

# WAUKESHA WATER UTILITY

# THE DEVELOPMENT OF A New Water Supply

March/April, 2012



# MEETING FORMAT

- Background on the Waukesha Water Utility
- How Did We Get to This Point?
- What Alternatives Have Been Evaluated?
- What Is the Schedule Moving Forward?
- Questions????



# BACKGROUND ON THE WAUKESHA WATER UTILITY



# Our Current Water System

- •8 deep wells (87%)
- 3 shallow wells (13%)
- 12 Storage tanks
- 10 pump stations
- 337 miles of pipe
- Population Served
   70,718



# MEETINGS AND TRANSPARENCY

- Water Utility Commission
  - •60+ Public Meetings
- Common Council
  - •9 Open Meetings
- Open Houses
  - •4 Open Houses
- Comments on Application
  - Over 200 pages of comments received
- Community Groups
- Neighborhood Meetings
- Web Site Access to All Application Materials:
  - www.ci.waukesha.wi.us/982



# HOW DID WE GET TO THIS POINT?



# OUR CURRENT WATER SUPPLY





The following series of slides shows the simulated history of groundwater pumping and groundwater levels in southeast Wisconsin from the late 1800s through the

present

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Circle areas proportional to pumping rate (cubic ft/day)

100,000

Water Levels in the Sandstone Aquifer (feet above sea level)

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400.0 300.0

200.0

Well Locations and Pumping Rates

Shallow

Deep

Pre-1864

Waukesha Water Utility





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Deep

0

Circle areas proportional to pumping rate (cubic ft/day)

0

100,000







Well Locations and Pumping Rates
Shallow Deep

Waukesha Water Utility









![](_page_18_Figure_0.jpeg)

![](_page_19_Figure_0.jpeg)

![](_page_20_Figure_0.jpeg)

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Circle areas proportional to pumping rate (cubic ft/day)

100,000

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Deep

![](_page_23_Figure_0.jpeg)

![](_page_24_Figure_0.jpeg)

![](_page_25_Figure_0.jpeg)

300.0

200.0

The Milwaukee/Chicago cone of depression is one of the largest areas of groundwater drawdown in North America  $\bigcirc$ O 0 000 g  $\odot$ 60  $\bigcirc$ 

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Circle areas

proportional to pumping rate (cubic ft/day)

100,000

Well Locations and Pumping Rates Shallow Deep

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2010-2020

Waukesha Water Utility

• 8

# LEGISLATIVE AND LEGAL IMPACTS

- Act 310 Groundwater Quantity Act (2003)
  - Groundwater Advisory Committee (Completed 2007)
- Great Lakes Compact
  - Wisconsin Implementation Legislation
- Lake Beulah Management District
  - State Supreme Court Decision
    - DNR Must consider impacts when issuing high capacity well permits
- Shallow Test Wells
  - Town of Waukesha Action
- All New Water Supply Alternatives are Outside the Current City Limits

![](_page_26_Picture_11.jpeg)

# OUR NEED FOR WATER

- Deep groundwater levels are declining (over 600 ft below ground) and capacity decreasing.
- Deep groundwater water quality is getting worse (High radium, salts). Court order to comply with radium by 2018.
- Deep groundwater wells are old (30 to 60 years). Several are no longer usable.
- Deep groundwater is not sustainable for the long-term.
- Shallow wells treat for iron/manganese, and recently arsenic has been discovered.
- Pumping shallow wells adversely impact wetlands and streams.
- Conservation has reduced water demand, but Waukesha needs more water for the future.

![](_page_27_Figure_8.jpeg)

# WHAT ALTERNATIVES HAVE BEEN EVALUATED?

![](_page_28_Picture_1.jpeg)

# Water Supply Alternatives Screening

#### **14 Alternatives Considered**

- **Deep Confined Aquifer**
- **Deep Unconfined Aquifer**
- **Shallow Groundwater**
- **Dolomite Aquifer**
- **Fox River**
- **Rock River**
- Lake Michigan
- Dam On The Fox or Rock River
- Waukesha Quarry
- Waukesha Springs
- **Pewaukee Lake**
- **Milwaukee River**
- **Wastewater Reuse**

#### Conservation

![](_page_29_Picture_16.jpeg)

Initial screening for water quantity or major environmental and regulatory issues. Eliminated 9 alternatives

#### 5 Alternatives after Initial Screening

Lake Michigan

**Shallow Aquifer** 

Deep Confined Aquifer

Deep Unconfined Aquifer

Shallow/Deep Aquifer Eliminated 2 alternatives based on adverse environmental impact to Great Lakes ecosystem unsustainability, public heath, and implementability.

