



PNWS-AWWA
2011 SPRING CONFERENCE
May 5, 2011
EB 1, 7:30 am

SHERWOOD'S JOURNEY DEVELOPING A CONTROVERSIAL WATER SUPPLY

Presented by
Chris Uber, P.E. Senior Vice President,
Murray, Smith & Associates, Inc.



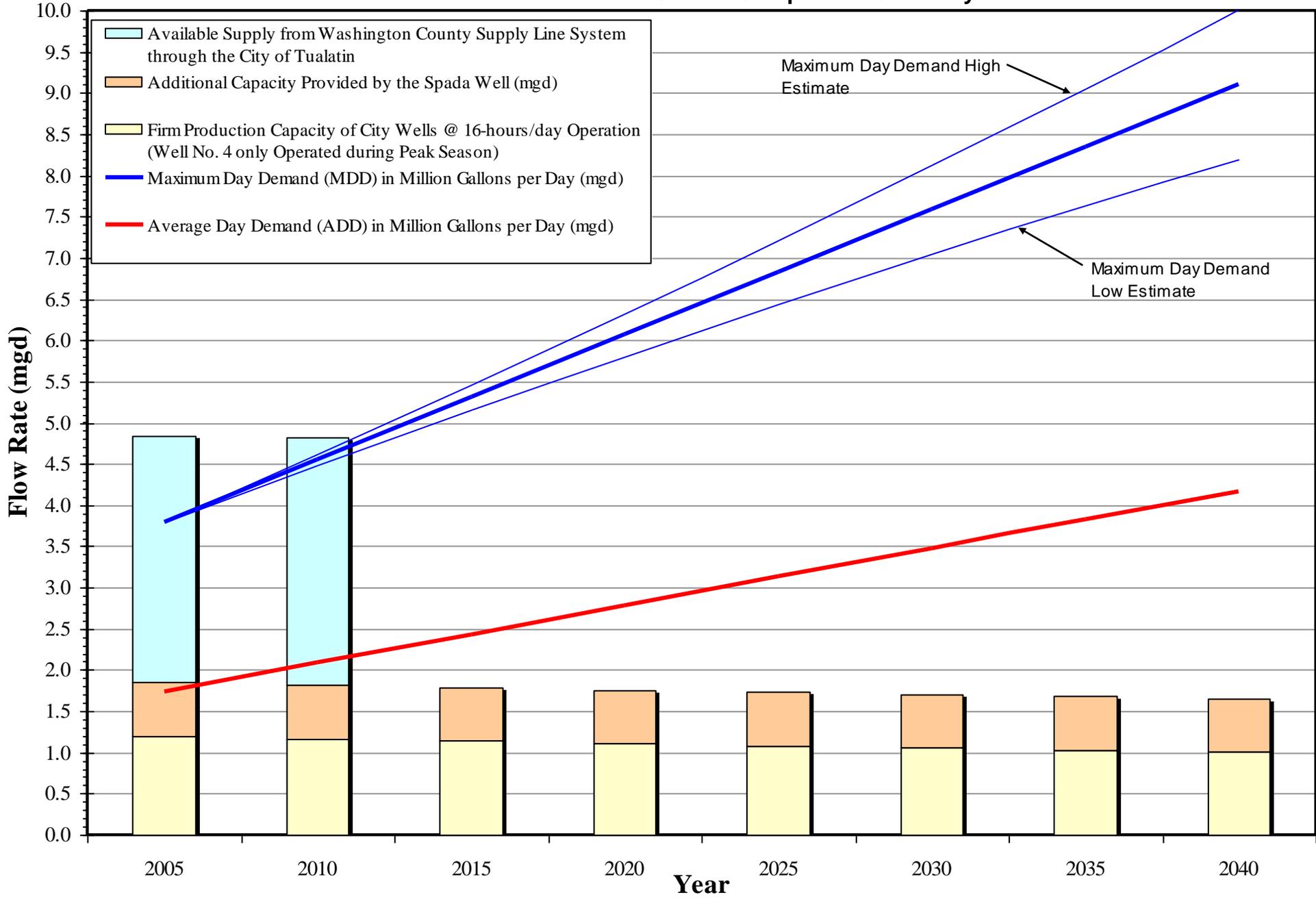
MSA Murray, Smith & Associates, Inc.
Engineers/Planners

City of Sherwood –
Settled in 1850s
Current Population: 16,000
Current City area: 4.5 square miles
Growth Oriented Community

Willamette River

- Water supply from 4 groundwater wells in Basalt formation aquifers**
- Aquifers showing declining water levels over recent decades**
- Additional surplus supply from Tualatin/Sherwood supply line constructed in the 1990s**
- With population growth comes water demand growth**
- In 2004 the City began a water system master planning project that included a follow-on supply source evaluation**
- Existing Wells**
 - ✓ Capacity of existing wells: 1.25 mgd pumping 16 hours a day
 - ✓ Slim possibilities for drilling/finding new wells with long-term sustainable yields
 - ✓ Limited prospect for continued long-term use of groundwater supplies
- Purchase of Short-term water from others**
 - ✓ City of Portland water through Tualatin
 - ✓ Surplus water supply agreement with Tualatin Valley Water District
- Bottom Line – The City needed a new long-term supply source**

City of Sherwood Water Demand and Available Source Comparison Summary

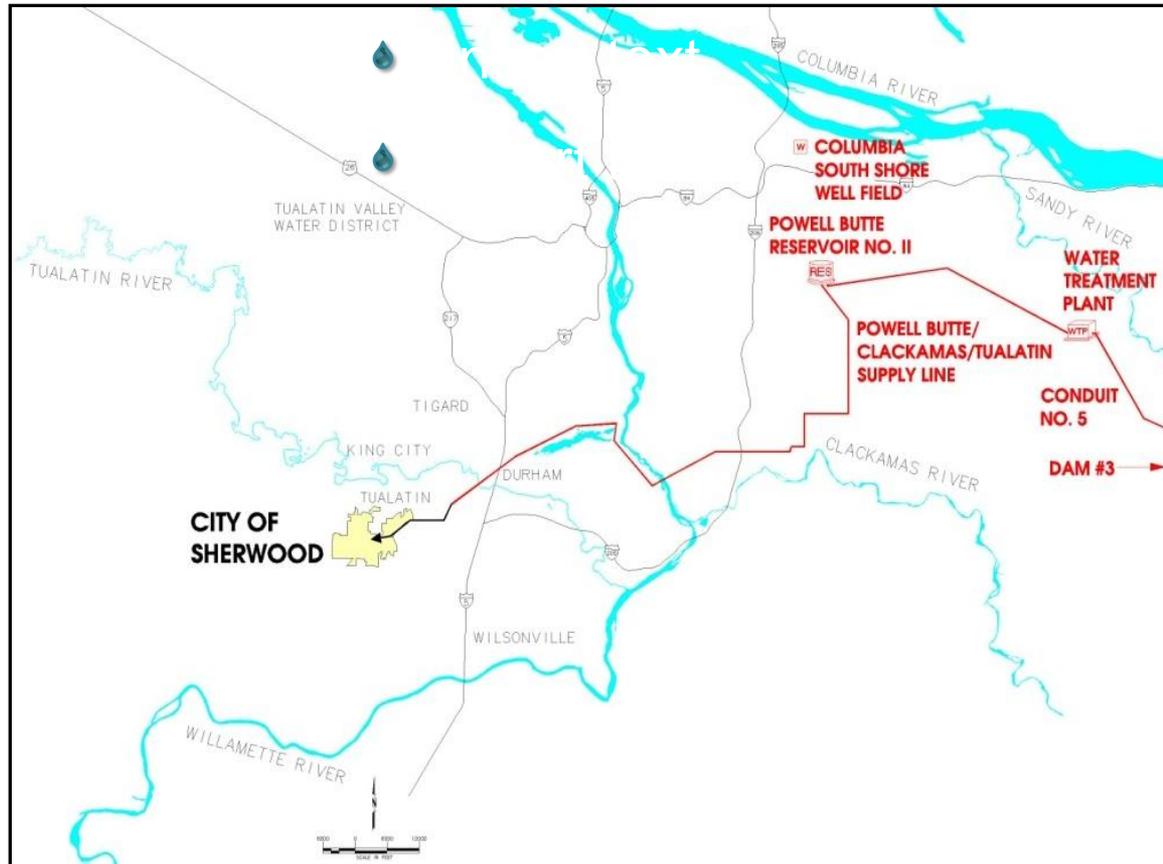


Supply Options



2004: City Council began considering new supply options

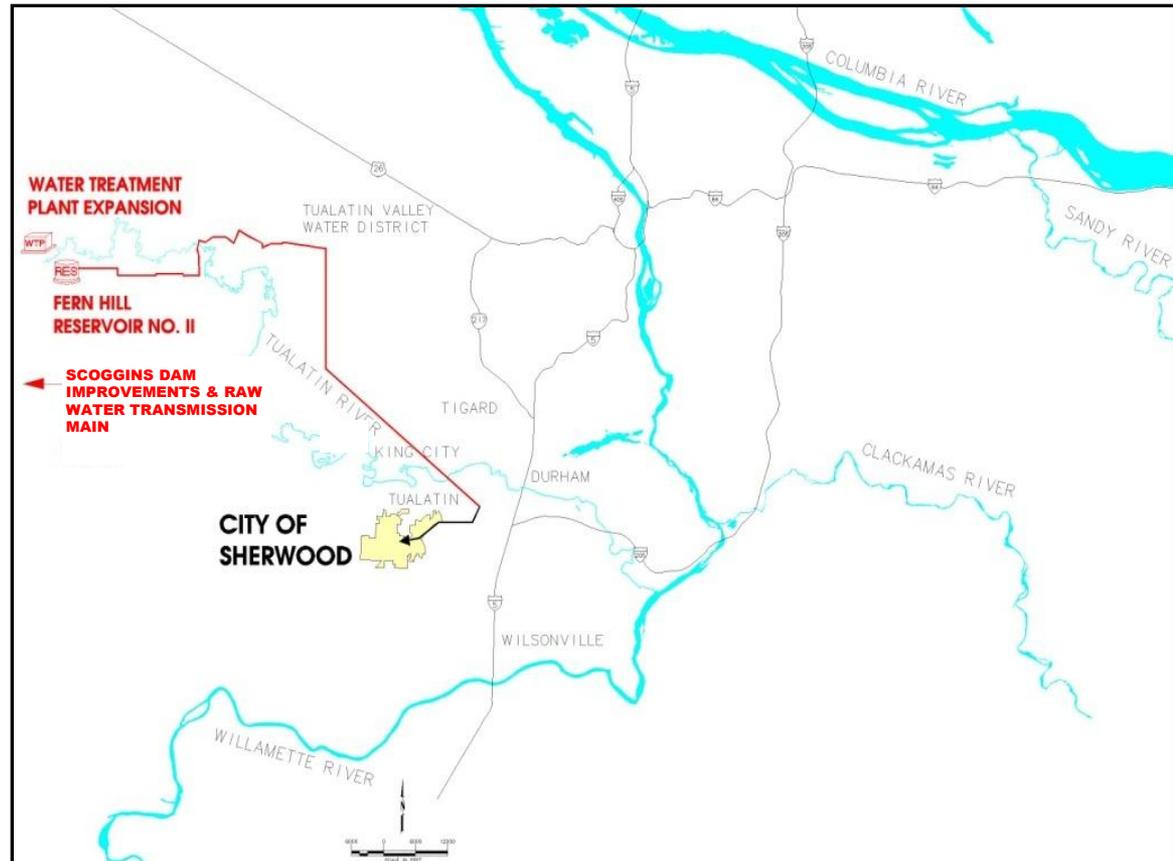
- City of Portland Supply
- Joint Water Commission
- City of Newberg
- Clackamas River Supply
- Willamette River Supply



Supply Option Overview (cont.)



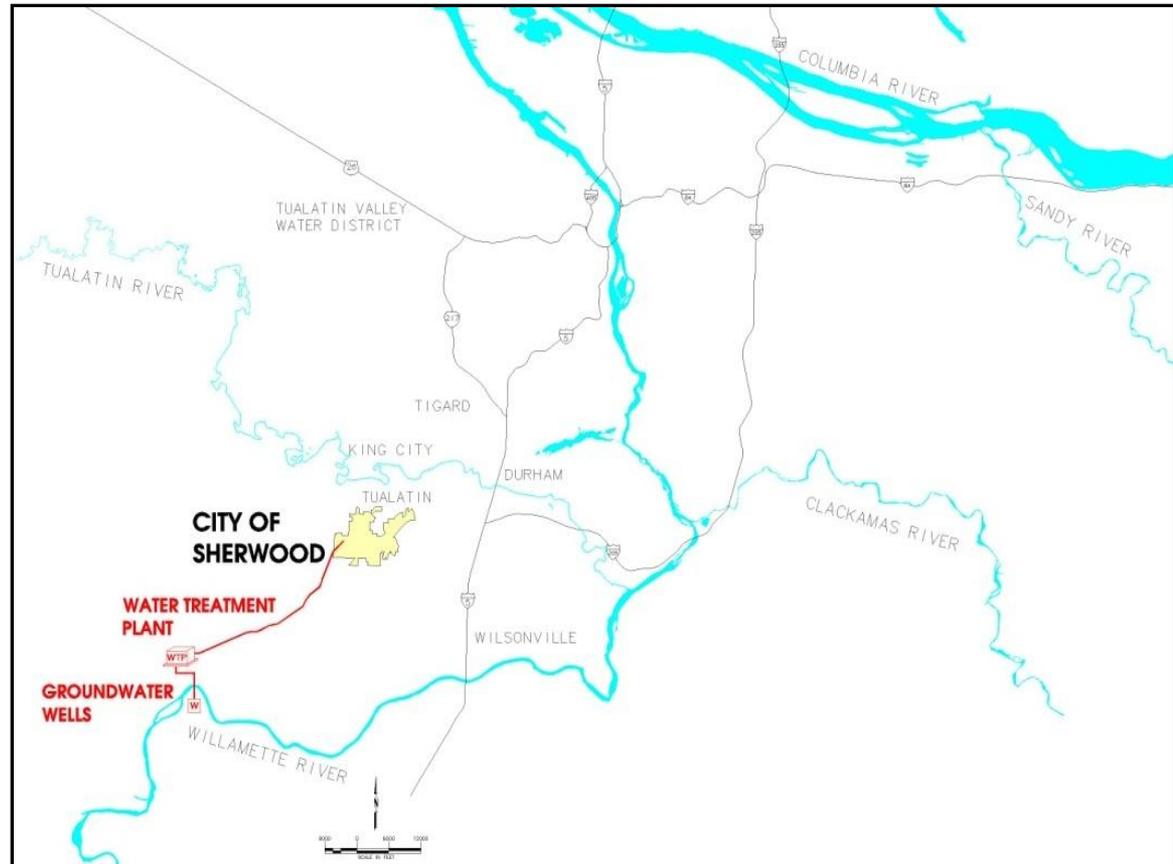
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Supply Option Overview (cont.)



