East Side Water Supply Project:

Summary of Work
and
Recommendations to the Board

July 12, 2012

Project Overview

Project Addressing Three Questions on Madison's East Side:

1)How do We Meet Expectations for Water Quality?

2)How do We Meet Expected Future Water Demands?

3)How Can We Better Conserve Water?

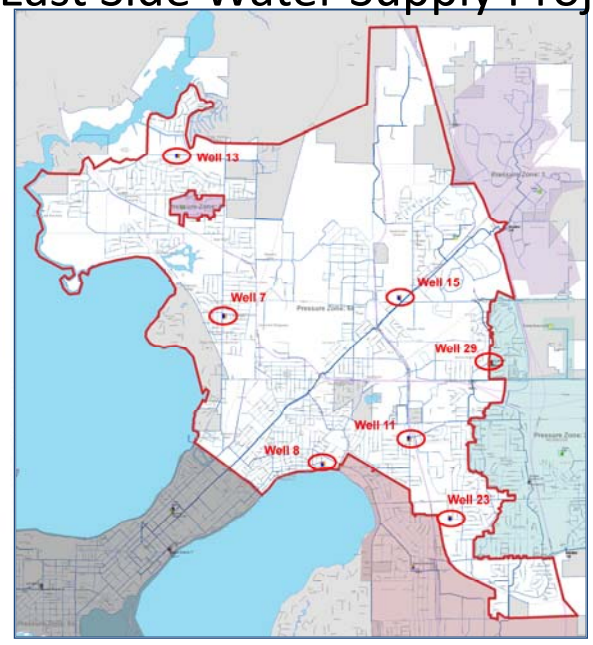
Understanding the East Side Water Supply Project

— What is the "East Side" Area?

—Where Are East Side Wells?

—What are East Side "Issues?"

—How does Water Get to Your House?



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Project Overview - Activities

- Several Concurrent Consulting Team Technical Activities
- CAP Formation
- More than 40 CAP Meetings
- Three Public Meetings

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Project Overview - Draft Consulting Team Products

1. Level of Service Review
2. Water Demand Analysis
3. East Side Water Quality Summary
4. VOC Treatment at Well 15
5. Iron and Manganese Treatment Technology Evaluation for Wells 7 and 8
6. Iron and Manganese Management Options for Wells 7 and 8

Project Overview - CAP Products

1. CAP Advisory for Water Quality
2. CAP Advisory for Water Supply and Demand
3. CAP Advisory for Conservation
4. Overall CAP Project Summary

Level of Service

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Unit Well Planning and Design Criteria

Criteria	Guideline
Well Capacity	For each pressure zone served by a well: • Average run time on unit wells less than 12 hours during the average day demand (ADD). • Total capacity of wells at least 115% of the maximum day demand (MDD). • Firm capacity of wells at least 100% of MDD. For pressure zones 6E and 6W, firm capacity shall be based on two wells out of service
Emergency Operation	Emergency power generation (or engine powered pump capacity) to meet at lease the ADD.

Pressure Planning and Design Criteria Minimum Allowable Pressure

Criteria	Guideline
Minimum Pressure Peak Demands Non-emergency Emergency	 40 psi 20 psi (at any point in the pressure zone)
Preferred Operating Pressure	50 – 90 psi
Maximum Operating Pressure	< 125 psi (everywhere) < 100 psi (expansion areas

Pipeline Planning and Design Criteria

Criteria	Guideline
Maximum Velocity:	
Maximum Hour during MDD	< 5 feet per second (fps)
Fire during MDD	< 10 fps
Hazen-William Roughness Coefficient (C)	
Existing Pipes	125 (1)
High Density Polyethylene (HDPE)	150 (2) (horizontal directional drilling only)
Ductile Iron (new, cement lined)	140 (2)

Notes:
(1) From the 2006 IDSE hydraulic model calibration
(2) WAC NR 811.70

Pipeline Planning and Design Criteria

Criteria	Guideline (minimum diameter)
Pipe Diameter[1]	
General Grid Considerations	16-inch on 1 mile grid 12-inch on 0.5 mile grid (Larger diameter or closer spacing may be required based on use or zoning)
Arterial Collector Roads	12-inch
ICI Areas	10-inch
Residential Areas	8-inch (6-inch may be permitted for residential dead-end lines that are less than 200 feet in length with a fire flow requirement of less than 1000 gpm).
Pipe Material	Ductile Iron Class 52 or greater[2]

Notes:
(1) MWU Planning Guidelines
(2) HDPE is permitted for directional drilling or slip lining only (minimum pressure class 160 psi).