#### Alternatives Evaluated Further

Shallow/Deep Aquifer

Shallow Aquifer and RBI

Unconfined Deep Aquifer

**Multiple Source** 

Lake Michigan/ Shallow Aquifer Lake Michigan

WGLA\_119

## Water Supply Alternative 1 – Deep and Shallow Aquifer

## (\$189 MILLION)

- Continued use of deep wells with additional treatment.
- Develop shallow wells south of Waukesha near Vernon Marsh
- New groundwater treatment plants

![](_page_30_Figure_5.jpeg)

## Shallow/ Deep Combination 6.4 MGD Total Shallow (4.5 MGD Deep) – 1.9 MGD Lathers, 1.1 MGD Existing Wells, 3.4 MGD New Wells

![](_page_31_Figure_1.jpeg)

- Maximum Drawdown exceeds 50 feet
- Baseflow Reduction to Fox River greater than 140%
- Baseflow
   Reduction to
   Pebble Brook
   greater than 60%
- Pebble Brook is designated a trout stream and is given special protections by Wisconsin Law

## Water Supply Alternative 2 – Shallow Aquifer and RBI

### \$184 MILLION

- Discontinue use of deep wells
- Add shallow wellfield South of Waukesha near Vernon Marsh and along the Fox River
- New central treatment plant

![](_page_32_Figure_5.jpeg)

### Shallow/RBI Combination 10.9 MGD Total – 3 MGD Lathers, 1.2 MGD Existing Wells, 2.2 MGD New Wells, 4.5 MGD Fox River Alluvium

![](_page_33_Figure_1.jpeg)

- Maximum
   Drawdown exceeds
   100 feet
- Baseflow Reduction to Fox River greater than 340%
- Baseflow Reduction to Pebble Brook greater than 50%
- Pebble Brook is designated a trout stream and is given special protections by Wisconsin Law
- Vernon Marsh and Mill Brook are significantly impacted

#### Shallow Well Alternative 10.9 MGD Total – 1.95 MGD Lathers, 1.2 MGD Existing Wells, 7.8 MGD New Wells

![](_page_34_Figure_1.jpeg)

- Maximum
   Drawdown exceeds
   55 feet
- Baseflow Reduction to Fox River greater than 150%
- Baseflow
   Reduction to
   Pebble Brook
   greater than 80%
- Pebble Brook is designated a trout stream and is given special protections by Wisconsin Law
- Vernon Marsh and Mill Brook are significantly impacted

## WATER SUPPLY ALTERNATIVE 3 – UNCONFINED DEEP AQUIFER

## \$228 MILLION

- Supply pipeline from Unconfined Aquifer West of Waukesha
- New water pump station
- New water supply main
- New water treatment plant
- New distribution system infrastructure

![](_page_35_Figure_7.jpeg)

![](_page_35_Picture_8.jpeg)

## Western Unconfined Aquifer 10 MGD from 3 High Capacity Wells Deep Aquifer Impacts

![](_page_36_Figure_1.jpeg)

## Western Unconfined Aquifer 10 MGD from 3 High Capacity Wells Shallow Aquifer Impacts

![](_page_37_Figure_1.jpeg)

## Western Unconfined Aquifer 10 MGD from 3 High Capacity Wells Deep Aquifer Impacts

![](_page_38_Figure_1.jpeg)

## Western Unconfined Aquifer 10 MGD from 3 High Capacity Wells Shallow Aquifer Impacts

![](_page_39_Figure_1.jpeg)

## WATER SUPPLY Alternative 4 – Multiple Source

## \$319 MILLION

- New treatment at existing deep aquifer wells
- New treatment for quarry water from multiple quarries
- New unconfined deep aquifer wells
- New solarium dolomite wells
- Add shallow wellfield South of Waukesha near Vernon Marsh and along the Fox River