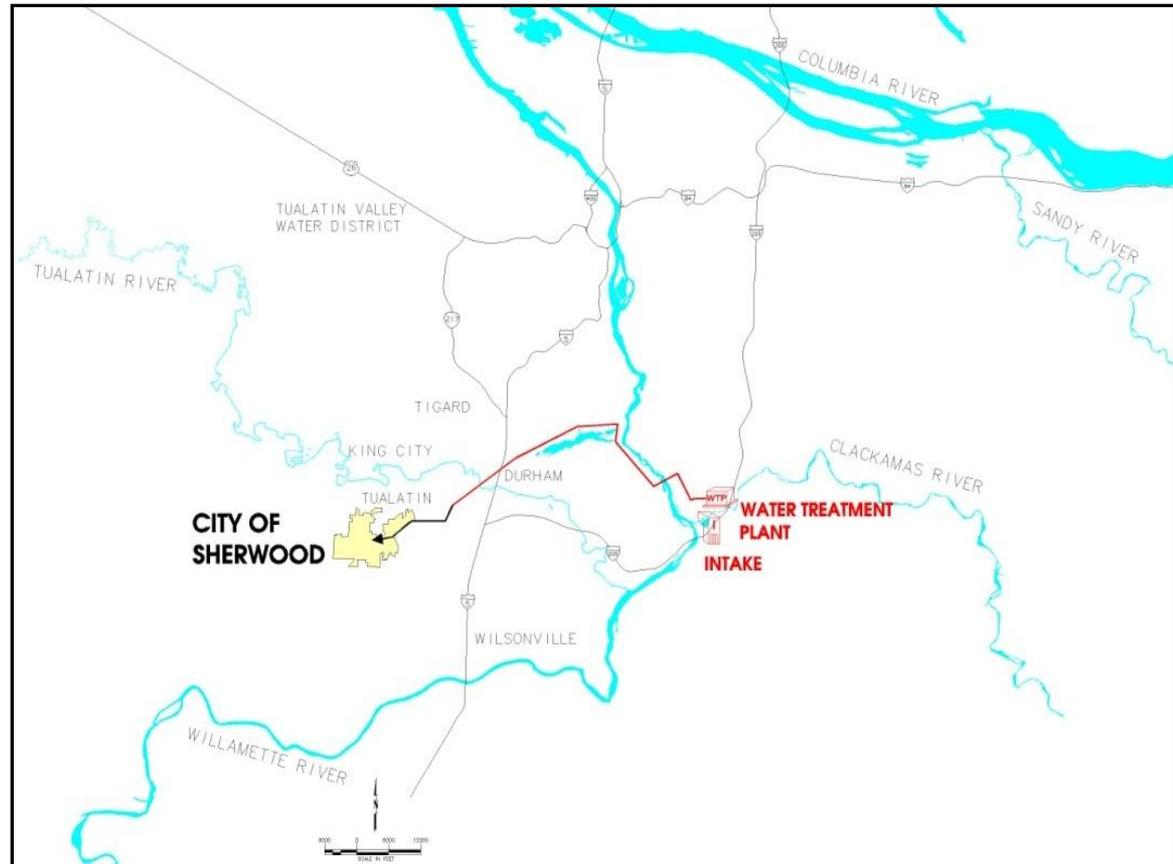
- ◆ City of Portland Supply
- ◆ Joint Water Commission
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Supply Option Overview (cont.)



- ◆ City of Portland Supply
- ◆ Joint Water Commission
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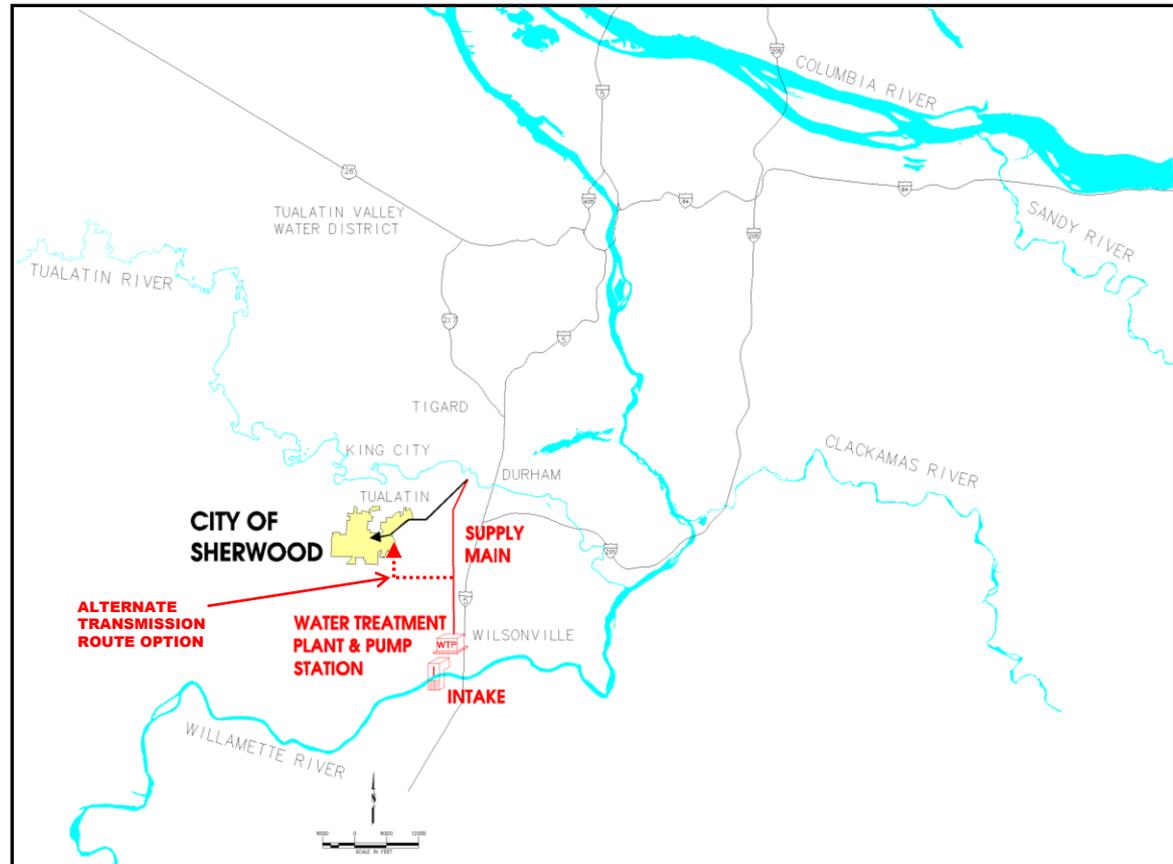
Supply Option Overview (cont.)



- ◆ City of Portland Supply
- ◆ Joint Water Commission
- ◆ City of Newberg
- ◆ Clackamas River Supply
- ◆ Willamette River Supply

Sherwood City Council Considered Two Final Options:

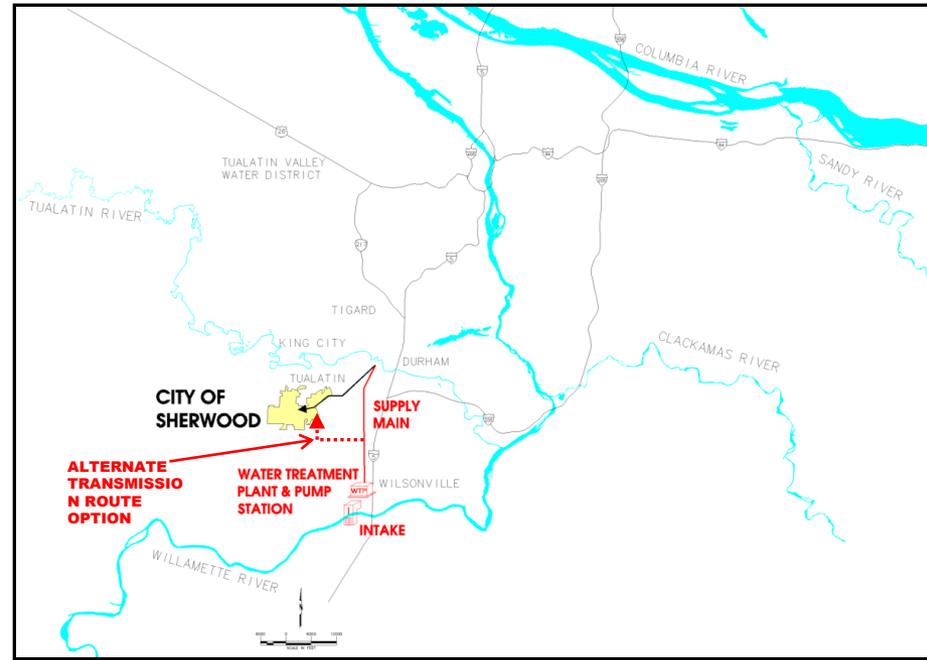
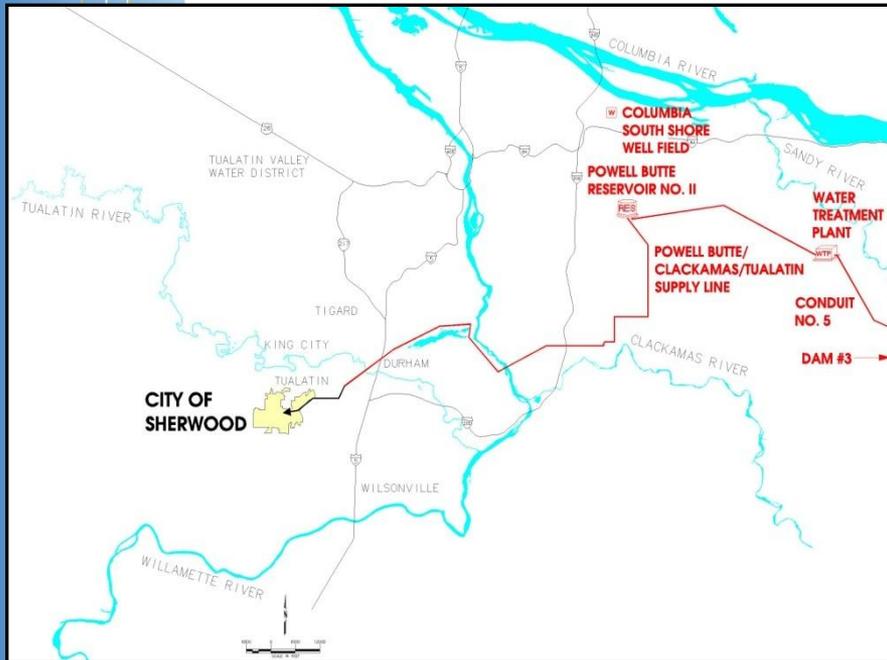
- City of Portland Supply
- Willamette River Supply