Booster Pump Station and Storage Planning and Design Criteria

Criteria	Guideline
Booster Pump Stations	
Capacity	Firm Capacity (largest pump out of service) able to meet either: • MDD for pressure zone with equalization storage
Storage	
Volume	Every pressure zone be able to meet both of the following: • 12 hour supply at ADD • Fire flow plus equalization storage
Equalization storage	Volume required to deliver difference between MH demand and MDD for each pressure zone (normally 15 -30% of MDD)
Fire storage	Fire flow goal times fire duration (refer to Fire Fighting Criteria)

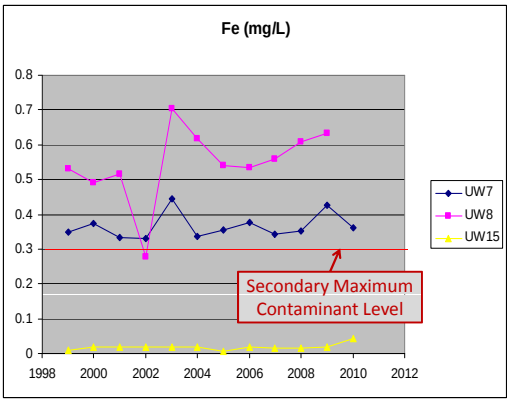
Fire Fighting Planning and Design Criteria (1)

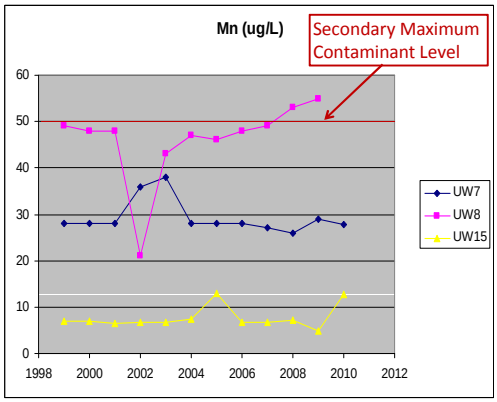
Land Use	Fire Flow Goal (gpm)	Fire Duration (hours)(2)	Hydrant Spacing (feet)
Low Density Residential (LDR) Neighborhood Planning Area (NPA) Traditional Neighborhood Development (TND)	1,000	2	400
Medium Density Residential (MDR) Neighborhood Mixed Use (NMU)	2,000	2	375
High Density Residential (HDR) Community Mixed Use (CMU) General Commercial (GC)	2,500	2	360
Regional Mixed Use (RMU) Downtown (D) Regional Commercial (RC) Campus (C) Employment (E) Airport (SP) Special Institutional (SI) Industrial (I)	3,500	3	300

Notes:
(1) Fire flow in addition to MDD.
(2) *Distribution System Requirements for Fire Protection*, AWWA M31, 1989