![](_page_40_Figure_7.jpeg)

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## WATER SUPPLY ALTERNATIVE 5 – LAKE MICHIGAN AND SHALLOW AQUIFER

- Supply pipeline from Lake Michigan supplier to Waukesha
- New water pump station
- Return flow pump station at Waukesha wastewater plant
- Return flow pipeline
- Add shallow wellfield South of Waukesha near Vernon Marsh and along the Fox River
- New central treatment plant

![](_page_41_Figure_7.jpeg)

## Water Supply Alternative 6 – Lake Michigan

## \$164 MILLION

- Supply pipeline from Lake Michigan supplier to Waukesha
- New water pump station
- Return flow pump station at Waukesha wastewater plant
- Return flow pipeline

![](_page_42_Figure_6.jpeg)

#### Municipalities Within the Waukesha Water Service Area

![](_page_43_Figure_1.jpeg)

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## **Return Flow Location**

![](_page_44_Figure_1.jpeg)

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# Existing Base Flow in Underwood Creek ~ 3 cfs

![](_page_45_Picture_1.jpeg)

![](_page_45_Picture_2.jpeg)

## Underwood Creek - Existing Base Flow with additional Return Flow ~ 23 cfs

![](_page_46_Picture_1.jpeg)

![](_page_46_Picture_2.jpeg)

# WATER SUPPLY EVALUATION CRITERIA

#### Summary of Water Supply Alternatives Evaluation

	Major Criteria				
Water Supply Alternatives	Environmental	Public Health	Long-Term Sustainability	Implementability	
1. Deep and shallow aquifers		$\bullet$	$\bullet$	•	
2. Shallow aquifer and riverbank inducement	lacksquare	$\bullet$	$\bullet$	•	
3. Unconfined deep aquifer	igodol	$\odot$	$\bullet$	•	
4. Multiple sources	igodol	ightarrow	ightarrow	•	
5. Lake Michigan and shallow aquifer	ullet	0	0	•	
6. Lake Michigan with return flow to Underwood Creek	$\odot$	$\odot$	0	0	

- No adverse impact 0  $\odot$
- Moderate adverse impact
- Minor adverse impact •
- Significant adverse impact

![](_page_47_Picture_7.jpeg)

# SUMMARY OF WATER SUPPLY COSTS

#### Water Supply Alternative Cost Estimates

Water Supply Alternative	Capital Costª (\$ million)	Annual Operation/Maintenance Cost (\$ million)	20 yr Present Worth Cost (\$ million, 6%)	50 yr Present Worth Cost (\$ million, 6%)
Deep and shallow aquifers	189	7.2	272	302
Shallow aquifer and riverbank inducement	184	7.4	269	301
Unconfined deep aquifer	228	6.6	304	332
Multiple sources	319	7.9	410	444
Lake Michigan and shallow aquifer	238	7.5	324	356
Lake Michigan with return flow to Underwood Creek	164	6.2	235	262

<sup>a</sup>Includes direct construction cost, contractor administrative costs (insurance, bonds, supervision etc), 25% contingency, and costs for permitting, legal, engineering, administrative.

![](_page_48_Picture_4.jpeg)

# **Monthly Rate Comparison**

![](_page_49_Figure_1.jpeg)

Cost per Month

# Public Service Commission Oversight

- Approves Construction Projects
- Sets Water Rates
- Determines Service and Billing Procedures
- Stipulates Record Keeping Requirements
- Sets Engineering Standards
- Requires Meter Accuracy
- Establishes Standards for Water Quality and Adequacy of Supply

![](_page_50_Picture_8.jpeg)

## GROUNDWATER LEAVES THE REGION AND GOES TO THE OCEAN.

![](_page_51_Figure_1.jpeg)

![](_page_51_Picture_2.jpeg)

# LAKE MICHIGAN WATER IS RECYCLED AND IS SUSTAINABLE

![](_page_52_Figure_1.jpeg)

# WHAT IS THE SCHEDULE MOVING FORWARD?

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# TIMELINE

#### **Next Steps**

![](_page_54_Figure_2.jpeg)

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# QUESTIONS?

![](_page_55_Picture_1.jpeg)