Supply Option Selection



- **Sherwood City Council Considered Two Final Options**

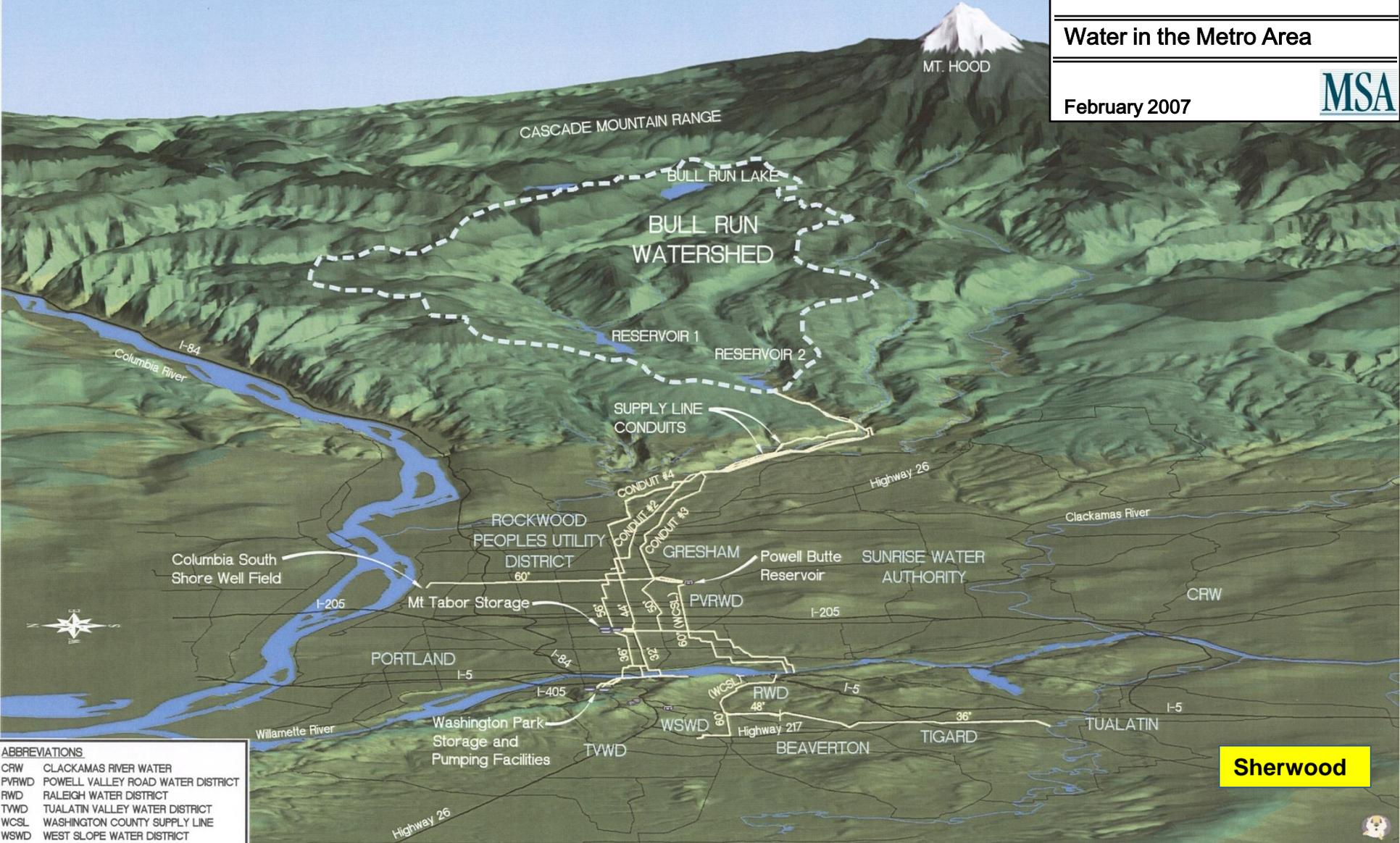


City of Portland Supply Overview

Perspective Overview –
City of Portland

Water in the Metro Area

February 2007



ABBREVIATIONS

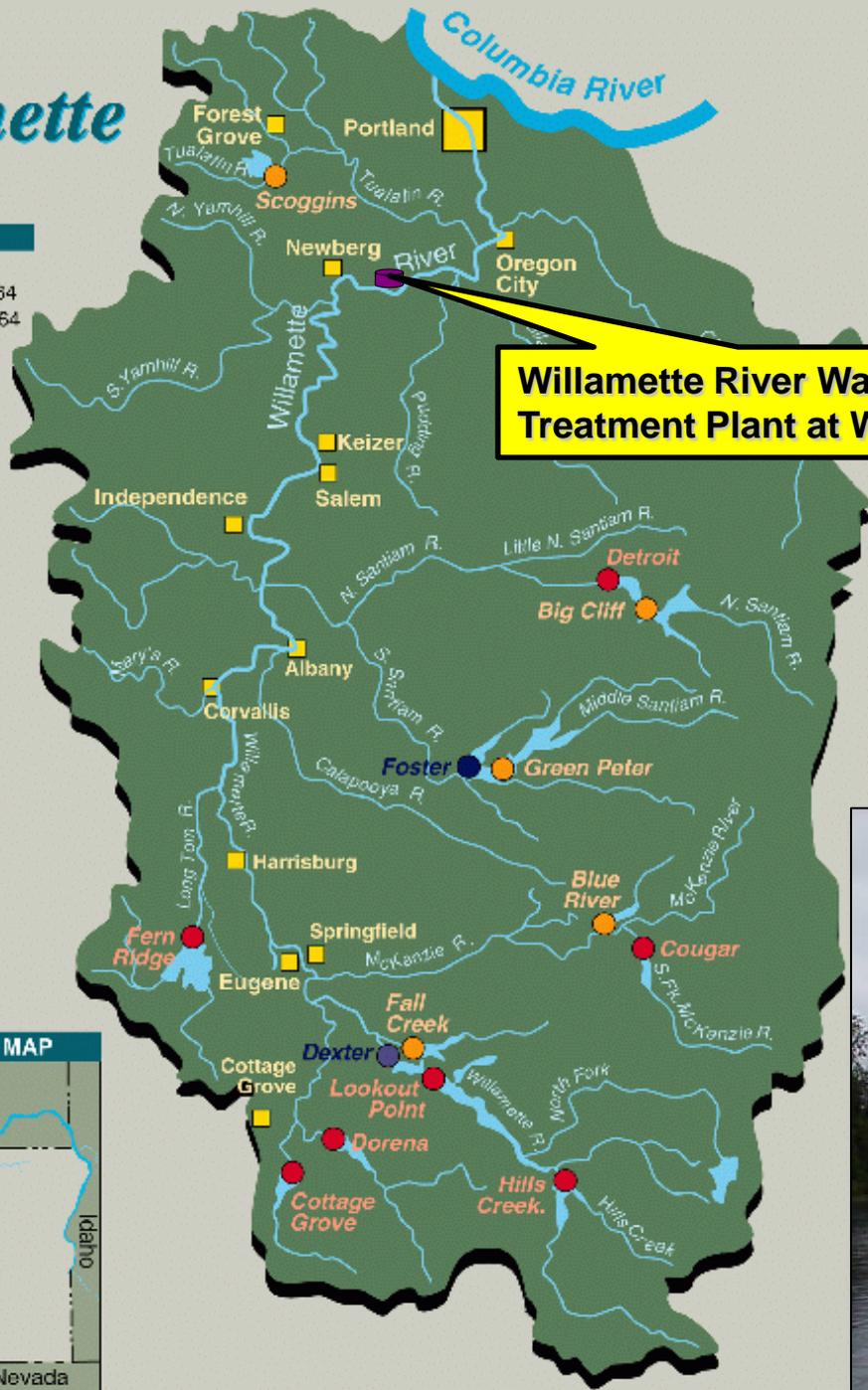
CRW	CLACKAMAS RIVER WATER
PVRWD	POWELL VALLEY ROAD WATER DISTRICT
RWD	RALEIGH WATER DISTRICT
TWWD	TUALATIN VALLEY WATER DISTRICT
WCSL	WASHINGTON COUNTY SUPPLY LINE
WSWD	WEST SLOPE WATER DISTRICT

Sherwood

The Willamette Basin

LEGEND

- Projects operating in 1964
- Projects added since 1964
- Re-regulating Dams



Willamette River Supply Overview

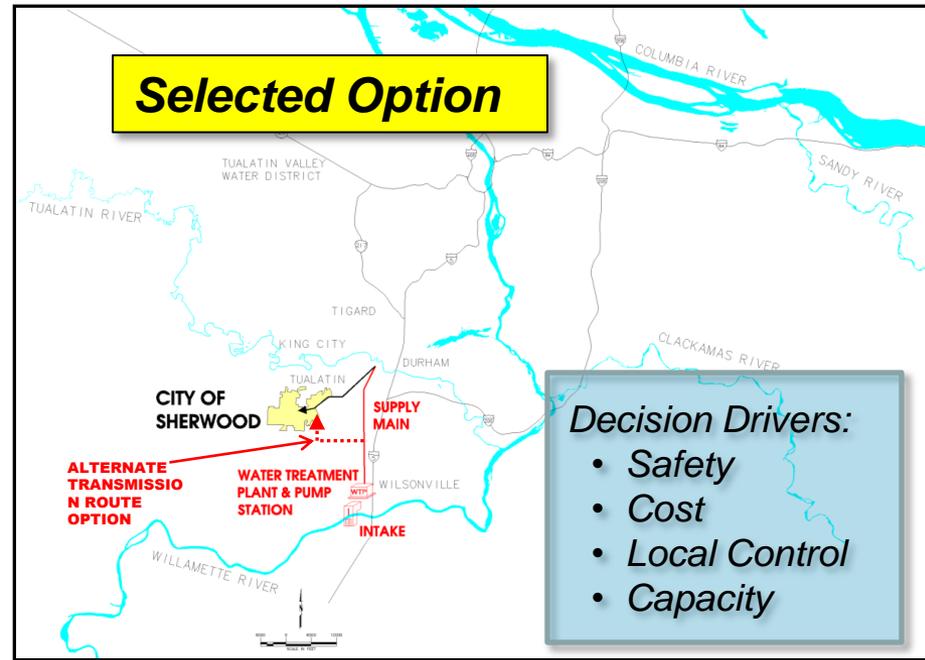
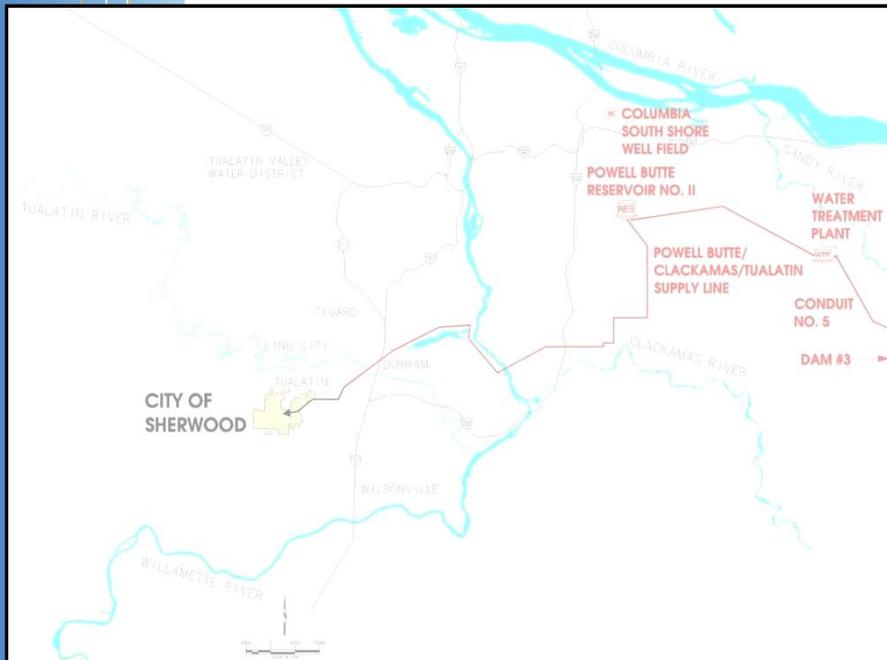
Willamette River Water Treatment Plant at Wilsonville



City Council Selection of Preferred Option



- Commission preparation of Decision Document
- Invite proposals and presentations from representatives of each option



Supply Development and Politics



- Activist groups interested and involved from the start
 - Organized opposition to the Willamette River supply formed in the late 1990's
 - Heavy opposition to Wilsonville's initiative to develop the Willamette River supply in 1999
 - Same groups organized opposition to Sherwood's decision
 - Sherwood relied on the Willamette plant's track record, actual water quality data and getting information in front of the voters

CITIZENS FOR SAFE WATER

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Sherwo
voted to u

Tualatin Valley Water District
P.O. Box 745 • Beaverton, Oregon 97075 • Phone: (503) 642-1511 • Fax: (503) 649-2733 • www.tvwd.org

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General Manager

Bernice Bagnall
Chief Financial Officer

Debra Erickson
Manager, Human Resources

Dale Fishback
Manager, Operations & Field Services

Todd Heidgen
Manager, Community & Intergovernmental Relations

Brenda Lennox
Manager, Customer & Support Services

Gary Pipin
Manager, Engineering Services

Memo

To: Those Interested in Water Quality Comparisons of the Bull Run, the Joint Water commission and the Willamette River Water Treatment Plant

CC: Greg DiLoreto, P.E., General Manager

From: TVWD Management Team

Date: July 26, 2005

RE: Revised Water Quality Comparison Chart

Attached to this memo is a revised chart showing the water quality results for the three sources of interest to the Tualatin Valley Water District. Unless otherwise noted, all of the results are for finished water.

In an attempt to continue to improve the clarity of the information presented in the chart, we have refined the information. Specifically, information regarding the finished water data from the Willamette River Water Treatment Plant for Aluminum, Iron, Manganese, Silver and Zinc have been modified and the result of the October 2003 E-coli and Coliform results were shown in the proper format.

The attached chart with the revision date of July 14, 2005 should be used in place of earlier versions.

Water Quality Comparison Data

WATER - not to be taken for granted



Supply Development and the Media



- Controversy sells and water in Sherwood was controversial
- City officials and other agency officials knew the facts and worked to get them out to the press
- Local Sherwood papers ran a mix of information pieces and letters for and against
- Articles in the Wilsonville Spokesman referenced treatment plant operations since April 2002 start-up

THAT'S SHOWBIZ
Broadway Rose Theatre Company opens its summer season. Events, Page 2

Not cut from the same cloth
Managing a fabric store means finding just the right material for the right job. People, Page 5

The Oregonian
Washington County Weekly
TIGARD-TUALATIN-SHERWOOD EDITION

THURSDAY • JULY 7, 2005
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Sherwood reflects on its water use

As need intensifies with growth, the city considers increasing its purchases of Bull Run water or turning to the Willamette River

By LUCIANA LOPEZ
THE OREGONIAN

As Sherwood grows, so must its water supply.

Sherwood officials are examining the city's options for a long-term source of drinking water, including the controversial step of tapping the Willamette River.

But in 2001, Sherwood residents approved a charter amendment requiring voter approval for the city to draw drinking water from the Willamette. That means that if the City Council decides to change water sources, the mat-

ter must go before the voters.

The city, which needs to pinpoint a long-term water source for its water system master plan, could also increase its present arrangement of buying Portland's Bull Run water.

On July 19, the council will hear from two consulting companies — Murray, Smith & Associates of Portland and PCS Group of Redmond, Wash. — which are slated for presentations on the water

quality, cost and engineering of the two options.

Sherwood uses about 4 million to 5 million gallons of water a day, said Ross Schultz, the city manager. About 80 percent of that comes from well water, with the remaining 20 percent from Portland, largely from the Bull Run watershed, through an agreement with the Tualatin Valley Water District.

But the well water supply can only go so far, Schultz said, and the city's growing population means demand will keep growing. The 20-year projection for the city's water needs is 10 million gallons a day, Schultz said.

Sherwood had about 14,200 residents in July 2004, according to the Population Research Center at Portland State University. In April of 1990,

Please see **SHERWOOD**, Page 8



City Approach and Perspective



- Keep information flowing –
 - Chamber of Commerce and civic organizations: Rotary, Lions, Elks, Parent/teacher groups, etc.
 - City web site and online information
 - Flyers and mailer pieces
 - Public events: Music on the Green, School Fairs
 - Voter's pamphlet
 - Public kept engaged through a number of forums
- Created and produced message pieces
- Recognized that City staff must obey rules for discussion of this topic with the election pending



It's About Your Drinking Water Voters Asked To Determine Sherwood's Future Water Source

In 2 years Sherwood's current water resources are expected to be inadequate to meet its residential and commercial needs. Local aquifers are declining and the City is buying surplus water on a short-term contract. New supplies are needed to serve existing requirements and future growth. The Sherwood City Council has been working toward a solution that guarantees its residents and businesses high quality, safe, adequate and affordable water for the next 50 years.

