Oregon
Theodore R. Kulongoski, Governor

Department of Land Conservation and Development
635 Capitol Street, Suite 150
Salem, OR 97301-2540
(503) 373-0050
Fax (503) 378-5518
www.lcd.state.or.us

NOTICE OF ADOPTED AMENDMENT

09/17/2012

TO: Subscribers to Notice of Adopted Plan or Land Use Regulation Amendments

FROM: Plan Amendment Program Specialist

SUBJECT: City of Wilsonville Plan Amendment
DLCD File Number 002-12

The Department of Land Conservation and Development (DLCD) received the attached notice of adoption. Due to the size of amended material submitted, a complete copy has not been attached. A Copy of the adopted plan amendment is available for review at the DLCD office in Salem and the local government office.

Appeal Procedures*

DLCD ACKNOWLEDGMENT or DEADLINE TO APPEAL: Monday, October 01, 2012

This amendment was submitted to DLCD for review prior to adoption pursuant to ORS 197.830(2)(b) only persons who participated in the local government proceedings leading to adoption of the amendment are eligible to appeal this decision to the Land Use Board of Appeals (LUBA).

If you wish to appeal, you must file a notice of intent to appeal with the Land Use Board of Appeals (LUBA) no later than 21 days from the date the decision was mailed to you by the local government. If you have questions, check with the local government to determine the appeal deadline. Copies of the notice of intent to appeal must be served upon the local government and others who received written notice of the final decision from the local government. The notice of intent to appeal must be served and filed in the form and manner prescribed by LUBA, (OAR Chapter 661, Division 10). Please call LUBA at 503-373-1265, if you have questions about appeal procedures.

*NOTE: The Acknowledgment or Appeal Deadline is based upon the date the decision was mailed by local government. A decision may have been mailed to you on a different date than it was mailed to DLCD. As a result, your appeal deadline may be earlier than the above date specified. NO LUBA Notification to the jurisdiction of an appeal by the deadline, this Plan Amendment is acknowledged.

Cc: Eric Mende, City of Wilsonville
Gordon Howard, DLCD Urban Planning Specialist
Jennifer Donnelly, DLCD Regional Representative

<paa> YA

FORM 2 DLCD Notice of Adoption

This Form 2 must be mailed to DLCD within **5-Working Days after the Final Ordinance is signed** by the public Official Designated by the jurisdiction and all other requirements of ORS 197.615 and OAR 660-018-000

DATE STAMP

☐ In person ☐ electronic ☐ mailed

DEPT OF

SEP 11 2012

LAND CONSERVATION AND DEVELOPMENT

For Office Use Only

Jurisdiction: **City of Wilsonville**

Local file number: **LP12-0002/Ord. # 707**

Date of Adoption: **9/6/2012**

Date Mailed: **9/10/2012**

Was a Notice of Proposed Amendment (Form 1) mailed to DLCD? ☒ Yes ☐ No Date: 4/26/2012

☒ Comprehensive Plan Text Amendment

☐ Comprehensive Plan Map Amendment

☐ Land Use Regulation Amendment

☐ Zoning Map Amendment

☐ New Land Use Regulation

☒ Other: **Master Plan Update**

Summarize the adopted amendment. Do not use technical terms. Do not write "See Attached".

Water System Master Plan update. The Plan documents current water demand, evaluates current system deficiencies, estimates future water demands over a 20-year growth horizon, and estimates the capital and operation costs needed to meet these future demands.

Does the Adoption differ from proposal? Yes, Please explain below:

An Acronyms, Abbreviations and Definitions section was added (2 pages), Sections ES 3.2 and Chapter 7 were added describing applicable City Comprehensive Plan Goals, Policies and Implementation Measures, the Priority Capital Improvements estimate was revised from $27.3M to $25.6M, and O&M Recommendations were expanded.

Plan Map Changed from: **n/a** to: **n/a**

Zone Map Changed from: **n/a** to: **n/a**

Location: **Citywide** Acres Involved:

Specify Density: Previous: **n/a** New: **n/a**

Applicable statewide planning goals:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐

Was an Exception Adopted? ☐ YES ☒ NO

Did DLCD receive a Notice of Proposed Amendment...

35-days prior to first evidentiary hearing? ☒ **Yes** ☐ **No**

If no, do the statewide planning goals apply? ☐ **Yes** ☐ **No**

If no, did Emergency Circumstances require immediate adoption? ☐ Yes ☐ No

DLCD file No. 002-12 (19314) [17163]

Please list all affected State or Federal Agencies, Local Governments or Special Districts:

See Attached List

Local Contact: **Eric Mende, Deputy City Engineer** Phone: **(503) 682-4960** Extension:

Address: **29799 SW Town Center Loop E** Fax Number: **503-682-7025**

City: **Wilsonville** Zip: **97070-** E-mail Address: **mende@ci.wilsonville.or.us**

ADOPTION SUBMITTAL REQUIREMENTS

This Form 2 must be received by DLCD no later than 5 working days after the ordinance has been signed by the public official designated by the jurisdiction to sign the approved ordinance(s)

per ORS 197.615 and OAR Chapter 660, Division 18

1. This Form 2 must be submitted by local jurisdictions only (not by applicant).
2. When submitting the adopted amendment, please print a completed copy of Form 2 on light **green paper if available**.
3. Send this Form 2 and **one complete paper copy** (documents and maps) of the adopted amendment to the address below.
4. Submittal of this Notice of Adoption must include the final signed ordinance(s), all supporting finding(s), exhibit(s) and any other supplementary information (ORS 197.615).
5. Deadline to appeals to LUBA is calculated **twenty-one (21) days** from the receipt (postmark date) by DLCD of the adoption (ORS 197.830 to 197.845).
6. In addition to sending the Form 2 - Notice of Adoption to DLCD, please also remember to notify persons who participated in the local hearing and requested notice of the final decision. (ORS 197.615).
7. Submit **one complete paper copy** via United States Postal Service, Common Carrier or Hand Carried to the DLCD Salem Office and stamped with the incoming date stamp.
8. Please mail the adopted amendment packet to:

ATTENTION: PLAN AMENDMENT SPECIALIST
DEPARTMENT OF LAND CONSERVATION AND DEVELOPMENT
635 CAPITOL STREET NE, SUITE 150
SALEM, OREGON 97301-2540

9. **Need More Copies?** Please print forms on **8½ -1/2x11 green paper only if available**. If you have any questions or would like assistance, please contact your DLCD regional representative or contact the DLCD Salem Office at (503) 373-0050 x238 or e-mail **plan.amendments@state.or.us**.

City of
WILSONVILLE
in OREGON

Planning Division
29799 SW Town Center Loop E
Wilsonville, OR 97070
503-682-4960
503-682-7025 fax

PLANNING DIVISION

Linda Straessle
FAX: (503) 682-7025
(503) 570-1571
straessle@ci.wilsonville.or.us

Delivery via Certified Mail

Letter of Transmittal

TO: Attention: Plan Amendment Specialist	FROM: Linda Straessle
Department of Land Conservation & Development	Administrative Assistant
635 Capital Street NE, Suite 150	
Salem, Oregon 97301-2540	DATE: September 10, 2012

WE ARE TRANSMITTING THE FOLLOWING:

- **DLCD Notice of Adoption form for LP12-0002 Water System Master Plan update.**
- **List of Affected State or Federal Agency, Local Government or Special Districts**
- **Wilsonville City Council Notice of Decision for Ordinance No. 707, with attached Affidavit of Mailing Notice of City Council Decision.**
- **List of changes made to Ordinance No. 707 Exhibit A – Water System Master Plan Final Draft dated July 25, 2012 during City Council hearings. (Final adopted Plan not available prior to the due date of this notice.)**
- **Adopted Ordinance No. 707**

Affected State or Federal Agencies, Local Governments or Special Districts

Name	Company	Address	City	State	Zip
Columbia Cable of Oregon		14200 SW Brigadoon Ct.	Beaverton	OR	97005
Tualatin Valley Water District		1850 SW 170th Ave.	Beaverton	OR	97005-4211
Planning Director	City of Sherwood	22560 SW Pine Street	Sherwood	OR	97140
City Planner	City of Canby	182 N. Holly	Canby	OR	97013
Mike McCallister	Clackamas Cty Planning Manager	150 Beavercreek Road	Oregon City	OR	97045
William Graffi	Unified Sewerage Agency	155 N. First Avenue, Room 270	Hillsboro	OR	97124
Andy Back	Wash. County Long Range Planning	155 N. First Avenue	Hillsboro	OR	97124
Wendy Buck	Portland General Electric	121 SW Salmon 1 WTC3	Portland	OR	97204
Shelley Fenton	BPA Realty Department	PO Box 3621	Portland	OR	97208
Tom Simpson	NW Natural Gas	220 NW 2nd Avenue	Portland	OR	97209
Michael Dennis	Tri-Met Project Planning Dept	4012 SE 175th Avenue	Portland	OR	97202
Oregon Dept of Environ Quality		811 SW Sixth Avenue	Portland	OR	97204
Ray Valone	Metro	600 NE Grand Avenue	Portland	OR	97232
Manager, Community Development	Growth Management Services Metro	600 NE Grand Avenue	Portland	OR	97232
Attn: Development Review	ODOT	123 NW Flanders Street	Portland	OR	97209
John Lilly	Department of State Lands	775 Summer Street, NE	Salem	OR	97301-1279
Richard Ross	Department of Corrections	2575 Center Street NE	Salem	OR	97310
Bobbi Burton	Community Coordinator, Facilities Division	2575 Center Street, NE	Salem	OR	97310
Bill Ferber, Region Manager	Oregon Water Resources Department	725 Summer Street, NE	Salem	OR	97301
Sherwood School Dist Admin Office		23295 SW Main Street	Sherwood	OR	97140
Aquilla Hurd-Ravich	Community Development Director City of Tualatin	18880 SW Martinazzi Avenue	Tualatin	OR	97062
Bill Rhoades	West Linn/Wilsonville School District 3JT	22210 SW Stafford Rd.	Tualatin	OR	97062
Brian Tietsort	United Disposal Services	10295 SW Ridder Road	Wilsonville	OR	97070
Brian Moore	Portland General Electric	9540 SW Boeckman Road	Wilsonville	OR	97070
Tualatin Valley Fire and Rescue	South Division	7401 SW Washo Court	Tualatin	OR	97062-8350
Tualatin Valley Fire and Rescue		29875 SW Kinsman Road	Wilsonville	OR	97070

City of
WILSONVILLE
in OREGON

29799 SW Town Center Loop E
Wilsonville, Oregon 97070
(503) 682-1011
(503) 682-1015 Fax Administration
(503) 682-7025 Fax Community Development

WILSONVILLE CITY COUNCIL
NOTICE OF DECISION

FILE NO: **Ordinance No. 707**
An Ordinance Of The City Of Wilsonville Adopting An Updated Water System Master Plan As A Sub-Element Of The City's Comprehensive Plan; Adopting A Capital Improvement Project List For Water Supply, Storage And Distribution; And Replacing All Prior Water System Master Plans.

APPLICANT: **City of Wilsonville**

After conducting public hearings, the City Council voted to adopt Ordinance No. 707 as submitted and adopted findings and conclusions to support their action.

This decision has been finalized in written form as **Ordinance No. 707** and placed on file in the city records at the Wilsonville City Hall this 10th day of September, 2012 and is available for public inspection. The date of filing is the date of decision. Any appeal(s) must be filed with the Land Use Board of Appeals (LUBA) in accordance with ORS Chapter 197, within twenty-one days from the date of decision. Copies of Ordinance No. 707 may be obtained from the City Recorder, 29799 SW Town Center Loop East, Wilsonville, OR 97070, (503) 570-1506.

For further information, please contact the Wilsonville Engineering Division, 29799 SW Town Center Loop Road, Wilsonville, Oregon 97070 or telephone (503) 682-4960.

AFFIDAVIT OF MAILING
NOTICE OF CITY COUNCIL DECISION
OF THE CITY OF WILSONVILLE

STATE OF OREGON)
)
COUNTIES OF CLACKAMAS)
)
CITY OF WILSONVILLE)

I, Sandra C. King, do hereby certify that I am City Recorder of the City of Wilsonville, Counties of Clackamas and Washington, State of Oregon, that the attached copy of Notice of Decision regarding Ordinance No. 707 "An Ordinance Of The City Of Wilsonville Adopting An Updated Water System Master Plan As A Sub-Element Of The City's Comprehensive Plan; Adopting A Capital Improvement Project List For Water Supply, Storage And Distribution; And Replacing All Prior Water System Master Plans" is a true copy of the original notice; that on, September 10, 2012 , I did cause to be e-mailed copies of such notice of decision in the exact form hereto attached to the listed below:

Dean Tessler – dtessler@theram.com
Stanley Wallulis – Swallulis@gmail.com
Cliff Engel – engel1@hevanet.com

Witness my hand this 10th day of September, 2012.

OFFICIAL SEAL
PAMELA J MUNSTERMAN
NOTARY PUBLIC-OREGON
COMMISSION NO. 449899
MY COMMISSION EXPIRES JUNE 14, 2014

Sandra C. King
Sandra C. King, MMC, City Recorder

Subscribed and sworn to before me this 10th day of September, 2012.

NOTARY PUBLIC, STATE OF OREGON

My commission expires: 6-14-14

DLCD Attachment – Water System Master Plan

There is one text change to the Final Draft of the Water System Master Plan dated July 2012, as adopted by Wilsonville City Council on September 06, 2012 by Ordinance 707.

The text of Section ES 3.2 and identical text in Chapter 7 were modified as follows: (added text is underlined):

..... The primary goal of the water master plan is derived from Wilsonville's Comprehensive Plan Goal 3.1 providing for infrastructure in general and is as follows:

> To assure that good quality public facilities and services are available with adequate but not excessive capacity to meet community needs, while assuring that growth does not exceed the community's commitment to provide adequate facilities and services.

ORDINANCE NO. 707

AN ORDINANCE OF THE CITY OF WILSONVILLE ADOPTING AN UPDATED WATER SYSTEM MASTER PLAN AS A SUB-ELEMENT OF THE CITY'S COMPREHENSIVE PLAN; ADOPTING A CAPITAL IMPROVEMENT PROJECT LIST FOR WATER SUPPLY, STORAGE AND DISTRIBUTION; AND REPLACING ALL PRIOR WATER SYSTEM MASTER PLANS

WHEREAS, the City currently has a Water System Master Plan that was adopted by City Council (Ordinance No. 531) on January 7, 2002; and

WHEREAS, ORS 197.175 requires cities to prepare, adopt, and implement Comprehensive Plans consistent with statewide planning goals adopted by the Land Conservation and Development Commission; and

WHEREAS, ORS 197.712 (2)(e) requires cities to develop and adopt a public facilities plan for areas within the Urban Growth Boundary containing a population greater than 2,500 persons, including rough cost estimates for projects needed to provide sewer, water and transportation uses contemplated in the Comprehensive Plan and Land Use Regulations; and

WHEREAS, an updated Water System Master Plan is needed to account for growth and plan for future development; and

WHERAS, the update to the Water System Master Plan documents current water demand, evaluates current system deficiencies, estimates future water demands over a 20-year growth horizon, and estimates the capital and operation costs needed to meet these future demands; and

WHEREAS, in developing the new Water System Master Plan, the City has sought to carry out federal, state and regional mandates, provide for alternative improvement solutions to minimize public and private expense, avoid the creation of nuisances and maintain the public's health, safety, welfare and interests; and

WHEREAS, proposed amendments to the Water System Master Plan identifies changes to Comprehensive Plan Goal 3.1; and

WHEREAS, Keller Associates, the project consultant, and City staff conducted work sessions with the Planning Commission and City Council and held a public open house on the Water System Master Plan to solicit citizen input addressing Statewide Planning Goal #1 – Citizen Involvement; and

WHEREAS, following the timely mailing and publication of the required Ballot Measure 56 notice, the Wilsonville Planning Commission conducted a public hearing on July 11, 2012 and adopted Resolution Number LP12-0002 recommending the City Council adopt the Water System Master Plan; and

WHEREAS, after providing due public notice, as required by City Code and State Law, a public hearing was held before the City Council on August 20, 2012, at which time the City Council considered the recommendation of the Planning Commission, gathered additional evidence and afforded all interested parties an opportunity to present oral and written testimony concerning the Water System Master Plan; and

WHEREAS, the City Council has carefully considered the public record, including all recommendations and testimony, and being fully advised.