Water Quality

Water Quality – Iron (Fe) and Manganese (Mn) at Wells 7 and 8





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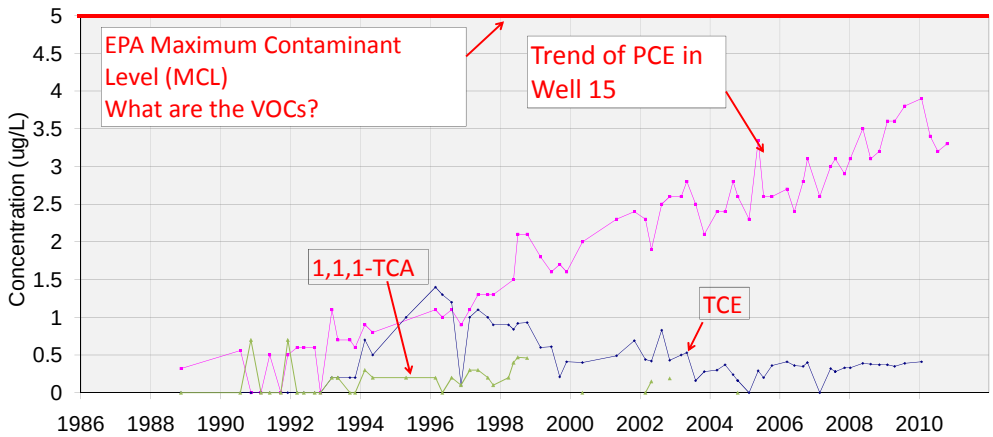
Water Quality - Volatile Organic Compounds (VOCs) at Well 15



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- PCE = Perchloroethene
- TCE = Trichloroethene

What Would an Iron and Manganese Well Head Treatment Look Like at Wells 7 and 8?

Outside View of Iron and Manganese Treatment System at Well 29

Iron and Manganese Filter at Well 29

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Options for Well 15

- Treat the Groundwater
  - Air Stripping
  - Granular Activated Carbon
  - Evaluate Radium Impacts on treatment systems
- Reduce Groundwater Contamination
  - Eliminate the Source
  - Extend the Well Casing

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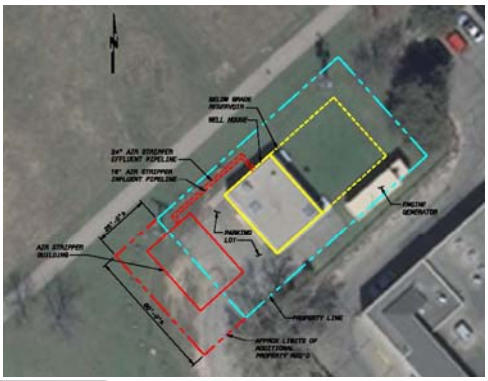
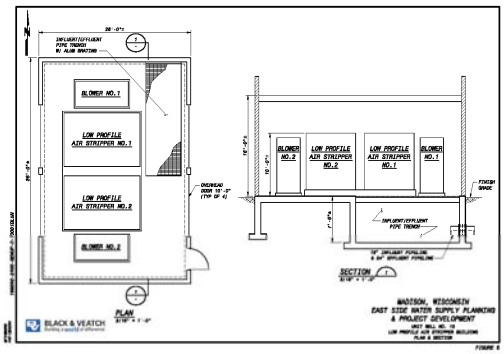
Conceptual Treatment System at Well 15

A Treatment System Would Approximately Double the Size of the Existing Well 15 Building



Approximate Floor Plan and Section View for VOC Treatment



Building Layouts and Sizing are Preliminary

Recommendation No. 1

Implement Treatment at Well 15

- Increasing VOC concentrations require active treatment
- Source water mitigation
  - Finding and addressing the source of contamination is risky and may not sufficiently reduce VOC levels
  - Extending the well screen may not adequately reduce VOC
- Air stripping most economical technology for VOC removal.
- Radium treatment will be evaluated and added if necessary
- Cost - $2.8 million for design and construction

Recommendation No. 2

Implement Well Head Treatment at Well 8 for Iron and Manganese Control

- Treatment is be required to consistently meet secondary water quality standards.
- Wellhead treatment is more cost effective than regional treatment or mixing water from other wells.
- Cost - $6 million for design, construction, and administrative costs