The City has retained the region's best water system experts to help examine seven long-term water supply options. The effort has determined that water from Portland's Water Bureau and Wilsonville's Willamette River water treatment facility are the two best options.

**You Deserve
Safe, Clean, Reliable and Affordable
Drinking Water**

Willamette River Water Treatment Plant

Water Is Becoming Our Region's Number One Issue...

Information vs. Misinformation



Spreading the word and sounding the cry:

CITIZENS FOR SAFE WATER

What's Wrong with Drinking Treated Willamette River Water?

The West Linn sewage treatment plant, showing its effluent discharge into the center of the Willamette. This plant is only one of an estimated 85 sewage facilities discharging sewage effluent into the Willamette.

Why are the citizens against the Willamette river filter plant? One reason is the water quality issue. Governor Kitzhaber's task force report on the Willamette (as stated in the Oregonian) said "The Willamette river is sick. Dioxins, PCB's sewage, deformed fish, now plague the river running through the Willamette River Basin." Dr. Harold Osterud, Professor and Chairman Emeritus, University of Oregon Health Science Center, School of Medicine is quoted as saying "Filtration will not remove toxic products from the breakdown of biological organisms, nor can it remove hazardous chemicals that inadvertently may pollute the supply". The fact is that even the most modern "State of the Art" type of filter plant will not remove 100% of the contaminants in the water.

A five year study by the US Geological Survey of 20 major American rivers reported the Willamette among the least healthy for fish habitat. The report showed 50 kinds of pesticides in the water, some of which have been suspected of causing severe damage to human health and wildlife. The most common pesticide detected was atrazine, which has been banned in 7 European countries and has been linked to cancer and fertility problems.

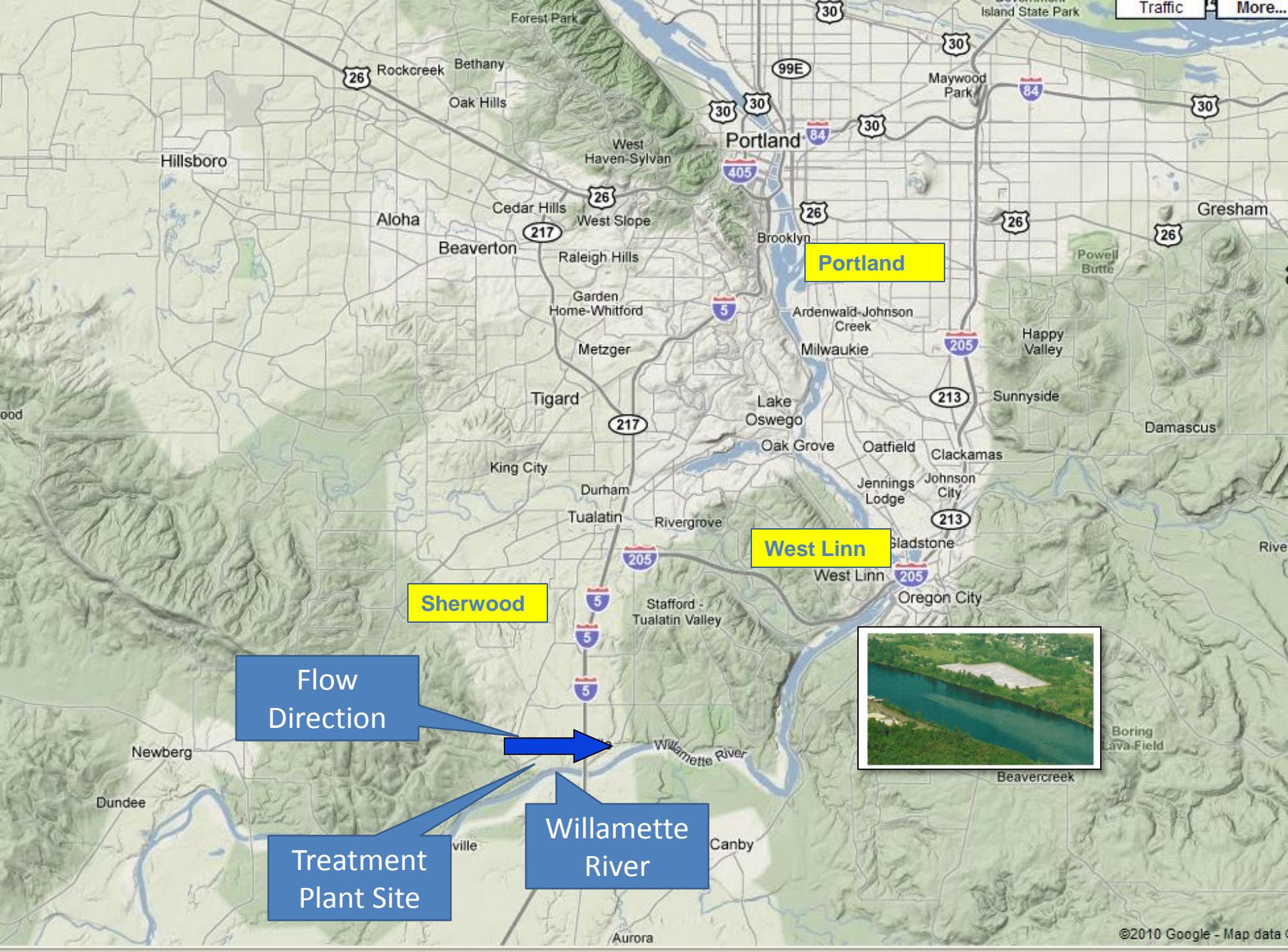
The problem with trying to clean up the Willamette is that most of the pollution comes from "non point" sources. (70 to 80% according to USGS). More than 4.5 million pounds of pesticides are used each year in the Willamette basin. The river flows for hundreds of miles from southern Oregon north to the Columbia. All along its route are hundreds of streams that flow thru agricultural land picking up pesticides, and thru cattle feed lots and grazing land picking up bacteria from manure, and then flowing into the Willamette.

Add to this the estimated 70 sewage treatment facilities and scores of industrial facilities upstream from the Wilsonville filter plant site which dump their effluent into the river. And over time the water quality is only getting worse. In Nov. 1997 OSPIRG reported that over 1.2 million pounds of toxics were legally discharged into the Willamette in 1994. An April 7, 2000 Oregonian article stated that the Riverkeepers organization released a study which showed that "Industries discharged 4.1 million pounds of pollutants in the river in 1997, up from 2 million in '95."

Bill Preble, a retired Senior Water Quality Inspector for the Portland Water Bureau, said "There are an estimated 85 sewage treatment facilities dumping their effluent into the Willamette. In the summer season when water demand is the highest, 85% of the Willamette river has already been thru a sewage treatment plant." There are also the occasional "Combined Sewer Overflows", and "Sanitary Sewer Overflows" which dump raw untreated sewage into the river during heavy rains, and during which period the public is warned to stay away from the Willamette for a few weeks. This is just the opposite situation from the Bull Run, with its protected watershed where man, farming and industry are not allowed. It has been said by experts that Bull Run water purity is similar to rain water.

What is wrong with this picture?





Portland

West Linn

Sherwood

Flow
Direction

Treatment
Plant Site

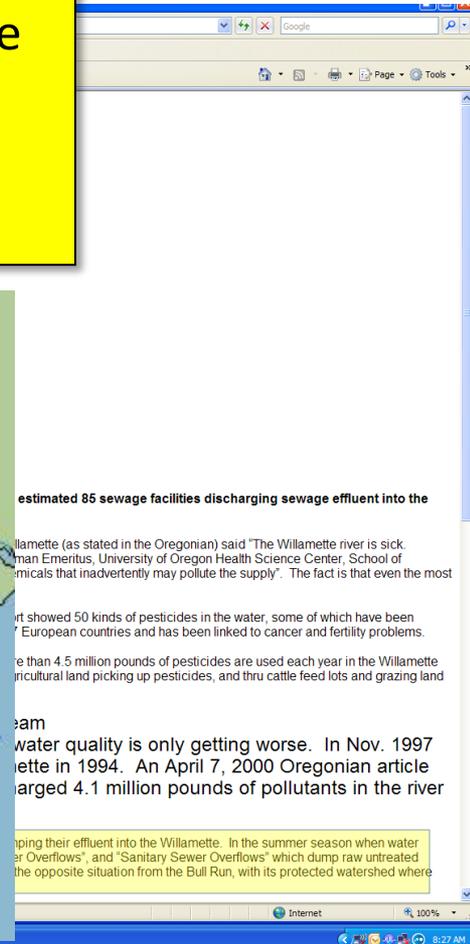
Willamette
River



Information vs. Misinformation



The lowest flow in the Willamette River is 4,200 cfs.
So with a population of 2,700,000 each person in the
Valley uses: 850 gallons of water per day
...or using 120 gpcd average use, the population in
the Willamette Valley is: 19,000,000 people



estimated 85 sewage facilities discharging sewage effluent into the

Willamette (as stated in the Oregonian) said "The Willamette river is sick man Emeritus, University of Oregon Health Science Center, School of Chemicals that inadvertently may pollute the supply". The fact is that even the most

report showed 50 kinds of pesticides in the water, some of which have been found in European countries and has been linked to cancer and fertility problems.

More than 4.5 million pounds of pesticides are used each year in the Willamette agricultural land picking up pesticides, and thru cattle feed lots and grazing land

Water quality is only getting worse. In Nov. 1997 the Oregonian reported that water quality in the Willamette in 1994. An April 7, 2000 Oregonian article reported that 4.1 million pounds of pollutants in the river

comparing their effluent into the Willamette. In the summer season when water quality is poor due to "Sanitary Sewer Overflows" which dump raw untreated sewage into the opposite situation from the Bull Run, with its protected watershed where



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→ news

NEWS RIVER OF RISK from The Oregonian The Oregonian

Murky science

Knowing there are problems with the Willamette River is a long way from knowing how bad they are and what should be done

Wednesday, December 20, 2000

By Brent Hunsberger of The Oregonian staff

The lower Willamette River -- the target of a 1960s drive to rid it of raw sewage, dead fish and pulp wastes -- is about to be cleaned up again. Yet the depth of its pollution is as muddy as the river after a heavy rain.

Environmental officials know the Portland harbor bottom is contaminated with some of the world's most persistent and dangerous chemicals. They know little about how these contaminants behave, however, or how great their dangers are to harbor fish or fishermen.

The harbor was listed as a federal Superfund site Dec. 1. Throw in an Endangered Species Act that demands a precise knowledge of the river's condition and habits, and the Willamette's mysteries promise to lengthen and make contentious any cleanup -- already expected to last years and cost tens of millions of dollars.

"Given the increasing importance of this river, our knowledge of it is pathetic, biologically and ecologically," said Bruce Hope, an environmental toxicologist with the Oregon Department of Environmental Quality. "We probably know more about Cow Creek than the lower Willamette."

Seattle-based officials of the U.S. Environmental Protection Agency, eager to launch the cleanup on a cooperative note, say the region's knowledge about the harbor's problem is actually more plentiful than in most Superfund sites. The weight of the 20-year-old program's powerful laws and \$1.4 billion budget will compel harbor polluters to quickly fill the data gaps.

For the past five months, The Oregonian has worked to shed light on one pressing question: Are harbor fish contaminated? It plucked 30 fish from a 26-mile stretch of the river below Willamette Falls and sent them to Oregon State University to be tested for pesticides, polychlorinated biphenyls (PCBs) and mercury.

The lack of knowledge -- even of historical contamination levels -- will set the stage for bitter disputes between regulators, liable parties, tribes and environmentalists over costs and remedies.

"These things are nightmares to clean up," said William Fish, environmental sciences professor at Portland State University. "In almost every case, you can't return it to a pristine case, and who knows what a pristine case is anyway in a harbor that's been used industrially for 100 years?"

Many aspects of the Willamette's contamination are still a mystery, making its previous cleanup look crude and basic.

In the 1960s, journalist Tom McCall, who would become governor, boosted his political career with a television special about industrial waste in the Willamette. The resulting outrage prompted controls on paper mills, sewage pipes and other discoloration in the river.

Today, the Willamette's contaminants lurk invisibly, at concentrations of parts per million, layered in the muck at the river bottom. They include pesticides such as DDT and insulation or fireproofing material with PCBs -- both banned in the 1970s and, perhaps, forgotten -- but not gone.

"My thought is that under the Tom McCall standards of the 1960s, the Willamette River is probably pretty clean," said Steve Schell, an attorney with Black Helterline who specializes in natural resource cases. "But under our standards of the 1990s and 2000, the river still has a lot of progress to make before it's clean."

"We've gotten a little complacent, and the problems are more subtle," explained DEQ's Hope. "You don't see dead fish and toilet paper floating in the water. So when you put a call out to clean up the river, people say, 'Well I don't see a problem.'"

Persistent problem

The stubborn chemical makeup of these contaminants allows them to persist for years at the dark river bottom. They are hydrophobic, meaning they hate water. So they attach to organic material -- leaves, silts and fine clay 40 to 60 feet below the river's surface -- where they go undisturbed.

That muck, however, is home to invertebrates and insects that serve as fish food. Some of these critters, such as oligochaetes or worms, eat the muck. Their stomach acids are strong enough to strip contaminants from the sediments. The pollutants then sequester themselves in fatty tissues, multiplying in magnitude as they pass from worm to fish to bird or man, threatening reproduction and health along the way.

"One of the biggest questions on the Willamette is what does the sediment concentration mean to fish and wildlife," said Jeremy Buck, toxicologist with the U.S. Fish and

Wildlife Service. "It's very hard to get at."

"Industry and everyone else wants to know what sediment level we can clean up to and feel safe. The trouble is, when you look at the toxicology of it, it's never as simple as, 'This number is safe.' And when you throw endangered species in, it gets even more complex, because you want to err on the side of the species."

Naming names

With negotiations expected to begin next month, the breadth of the cleanup isn't quite certain. The EPA, responsible for in-river work, has identified 17 liable parties between Sauvie Island and Swan Island. The DEQ, responsible for curbing pollution on upland sites, is investigating more than 50 landowners. EPA officials say they might look for sources as far upstream as the Willamette Falls. Those investigations could take two years or more.