NOW, THEREFORE, THE CITY OF WILSONVILLE ORDAINS AS FOLLOWS:

1. FINDINGS.

   The above-recited findings are adopted and incorporated by reference herein, including the findings and conclusions of Resolution No. LP12-0002, which includes the staff report. The City Council further finds and concludes that the adoption of the updated Water System Master Plan is necessary to help protect the public health, safety and welfare of the municipality by planning that will help to ensure there will continue to be adequate capacity and quality of water within the City's municipal system.

2. DETERMINATION.

   Based upon such findings, the City Council hereby adopts the Water System Master Plan, attached hereto and marked as Exhibit A, and incorporated by reference as if fully se forth herein, which shall replace and supersede all prior Water System Master Plans adopted by Ordinance, resolution or motion.

3. EFFECTIVE DATE OF ORDINANCE.

   This Ordinance shall be declared to be in full force and effect thirty (30) days from the date of final passage and approval.

SUBMITTED to the Wilsonville City Council and read the first time at a regular meeting thereof on the 20th day of August, 2012, and scheduled for second reading at a regular meeting thereof on the 6th day of September, 2012, commencing at the hour of 7.P.M. at Wilsonville City Hall.

Sandra C. King

Sandra C. King, MMC, City Recorder

ENACTED by the City Council on the 6th day of September 2012, by the following votes:

YEAS:-4- NAYS: -0-

Sandra C. King

Sandra C. King, MMC, City Recorder

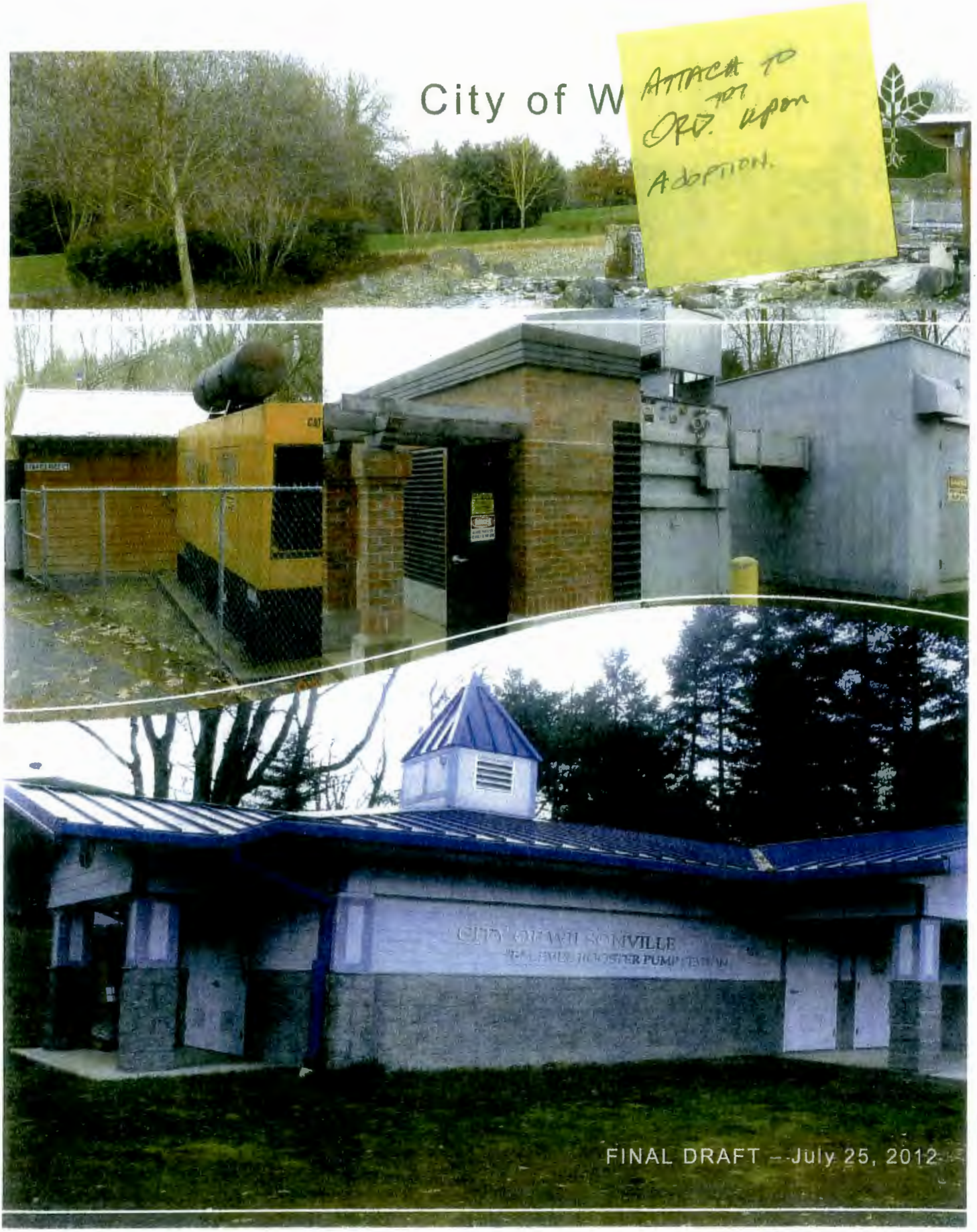
DATED and signed by the Mayor this 7TH day of September 2012.

Tim Knapp

Tim Knapp, Mayor

SUMMARY OF VOTES:

Mayor Knapp	Yes
Council President Nunez	Yes
Councilor Goddard	Yes
Councilor Starr	Yes



WATER SYSTEM MASTER PLAN

KELLER associates

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Water System Master Plan

City of Wilsonville, Oregon

KELLER associates

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KELLER associates

ACRONYMS, ABBREVIATIONS, AND SELECTED DEFINITIONS

AC	asbestos cement
ADD	average day demand
Amp	electrical amperage rating
AWWA	American Water Works Association
blow-off	end-of-line valve and fittings used for manual flushing of pipelines
Conc	concrete
C	Celcius
CCTV	closed circuit television
CFD	computational fluid dynamic
CI	cast iron
CIP	Capital Improvement Plan
CT	concentration x T_{10}
CU	elemental designation for copper material
DI	ductile iron
DC	direct current electricity
EDU	equivalent dwelling unit
EPA	U.S. Environmental Protection Agency
ERU	equivalent residential unit
fps	feet per second
ft	feet (or) foot
hp	horsepower
GIS	geographic information system
gpcd	gallons per capita per day
gpm	gallons per minute
gpm/sf	gallons per minute per square foot
hrs	hours
HRT	hydraulic residence time
ID	identification
in	inch
Level A	The lowest pressure service area in Wilsonville (also referred to as "A Level")
Level B	The middle pressure service area in Wilsonville (also referred to as "B Level")
Level C	The higher pressure service area in Wilsonville (also referred to as "C Level")
Level D	A future, highest pressure service area in Wilsonville (also referred to as "D Level")
LIDAR	light detection and ranging
LMI	Liquid Metronic Incorporated (metering pump)
MCC	motor control center
MDD	maximum day demand
Metro	An elected, regional government for the Portland metropolitan area
MFDU	multi-family dwelling unit
MG	million gallons
mgd	million gallons per day
mg·min/L	milligram-minute per liter
mg/L	milligrams per liter

min	minutes
OAR	Oregon Administrative Rules
ODHS	Oregon Department of Human Services
ODWR	Oregon Department of Water Resources
O&M	operation and maintenance
PDD	peak day demand
pH	potential Hydrogen (measure of the acidity or basicity)
PHD	peak hour demand
PLC	programmable logic control unit
ppd	pound per day
ppm	parts per million
PRV	pressure reducing valve
psi	pounds per square inch
PSU	Portland State University
PVC	polyvinyl chloride plastic
RCP	reinforced concrete pipe
SCADA	supervisory control and data acquisition
sf	square feet
SFDU	single family dwelling unit
T_{10}	time required for 10% of the inlet chemical concentration to reach the outlet
T_{90}	time required for 90% of the inlet chemical concentration to reach the outlet
T_{10}/T_{90}	more conservative hydraulic efficiency factor obtained by dividing T_{10} by T_{90}
T_{10}/HRT	hydraulic efficiency factor
TAZ	traffic analysis zone
turnout	refers to a water delivery point or water enters the distribution system
TVF&R	Tualatin Valley Fire and Rescue
TVWD	Tualatin Valley Water District
UGB	urban growth boundary
UPS	uninterruptible power supply
URA	urban reserve area
USEPA	U.S. Environmental Protection Agency
US	United States
UV	ultraviolet radiation
VFD	variable frequency drive
WMP	water master plan
WMCP	water management and conservation plan
WRWTP	Willamette River Water Treatment Plant
WSMP	water system master plan
WTP	water treatment plant

Water System Master Plan

Executive Summary

KELLER associates

INTRODUCTION AND OVERVIEW

Keller Associates, Inc. was commissioned in 2011 to complete a Water System Master Plan that would update the 2002 plan. This water master plan is a 20-year planning document that focuses primarily on Wilsonville's water distribution system. This system includes the City's network of water pipelines, storage tanks, valves, and hydrants. An overview of the system is illustrated in Figure 1, found in Appendix A of this report.

The primary water supply for Wilsonville is from a state-of-the-art surface water treatment plant, commissioned in April 2002. This master plan includes an evaluation of the existing treatment plant capacity, and identifies minor improvements to accommodate an increase in the production rate from 12 to 15 million gallons per day. (A more comprehensive evaluation and master plan for the treatment plant is not part of this document, but the City intends to complete one at a later date.) The plan also evaluates the existing groundwater wells that now serve as an emergency backup supply to the City.

In general, Wilsonville's water system is in great condition, providing a safe and reliable water source to the residents and businesses serviced. Water rights are sufficient for projected needs, the treatment plant is only 10 years old, and the majority of the pipelines and other distribution facilities are less than 30 years old. The City has well-trained employees who perform regular maintenance of the facilities, and few deficiencies exist.

This planning document identifies upgrades to the water system to accommodate anticipated future demands. The plan also identifies potential vulnerabilities and localized areas where the fire protection could be improved. Recommended improvements for the 20-year planning horizon are discussed in more detail in the technical summary that follows, and generally include the following:

- An additional 3.0 million gallons (MG) of water storage tank
- Completion of the 48-inch transmission pipeline
- A new 16-inch waterline under the Willamette to Charbonneau District
- Minor water treatment plant upgrades
- Miscellaneous pipeline and facility upgrades intended to improve operations, water quality, and fire protection

In addition to these capital improvements, this plan identifies repair and replacement needs and recommends continued routine maintenance activities. These include:

- Ongoing pipeline, hydrant, and meter replacement programs
- Ongoing maintenance and upgrades to the well facilities to retain functionality as a reliable backup supply
- Efforts to reduce the amount of unaccounted for water (water loss) to less than 10%

TECHNICAL SUMMARY

This section provides a summary of the major findings of the master plan. It includes brief discussions of water demand assumptions, water system asset conditions, system deficiencies, and recommendations for improvements to the water storage and distribution system. A partial assessment of the water treatment capabilities is also provided consistent with this documents' focus on City of Wilsonville needs and requirements. Long range planning for the Willamette River Water Treatment Plan (WRWTP) involves multiple parties and is beyond the scope of this document.

ES.1 DESIGN CONDITIONS

ES.1.1 Demographics

The study area is illustrated in Figure 2, found in Appendix A. It includes the area within the existing Urban Growth Boundary, plus portions of Clackamas and Washington County Urban Reserve Areas expected to be incorporated into Wilsonville. The study area is intended to coincide with the ongoing Transportation System Plan update.

Based on an evaluation of population projections from various sources, an annual residential growth rate of 2.9% was assumed. Both single family and multi-family dwelling units were assumed to grow at this rate until build-out of their respective parts of the study area.

For nonresidential development, the number of employees in the study area was projected (per previous planning studies) to double over a 20-year period. This equates to an annual average nonresidential growth rate of 3.5%.

ES.1.2 Water Demand

Water production data from 2005 to 2009 was used to establish water demand patterns (due to current economic conditions, 2010 was not considered representative of normal usage). Table ES.1 shows the values used to estimate future demands.

TABLE ES.1 - Water Demands by User Type

	Single Family	Multi-Family	Commercial	Industrial
Average Daily Demand				
gallons/Household	247	162	-	-
gpm/Acre	-	-	1.93	0.56
Maximum Day Demand				
gallons/Household	606	283	-	-
gpm/Acre	-	-	3.3	0.84

gpm = gallons per minute

For build-out, industrial demands were increased by an additional 25 percent to reflect redevelopment, additional infill, and higher water users within existing structures. Three large future industries totaling 1.0 mgd in demand were also included in future water usage projections.

The existing treatment plant and Wilsonville transmission system will also provide supplemental potable water supply to the City of Sherwood. Sherwood is currently receiving up to 2.5 mgd, and by 2015 will be receiving 5.0 mgd.

Table ES.2 summarizes the future demands for residential and nonresidential users, future industry, and supplemental supply for the City of Sherwood. Supply to the City of Sherwood was assumed to increase to 10 mgd in 2030 and 20 mgd at final build-out. Build-out of the study area is projected to occur in the year 2036 for nonresidential areas, and in the year 2045 for residential areas.