Recommendation No. 3

Implement Well Head Treatment at Well 7 for Iron and Manganese Control

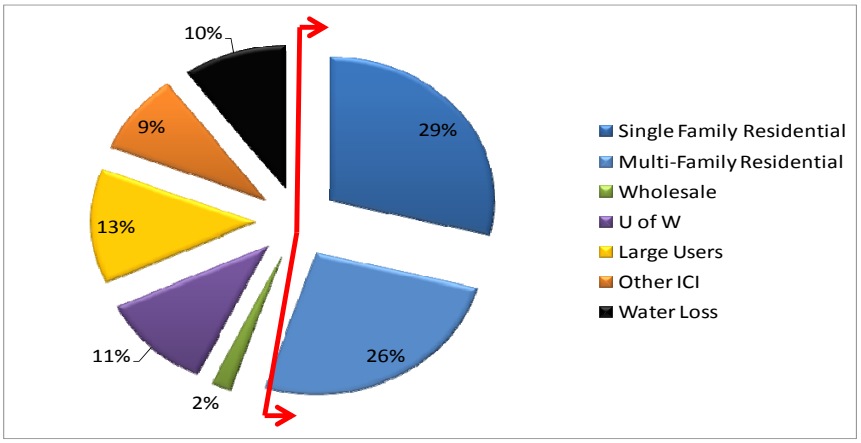
- Treatment is be required to consistently meet secondary water quality standards.
- Wellhead treatment is more cost effective than regional treatment or mixing water from other wells.
- Cost - $6 million for design, construction, and administrative costs

Water Demand

Madison's Existing City Wide Water Use

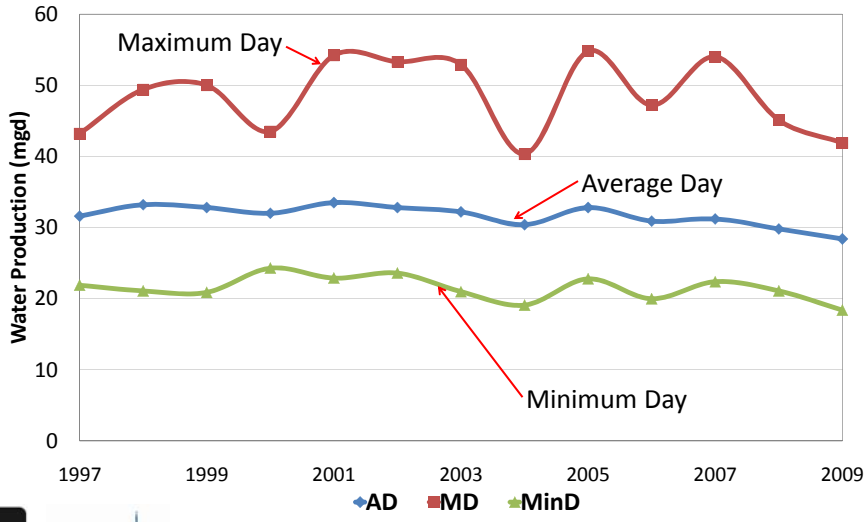
Who Uses our Water?

Residential Water Use



-55% of Madison's Water is for Residential Use
-Wholesale is Water Sold to Other Communities

How Much do We Use City Wide?



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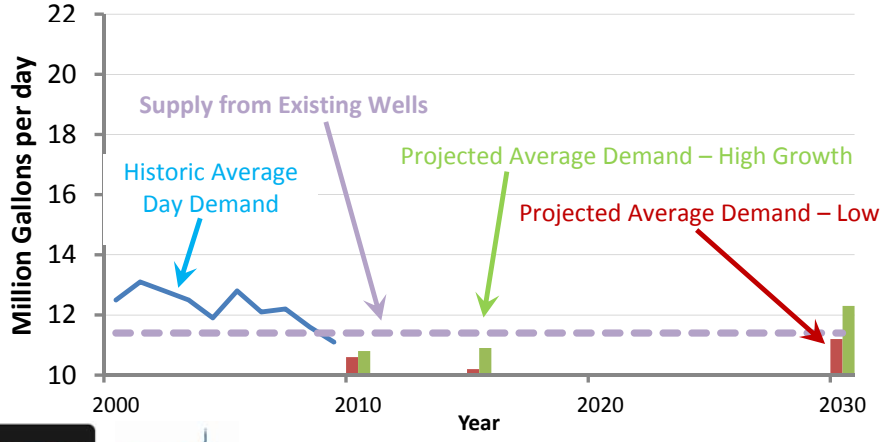
Does the Existing East Side Water Supply Meet Demand?