The effects of the harbor's most extensive pollutants -- oils -- might be difficult to determine because their residues, called polycyclic aromatic hydrocarbons, don't remain in fish fats as DDE and PCBs do. But federal biologists, using fluctuations in enzyme and protein levels in fish, conclude even low levels of PAHs cause liver cancer and harm immune systems. Harbor landowners already are questioning the science, and the EPA has not embraced it.

"It's interesting," said John Malek, sediment specialist with the EPA's Region 10 office in Seattle. "But we're not finding it terribly useful in making cleanup decisions at this point."

Observers say those contaminants could spark deep disagreements between harbor landowners seeking a fast and affordable cleanup and natural-resource agencies and Native American tribes seeking protection of salmon habitat.

"Just because they're there doesn't mean they're hurting anybody," Portland State's Fish said. "But if you want to start arguments, just tell people you want to leave them there."

"It's like when you drive your car," Fish continued. "We can't make your car 100 percent safe. But if you put on your seat belt and you stop at stop lights, you can reduce your risks. It's the same thing with cleanups. You can't afford to not do anything. But you can't afford to do everything, either." You can reach Brent Hunsberger at 503-221-8359 or by e-mail at brenthunsberger@news.oregonian.com.

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This is new to Oregon. State officials have historically focused their attentions and efforts on obviously contaminated groundwater and soils that threaten public health -- or are plain easier to fix. Their experience with large, complex Superfund cleanups is limited. Since 1980, EPA has launched 62 Superfund cleanups in Washington and 98 in California but only 12 in Oregon.

What few studies have been done in Portland harbor confirm that problems exist:

- The EPA, DEQ and U.S. Army Corps of Engineers have found hot spots in harbor sediments polluted by PCBs, tars, tins and pesticides at levels presumably toxic to aquatic life.

- The U.S. Geologic Survey says dioxin levels in fish and harbor sediments are among the highest in Oregon. But their studies haven't identified sources.

- U.S. Fish and Wildlife researchers have found high levels of DDE, a byproduct of degraded DDT, in great blue heron eggs along the Willamette River. They speculate even higher levels may exist in the two bald eagle pairs on the lower Willamette, causing thinning in their eggs. They await results of similar tests on the river's otters.

- The Port of Portland this year found midgets and amphipods -- insect and invertebrates eaten by fish -- dying from the polluted muck around Terminal 4. The Port's consultants blamed their death on high levels of PCBs, heavy metals and oil residues stuck in the river bottom around the terminal.

- A study by Betsy Striplin, a consultant for the Port of Portland who's worked on cleanups in Puget Sound and Commencement Bay in Washington, found a low abundance and diversity of organisms on the river bottom around the Swan Island shipyard, even compared with the main river shipping channel. The Port's consultant speculated the area could lack food, oxygen and suitably sized sediments to support a robust fish-food supply, but Striplin cautioned against fingering industrial activity as the problem.

Naming names

With negotiations expected to begin next month, the breadth of the cleanup isn't quite certain. The EPA, responsible for in-river work, has identified 17 liable parties between Sauvie Island and Swan Island. The DEQ, responsible for curbing pollution on upland sites, is investigating more than 50 landowners. EPA officials say

The results: PCB levels in fish throughout the test area exceeded state and federal health standards, prompting the Oregon Health Division to consider additional warnings about eating fish from the river.

Fish from Sauvie Island to the St. Johns Bridge were the most polluted. Carp, black crappie and smallmouth bass contained PCB levels, on average, four times higher than fish collected for reference purposes outside the 26-mile area. Five of nine fish caught in that same lower harbor stretch contained DDT-related contaminants at levels exceeding state health standards.

Making sense of it all

The findings suggest the harbor's contaminants pose threats to its ecosystem. But biologists and toxicologists say significant knowledge gaps remain and are crucial to a cleanup:

- How clean is clean? The EPA and Oregon have no cleanup standards for river-bottom sediments. Oregon's DEQ will develop them under intense pressure from companies on the hook for the cleanup bill; tribes and federal salmon-protection officials want whatever it takes to create a safe river.

- What does the bottom of the river look like and how does it change? Scientists don't know how sediments, many of them tainted, build up or move about the harbor. Their behavior could be key to curbing unnecessary cleanup costs.

- How many worms and insects call the harbor bottom home? Wildlife officials have no inventory of the river's bottom dwellers, an important food source for fish. If worms and insects live in contaminated sediments, scientists fear even trace amounts of pollution will magnify as they're passed up the food chain, from insect to fish to bird or human.

- Who eats fish from the river? The answer could drive cleanup decisions and costs. Portland officials have studied fish consumption along the heavily polluted Columbia Slough, which bears postings against eating caught fish, but not the Willamette. The Oregonian found fishermen regularly casting from the harbor's banks. Some, particularly Russian immigrants, took the fish home to feed their families, unaware or unconcerned that they might be contaminated.

- Do juvenile chinook salmon stick around long enough to be harmed by the harbor's pollution? The Oregon Department of Fish and Wildlife and the City of Portland have launched a \$1 million, four-year study that could help answer that question, using implanted radio transmitters to follow fish in the lower Willamette. Research in Puget Sound and Alaska suggests even tiny amounts of oil and PCBs harm juvenile salmon by reducing their immunity to disease. But harbor landowners potentially responsible for the pollution have challenged the science.



What About the Fish?



Pike Minnow Deformities exist in the Newberg Pool

OSU Conducted a two year, \$0.5 Million Study

Findings:

- Doug Markle, a professor of fisheries and wildlife at OSU, found three northern pike minnows that had been collected from the Willamette River by a scientific expedition in 1855:

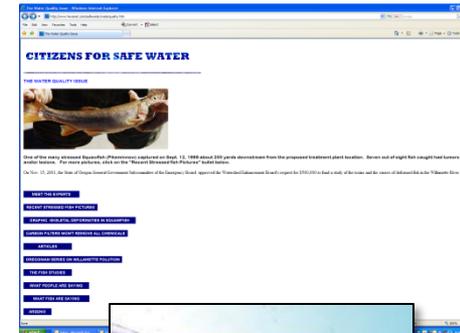
“We had x-rays taken of the three preserved fish,” Markle said, “and one of them had skeletal deformities exactly like what we’re seeing now in the Newberg Pool.”

- Deformities ultimately linked to parasites that live in the fish:

“Discovering the link between parasites and fish deformities answered some questions and prompted more. Why, for example, is there a higher incidence of parasitic infections in the Newberg Pool than elsewhere in the Willamette basin? Doug Markle speculated that perhaps there are more snails in the Newberg Pool or fish with a greater susceptibility to parasites. In any case, unlike toxic chemicals, the parasites pose little or no risk to human health. Cooking or freezing will kill the parasites in infected fish.”

- Both the supporters and the detractors of the new water-treatment plant were pleased with the report’s results:

“That’s a sign we’ve been an honest broker of information and produced a balanced report,” Curtis said. “There are new questions that would be interesting to pursue, but this wasn’t an invitation for open-ended research. We were called on to answer one question — what’s causing fish deformities in the Newberg Pool? — and we answered it.”



City Staff Perspective and Results



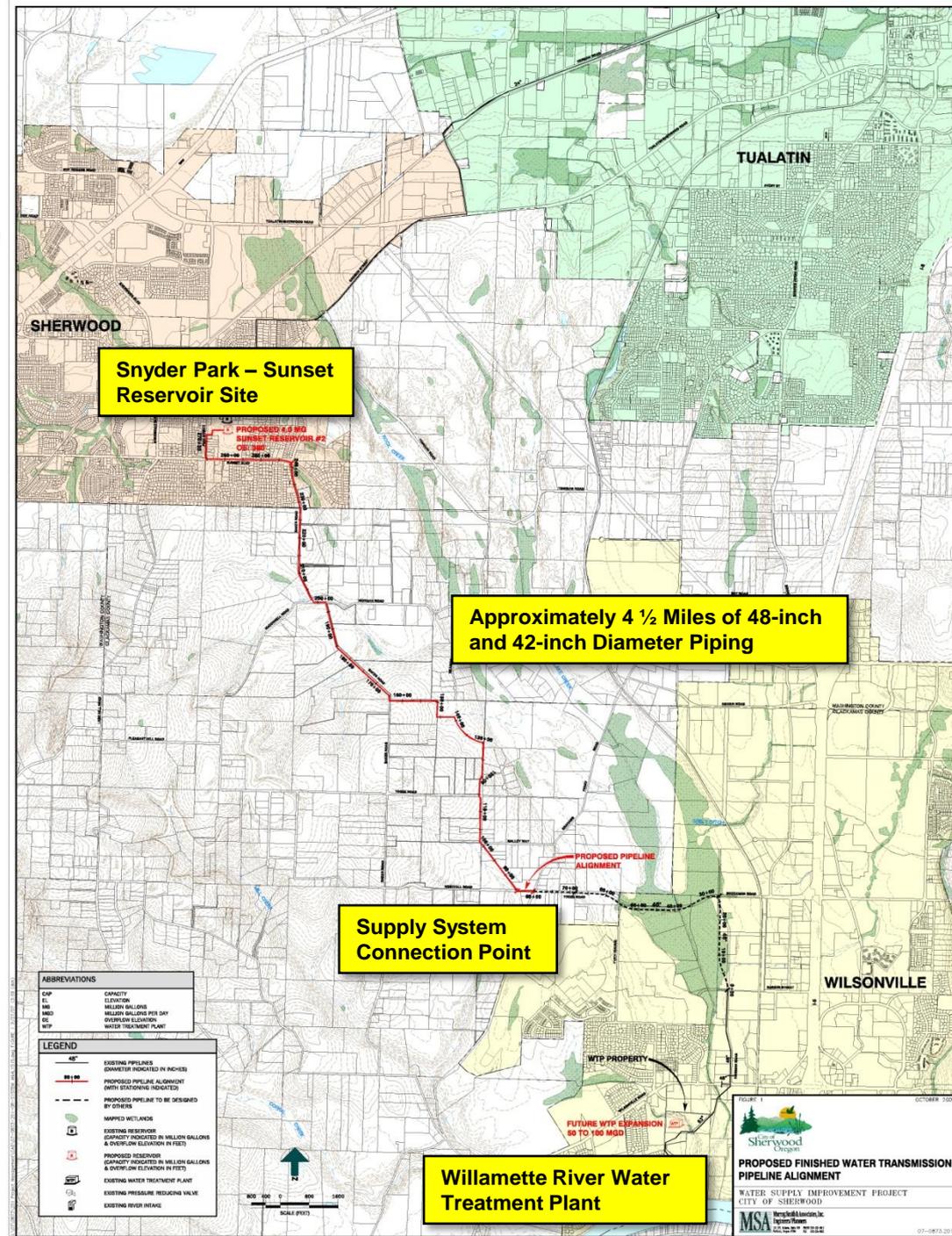
❑ City Manager Perspective

- Getting to a decision: Informing your policy makers and getting 100% support from your Council
 - Sticking with the decision: Reassurance that their decision continues to be a good one
 - The politics of change: Decisions made during an election cycle and potential changing of the guard can be tricky
 - Keeping perspective: Don't let your issue become a Council seat election issue
- ❑ In November 2005 City of Sherwood voters pass Measure No. 34-112, allowing the use of the Willamette River as drinking water supply
- ❑ Voting results showed 52% to 48% favorable vote

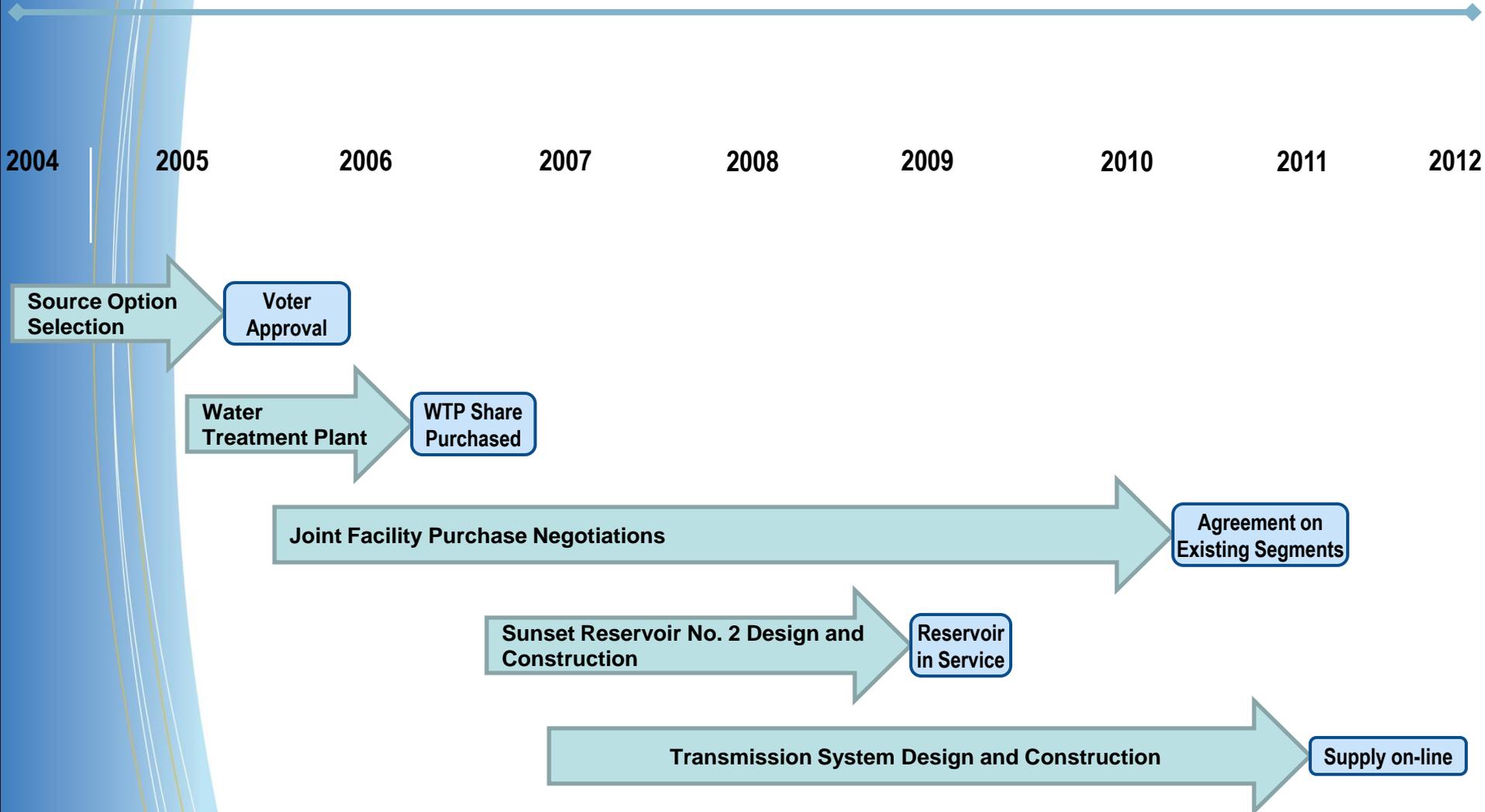


Building the System

- Water treatment plant
- Jointly constructed/owned facilities
- Supply system connection
- Sherwood owned transmission system
- 4.0 million gallon distribution system reservoir
- Sherwood's water right exercised through Willamette River Water Coalition (WRWC)
- Overall project cost \$42 million
 - Certain facilities oversized
 - Includes distribution system improvements, including 4.0 million gallon reservoir

