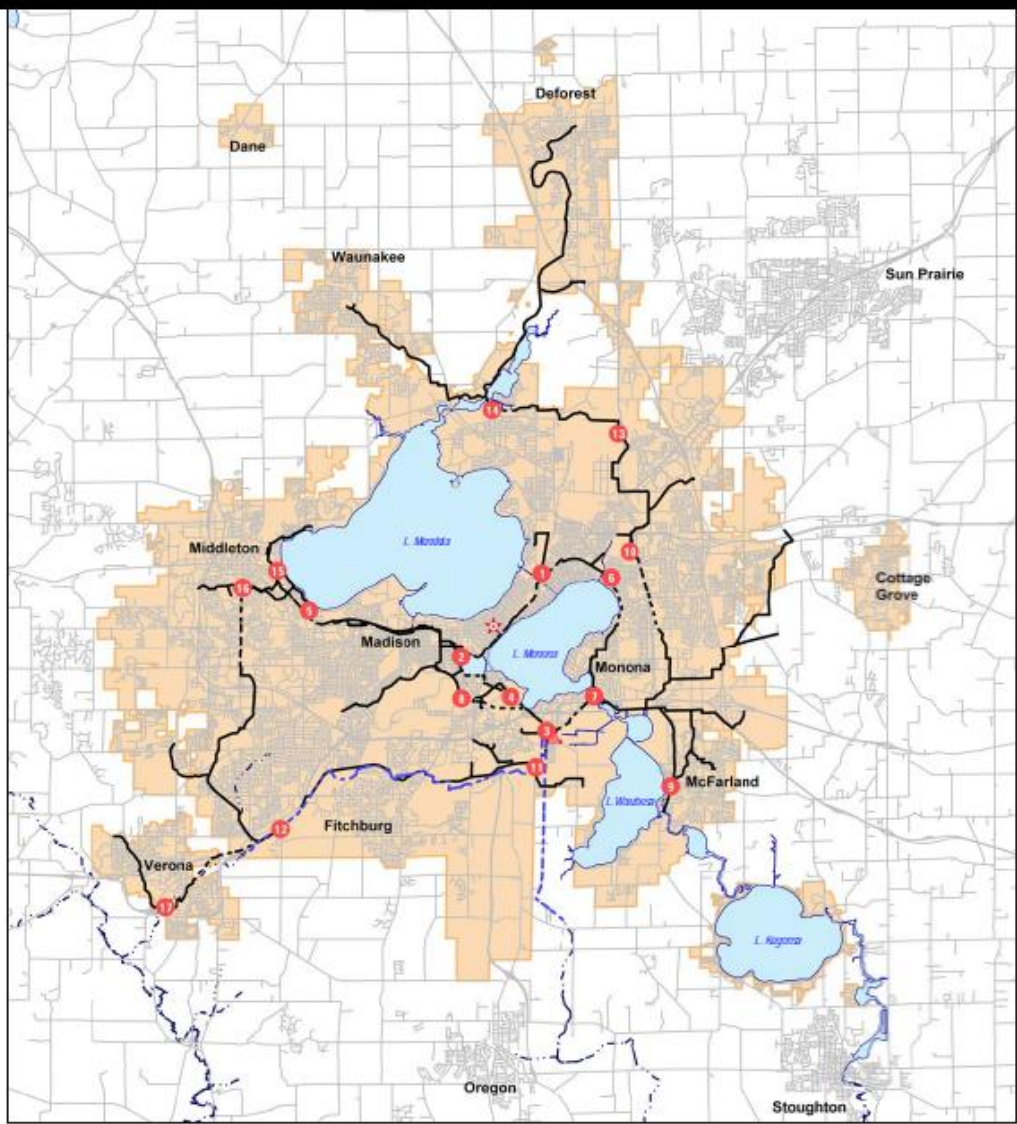
Source: Sedlak, Water 4.0

# How are Water and Wastewater Governed Today?









**Madison Metropolitan Sewerage District**

**Collection System Overview**

Prepared by: JP  
Date: 6/15/11





# A “Modest” Proposal

- Divide the state into integrated Water Management Districts by overlaying watershed boundaries on urbanized areas
- Establish ‘One Water’ regional commissions governed by either:
  - A board appointed by the represented municipalities; or
  - A board elected by members (Co-Op model)
- Adopt building codes that encourage decentralized, localized water management such as:
  - Rainwater harvesting
  - Segregation of gray and black water in new construction (retrofits where feasible)
  - Gray water used for flushing wastes
  - Excess gray water combined with storm water and treated in constructed wetlands
  - Composting of food waste, curbside organics collection
  - Residential and commercial landscapes that don’t require irrigation
- Reduce or eliminate inter-basin water transfers

**QUESTIONS?**