TABLE ES.2 – Future Water System Demands

Scenario	2010	2015	2020	2025	2030	Build-out
Population	19,525	22,525	25,986	29,979	34,585	52,400
Households	7,873	9,083	10,478	12,088	13,946	21,129
Residential						
Average, mgd	1.70	1.96	2.26	2.60	3.00	4.21
Peak Day, mgd	3.62	4.17	4.82	5.56	6.41	8.74
Peak Hour, mgd	6.16	7.10	8.19	9.45	10.9	14.86
Nonresidential						
Average, mgd	1.50	1.79	2.12	2.52	2.99	3.09
Peak Day, mgd	3.08	3.66	4.35	5.16	6.13	6.35
Peak Hour, mgd	5.24	6.23	7.40	8.79	10.4	10.80
Other Miscellaneous						
3 Future Large Industries	0.00	0.50	0.75	1.00	1.00	1.00
Sherwood	0.00	5.00	5.00	10.0	10.0	20.0
Total System						
Average, mgd	3.20	9.24	10.1	16.1	17.0	28.3
Peak Day, mgd	6.70	13.3	14.9	21.7	22.5	36.1
Peak Hour, mgd	11.4	18.8	21.3	29.2	32.3	46.7

mgd = million gallons per day

ES.2 WATER SYSTEM EVALUATION

The City of Wilsonville's primary supply comes from the Willamette River. A state-of-the-art treatment plant produces high-quality finished water that is pumped into a transmission pipeline and conveyed to the City's distribution system through three delivery points ("turnouts") as shown on Figure 1. The system also includes four

storage reservoirs, two booster stations, over 107 miles of distribution pipeline, three pressure zones, and eight wells.

Keller Associates updated the City's existing computer model of the City's distribution system. Every storage reservoir, booster station, and City pipeline 4-inches and larger were included in the model. The model was refined as field measurements were compared to model results in a process referred to as calibration. The City now has a highly accurate and dynamic hydraulic model of their water system. This tool can be used and updated to quickly investigate potential system impacts from new users.

ES.2.1 Storage

Storage in a water system is provided for operational flexibility, to meet peak demands, for fire flows, and for emergency conditions. The City's four existing storage reservoirs provide 7.6 million gallons (MG) of effective (or useable) storage. These reservoirs are located within the City's distribution system, providing needed operating, peaking, fire, and emergency storage. In addition to these four reservoirs, a minimum storage volume is maintained in the treatment plant clearwell for chlorine disinfection. During an emergency, it was assumed that this water would also be available to the City, providing an additional 1.08+ MG of emergency storage. Adding the clearwell emergency storage provides the City with approximately 8.7 MG of storage. Based on a worst case scenario (no backup wells to supplement storage), the total storage required is anticipated to increase from 9 MG to almost 18 MG by 2030.

The City has plans to construct an additional 3.0 MG storage reservoir near the intersection of Tooze and Baker Road. This reservoir, combined with existing storage, will provide sufficient long-term storage for the City's 20-year needs provided that the City continues to maintain the majority of the existing backup wells to offset storage needs. This storage volume would also allow the existing Charbonneau tank to be abandoned, provided a secondary supply line is constructed to the District.

ES.2.2 Pumping

The Charbonneau Booster Station and the B-to-C Booster Station are currently the only two pumping facilities in the distribution system. The Charbonneau Booster Station runs only periodically because the Charbonneau District can usually receive needed flows and pressures through the connection to the main distribution system (Zone B). The B-to-C Booster Station works together with the C Level Reservoir to meet the pressure and flow needs of the C Level pressure zone. No additional booster pumping is required for the current system, but several upgrades to the existing booster stations are recommended. As the City grows, a future D Level Booster Station will be required to service the northeast corner of the study area.

ES.2.3 Distribution System

The existing distribution system was evaluated for age, physical condition, water pressure, and capability to provide fire flows.

Age & Physical Condition

Most of the pipe materials are ductile iron or cast iron, which can have a life of 75-100 years in non-aggressive soil environments. However, recurring problems have been reported with some cast iron pipe – particularly those sections installed in the 1970s (approximately 32,800 feet of pipeline), much of which is located in the Charbonneau District. In addition, approximately 1,700 feet of small diameter steel pipe sections may need to be replaced, since these pipe materials are generally in poorer condition. These problematic pipeline sections are recommended for replacement within the next 20 years. Replacement of 34,500 feet of pipe over the next 20 years will involve replacing an average of 1,725 feet of pipe per year.

In addition to the pipeline sections that need to be replaced, the City has identified 40 fire hydrants that need replacing. Hydrant and pipeline replacement projects should be coordinated with each other and with planned street repairs wherever possible to minimize costs. Replacements should also be coordinated with the Tualatin Valley Fire and Rescue.

Keller Associates recommends that the City continue their meter testing and replacement program of large commercial meters on a 3-year cycle, and expand the residential meter testing program to include a representative sample (100±) each year.

Fire Flows

Based on water system modeling, fewer than 5 percent (55 of approximately 1200) locations modeled in the system cannot meet the target fire flow standard (1500 gpm residential, 3000 gpm commercial/industrial). Most of these are dead-end or short lengths of smaller diameter piping.

Pressure

Most modern appliances and plumbing fixtures operate best when water system pressures are between 50 psi and 80 psi. Water system modeling shows that much of Wilsonville's water system will experience water pressure greater than 80 psi. This is because the greater part of Wilsonville is served by the B Level pressure zone (refer to Figure 5 in Appendix A for pressure zone map). This arrangement is not uncommon for water systems, but does require that individual pressure regulators be installed to regulate pressures below 80 psi. For Wilsonville's system, Keller Associates recommends that individual pressure regulators be installed on all new connections. This will give the City the greatest flexibility in operations, while providing a level of protection to the user. Where future mainline pressures are anticipated to exceed 120 psi, special piping is recommended.

There are also some areas of low pressure in the northern portion of the system. While none of the areas are less than 40 psi, these may be areas the operations crew should monitor as the system continues to evolve. In order to provide water service with pressures greater than 40 psi to the northeast portion of the study area, a new pressure zone will be required. Existing and future pressure zones are illustrated in Figure 5 in Appendix A.

Water Loss

The City has active meter testing and leak detection programs. However, in recent years unaccounted for water (often referred to as water loss) amounted to between 15.7% and 17.6% of the total reported water produced at the water treatment plant. Efforts to locate this water, which were completed in conjunction with this study, suggest that the actual unaccounted for water is closer to 13% (refer to Section 2.3). Keller Associates recommends the following activities to reduce the unaccounted for water to less than 10%:

- Continued leak detection and large meter testing programs.
- Expand leak detection to include private unmetered fire lines.
- Implement residential meter testing and replacement programs.
- Account for water treatment plant utility water and onsite irrigation usage.
- Enhance tracking of water loss by trending water loss on a 12-month volumetric moving average basis.
- More aggressively investigate atypical low water uses. This process can be partially automated with the billing system, flagging accounts with no water usage or water usage substantially less than that reported for the same time the previous year.
- Look at partitioning of segments of the City (e.g. Charbonneau District) and compare metered delivery volumes for the region to the total of the individual meter readings.

These recommendations will be included in Wilsonville's forthcoming Water Management and Conservation Plan. The plan is currently being prepared in accordance with OAR 690.86.

Other Issues

Other system vulnerabilities and inefficiencies were found while evaluating the existing water system. Additional improvements were recommended to address these issues.

One of the vulnerabilities discovered in Wilsonville's system was single line connections to large parts of the system. In the event that the single pipeline were to rupture, the entire downstream area would be without water. Looping is recommended. Examples of these areas include the single line supplying Zone C north of Elligsen, and the Canyon Creek, Ash Meadow, and Sundial apartments.

Another vulnerability found in the system was hydrant coverage shortage in several of the more populated sections of the water system (based on a maximum service area radius of 300 feet from the hydrant). Hydrants, and in some cases new or upsized pipelines, are proposed to provide adequate coverage in the evaluated areas.

One inefficiency relates to the operations of the Charbonneau tank. Under the current operation, water enters the tank from the water system and then has to be pumped again into the water system to be used. The improvements identified in this plan will remove unnecessary pumping.

ES.2.4 Wells

The City owns and maintains eight potable groundwater wells that once supplied all of the City's drinking water. Since the completion of the water treatment facility in 2002, these wells are designated for emergency backup water supply only. Keller Associates reviewed the well conditions, water rights status, availability of standby power, water quality, and pump tests (conducted as part of the study) to prioritize which well facilities warrant upgrades and continued maintenance, and which ones should be considered for potential abandonment or conversion to nonpotable (e.g. irrigation) use.

Given the potential for the Charbonneau District to become isolated from the remainder of the system due to an earthquake, it was felt that the two Charbonneau wells should be maintained as a critical backup supply source for areas south of the Willamette River. The Wiedeman, Boeckman, Gesellshaft, and Elligsen wells all have deficiencies, but should be maintained as part of the City's backup water supply. Keller Associates recommends that the City consider abandoning the Canyon Creek and repurposing Nike well for local irrigation purposes. Before abandoning any well, the City should carefully review the long-term benefits of maintaining/transferring existing water rights.

ES.2.5 Treatment and Transmission Overview

The Willamette River Water Treatment Plant (WRWTP), completed in 2002, is jointly owned by the City of Wilsonville and the Tualatin Valley Water District (TVWD). Most of the existing treatment plant is currently rated for 12-15 mgd, with portions capable of handling 70+ mgd. Though a detailed treatment study was outside the scope of this master plan, hydraulics and process capacities were analyzed. With relatively minor upgrades or policy changes, the WRWTP will be able to treat the design production rate of 15 mgd. Based on projected system demands, a major plant expansion would be needed sometime after 2020. A separate water treatment plant master plan is needed to define what additional plant upgrades are needed to increase the capacity beyond 15 mgd.

Multiple evaluations have been performed on the WRWTP's production capacity each with different results. Applying the more conservative assumptions, the current plant capacity is 12 mgd. Under these assumptions, the limitation of the treatment plant is the clearwell storage volume. Under the current City policy of maintaining 1.25 million gallons of operational storage

(15 mgd for 2 hours), the remaining storage is insufficient to provide adequate disinfection contact time. However, modifying the policy to keep only 0.30 million gallons of operational storage (a conservative estimate of what is needed for on-site operations) would result in a treatment capacity in excess of 15 mgd. Alternatives to policy modification include capital improvements to the clearwell such as adding mixer pumps or baffles. In either case, a new tracer study on the clearwell is warranted because the previous tracer study results are only applicable for flows up to 9.5 mgd. Further details on this subject can be found in Chapter 4.

In addition to the potential clearwell limitations, there are also transmission limitations. When flows begin to exceed 12.5 mgd from the WRWTP, a sudden stop in flow (e.g. power failures) can lead to damaging surge conditions in the transmission and distribution lines. A 750 cubic foot hydropneumatic tank is recommended to mitigate this potential damage and allow the plant to safely operate at 15 mgd.

ES.2.6 Charbonneau District

Because of the age and isolated nature of the Charbonneau District, Keller Associates evaluated the water distribution system needs specific to the District service area. The single largest concern for the District area is the risk associated with an earthquake. An earthquake could easily disrupt the single pipeline service that feeds the District. Additionally, the Charbonneau tank that would service the District is at risk of settling during a major earthquake. Settling of the tank is not anticipated to result in a catastrophic failure and release of water, but it would result in loss of use of the reservoir. To address these risks, Keller Associates evaluated tank rehabilitation and replacement options and investigated the possibility of a secondary supply pipeline across the Willamette River (refer to Section 3.3). Constructing the secondary pipeline appears to be the lowest cost and lowest risk alternative. The pipeline alternative will also allow for the abandonment of the existing tank and booster station which are approximately 35 years old.

The Charbonneau District also has a disproportionate amount of older and undersized pipelines that will require replacement within the planning period. Additionally, stricter fire protection standards will require additional hydrants and associated pipelines if the system is going to be brought up to current standards. For a more complete evaluation of the District, refer to Appendix F.

ES.3 RECOMMENDATIONS

ES.3.1 Prioritized Improvement Plan

Recommended improvements resulting from the system evaluation are presented in this section in order of priority. These improvements are necessary to meet the available fire flow standards, provide hydrant coverage, address hydraulic restrictions, correct deficiencies in the physical condition of the existing system components, increase system storage capacity, and provide reliable backup well capability. Also included are development-driven and City-identified capital improvement projects.

Prioritization of the improvements was developed in consultation with City staff. Table ES.3 summarizes the recommended capital improvements.

Priority 1 improvements represent more urgent facility and pipeline improvements, and projects to increase fire flows that are currently less than 1,000 gpm. Priority 1A improvements are recommended within the next 5 years and (for capital projects) are intended to guide development of the water-related, 5-year Capital Improvement Plan (CIP). Priority 1B improvements are recommended by 2022. Priority 2 improvements are those that are needed within the next 20 years, and include lower priority facility upgrades and replacements, and projects to improve fire flows currently between 1,000 and 1,500 gpm. Hydrants needed for residential area coverage not tied to a Priority 1 improvement, are considered Priority 2 improvements.

Priority 3 improvements include facility replacements and pipeline improvements, to be implemented as development or redevelopment occurs. These may include improvements intended to correct marginal fire flow deficiencies, to address poor hydrant coverage in developed industrial/commercial areas, or to provide water to currently unserviced future growth areas.

Each improvement is assigned a numeric identifier that corresponds to the Priority Improvements and Replacements map (Figure 4, Appendix A). The primary purpose for the recommended improvements is also noted in the capital improvement tables, along with an opinion of probable cost.

The various improvements listed in the capital improvement plan may have a portion of the cost attributed to future growth because they are, at least in part, intended to benefit growth. Where this is the case, the incoming development or redevelopment is responsible for the growth portion of the cost through the application of system development charges. To assist in future system development charge evaluations, Keller Associates has estimated the portion of the improvement cost that could be attributed to growth. It should be noted that additional capital improvements to expand the treatment capacity of the Willamette River Water Treatment Plant are not included in Tables ES.3.