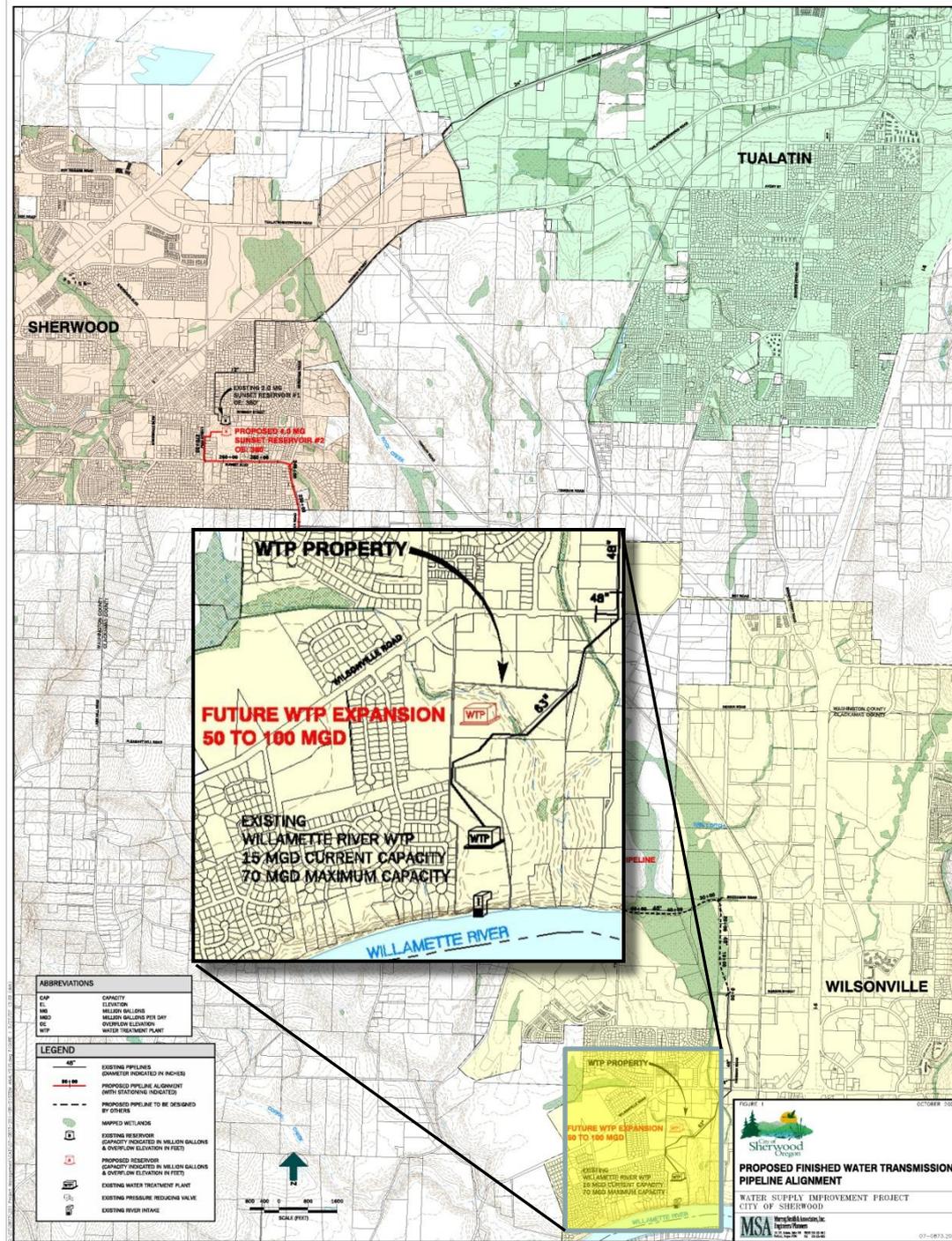


Project Schedule



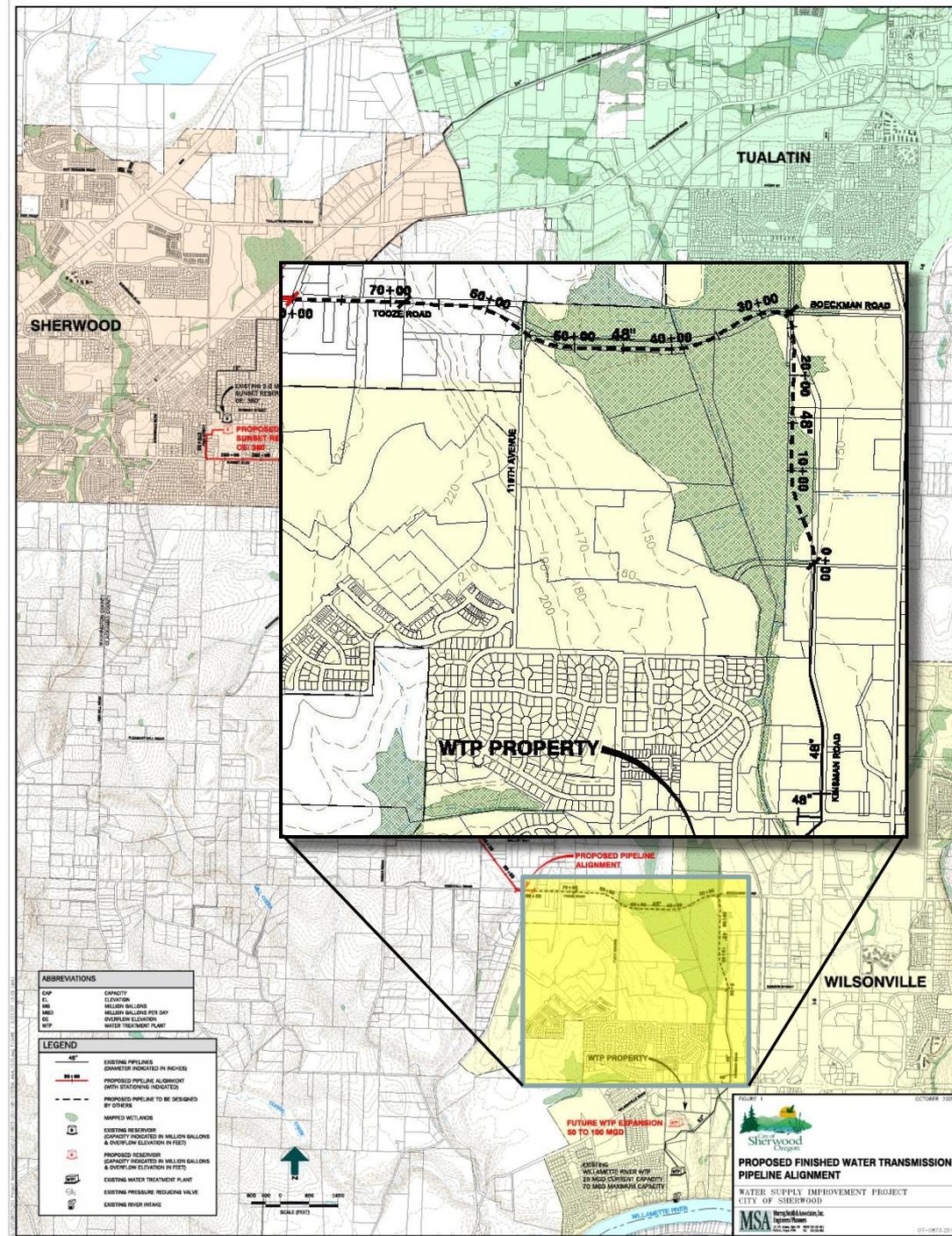
Water Treatment Plant

- 15 mgd – existing capacity: Sherwood owns 5 mgd, Wilsonville 10 mgd
- Expandable in 15 mgd increments up to ~70 mgd on lower site
- Capacity expansion planned for year ~2012
- Includes 3,500 lf 63-inch diameter transmission main



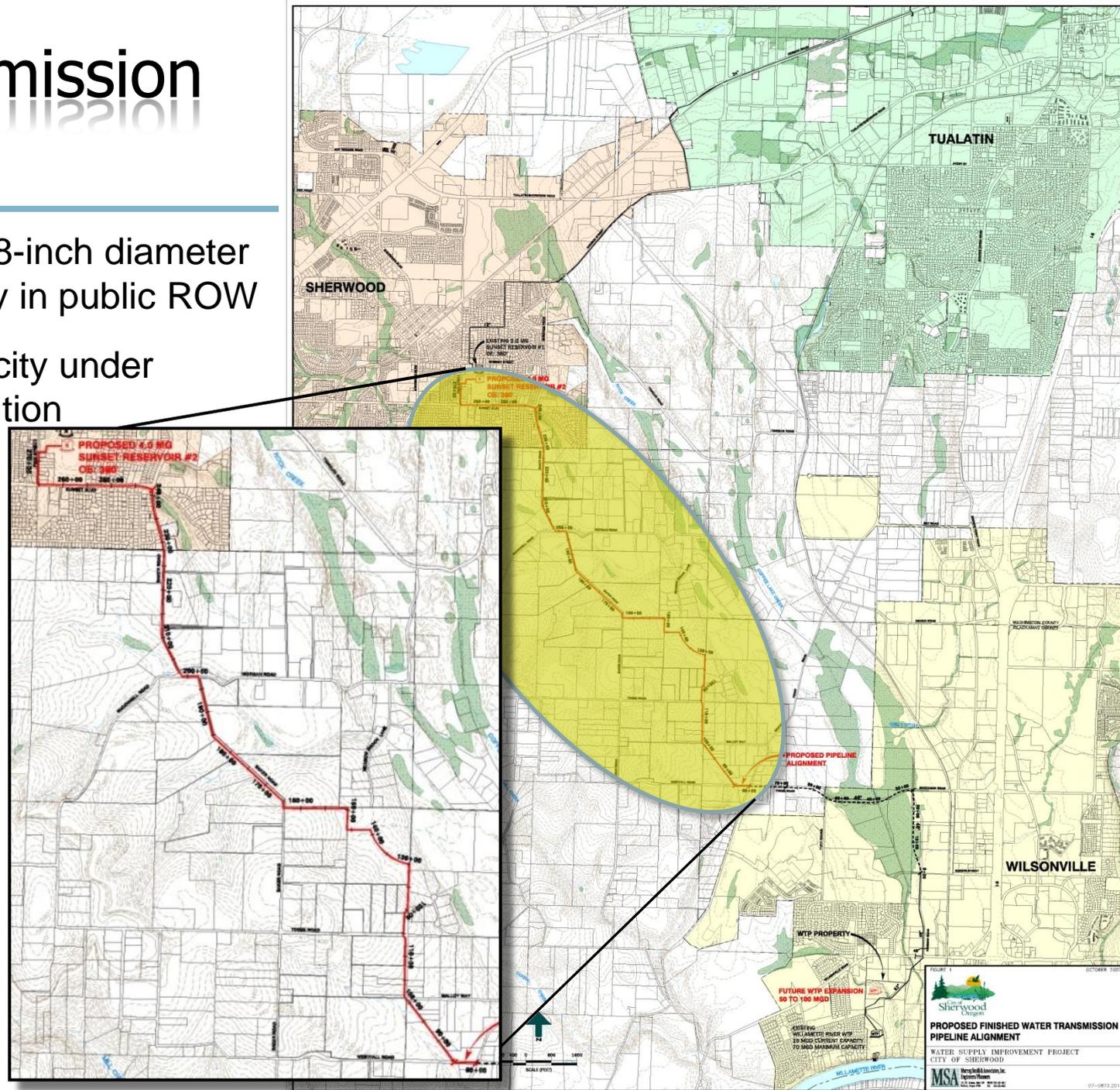
Shared Transmission

- 11,100 lf of 48-inch diameter main through Wilsonville
- Sherwood to own a minimum of 20 mgd capacity under existing operating conditions
- Under certain operating conditions higher capacities may be achieved
- Transmission mains upsized for potential regional supply opportunities.