Existing Water Supply Can Meet <u>Current</u> "Average Day" Demands



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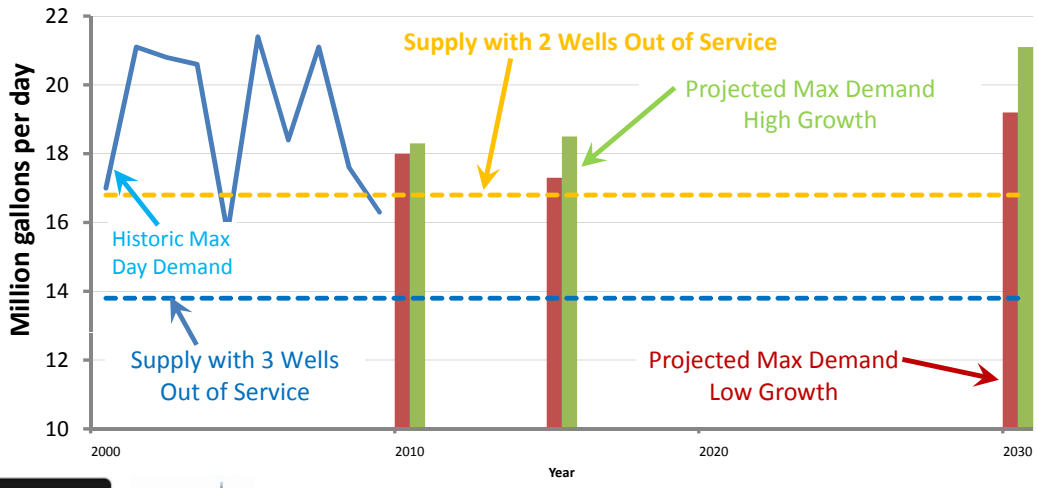
Existing Water Supply Cannot Meet "Maximum Day" Demands



Note – Madison Water Utility Policy is to be Able to Meet Demand with 2 Wells Out of Service

Recommendation No. 4

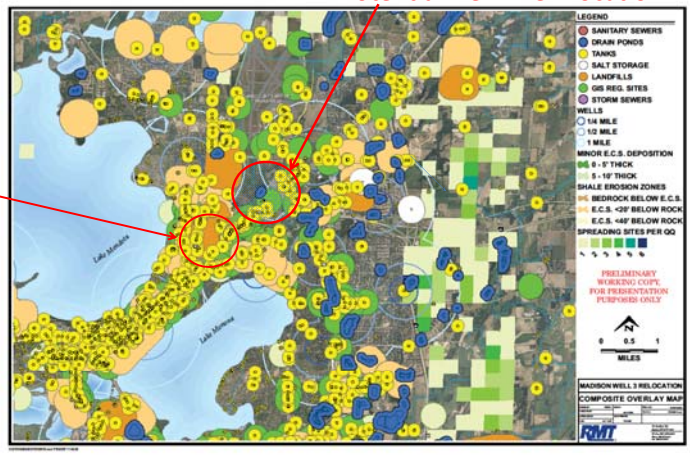
Replace Abandoned Well No. 3

- Basis
  - MWU Level of Service requires that maximum day demand be met with two wells out of service
  - Cannot be met with the existing system
  - Loss of system capacity from Abandoned Well 3 has not be replaced
  - Replacing Well 3 would add needed redundancy to the system.
- Cost - $8 million for design, property acquisition and construction.

Where Would New Well Be Located?

Potential New Well Location

Well 3 was Abandoned and Not Replaced



New Well Needs to be Located in an Area where Groundwater is Unlikely to be Impacted by Contamination

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Water Conservation

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City of Madison Water Conservation and Sustainability Plan (2006)

Primary Goal: Maintain the current annual rate of groundwater pumping in existing areas.

Secondary Goals:

- Reduce residential water use 20% by 2020 (gallons per capita per day)
- Promote commercial conservation through rebate promotions and education
- Develop a water conservation plan for each industrial customer
- Enact water savings programs at each government building

Questions?