TABLE ES.3 – Priority Capital Improvements

ID#**	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment %	Growth Apportionment Cost	Operating Fund	Additional Annual O&M
Priority 1A Improvements (by 2017)							
Water Supply							
106	Portable Flow Meter (for well tests)	Operations	$ 13,000	0%	$ -	$ 13,000	$ 1,360
Water Treatment and Transmission							
	Surge Tank	Operations	$ 170,000	100%	$ 170,000	$ -	$ 960
	Clearwell Improvements (assume policy change)	Operations	$ -	100%	$ -	$ -	
Water Storage							
121	C Level Reservoir Security and Sampling Improvements	Operations	$ 18,000	0%	$ -	$ 18,000	$ 640
123	Charbonneau Reservoir Chlorine Monitoring	Operations	$ 7,000	0%	$ -	$ 7,000	$ 960
124	Automated Valve at Tooze/Westfall (West Side Tank)	Operations	$ 58,000	100%	$ 58,000	$ -	$ 580
125	3.0 Million Gallon West Side Tank and 24-inch Transmission (in Pre-design)*	*Growth*	$ 5,840,000	100%	$ 5,840,000	$ -	$ 17,160
126	Elligsen West Tank - Add Altitude Valve	Operations	$ 31,000	100%	$ 31,000	$ -	$ 580
Booster Stations & Turnouts							
140	Charbonneau Booster PRV & SCADA	Operations	$ 22,000	20%	$ 4,400	$ 17,600	$ 920
Water Distribution Piping							
163	18-inch Loop on Barber St. (Montebello to Kinsman)	Growth	$ 371,000	100%	$ 371,000	$ -	$ 320
165	48-inch Transmission on Kinsman St. - Barber to Boeckman (in Design)*	*Growth*	$ 3,960,000	100%	$ 3,960,000	$ -	$ 3,000
	Total Priority 1A Improvements		**$ 10,450,000**		**$ 10,434,400**	**$ 55,600**	**$ 26,480**
Priority 1B Improvements (by 2022)							
Water Supply							
110	Nike Well Telemetry & Misc. Improvements	Operations	$ 35,000	32%	$ 11,300	$ 23,700	$ 420
111	Wiedeman Well Generator & Telemetry	Operations	$ 98,000	12%	$ 11,300	$ 86,700	$ 2,460
112	Boeckman Well Telemetry Upgrade	Operations	$ 26,000	43%	$ 11,300	$ 14,700	$ 420
113	Gesellschaft SCADA & Instrumentation	Operations	$ 32,500	35%	$ 11,300	$ 21,200	$ 420
114	Elligsen Well Instrumentation	Operations	$ 20,000	29%	$ 5,700	$ 14,300	$ 120
Booster Stations & Turnouts							
143	Charbonneau Booster Flow Meter Vault	Replacement/ Operations	$ 29,000	54%	$ 15,700	$ 13,300	$ 380
Water Distribution Piping							
160	8-inch Upgrade on Jackson St.	Fire Flow	$ 64,000	0%	$ -	$ 64,000	$ 100
161	8-inch Upgrade on Evergreen St.	Fire Flow	$ 83,000	0%	$ -	$ 83,000	$ 200
162	8-inch Loop N. of Seely St.	Fire Flow	$ 8,000	0%	$ -	$ 8,000	$ 100
164	10-inch Extension on Montebello St.	Growth (School)	$ 217,000	100%	$ 217,000	$ -	$ 400
166	8-inch Loop between Boberg St. & RR (north of Barber)	Fire Flow	$ 78,000	0%	$ -	$ 78,000	$ 200
167	8-inch Loop on Boones Ferry (north of Barber)	Operations	$ 19,000	0%	$ -	$ 19,000	$ 100
168	10-inch Loop (Appts E. of Canyon Creek/Burns)	Fire Flow	$ 41,000	0%	$ -	$ 41,000	$ 100
169	8-inch Loop between Viahos & Canyon Creek	Fire Flow	$ 42,000	0%	$ -	$ 42,000	$ 100
170	8-inch Upgrade on Metolius cul-de-sac	Fire Flow	$ 54,000	0%	$ -	$ 54,000	$ 100
171	8-inch Loop on Metolius private drive	Operations	$ 20,000	0%	$ -	$ 20,000	$ 100
172	8-inch Upgrade on Middle Greens	Hydrant Coverage	$ 68,000	0%	$ -	$ 68,000	$ 200
173	Fairway Village Hydrant on French Prairie	Hydrant Coverage	$ 10,000	0%	$ -	$ 10,000	$ 100
175	16-inch Willamette River Crossing to Charbonneau District	Displace Charb. Tank	$ 1,532,000	0%	$ -	$ 1,532,000	$ 3,600
	Total Priority 1B Improvements		**$ 2,476,500**		**$ 283,600**	**$ 2,192,900**	**$ 9,520**

Needed projects previously identified in 2008 Water Master Plan, but not yet completed

** Colored/Bold ID #s are mapped on Figure 4 in Appendix A for reference

NOTE: Costs are in 2012 dollars

TABLE ES.3 – Priority Capital Improvements (Continued)

ID#**	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment %	Growth Apportionment Cost	Operating Fund	Additional Annual O&M
Priority 2 Improvements (by 2030)							
Water Supply							
203	Gesellschaft Well Generator	Operations	$ 78,000	0%	$ -	$ 78,000	$ 2,160
205	Charbonneau Well Mechanical Building	Operations	$ 81,000	0%	$ -	$ 81,000	$ 1,800
	Video Surveillance (various wells)	Operations	$ 22,000	0%	$ -	$ 22,000	$ 3,000
Booster Stations & Turnouts							
241	Meter Valve at Wilsonville Rd turnout	Operations	$ 118,000	0%	$ -	$ 118,000	$ 960
Water Distribution Piping							
260	10-inch Extension on 4th St. (E. of Fir)	Fire Flow	$ 69,000	7%	$ 4,900	$ 64,100	$ 200
261	8-inch Loop - Magnolia to Tauchman	Fire Flow	$ 59,000	0%	$ -	$ 59,000	$ 100
262	8-inch Upsize on Olympic cul-de-sac	Fire Flow	$ 44,000	0%	$ -	$ 44,000	$ 100
263	8-inch Loop near Kinsman/Wilsonville	Fire Flow	$ 36,000	0%	$ -	$ 36,000	$ 100
264	10-inch Loop near Kinsman/Gaylord	Fire Flow	$ 82,000	6%	$ 5,200	$ 76,800	$ 200
265	8-inch Upsize on Lancelot	Fire Flow	$ 100,000	0%	$ -	$ 100,000	$ 200
266	Fire Hydrants (main City)	Fire Flow	$ 119,000	0%	$ -	$ 119,000	$ 200
267	Fire Hydrants (Charbonneau)	Fire Flow	$ 46,000	0%	$ -	$ 46,000	$ 100
268	8-inch Loop near Kinsman (between Barber & Boeckman)	Fire Flow	$ 126,000	0%	$ -	$ 126,000	$ 200
269	8-inch Upsize near St. Helens	Fire Flow	$ 26,000	0%	$ -	$ 26,000	$ 100
270	8-inch Loop near Parkway Center/Burns	Fire Flow	$ 66,000	0%	$ -	$ 66,000	$ 100
271	8-inch Loop near Burns/Canyon Creek	Fire Flow	$ 110,000	0%	$ -	$ 110,000	$ 200
272	10 & 8-inch Loop near Parkway/Boeckman	Fire Flow	$ 315,000	4%	$ 12,600	$ 302,400	$ 500
273	12-inch Loop crossing Boeckman	Water Quality	$ 16,000	0%	$ -	$ 16,000	$ 100
274	8-inch Loop at Holly/Parkway	Water Quality	$ 56,000	0%	$ -	$ 56,000	$ 100
275	8-inch Upsize on Wallowa	Fire Flow	$ 62,000	0%	$ -	$ 62,000	$ 100
276	8-inch Upsize on Miami	Fire Flow	$ 68,000	0%	$ -	$ 68,000	$ 200
277	8-inch Extension for hydrant coverage on Lake Bluff	Hydrant Coverage	$ 63,000	0%	$ -	$ 63,000	$ 100
278	8-inch Upsize on Arbor Glen	Hydrant Coverage	$ 92,000	0%	$ -	$ 92,000	$ 200
279	8-inch Loop at Fairway Village	Fire Flow	$ 42,000	0%	$ -	$ 42,000	$ 100
280	8-inch Extension for fire flow - private drive/Boones Bend	Fire Flow	$ 18,000	0%	$ -	$ 18,000	$ 100
281	8-inch Upsize on East Lake	Fire Flow/Hydrant	$ 187,000	0%	$ -	$ 187,000	$ 300
282	8-inch Extension for fire flow on Armitage Pl	Fire Flow	$ 55,000	0%	$ -	$ 55,000	$ 100
283	8-inch Upsize on Lake Point Ct	Hydrant Coverage	$ 56,000	0%	$ -	$ 56,000	$ 100
284	8-inch Loop - Franklin St to Carriage Estates	Water Quality	$ 94,000	0%	$ -	$ 94,000	$ 200
285	8-inch Upgrade on Boones Ferry Rd (south of 2nd St)	Replace/Upsize	$ 44,000	0%	$ -	$ 44,000	$ 100
286	Valves at Commerce Circle & Ridder Rd/Boones Ferry I-5 Crossing	Operations	$ 44,000	0%	$ -	$ 44,000	$ 100
	Total Priority 2 Improvements		$ 2,394,000		$ 22,700	$ 2,371,300	$ 12,140
Priority 3 Development Dependent Improvements (by Build-out)							
Water Distribution Piping							
361	Zone D Booster Station at C Level Tank	Growth	$ 609,000	100%	$ 609,000	$ -	$ 11,000
362	Upsize costs (greater than 8 inches) for future distribution piping	Growth	$ 9,659,000	100%	$ 9,659,000	$ -	$ 39,120
	Total Priority 3 Improvements		$ 10,268,000		$ 10,268,000	$ -	$ 50,120
	TOTAL CAPITAL IMPROVEMENTS (Priority 1-3)		$ 25,628,500		$21,008,700	$ 4,619,800	$ 98,360

* Needed projects previously identified in 2002 Water Master Plan, but not yet completed

** Colored/Bold ID #s are mapped on Figure 4 in Appendix A for reference

NOTE: Costs are in 2012 dollars

ES.3.2 Comprehensive Plan Goals, Policies, and Implementation Measures

The City's Comprehensive Plan provides the context within which the water master plan has been developed. Efforts have been made to solicit citizen input and coordinate with other agencies and organizations consistent with Comprehensive Plan Goal 1.2. The primary goal of the water master plan is derived from Wilsonville's Comprehensive Plan Goal 3.1 providing for infrastructure in general and is as follows:

> To assure that good quality public facilities and services are available with adequate capacity to meet community needs, while also assuring that growth does not exceed the community's commitment to provide adequate facilities and services.

The majority of the water related policies are highlighted in Comprehensive Plan Policy 3.1.5 which states:

> The City shall continue to develop, operate and maintain a water system, including wells, pumps, reservoirs, transmission mains and a surface water treatment plant capable of serving all urban development within the incorporated City limits, in conformance with federal, state, and regional water quality standards. The City shall also continue to maintain the lines of the distribution system once they have been installed and accepted by the City.

Keller Associates recommends one minor addition (underlined below) to the existing Implementation Measure 3.1.5.b:

> All major lines shall be extended in conformance to the line sizes indicated on the Master Plan and, at a minimum, provisions for future system looping shall be made. If the type, scale, and/or location of a proposed development negatively impacts operating pressures or available fire flows to other properties as determined by the City Engineer, the Development Review Board may require completion of looped water lines, off-site facilities, pipelines, and/or facility/pipelines to achieve or maintain minimum pressures or fire flows as a condition of development approval.

Keller Associates also recommends the following additional policies for consideration. Refer to Chapter 7 for recommended implementation measures associated with these policies.

Proposed Policy 3.1.6: The City of Wilsonville shall continue a comprehensive water conservation program to make effective use of the water infrastructure, source water supply and treatment processes.

Proposed Policy 3.1.7: The City of Wilsonville shall maintain an accurate user demand profile to account for actual and anticipated demand conditions in order to assure an adequately sized water system.

Proposed Policy 3.1.8: The City of Wilsonville shall coordinate distribution system improvements with other CIP projects, such as roads, wastewater, and storm water, to save construction costs and minimize public impacts during construction.

ES.3.3 Operations and Maintenance Recommendations

In addition to the capital improvement projects identified in the preceding tables, Keller Associate identified several major repairs and replacements which are summarized in Table ES.4 (see also Figure 4, Appendix A). Additionally, there are several larger routine maintenance activities, recurring system management related projects, and ongoing replacement/rehabilitation activities that are recommended on an annual or recurring basis. These activities are summarized in Table ES.5.

When it comes to maintenance, repair, and replacement activities, the key recommendation is to establish an adequate budget consistent with the selected replacement life span of the facilities. Keller Associates recommends that future user rate evaluations consider needed capital improvements as well as the budget increases needed to fund a 20-year maintenance and replacement program.

TABLE ES.4 – Major Repairs and Replacements

ID#*	Item	Primary Purpose	Total Estimated Cost
Priority 1A (by 2017)			
Water Supply			
100	Nike Well Rehab & Misc. Maintenance	Maintenance	$ 30,000
101	Canyon Creek Well (assumes potential abandonment)	Maintenance	$ 26,000
102	Wiedeman Well Misc. Maintenance	Maintenance	$ 24,000
103	Boeckman Well Rehab Pump	Maintenance	$ 20,000
104	Gesellschaft Building Maintenance	Maintenance	$ 4,500
105	Elligsen Well Compressor & Controls	Maintenance	$ 8,000
Water Storage			
120	Elligsen Res. - Replace Ladder Fall Protection System	Replacement	$ 12,000
123	Charbonneau Reservoir Reseal between Roof and Wall	Maintenance	$ 4,000
Booster Stations & Turnouts			
141	B to C Booster Replacements	Replacement	$ 21,000
142	Painting & Safety Nets at Turnouts	Maintenance	$ 22,000
Priority 1B (by 2022)			
Water Storage			
127	Replace Sealant at Base of C Level Reservoir	Maintenance	$ 7,000
Booster Stations & Turnouts			
144	Replace Cover on Burns PRV	Replacement	$ 9,000
Priority 2 (by 2030)			
Water Supply			
200	Nike Well New Roof and Trim, Paint	Maintenance	$ 13,000
201	Wiedeman Well Replace Metal Siding	Maintenance	$ 20,000
202	Boeckman Well Pump Motor & Replace Roof and Trim	Replacement/ Maintenance	$ 21,000
203	Gesellschaft Well Roof Maintenance	Maintenance	$ 4,000
204	Elligsen Well MCC Replacement & Building Maintenance	Replacement/ Maintenance	$ 22,000
Water Distribution Piping			
287	Replace service lines - Parkway Ave	Replacement	$ 77,000
288	Replace service lines - Wilson cul-de-sacs	Replacement	$ 227,000
289	Replace service lines - Mariners Drive	Replacement	$ 22,000
290	Replace service lines - Old Town	Replacement	$ 15,000
Water Storage			
220	Paint Elligsen Reservoirs (interior)	Maintenance	$ 460,000
221	Paint C Level Reservoir (interior)	Maintenance	$ 180,000
Booster Stations & Turnouts			
240	Relocate Parkway PRV out of Elligsen Rd intersection	Replacement	$ 75,000
Future (beyond 2030)			
Water Supply			
300	Nike Well - Replace MCC	Replacement	$ 15,000
301	Wiedeman Well MCC & Building Maintenance	Maintenance	$ 18,000
302	Gesellschaft Well Building Maintenance	Maintenance	$ 5,000
Water Storage			
320	Paint Elligsen Reservoirs (exterior)	Maintenance	$ 310,000
321	Paint C Level Reservoir (exterior)	Maintenance	$ 115,000
	TOTAL MAJOR REPAIRS AND REPLACEMENTS		**$ 1,786,500**

* Colored/Bold ID #s are mapped on Figure 4 in Appendix A for reference

NOTE: Costs are in 2012 dollars

TABLE ES.5 – Recurring Maintenance Costs

Activity	Budget	Frequency
Wash exterior of above-ground tanks	$5,000/each	Every 5 years
Clean and inspect interior of tanks	$5,000/each	Every 10 years
Pipeline and valve replacement (coordinate with planned street improvements, 1725 feet/year)	$ 173,000	Annual recommended budget for 20-year planning period
Meter replacement (250 meters/year)	$ 50,000	Annual recommended budget (assumes 20-year life)
Hydrant replacement (10 hydrants/year)	$ 30,000	Annual recommended budget
Well hole and facility upgrades/maintenance	$95,000-$105,000	Annual budget (includes 6 wells)
GIS and water model updates	$ 6,000	Recommended annual budget for 3rd party support
Water Master Plan update	$ 150,000	Every 5 years
Water Management and Conservation Plan (WMCP)	$ 20,000	Every 10 years, beginning 2022
WMCP progress reports	$ 5,000	Every 10 years, beginning 2017

ES.3.4 User Rates and System Development Charges

The scope of this study did not include an evaluation of user rates and system development charges (SDC). The City intends to complete a separate rate study at a later date to address the impacts of the Water Master Plan on the utility rates. The rate study should also incorporate findings from the upcoming water treatment plant master plan. It is anticipated that the Capital Improvement Plan, the identified Major Repairs and Replacements, and the recommended operational and maintenance activities will be used in establishing these fees. Additionally, the estimated percent of each improvement attributed to growth will be useful in developing the growth component of the SDC.