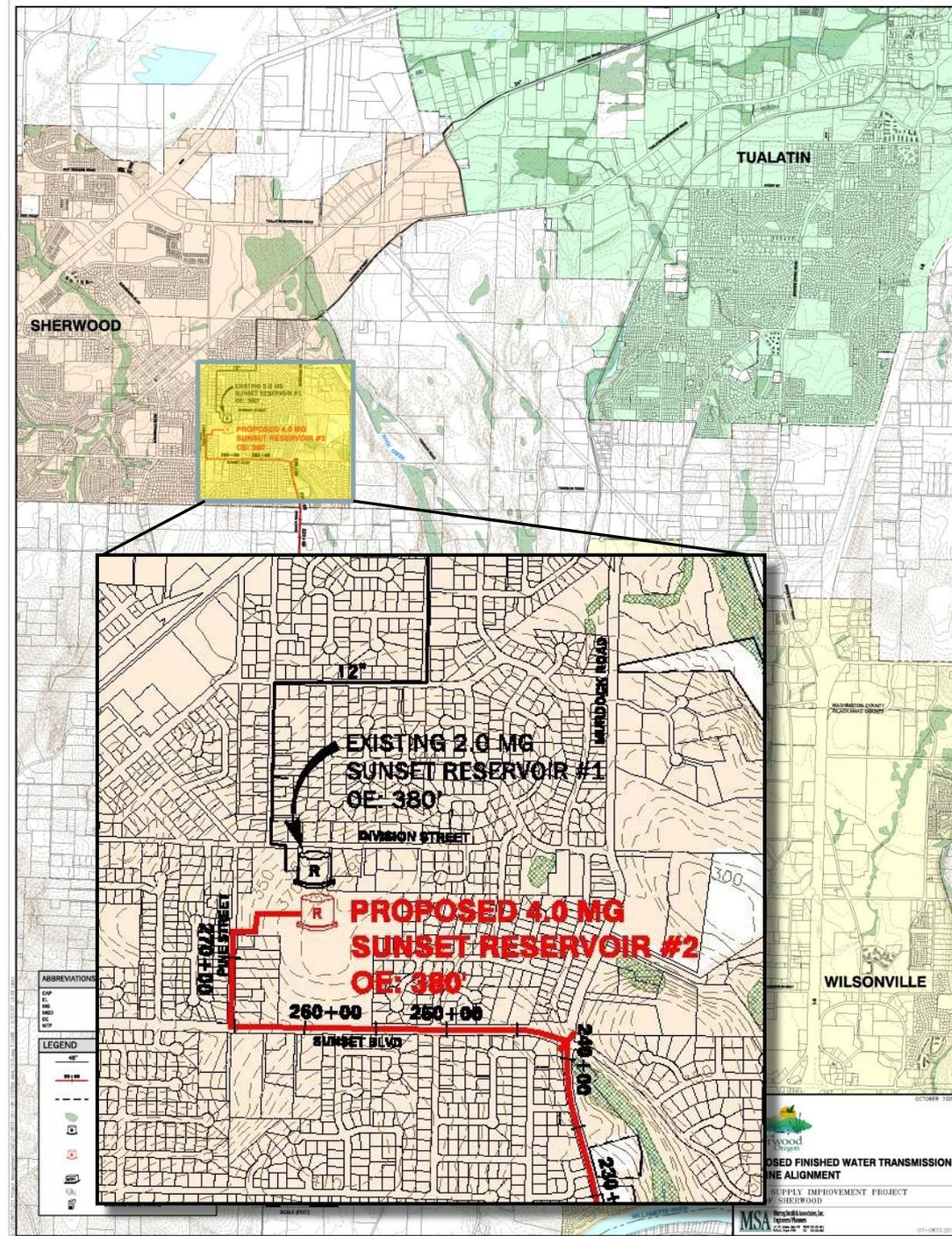
New Transmission Mains

- 19,500 lf of 48-inch diameter main primarily in public ROW
- 20 mgd capacity under existing condition
- Under certain operating conditions higher capacities may be achieved
- Facilities up sized for potential regional opportunities



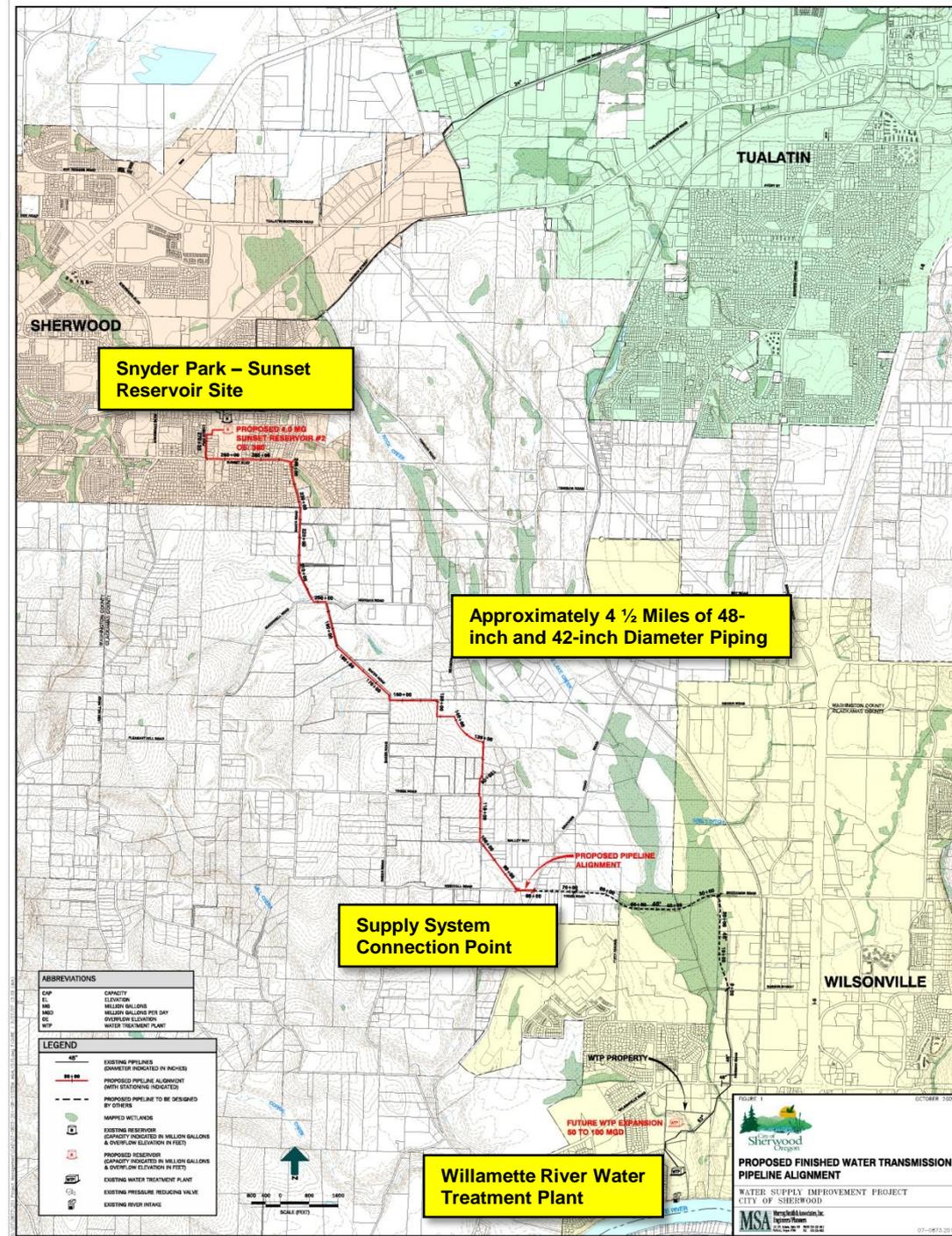
4.0 Million Gallon Reservoir

- Dual purpose facility
- Water System Master Plan recommended an additional 4.0 million gallons of distribution system storage be constructed to serve the City's main service zone.
- The new reservoir also serves as the terminal reservoir for the new supply system
- Project completed in 2009



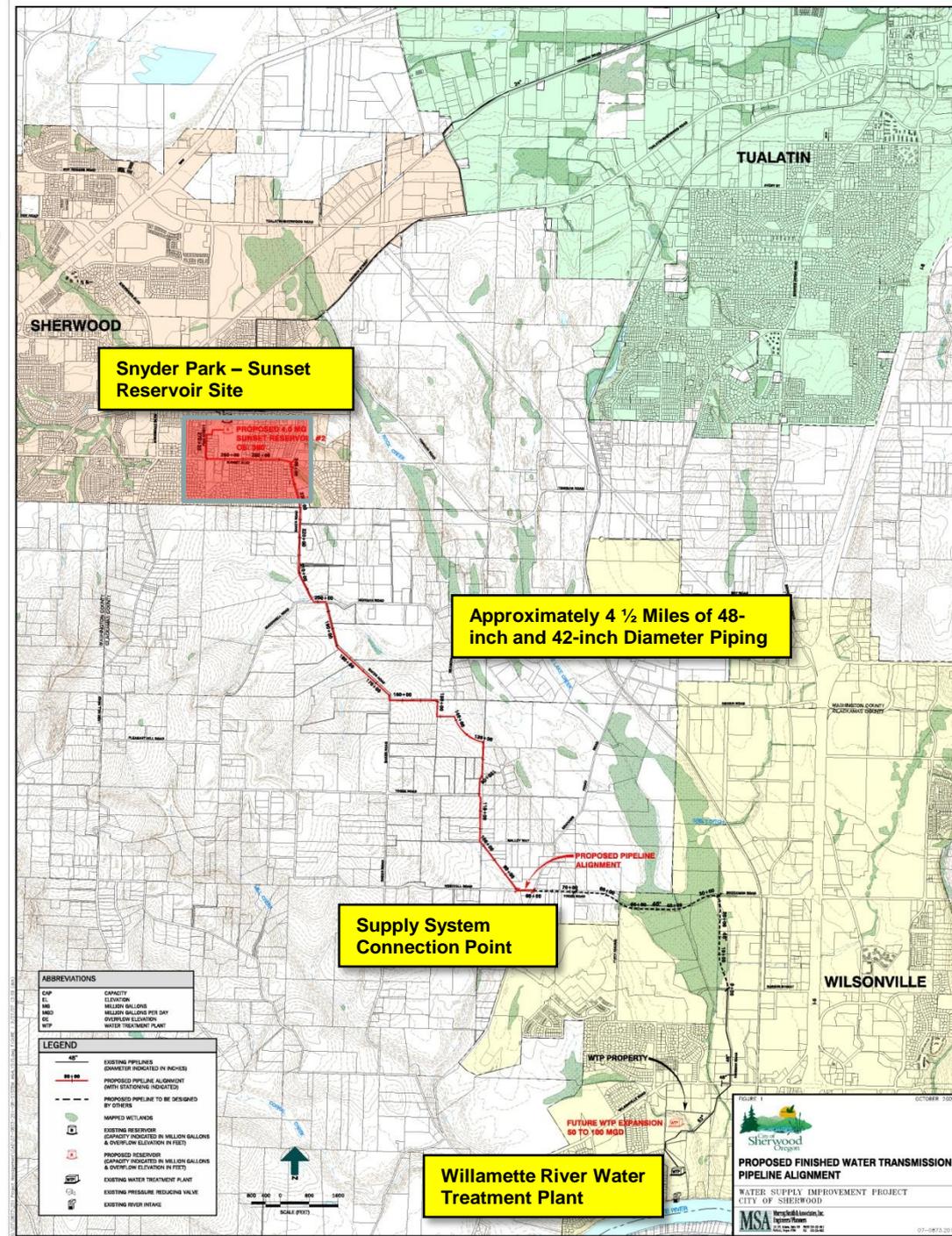
Project Challenges

- ◆ Politics
- ◆ Improvement funding
- ◆ Economic variables
- ◆ Transmission main easements
 - Measure 37 claim
 - Easement negotiations
 - Need for condemnation
- ◆ Delivering the project to the public



4.0 Million Gallon Reservoir

- ◆ First element of new supply system
- ◆ Additional storage gives City much greater operational flexibility and reliability under existing conditions
- ◆ Will serve as terminal reservoir once the Willamette River supply is brought on line
- ◆ Facility located in popular, high use City-owned park
- ◆ Need to integrate reservoir into park setting
- ◆ High neighborhood interest in project



Reservoir Construction – Neighborhood Outreach



Preliminary Concept Overview

City of Sherwood - Sunset Reservoir #2



MSA Murray, Smith & Associates, Inc. Engineers/Planners



Reservoir Construction Highlights



Site Prior to
Excavation



Tank and Site
Excavation



Reservoir Construction Highlights



07/07/2008

Site
Excavation



07/07/2008

Foundation
Preparation



07/07/2008



07/11/2008

Reservoir Construction Highlights



Tank Piping



Geotextile Fabric for PVC Liner Protection



30 mil PVC Liner



Foundation Subgrade Preparation

Reservoir Construction Highlights



08/
Overflow/Drain Detention Pond
Excavation and Manholes



08/08/2008



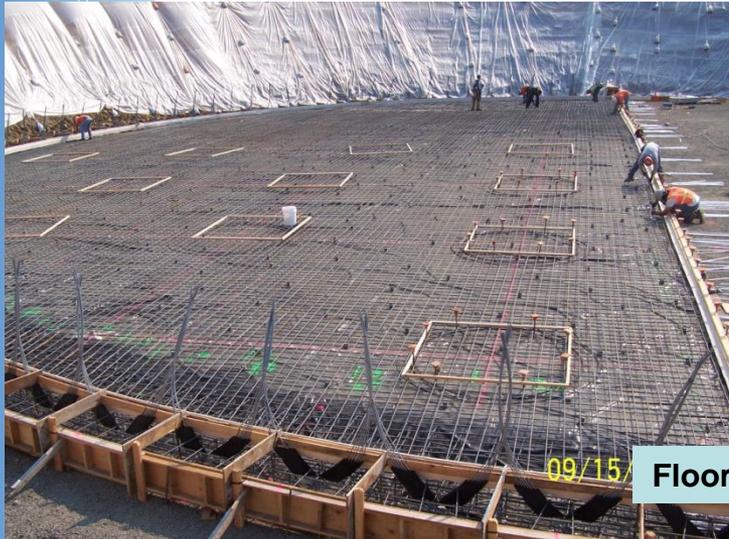
Yard Piping

08/26/2008



09/10/2008

Reservoir Construction Highlights



09/15/ Floor Slab Rebar and Forms



09/12/2008



09/18/ Floor Slab Concrete Pour



09/17/2008

Reservoir Construction Highlights



**Overflow/Drain
Detention Pond**



Concrete Floor Slab Finishing



**Preparing for Wall
and Column Form
Placement**



**Setting Wall
Section Form**

Project Vision and Project Completion



WATER
matters

THE OFFICIAL MAGAZINE OF THE
PACIFIC NORTHWEST SECTION - AWWA

SUMMER 2010

2010
EXCELLENCE IN
ENGINEERING AWARD

> 2010-PNWS-AWWA CONFERENCE RECAP
> SUBSECTION REPORTS

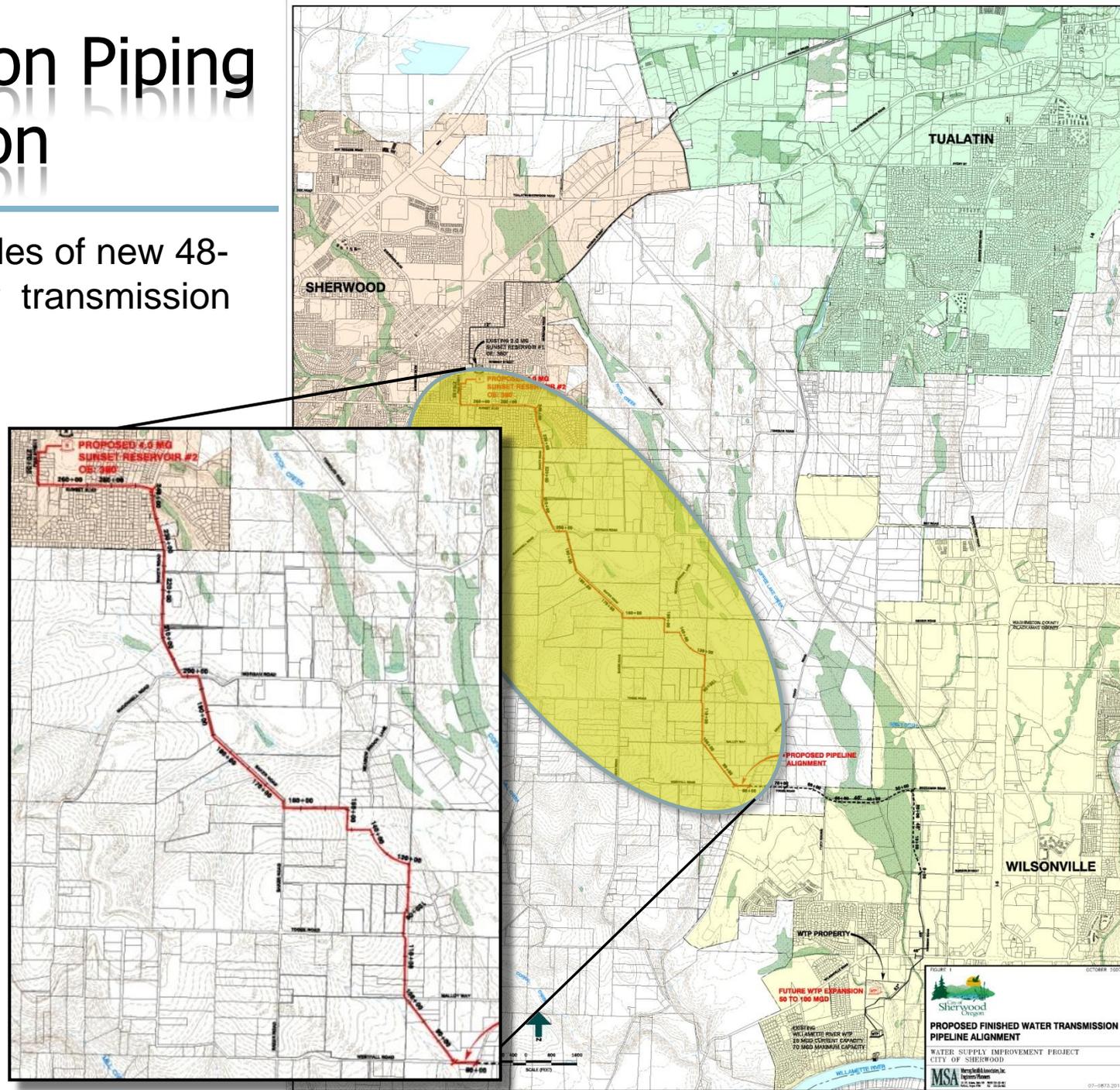
PNWS-AWWA
6501 SW Taylors Ferry Road
Portland, OR 97223
Address Service Requested

*****3-01011 984 2474
NON-PROFIT
MR. CHRIS H. UBER
2474
POST STG
MURRAY SMITH & ASSOCIATES, INC.
US POSTAGE PAID
PERMIT NO. 1119
TACOMA, WA 98402-4223



Transmission Piping Construction

- Nearly 4.0 miles of new 48-inch diameter transmission main
- Under certain operating conditions higher capacities may be achieved
- Facilities upsized for potential regional opportunities



Transmission Piping Construction



- Construction began in 2009 and all piping work is now completed



Transmission Piping Construction



Transmission piping contractor: Emery & Sons Construction, Inc.



Transmission Piping Construction – Piping Joint Systems

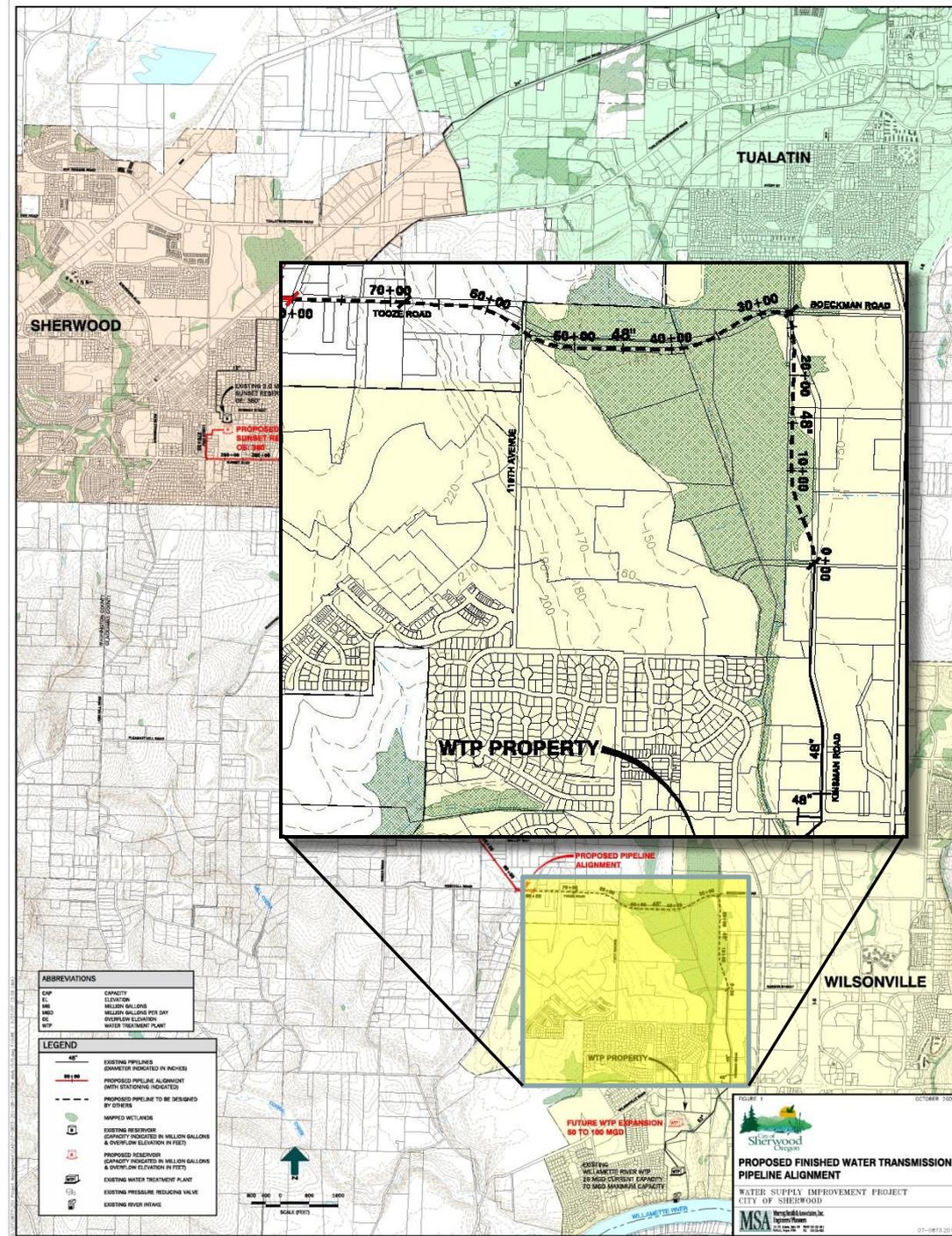


Transmission Piping Construction – Finishing Touches



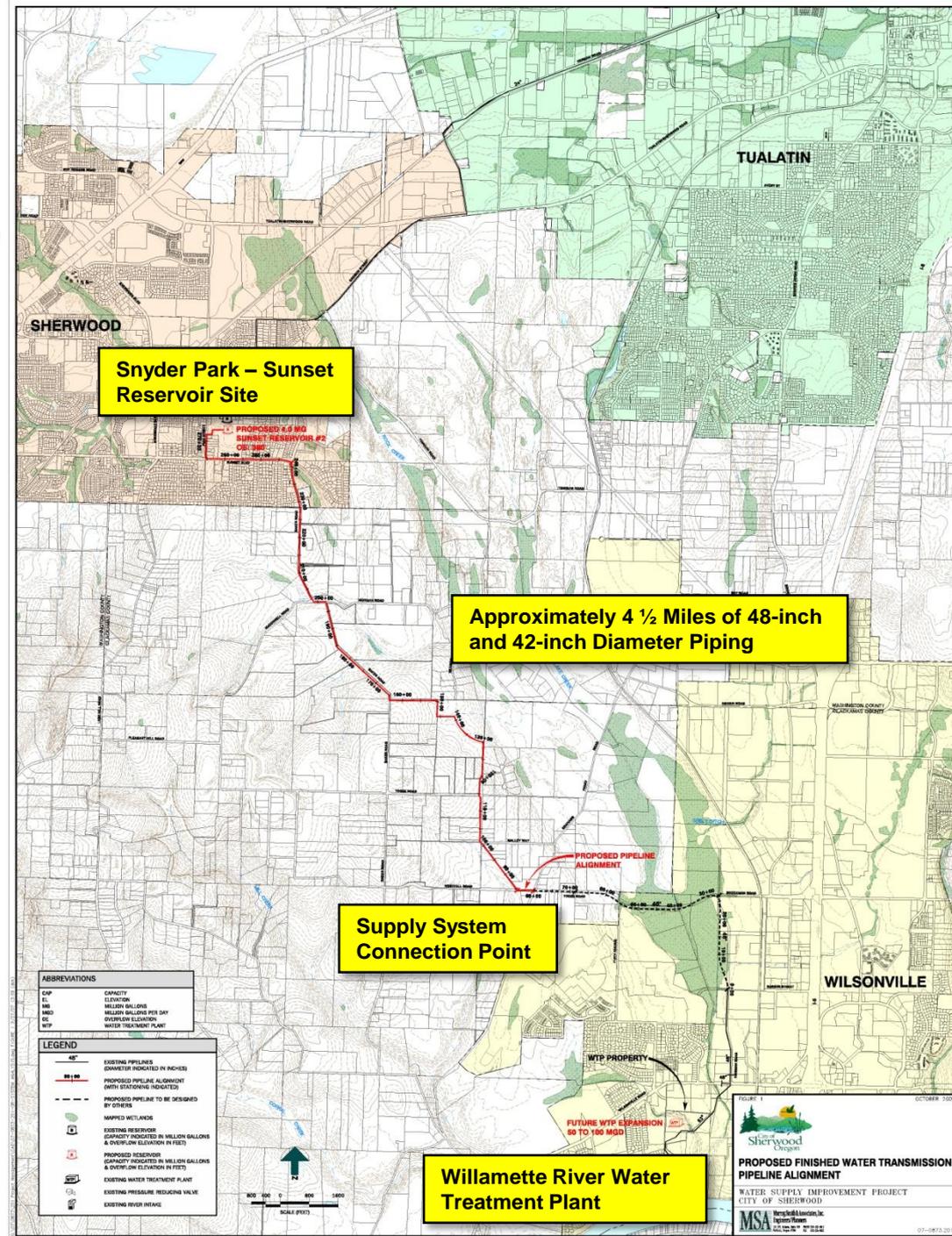
Shared Transmission

- 11,100 lf of 48-inch diameter main through Wilsonville
- Most challenging part of the project
- Negotiations near final



Project Overview

- 2004 project cost estimate: \$42 million
- 2011 actual project cost: \$43 million
- First supply from the new system is expected in Sherwood next month



Thank You!



WATER SUPPLY IMPROVEMENTS PROJECT

Winner of the 2010 PNWS-AWWA Excellence in Engineering Best Large Engineering Works Project and 2010 Oregon Concrete and Aggregate Producers Association Excellence in Concrete awards

MSA recently completed final designs for the multi-phase City of Sherwood Water Supply Improvement Project that will provide the City a new finished water supply from the Willamette River by Spring 2011. The project involves approximately 3.5 miles of new 48-inch diameter welded steel water transmission main, a new 4.0-million gallon (mg) terminal storage facility and a new 2,200-gallons per minute (gpm) booster pumping station. This project connects the City of Sherwood with the Willamette Water Treatment Plant at Wilsonville through a combination of new facilities constructed by the City of Sherwood along with joint



www.msa-ep.com



ownership and use of existing and new facilities developed in coordination with the City of Wilsonville. MSA's work included transmission system routing and reservoir siting analyses, preliminary designs, intergovernmental agreement support, joint facility evaluation, assistance with easements acquisitions land use permits, final design of all facilities, and construction management. MSA recently completed Phase 2 (off-site piping designs) and is currently managing the construction of four and a half miles of 48-inch diameter piping that connects the Sherwood water system to the existing piping in Wilsonville. All improvements followed CIP recommendations set forth in the City's Water System Master Plan prepared by MSA. This project is a winner of the 2010 PNWS-AWWA Excellence in Engineering Best Large Works Project Award and the Oregon Chapter American Construction Institute/Oregon Concrete Aggregate Producers Association 2010 Excellence in Concrete Award – Utility Category.

KEY PROJECT HIGHLIGHTS

- Transmission system routing and reservoir siting analyses
- New 4.0-million gallon (mg) terminal storage facility
- New 2,200-gallons per minute (gpm) booster pumping station
- 2.5 miles of new 48-inch diameter welded steel water transmission main
- Winner of the 2010 PNWS-AWWA Excellence in Engineering Best Large Works Project Award
- Winner of 2010 OCAPA/ACI Excellence in Concrete Award – Utility Category