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1.0 EXISTING SYSTEM DESCRIPTION

This chapter provides an introduction to the water system master planning effort and describes Wilsonville's existing water system infrastructure.

1.1 INTRODUCTION

The City of Wilsonville authorized Keller Associates, Inc. to complete a Water System Master Plan in February 2011. The previous master plan was completed in 2002 by Montgomery Watson Harza. Over the course of the last decade, many changes have occurred to the water system, including the completion of a state-of-the-art surface water treatment plant that has displaced the City's groundwater wells as the primary water supply. The primary purposes of this planning effort include the following:

- Update water system demands and demand projections for an expanded study area, including water sales to the City of Sherwood.
- Update the planning criteria used to evaluate system performance and prioritize improvements.
- Update the existing water distribution system hydraulic computer model.
- Evaluate the current condition of the City's water system assets.
- Identify existing and anticipated future deficiencies.
- Update the City's capital improvement plan as it pertains to the water distribution system (pipelines, wells, booster stations, and tanks).
- Provide a review of existing water treatment facilities and identify potential bottlenecks that would need to be addressed to reach a 15 mgd treatment capacity.

Complementing this master plan and performed as a separate task is a Water Management and Conservation Plan that will replace the previous plan completed in 2004.

1.2 EXISTING SYSTEM OVERVIEW

The City of Wilsonville's primary supply comes from the Willamette River. The Willamette River Water Treatment Plant (WRWTP) is a state-of-the-art treatment plant. It produces high-quality finished water that is pumped into 63-inch and 48-inch transmission pipelines. From the transmission pipeline, water is conveyed to the City's distribution through three delivery points, referred to as "turnouts." The transmission pipeline also extends to a delivery point near Tooze Road and Westfall to provide transmission to the City of Sherwood.

Figure 1 (Appendix A) illustrates the existing water distribution system. The City's service area is made up of three pressure service areas or pressure zones. From the turnouts, water flows to pressure zone B, the main pressure zone that services most of the City. The Elligsen reservoirs directly serve this zone. Water is pumped from pressure zone B to zone C (and the C Level reservoir) via the B to C Booster Station. Water to the Charbonneau District (pressure zone A) is delivered across the river in pipeline attached to I-5 Bridge and through pressure reducing valves located inside the Charbonneau booster station. Backup wells, the Charbonneau tank, and the Charbonneau booster station provide system redundancy and emergency water supply to the Charbonneau District.

1.2.1 Water Treatment Plant

The Willamette River Water Treatment Plant (WRWTP) was commissioned to provide a reliable long-term water supply to Wilsonville and the surrounding area. The new treatment facility has allowed the City to continue to grow and has eliminated concerns of declining aquifer levels that resulted from excessive pumping of the City's groundwater wells. The facility was completed in 2002 and has been providing high quality water to the City since it was completed.

Ownership of the water treatment plant is shared with the Tualatin Valley Water District (TVWD). Unit treatment process and facilities initially constructed at the existing treatment plant are generally rated for 15 mgd, with portions of the site such as the buildings and intake structure capable of handling 70+ mgd. The July 2000 Agreement between Wilsonville and TVWD (Wilsonville Resolution No. 1661) specifies that of the first phase plant capacity of 15 mgd, Wilsonville owns 10 mgd and TVWD 5 mgd.

A preliminary evaluation of the treatment plant process capacities is provided in Chapter 4 of this report. The City of Wilsonville, in partnership with the TVWD, will need to complete a more comprehensive treatment facility master plan update within the next few years.

1.2.2 Transmission Pipelines

Wilsonville conveys water from the WRWTP to the distribution system through a 4,000-foot long, 63-inch steel transmission. At Wilsonville Road, the 63-inch transmission line wyes to two 48-inch transmission lines. Each of the 48-inch steel lines has a design capacity of 40 mgd (5 fps design velocity). Currently only one of these 48-inch transmission lines is installed. The final connecting section of this transmission line is currently under design. When completed, this line will carry supply northwest to Sherwood and other turn-outs to the Wilsonville distribution system.

1.2.3 Water Distribution System Piping, Valves, Hydrants, and Meters

The City has approximately 107 miles of waterlines ranging from 2 inches to 63 inches in diameter. According to GIS records, the City also has over 3341 valves, 1005 hydrants, over 5000 meters, and 262 blow-offs. Table 1.1 summarizes the variations in pipe materials and sizes for the distribution system.

Most of the pipe materials are ductile iron or cast iron. Because of the large amount of new growth that has occurred since 1980, the majority of the City's infrastructure is also relatively new. An evaluation of the existing distribution system conditions along with recommended replacement budgets can be found in Technical Memorandum No. 1 located in Appendix B. Chapter 3 summarizes existing pipeline capacity and fire hydrant coverage deficiencies.

TABLE 1.1 - Wilsonville Pipe Material Summary

Pipe Diameter (in)	Pipe Material Lengths Per GIS(ft)							Total by Diameter (ft)	% of Total
	Steel	CU	Ductile Iron	CI	Conc	PVC	Unknown		
Unknown	0	0	3,680	191	0	0	5,332	9,203	1.54%
2"	328	135	415	1,095	0	0	211	2,184	0.37%
2.5"	0	0	546	0	0	0	0	546	0.09%
3"	0	0	5	0	0	0	0	5	0.00%
4"	38	0	16,312	5,233	10	72	74	21,739	3.65%
6"	0	25	67,930	8,213	0	901	5,721	82,790	13.89%
8"	0	0	209,556	8,584	0	1,326	12,999	232,465	38.99%
10"	0	0	27,219	11,848	0	0	808	39,875	6.69%
12"	0	0	93,041	6,620	234	0	828	100,723	16.89%
14"	1,039	0	23,008	2,032	0	0	0	26,079	4.37%
16"	0	0	5,112	0	0	0	0	5,112	0.86%
18"	0	0	32,466	25	0	0	218	32,709	5.49%
24"	0	0	619	0	0	0	1,555	2,174	0.36%
48"	7,053	0	0	0	0	0	0	7,053	1.18%
63"	4,338	0	0	0	0	0	0	4,338	0.73%
Total by Material (ft)	*12,796*	*160*	*479,909*	*43,842*	*244*	*2,299*	*27,746*	*566,995*	*100.0%*
% of Total	*2.15%*	*0.03%*	*80.50%*	*7.35%*	*0.04%*	*0.39%*	*4.65%*	*107.4*	*MILES*

1.2.4 Water Storage

There are four existing storage reservoirs located in the distribution system. These include the two above-ground welded steel Elligsen Reservoirs (constructed in 1970 and 1992) that service the main pressure zone (Zone B), the buried concrete Charbonneau Reservoir (constructed in 1978) that services Zone A, and the above-ground welded steel C Level Reservoir (constructed in 1999) that services the upper pressure zone. Combined, these reservoirs provide approximately 7.6 million gallons of effective storage. A detailed evaluation of the existing reservoir conditions and storage capacities along with recommended improvements can be found in Technical Memorandum No. 1 and Technical Memorandum No. 3 located in Appendix B. A summary of these evaluations and recommendations can be found in Chapter 3.

1.2.5 Backup Wells

The City currently maintains eight groundwater wells. These wells were once the primary potable supply, but since the completion of the WRWTP these wells serve as an emergency backup water supply. These wells include Nike, Canyon Creek, Wiedeman, Boeckman, Geshellschaft, Elligsen, and two additional wells located within the Charbonneau District (Charbonneau wells #2 and #3). Technical Memorandum No. 5, Attachment 1 in Appendix B shows the location of all the well facilities. A detailed evaluation of these wells can be found in Technical Memorandum No. 5 located in Appendix B, and a summary of the findings is presented in Chapter 3 of this report.

1.3 SUMMARY OF PREVIOUS PLANNING EFFORTS

In preparing this master plan update, Keller Associates has built upon previous planning efforts completed by others. A list of documents evaluated as part of this study includes the following:

- City of Wilsonville Well Site Review Report (GSI, 2004)
- Transportation System Plan (Entranco, 2009)
- Transit Master Plan (SMART Transit, 2008)
- Water System Master Plan (MWH, 2002)
- Water Management and Conservation Plan (Wilsonville, 1998 and 2004)
- Waterline Leak Detection Reports (Utility Services Associates, 2000-2010)
- Comprehensive Plan (Wilsonville, 2010 and 2011)
- 20-Year Look (Wilsonville, 2008)
- Water System Surveys (ODHS, 2008 and 2012)
- Planning documents for various developments, including Basalt Creek, Coffee Creek, Brenchley Estates, Graham Oaks, West Side, and Villebois
- Technical Memorandum, Hydraulic Analysis (MWH, Feb 22, 2011)
- Technical Memorandum, Hydraulic Transient (MWH, April 6, 2011)
- Technical Memorandum, Willamette River WTP Disinfection (CT) Analysis (WMH, April 7, 2011)
- Willamette River Water Treatment Plant Master Plan (MWH, 2006)
- Willamette River Water Supply System, Preliminary Engineering Report (MSA, 1998)
- Operations and Maintenance Manuals and record drawings for the water treatment plant and distribution system facilities
- Elligsen, Charbonneau, and C Level Reservoir Inspection Reports (LiquiVision, 2009)
- Elligsen Seismic Evaluation (KPFF, 1998)
- Parks Master Plan (MIG, 2007)

- Development Code (Wilsonville, 2010 and 2011)
- Sherwood Water System Master Plan (MSA, 2005)
- Bicycle and Pedestrian Master Plan (Atla, 2006)
- Economic Opportunity Analsyis Report (Cogen Owens Cogan, Otak, FCS Group, 2008)
- Infrared Electrical Inspection (PMT, 2011)
- Charbonneau Tank Seismic Study (Keller Associates, 2012)

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KELLER associates

2.0 DEMAND FORECASTS

This chapter evaluates the existing and future water system demands for residential and nonresidential uses. Water loss and irrigation demands are also summarized.

2.1 METHODOLOGY

Demand forecasts were developed using a combination of current water demands for existing residential and nonresidential users, population and household data, employment and commercial/industrial acreage, anticipated residential and nonresidential growth rates within the defined study area, and estimated per capita demand rates for different user groups.

A review of different methodologies and available data was conducted to determine the best approach to estimate existing and future demands. The data revealed that the 2002 Water Master Plan overestimated a peak day demand for 2010 at more than twice the actual (measured) peak day demand. These previous estimates were made prior to the completion of the water treatment plant and without the benefit of several years of operational data. Keller Associates worked closely with City staff to review actual operational data and develop future demand estimates that reflect historical demand growth but still provide a modest amount of conservatism. In determining existing and future demands, the following methodology was used:

1. Historical system demands for 2005-2009 were used to define the existing average day and peak day water usage for the system.

2. Recent SCADA data was reviewed to develop a 24-hour demand pattern for summer and winter periods. This information was used to estimate the peak hour demand.

3. Where possible, the water meter data were spatially allocated to the distribution system using the City's billing data and geographic information system (GIS). Approximately 85% of current demand could be linked to specific locations. The remaining 15% was distributed to developed parcels based on existing land use and acreage.

4. Existing demands per household and estimated residential units per gross acre were used to project future residential demands.

5. Existing per acre demands for commercial/industrial areas were used to project future nonresidential demands.

2.2 EXISTING DATA REVIEW AND ANALYSIS

Study area acreage, land use (zoning), population, and water usage data were analyzed to determine existing conditions and establish the methodology for

generating demand forecasts. This section summarizes the data, analysis, and background associated with the water demand forecast methodology.

2.2.1 Study Area and Land Use

The study area was developed with input from City planning staff, and is illustrated in Figure 2 (Appendix A). The study area is consistent with the WV Comprehensive Plan and includes the area within the existing Urban Growth Boundary (UGB) and those portions of Clackamas County and Washington County Urban Reserve Areas (URAs) that are anticipated to be incorporated into Wilsonville. These urban reserve areas include Area 6 and Area 7 identified in the 20-Year Look prepared in 2008. The study area is also intended to coincide with the ongoing Transportation System Plan update.

Existing land use is illustrated in Figure 2-2. For those areas not yet developed, anticipated future land use was provided by City planning staff and is illustrated in Figure 2-3. (All figures referenced in this report can be found in Appendix A.)

2.2.2 Population and Household Data

Three sources of historical population data were reviewed as part of this study. These include US Census Bureau data, Portland State University (PSU) certified population estimates, and estimates developed from City of Wilsonville building permit information. The census data is believed to be the most accurate source of population data, but is only available for 10-year increments. PSU provides certified population estimates annually. However, the original PSU estimate for 2010 was 7.5% lower than the year 2010 census estimate. In 2011, after publication of the 2010 census data, PSU revised their 2010 population estimate to be in line with the 2010 census. The discrepancy between the original and revised estimates could be explained in part by the number of people per household assumed in the population estimates and the inclusion or exclusion of unoccupied units. According to census data, the number of people per household actually increased from 2.35 people per *occupied* household in 2000 to 2.48 people per *occupied* household in 2010, contrary to general planning assumptions which predict declining numbers of people per household.

Table 2.1 summarizes historical growth rates and the corresponding compounded 10-year average annual growth rates for 1980 - 2010. Even with the recession conditions that started in 2008, the City of Wilsonville averaged an approximate 3.4% annual population growth rate from 2000 to 2010.

Table 2.2 summarizes the growth data in terms of households for both Federal census data and for Wilsonville Planning Department data.

TABLE 2.1 - Historical Population Summary

Year	Census		PSU Certified Estimates[1]		Wilsonville Planning Department[2]	
	Population	Growth Rate[3]	Population	Growth Rate	Population	Growth Rate
1980	2,950					
1990	7,106	9.2%	7,225		9,030	
2000	13,991	7.0%	14,365	7.1%	14,772	5.0%
2010	19,509	3.4%	19,525[4]	3.1%	18,020	2.0%

1. PSU certified estimates reflect estimated July populations, whereas census data reflects April population.
2. Estimates from building data and an estimated population of 2.15 people per household.
3. Growth rates are calculated average annual growth rates.
4. Adjusted by PSU in 2011. Original estimate (before census) was 18,095.

TABLE 2.2 - Historical Household Summary

Year	Census[1]	Wilsonville Planning Department[3]		
		SFDU[2]	Multi-Family	Total
1990	3,327	2,172	2,028	4,200
2000	6,407	3,316	3,555	6,871
2010	8,487	3,745	4,846	8,591
2000-2010 Annual Growth	2.9%	1.2%	3.7%	2.3%

1. Total housing units includes occupied and vacant housing units.
2. SFDU = single family dwelling unit.
3. Multi-family includes apartments, condominiums, and duplexes. Mobile home units are included in SFDU.

In projecting future residential growth and associated water demand, historical populations were reviewed along with population projections developed as part of the 2002 Water Master Plan, 2004 Water Management and Conservation Plan, the 2006 Transit Master Plan, the 2007 Parks Master Plan, the 2008 20-Year Look, and the 2009 Transportation Plan. These previous estimates assumed annual residential growth rates between 2.42% and 3.15%. Four of the documents use approximately 2.9% as the annual growth rate.

According to the census data, the number of households increased from 6,407 to 8,487 between 2000 and 2010. This corresponds to an average annual growth rate of approximately 2.9% for households. This lower growth rate in households reflects the change in household density (2.34 and 2.48 people per household reported in 2000 and 2010, respectively). Both the 2000 and 2010 household densities based on census data were higher than the 2.15 people per household used by Wilsonville Planning Department. It should also be noted that the estimated vacancy rate from the census data remained relatively consistent at 7.3% and 7.4% reported in 2000 and 2010, respectively.

Since the demands per household are based on actual meter readings, they are felt to be a better basis for future demands than the demand per capita (i.e. person). Assumed household densities were therefore not considered to influence future demand projections. For planning purposes for this study, City staff indicated that **a 2.9% annual residential growth rate should be used for both population and the number of households, corresponding to a 2.9% annual growth rate in residential water demand**. This assumption implies that the household density will continue to be approximately 2.48 people per household.

The build-out population for the study area was calculated to be about 52,400 (21,129 households) using anticipated land use, estimated dwelling units per gross acre, and estimated people per household. Based on these assumptions and the projected growth rate, build-out of the residential areas could occur by the year 2045.

In distributing the new growth in households, Keller Associates used planned dwelling units for those developments that have already completed preliminary or final planning efforts. These include Villebois (approximately 1630 undeveloped units as of December 2009), Frog Pond (estimated 1000 dwelling units from 20-Year Look), and Brenchley Estates (estimated 763 dwelling units). For those future residential areas that currently do not have dwelling unit estimates, the following assumptions were made:

- Undeveloped property zoned for single family dwelling units will average 7 units per gross acre.
- Undeveloped property zoned for multi-family dwelling units will average 20 units per gross acre.
- Where land use does not differentiate between single family and multi-family, it is assumed that 50% of the area will be multi-family and 50% will be single family residential. This produces a composite average of 13.5 units per gross acre.

These assumptions are consistent with historical data and the expectations of City planning staff.

2.2.3 Nonresidential Growth

In the 2002 Water Master Plan, nonresidential use was assumed to have an annual growth rate that varied from 15% for the first 5 years, followed by 7.5% for the next 10 years, then 1% for the final 5 years. However, the actual growth rate from 2000 to 2010 (in terms of the number of water accounts) has been approximately 1.8%, which is lower than the residential growth rate. Additionally, the total nonresidential water usage in Wilsonville has steadily declined over the last five years, despite an increasing number of accounts. While there are significant differences in the number of existing employees reported, the Comprehensive Plan (2010), the previous Transportation System Plan (2009), the Economic Opportunity Analysis (2008), and the 20-Year Look (2008) all show the number of employees essentially doubling over a 20-year period. A doubling in employees equates to an average annual employment

growth rate of about 3.5%, which is slightly higher than the anticipated residential population growth rates assumed in the respective planning documents.

Previous water demand planning efforts looked at water usage per employee and utilized the traffic analysis zone (TAZ) and employment growth concepts developed by Metro in transportation planning efforts as the basis for predicting and distributing existing and future nonresidential water demands. By linking individual meter demands to parcels, Keller Associates was able to utilize land use data and quantify current nonresidential demands per developed acre. This allowed us to quantify per acre demands for Wilsonville land uses – something that the City has not been able to do in the past. Furthermore, these per acre demands include irrigation usage, which is often independent of the number of employees. For these reasons, the calculated per acre demands were felt to be more representative of actual baseline conditions than a corresponding demand per employee. Metro estimates of employee growth were therefore not used, and a per acre demand basis was assumed for future nonresidential development.

For this planning study, an annual **average annual growth rate of 3.5%** will be applied to nonresidential development. Based on the anticipated growth rate, build-out of the nonresidential areas could occur by year 2036. This growth in demand could occur from development of land or from existing developed land. Because of the preponderance of warehouse-type facilities, existing demands per acre are comparatively low to typical published values for industrial areas. In evaluating build-out demands for industrial properties, Keller Associates assumed that existing per acre demands would increase by 25 percent for build-out conditions in all industrially-zoned areas. This was done to allow for increased (e.g. higher density) use and/or redevelopment of existing commercial/industrial parcels, and to better account for a potential reversal of some of the recessionary declines in water usage experienced since 2006. The estimated demands per industrial and commercial acre are presented in section 2.4.2 of this report.

Supplementing assumed nonresidential demand, the City also identified a few site-specific water demand forecasts. Specifically, an increase in the Coffee Creek Correction Facility prison population of 650 inmates was assumed, as were three future large water users (two 0.25 mgd users and one 0.5 mgd user), plus three future public schools.

2.2.4 Water Production Data and Existing Demand Summary

Daily production data was reviewed for the period from 2005 to 2010 to establish annual average, seasonal, and maximum day demand patterns. This data is summarized in Table 2.3. The annual average flow remained relatively constant from 2006-2009 despite an increasing number of water users. Maximum day water demands also peaked in 2008 at 6.6 mgd. All demands (average, peak, etc.) in 2010 were below the previous 5 years, primarily due to current economic conditions. Therefore, 2010 was not considered to be representative of normal usage conditions, and the 2005-2009 average was used to represent current (2010) baseline conditions.

TABLE 2.3 – Finished Water Production Summary

	2005	2006	2007	2008	2009	2010	5-Year Avg. (2005-2009)
Yearly Average, mgd	2.81	3.10	3.16	3.13	3.07	2.82	3.05
Minimum Month, mgd	1.85	1.92	2.24	2.12	2.10	2.06	2.05
Maximum Month, mgd	5.22	5.38	5.29	5.48	5.27	5.18	5.33
Maximum Day, mgd	6.08	6.34	6.51	6.60	6.45	5.87	6.40
Peak Hour, mgd	10.34	10.78	11.07	11.22	10.96	9.97	10.87

For comparison purposes, Table 2.4 shows the water production data on a per capita basis. Existing baseline system demands are summarized in Table 2.5 and were calculated by multiplying the 2010 population by the 2005-2009 average per capita demand.

TABLE 2.4 – Finished Water Production Summary (gpcd)*

	2005	2006	2007	2008	2009	2010	5-Year Avg. (2005-2009)
Population**	17,753	18,156	18,715	19,290	19,376	19,525	18,658
Yearly Average	158	171	169	162	158	145	164
Minimum Month	104	106	120	110	108	106	110
Maximum Month	294	297	282	284	272	266	286
Maximum Day	343	349	348	342	333	300	343
Peak Hour	582	594	591	582	566	511	583

* gallons per capita per day.

** Certified PSU population for 2005-2009 were adjusted upward approximately 7.5% to reflect the difference between the original 2010 PSU certified estimate (previous to adjusting to reflect 2010 Census data) and the 2010 Census data.

TABLE 2.5 – 2010 Baseline System Demands

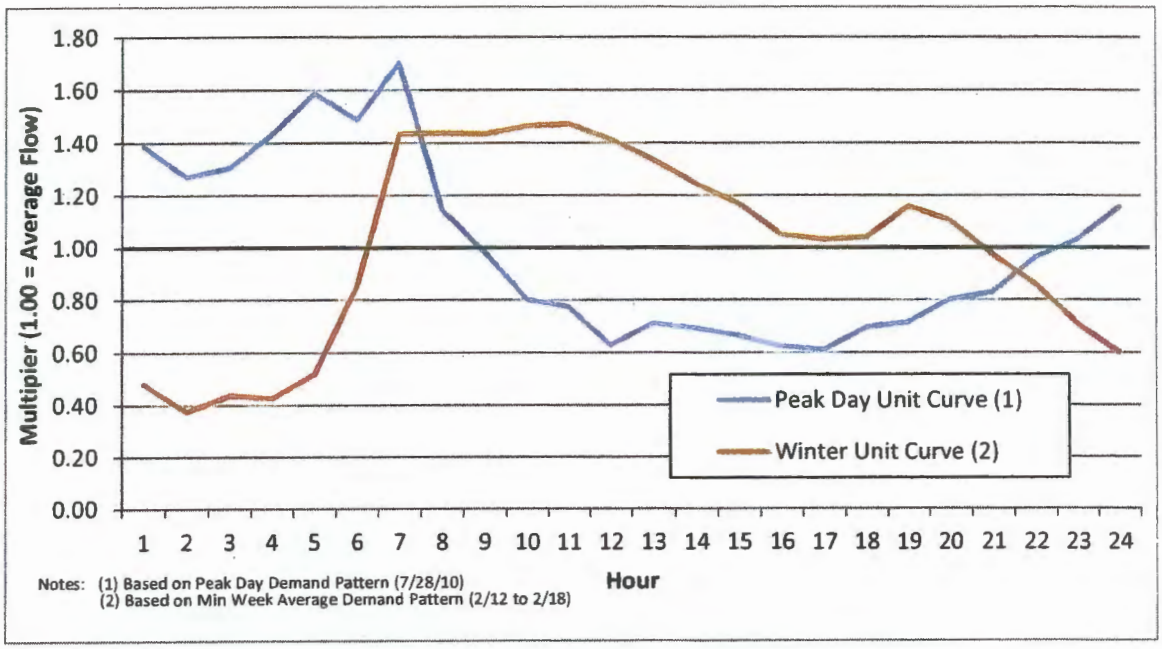
	Per Capita Demand* (gpcd)	System Demand (mgd)
Yearly Average	164	3.20
Minimum Month	110	2.15
Maximum Month	286	5.58
Maximum Day	343	6.70
Peak Hour	583	11.4

*Per capita demands are shown for reference and include nonresidential uses.

2.2.5 SCADA Data and Existing Peak Hour Demands

Peak hour demands were estimated based on demand patterns developed from 24-hour supervisory control and data acquisition (SCADA) data provided by the City. Chart 2.1 illustrates the water usage patterns for the system during the winter and summer periods. For the summer period, the high water usage during the night-time and early morning hours reflect irrigation usage within the city. A peak hour demand equivalent to approximately 1.7 times the corresponding average daily flow is anticipated around 7:00 a.m. during the summer months.

CHART 2.1 - Water Usage Pattern



2.2.6 Water Meter Data and Water Usage per User Category

Water consumption data for various categories of residential and nonresidential users were reviewed, summarized, and evaluated. This data is required reporting data for municipal water management and conservation plans submitted to the Oregon Department of Water Resources, and is used internally to look at major water use trends. Chart 2.2 shows the annual water usage for each user category. The decline in total water system consumption can largely be attributed to significant declines in commercial and industrial water usage, which peaked in 2006 and has declined by 30% since then. The total residential demand has held relatively steady between 2005 and 2010, despite the increasing number of residential users. This is believed to be a result of a combination of factors, including individual water conservation measures, higher water rates, low water use fixtures (low flush toilets, high efficient washers, etc.), and enhanced water awareness.

CHART 2.2 – Annual Water Usage by User Category

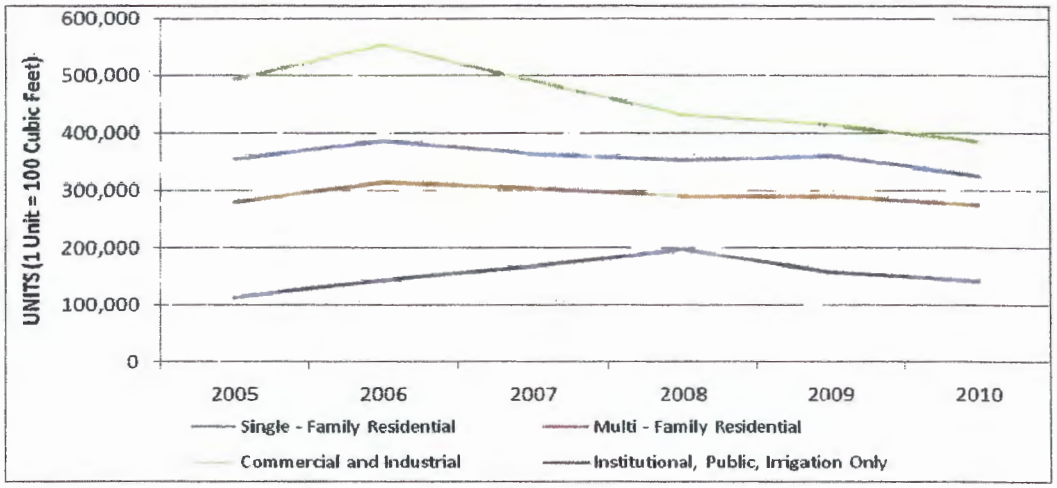
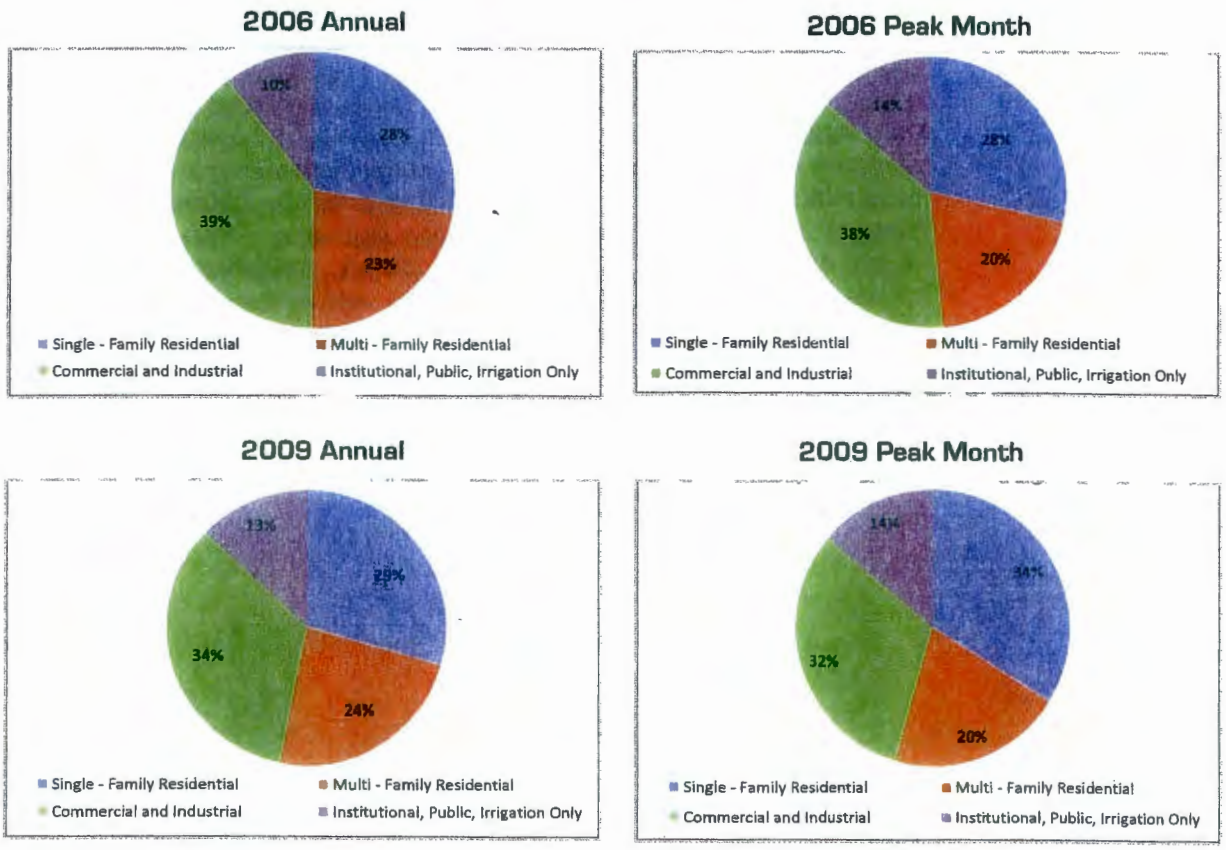


Chart 2.3 illustrates the water usage by user category on an annual and peak month basis. In 2009, water usage for single family dwelling units (blue) makes up 34% of the peak month water usage, as opposed to 29% of the annual water usage. This illustrates that single family dwelling units likely use more irrigation water than other types of water users as a percentage of total water usage.

CHART 2.3 – Annual & Peak Month Water Usage by Category (2006 & 2009)



2.2.7 Water Meter Data and Irrigation Demands

The City of Wilsonville requires separate meters and charges different rates for major irrigation users; however, determining an accurate estimate of total irrigation demand in the city remains difficult. While the City billing system has approximately 380 "irrigation" accounts, these irrigation accounts do not represent all of the total irrigation demand, and in some cases, irrigation accounts reported in the billing software include potable water uses that are fully consumptive (e.g. water bottling plant). This is because water metered through a regular meter is used as the flow basis for sewer billings, while water metered through an irrigation meter is not. Additionally, many accounts, particularly single-family residential properties, are provided both irrigation and potable water through a single meter. This creates calculation difficulties in estimating total irrigation demand.

In reviewing the irrigation account and total demand data from Wilsonville billing database, Keller Associates believes irrigation demands for Wilsonville are best estimated by comparing total water system demand during the winter months to those during the irrigation season. The 2005-2009 average winter-time (January, February, and December months) water system demands are approximately 2.076 mgd. Table 2.6 compares the winter average demands to average monthly system demands for March through November. Based on these comparisons, irrigation is estimated to account for approximately one-third of the total annual water usage and 60% of the demand during the months of July and August (though the percentages are highly variable from month to month).

TABLE 2.6 – Irrigation Water Usage

Period	2005-2009 Average (mgd)	Estimated Irrigation Usage (mgd)	% Irrigation Usage	"Irrigation Only" Accounts (mgd)
January	2.084	0	0%	0.007
February	2.060	0	0%	0.018
March	2.132	0.056	3%	0.027
April	2.187	0.111	5%	0.066
May	2.988	0.913	31%	0.274
June	3.912	1.836	47%	1.140
July	5.157	3.081	60%	1.738
August	5.226	3.151	60%	1.723
September	4.064	1.988	49%	1.362
October	2.520	0.444	18%	0.520
November	2.108	0.033	2%	0.057
December	2.084	0	0%	0.025
Winter*	2.076	0	0%	0.017
Average	3.044	0.968	32%	0.580

*Includes January, February, and December

Keller Associates recommends that the City continue efforts to track and quantify irrigation usage within the system. Future water conservation measures may have an impact on irrigation usage, which in turn could affect

utility revenues. User rate structures can also be used to influence water usage patterns. For future demand forecasts, irrigation usage has been built into the demand estimates. The irrigation usage per residential unit was assumed to remain constant over time.

2.3 UNACCOUNTED FOR WATER

All water systems experience some water loss. Unaccounted for water is defined as the difference between water produced and water delivered to the customer, corrected for any unmetered uses such as hydrant flushing, fire fighting, street cleaning, etc. If water loss exceeds 10%, then Oregon Administrative Rules (OAR Division 86) require that the water supplier implement a leak detection program. These rules require that the program be regularly scheduled and systematic, address distribution and transmission facilities, and utilize methods and technologies appropriate to the supplier's size and capabilities. Tracking water loss and developing a leak detection and repair program is required by, and is addressed in more detail in a Water Management and Conservation Plan (WMCP). Wilsonville has, and maintains a leak detection and repair program consistent with their WMCP. This has involved performing leak detection evaluations of 25% of their system annually, regular meter testing and upgrades of the City's larger meters, and repairing leaks as they are encountered. The City also tracks unaccounted-for-water on an ongoing monthly basis.

Unaccounted for water (water loss) for Wilsonville is summarized in Table 2.7. The data indicates unaccounted for water increased substantially beginning in 2007, and presently accounts for approximately 180 MG (17.5%) of the total water produced. This is substantially higher than the 10% standard set forth in OAR Division 86.

TABLE 2.7 – Water Production vs. Loss (MG)

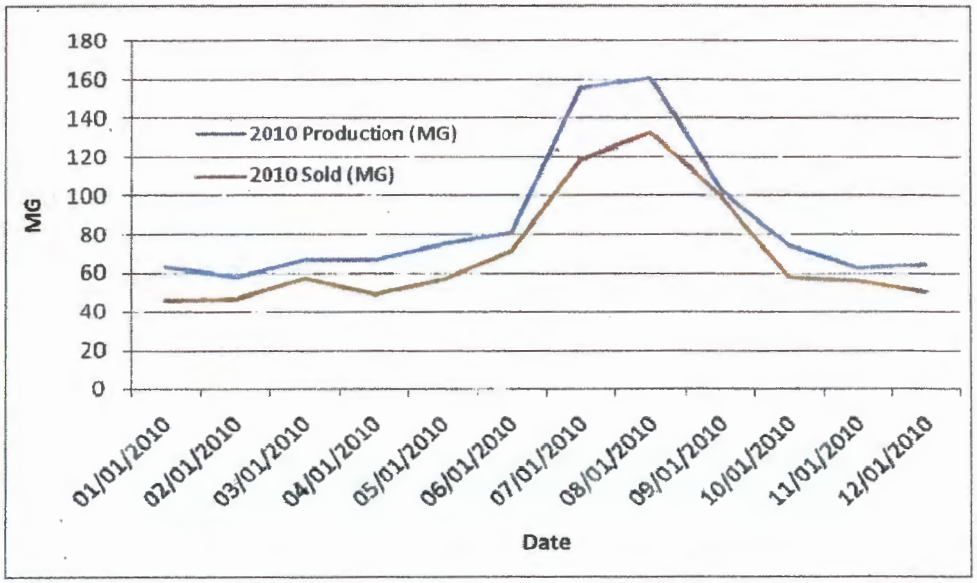
	2005	2006	2007	2008	2009	2010
Produced	1,016	1,130	1,153	1,143	1,120	1,030
Sold*	938	1,060	1,000	961	919	846
Other Uses**	3.5	3.5	3.5	3.5	4.1	3.4
Unaccounted	74	67	150	179	197	181
% Unaccounted	7.3%	5.9%	13.0%	15.7%	17.6%	17.5%

* Includes bulk water sales

** Includes estimated water usage for flushing, sampling, chlorine injection pump operation, street sweeper, and combination line cleaner

Chart 2.4 compares the water sold to that produced and delivered to the water system on a month-by-month basis in 2010. Similar figures were developed for 2006-2009. A significant amount of unaccounted for water appears to occur throughout the year indicating that unaccounted for water is not tied to unmetered irrigation use. During periods of low demand, water loss may make up a larger percentage (although not a large volume) of the total water produced. Keller Associates recommends that the City track volumetric losses. Trending 12-month moving averages will provide the City a better indicator of whether water loss reduction efforts are improving conditions; however, some conclusions can be drawn from the current data.

CHART 2.4 - Water Loss by Month for 2010



The City regularly tracks their water usage and takes active efforts to identify and minimize unaccounted for water. City staff recognize the complexities and challenges of this task and is currently focusing their efforts on understanding and reducing the unaccounted for water. Potential sources of unaccounted for water in the Wilsonville system and their potential for occurrence include the following:

Source	Potential
• Unmetered water users	Low
• Water theft	Low
• Leaky pipes, valves, hydrants, services	Moderate
• Older individual water meters	Moderate
• Meter inaccuracies	High

Unmetered Water Users

The City has gone to great lengths to meter all users, including City-owned facilities. City staff were not aware of any unmetered services within the City when the planning effort began. However, through the process of troubleshooting discrepancies in finished water meter production data, City staff discovered that utility water and onsite irrigation at the water treatment plant was not being accounted for. In March of 2012, water plant staff took physical readings over a week period to approximate utility water usage and potable water usage (excluding irrigation). According to their calculations, the water plant operators could account for approximately 7 million gallons of unaccounted for water annually. A portion of the landscape irrigation would be in addition to this and has not yet been quantified. Keller Associates recommends that all routine water usage be metered and accounted for each month.

Another unmetered source of water usage could results from unmetered private fire lines. According to City staff, most of the older large campuses like Nike, Joes,

Xerox, Ore-Pac, etc. have private fire loops that are not metered. Flushing of their lines is not metered. While it may not be cost-effective to meter these lines, the City should consider requiring these lines to be leak tested every four years similar to other City pipelines.

Water Theft

Water theft could result from contractors or other water users illegally taking water from the City's system. This could occur at fire hydrants or from illicit connections to the City's mainlines. Water theft from hydrants would likely be observed by City staff if it amounted to significant amounts of water. The probability that water theft accounts for a significant portion of the water loss is believed to be low.

Leaky Pipes, Valves, Hydrants, Services

Water loss is often attributed to older, leaky pipes. The City of Wilsonville has taken a proactive approach to detecting and eliminating water system leaks. Leak detection studies are completed annually, and identified leaks are typically fixed soon thereafter.

In investigating unaccounted for water, the City should also be aware that there is a realistic lower limit of water loss that is generally not cost-effective to go below. Keller Associates used the AWWA water audit method for calculating unavoidable annual real losses at approximately 50 million gallons per year, which represents about 5% water loss for 2010. The City of Wilsonville should consider this as a reference value representing the attainable technical low limit of leakage.

Meter Inaccuracies

Meter accuracy, particularly for large meters, is often responsible for the largest percentage of unaccounted for water. The City has taken a proactive approach to improve meter accuracy. According to City staff, all individual flow meters 3-inches in size and larger have been tested, calibrated, and repaired within the past few years.

However, further data review brought into question the accuracy of the finish water meter at the water treatment plant, the large meters at the three distribution system turnouts, and the accuracy of previous water loss calculations. Some history on the finish water meter is summarized as follows:

- According to plant records, the finish water meter was reading 8% low prior to September 2006 and some meter adjustments were made. This may explain why the water loss appears to have jumped in 2007.
- Sometime after the adjustments were made in 2006, operations staff observed that the raw water flow values measured slightly less than the finished water flow. After several efforts to understand this difference, no further adjustments were made to either flow meter.
- Keller Associates compared plant finish water meter readings to the totalized flow entering the Wilsonville distribution system as recorded by the flow meters at the two active delivery points (Wilsonville and Kinsman turnouts)

during this period. The 2010 peak week and minimum weekly flows were compared. The finish flow meter recorded values that were higher than the total recorded at the two delivery points by 6% and 4% for the low flow and high flow periods, respectively. A subsequent analysis of December 2011 data (post additional meter calibration completed in the fall of 2011) shows that the finish water meter was still about 6% higher than flow recorded at the turnouts. Onsite utility water usage is believed to account for less than 1%, and the unmetered portion of the irrigation usage has not yet been quantified.

- Keller Associates initially reviewed one week of SCADA data in an effort to compare the metered flow to the calculated flow based on a change in volume. This analysis suggested that the meter readings were actually about 2.5% low. However, it was also recognized that this value varied from 1% low to 3.8% low for different days, suggesting that there may be sources of error that are not accounted for. A subsequent analysis of December 2011 data shows that the finish water meter was reading between 2.4% and 3.0% higher than measured volumes calculated using clear well depths.

- Based on the data available, it appears that the finish water meter is likely reading about 3% higher than it should. Keller Associates recommends that the City continue to scrutinize water meter data as part of ongoing water balance / water loss calculations.

In September 2011, City staff discovered that one of the meters for a large school had failed sometime in 2008. A review of the monthly meter readings for this account suggests that meter readings for most of 2008 were not accurate. A value of zero was recorded for every month since September 2008. Based on water consumed from this single account in 2007, it is estimated that close to 8.6 million gallons of water were not accounted for in 2009 and 2010. *Adjusting Table 2.6 to reflect this water usage, account for 7 MG utility water usage at the water plant, and to reflect a 3% error in the finish water meter readings would result in an estimated % unaccounted for water of about 13% for 2009-2010.* This illustrates the importance of tracking changes in water usage for large users and regularly testing large water meters.

In summary, Keller Associates believes that the actual water losses are likely less than calculated (primarily as a result of meter accuracies), but may still exceed the 10 percent standard. The City has been proactive in their water loss reduction program, and Keller Associates recommends that the City continue to take measures to identify and remove sources of water loss. Annual leak detection studies, water meter testing and replacements, and ongoing water loss audits should continue.

If these efforts do not produce the desired results, Keller Associates recommends that the City partition off portions of the City and compare metered water usage to that delivered for various regions within the City. For many regions, this may be accomplished with little capital investment. For example, a new water meter is recommended to measure the water going into the Charbonneau District. Comparing monthly water meter readings from this master meter to the total water usage from all the individual meters within the District would allow the City to quantify the water loss for this area and compare the water loss for this area to the system as a whole. Similarly, by closing valves at strategic locations, the City could

use existing turnouts to supply certain regions of the City. Care should be made to notify the fire authority so that valves could be opened in the event of a fire.

For future demand forecasts, Keller Associates has assumed that the water loss reduction programs will continue, and water loss will only grow in proportion to the increase in water system demands.

2.4 WATER DEMAND FORECAST

Consistent with the methodology presented earlier, separate water demand forecasts were prepared for residential and nonresidential users, and for supplemental supply to the City of Sherwood. These are detailed in the subsections below.

2.4.1 Residential Demand Forecast

The average annual residential demand (including single family and multi-family users) for 2005-2010 has consistently made up 50-53% of the total system demand. Table 2.8 summarizes the estimated demands for single family and multi-family residential dwelling units. The number of single family dwelling units was estimated from 2010 meter account data. Because many multi-family users, such as large apartment complexes, are metered as single accounts, the total multi-family units was estimated by subtracting the number of single family accounts from the 2010 Census data showing 8487 households. The estimated number of multi-family households is consistent with estimates prepared by the Wilsonville staff during the first quarter of 2010.

For reference, Table 2.8 also lists current residential demands per unit compared to the previous planning document (2002 Water Master Plan). Daily average demands have not changed much from previous estimates. However, water usage data shows that the estimated maximum day water usage for this study is considerably lower than previous assumptions.

TABLE 2.8 - Residential Demands per Dwelling Unit (gallons/day)

	Single Family	Multi-Family
Number of Units	**3756**	**4731**
Average Daily Demand		
Current Planning Document	**247**	**162**
Compare to 2002 WMP	251	161
Maximum Day Demand		
Current Planning Document	**606**	**283**
Compare to 2002 WMP	866	375

In estimating future demands, single family and multi-family dwelling units were both assumed to grow at a rate of 2.9% until build-out of their respective parts of the study area.

2.4.2 Nonresidential Growth Forecast

Water system demands were summarized by land use for commercial and industrial areas after linking the water system demands (including all irrigation accounts) to parcels in Wilsonville. Table 2.9 summarizes the results. Maximum day demands were approximated based on system peaking factors (Maximum Day is approximately 120% of the Maximum Month demand). Demands also reflect the 2005-2009 average industrial/commercial usage.

TABLE 2.9 – Commercial / Industrial Demands per Acre

Parameter	Commercial	Industrial
Developed Area (acres)	**300**	**830**
January Demand (gpm/acre)	0.59	0.28
Maximum Month Demand (gpm/acre)	2.3	0.46
Maximum Day Demand (gpm/acre)	3.3	0.84

It should be noted that the industrial values are relatively low compared to other communities, which generally have industrial demands exceeding commercial demands on a per acre basis. The relatively low industrial demand per acre likely reflects the preponderance of distribution warehouse type uses encountered in Wilsonville. For build-out, industrial demands were increased by an additional 25 percent to reflect redevelopment, additional infill, and higher water users within existing structures.

Additionally, at the direction of City Engineering staff, three large future industries were also included in future water usage projections. These include a 0.5 mgd industrial user in the first five years, a 0.25 mgd industrial user by year 10, and another 0.25 mgd industrial user by year 15.

2.4.3 Sherwood Water Demands

In addition to supplying the existing water demands for the City of Wilsonville, the existing treatment plant and Wilsonville transmission and system will provide a guaranteed potable water supply to the City of Sherwood. This demand is anticipated to grow from a contractually specified peak of 2.5 mgd in 2011-2012 to a peak of 5.0 mgd by 2015. Sherwood demand is expected to vary by month and season; however, for modeling purposes, the daily demand was assumed to be constant, so no peak hour or peak day adjustment factors are applied to Sherwood demands. The 5.0 mgd demand is also assumed to eventually increase to 20.0 mgd at build-out.

2.4.4 Summary of Demand Forecast

Table 2.10 summarizes the future demands for residential and nonresidential users, future industry, and the City of Sherwood.

TABLE 2.10 – Future Water System Demands

Scenario	2010	2015	2020	2025	2030	Build-out*
Population	19,525	22,525	25,986	29,979	34,585	52,400
Households	7,873	9,083	10,478	12,088	13,946	21,129
Residential (increase of 2.9% per year)						
Average, mgd	1.70	1.96	2.26	2.60	3.00	4.21
Minimum Month, mgd	1.14	1.31	1.52	1.75	2.02	2.83
Maximum Month, mgd	3.01	3.48	4.01	4.63	5.34	7.48
Peak Day, mgd	3.62	4.17	4.82	5.56	6.41	8.74
Peak Hour, mgd	6.16	7.10	8.19	9.45	10.9	14.86
Nonresidential (increase of 3.5% per year)						
Average, mgd	1.50	1.79	2.12	2.52	2.99	3.09
Minimum Month, mgd	1.01	1.20	1.43	1.69	2.01	2.08
Maximum Month, mgd	2.57	3.05	3.62	4.30	5.11	5.27
Peak Day, mgd	3.08	3.66	4.35	5.16	6.13	6.35
Peak Hour, mgd	5.24	6.23	7.40	8.79	10.4	10.80
Other Miscellaneous						
3 Future Large Industries	0.00	0.50	0.75	1.00	1.00	1.00
Sherwood	0.00	5.00	5.00	10.0	10.0	20.0
Total System						
Average, mgd	3.20	9.24	10.1	16.1	17.0	28.3
Minimum Month, mgd	2.15	8.01	8.69	14.4	15.0	25.9
Maximum Month, mgd	5.58	12.0	13.4	19.9	21.4	33.8
Peak Day, mgd	6.70	13.3	14.9	21.7	22.5	36.1
Peak Hour, mgd	11.4	18.8	21.3	29.2	32.3	46.7

* Residential demands reflect larger proportion of multi-family households at build-out, with historically lower usage than single family households

3.0 SYSTEM ANALYSIS

This chapter documents the planning criteria used to evaluate the existing distribution system, summarizes existing deficiencies, and presents recommended improvements.

3.1 PLANNING CRITERIA

Planning criteria include water system demands (established in Chapter 2), planning period, the study area, and the criteria by which the existing distribution system is evaluated.

Planning Period

Planning efforts focused primarily on two planning periods – existing and buildout. Existing conditions are based on 2010 conditions. Buildout was estimated to occur in 2038. Demands were calculated for intermediate planning periods to assist in phasing of improvements such as water supply and storage needs.

Study Area, Land Use, and Population

The service area, land use, and population assumptions for this report are outlined in Chapter 2.

Evaluation Criteria

The evaluation criteria were developed with input from City staff. A comparison of the evaluation criteria used for this study to that assumed in the previous master plan is illustrated in Table 3.1 on the following page.

Minimum pressure criteria are intended to protect human health during emergencies and avoid low pressure complaints from customers. Higher pressure criteria are intended to protect plumbing fixtures and existing mainlines.

Desired fire flows were developed with input from the local fire authority. Providing mechanical redundancy (or firm capacity) ensures that the City is able to deliver water during high demand periods even when any one of the pumps servicing the area is off-line.

Backup source and storage evaluations are evaluated together, recognizing that the existing backup wells can offset emergency storage requirements during an extended plant shutdown.

Equalization storage, or peaking storage, refers to the storage required to meet peak hour demands in excess of the supply pumping capacity. For planning purposes, the supply pumping capacity is assumed to be equal to the average peak daily demand. Operational storage is the volume of water drained from the reservoirs during normal operation before the water sources begin pumping to refill the reservoirs.

TABLE 3.1 - Planning Criteria

Planning Criteria	Keller Assoc. (2012)	Previous WMP (2002)
Pressures		
Min pressure while delivering MDD + Fire, psi	20	20
Min pressure while delivering PHD, psi	40	40 (typ. demands)
Max pressure without pressure regulator, psi	80	Not Specified
Max pressure in mainlines (w/o special pipe), psi	120	100 (typ. demands)
Velocities		
Max for pipes < 12" under PDD+fire, or PHD, fps	10+	10*
Fire Flows		
Minimum for new residential areas, gpm	1500	1500
Target for commercial/industrial areas, gpm	3000	Not specified
Power Outage		
System delivery of ADD + fire?	Yes	Yes
Mechanical Redundancy		
Deliver PHD with largest pump out of service?	Yes	No (only MDD)
Deliver MDD+Fire with largest pump out of service?	Yes	Not specified
Backup Source		
Deliver ADD to Charboneau District with pipe failure?	Yes. 2+ days	Not specified
Deliver ADD demands with WTP out of service?	Yes. 2+ days	Yes
Storage		
Equalization storage for demands in excess of MDD	Yes (14.6% calculate from SCADA)	Yes (assumed at 25% of MDD)
Operation storage	10% of each reservoir	None included outside of WTP clearwell
Fire storage**	3000 gpm for 4 hours	3000 gpm for 4 hours
Emergency storage***	2 times ADD	2 times ADD
Can tank be taken offline for maintenance?	Yes	Yes (zone C supply from Tualatin intertie)

*Previous report assumed all pipes less than 8" in diameter were inadequate for fire protection; Keller allows 10+ fps for fire

**Per local fire authority

***Emergency storage needs can be reduced using wells equipped with standby power.

Abbreviations:

WMP = Water Master Plan
MDD = Maximum Day average Demand
PHD = Peak Hour Demand
ADD = Average Day Demand
WTP = Water Treatment Plant
psi = pounds per square inch
fps = feet per second
gpm = gallons per minute

3.2 HYDRAULIC MODEL DEVELOPMENT

3.2.1 Physical Modeling Inputs

The City of Wilsonville previously constructed and maintained an H20Net water model. This modeling platform is an Innovyze product which operates in AutoCAD. In 2008, the City elected to update and migrate the existing model to a GIS platform product, also by Innovyze, called InfoWater v. 8.1.

In 2011 Keller Associates reviewed the existing model against the best available mapping and information on the city water system. This review uncovered a number of inconsistencies and gaps in the water model. With field investigations and guidance from City staff, the main lines and other major components of the water system were corrected in the water model to reflect a more accurate picture of the system's current arrangement. Numerous "dummy" pipes used in certain modeling methods were removed from the model for clarity.

Pipe materials and their associated roughness values were also reviewed and corrected based on input from City staff. A Hazen-Williams roughness coefficient of 100 was assigned where pipe materials could not be reasonably determined. This value is generally considered an appropriately conservative value given the possible age and material of the water lines in Wilsonville's system.

Many of the existing model elevations were found to be inconsistent with the City's 2-foot LIDAR ground elevation contours. The physical elevations of the modeled junctions affect many aspects of the modeling, including calibration, reported pressures, and fire flow evaluations. In light of the potential impacts, the junction elevations were corrected to the LIDAR data.

Other system components such as pumps, pressure reducing valves, and storage reservoirs were compared to the available record drawings, curves, and operation manuals. These elements were also updated and corrected in the model to reflect the best available data.

3.2.2 System Demand Allocation

Keller Associates linked water consumption data from the City's billing database to the GIS parcel dataset. Although challenging, this accurately allocated demand quantities and locations in the water model. Approximately 85% of the water demands could be linked to specific locations, and the remaining 15% was distributed to developed parcels based on existing land use, acreage, and billing account type (i.e. industrial, commercial, etc.)

To facilitate a more seamless update of demand allocation in the future, it is recommended that the City create a meter dataset. Each meter in the GIS meter dataset and the billing database should be assigned a unique numeric meter ID. This common meter ID between the two sources of information will allow for 100% correlation with relatively little effort. It is recommended that the City continue their efforts to identify each account type as industrial, commercial, multi-family, single family, irrigation and so forth.

3.2.3 Model Calibration

To ensure the computer model results are consistent with observed field conditions, the model is calibrated to field observed test data.

A series of 11 field tests was performed through a coordinated effort with City staff and Keller Associates. The purpose of the testing is to observe the system reaction to higher than usual water demands. The demands were created by opening multiple fire hydrants at strategic points throughout the water system. Pressure changes at observation hydrants were observed and recorded, along with boundary conditions at turn-outs (pressure reducing valves delivering flow from the Water Treatment Plant to the distribution system), tanks, and booster pumps. These demands and boundary conditions for each test were then simulated in the model to see if the model reacted like the system. The calibration results shown in Appendix D indicate that the current model matches within 2-3 psi of field observations.

The calibrated water model was employed in all existing and future scenario evaluations related to this study. The scenarios explored and their results are detailed in section 3.5 *Distribution System Evaluation*.

Although primarily developed for this study, the water model can serve as a powerful planning and system management tool for the City of Wilsonville. It is recommended that the City consider regularly updating, running, and calibrating the water model. To do so, the City will need to purchase the Info Water Software.

3.3 STORAGE EVALUATION

In evaluating the existing storage reservoirs, Keller Associates calculated the existing effective storage, and required storage volumes, and documented the condition of the existing storage reservoirs.

Physical Conditions

In general, three of four existing storage reservoirs are in good shape, and will remain serviceable throughout the 20-year planning horizon. An evaluation of the conditions and recommended upgrades to the existing storage facilities can be found in Technical Memorandum No. 1 (Appendix B). A seismic evaluation of the Charbonneau Tank (Appendix H) shows that this facility is at risk during a major earthquake. Because of the large expense associated with rehabilitating the tank, Keller Associates recommends that the tank eventually be abandoned. Additional discussion about the Charbonneau tank is contained in this section and in Appendices F and H.

Existing and Future Storage Needs

Table 3.2 summarizes the effective available storage for each of the City's existing reservoirs. The effective storage was calculated using available record drawings and reflects the useable volume of water in the storage reservoir. Dead storage (the volume of water below the pipe outlet) was excluded from the available storage supply. Additionally, a one foot freeboard was assumed between the maximum

water surface elevation and the overflow elevation. This freeboard prevents the City from inadvertently overflowing the tank and wasting water.

TABLE 3.2 – Existing Effective Storage

Storage Reservoir	Volume[1] (MG)
Elligsen B-1 West	1.98
Elligsen B-2 East	2.97
C Level	1.96
Charbonneau	0.70
WTP Clearwell[2]	1.08
Total without Clearwell	*7.60*
Total with Clearwell	*8.67*

1. Assumes 1 foot freeboard to overflow. Excludes dead storage volume.
2. Assumes 92.9% of the minimum clearwell volume for summertime worst-case conditions when plant is operating at capacity of 15 mgd.

A portion of the clearwell volume at the water treatment plant was also considered in calculating existing available water storage. Under emergency conditions when the treatment plant may be cut off from the river supply, it is assumed that the clearwell volume containing the treated water at the water treatment plant would still be available. While the clearwell volume provides 2.5 MG of storage, this storage volume can fluctuate substantially depending on plant operations. However, a minimum clearwell volume is always maintained to ensure adequate chlorine contact time prior to delivering treated water to the distribution system. In estimating the available water for the City of Wilsonville during an emergency, Keller Associates assumed the worst-case condition which corresponds to the minimum clearwell volume necessary for treatment during a summer maximum day period (1.16 MG per original CT analysis, see Table 4.1. Note that this value could vary depending on future tracer study results). According to City staff, the City of Wilsonville is entitled to 92.9% of the available volume based on the portion of the clearwell construction costs that were funded by the City (Resolution 1661).

Table 3.3 summarizes the storage needs for 2010 and 2030. The total storage required is anticipated to increase from 9 MG to almost 18 MG by 2030. These storage volumes assume that the existing backup wells would not supplement storage water during a two-day emergency event.

TABLE 3.3 - Storage Needs (No Wells)

Storage Component	Year 2010	Year 2030
Operating Storage[1] (MG)	0.87	1.17
Peaking Storage[2] (MG)	0.98	1.75
Fire Storage[3] (MG)	0.72	0.72
Emergency Storage[4] (MG)	6.40	14.00
Total Storage Required (MG)	*8.97*	*17.64*
Less Storage Available (MG)	*-8.67*	*-8.67*
Storage Need (MG)	**0.30**	**8.97**

1. Operating storage recommendation is 10% of effective volume. For year 2030, it includes an additional 10% storage for the currently proposed 3 MG new tank.
2. Based on Wilsonville demand pattern, assumes supply equals max day demand.
3. Assumes 3000 gpm for 4 hours.
4. Assumes City desires to provide 2 times the average day demand

Although the above analysis indicates a current deficiency of 0.30 MG, the conservative nature of the analysis assumptions would not indicate that a current storage problem exists.

Potential Impacts of Backup Well Supply on Storage Needs

During an emergency event, the City's eight backup wells can supplement water demands. With the exception of the Charbonneau District wells, these wells all pump into the Level B pressure zone. Technical Memorandum No. 3 (Appendix B) documents several scenarios that were considered along with their potential impact on the storage need. With the preferred scenario (includes removing Nike and Canyon Creek wells from the potable system), the 2030 projected storage needs is reduced from 8.95 MG to 2.05 MG.

For the 20-year planning period, the cost to maintain these six wells as a backup supply is between a third and one half the cost of constructing the equivalent amount of storage. Additionally, it should be noted that another benefit of maintaining the backup wells is that in the event of an extended interruption of the water treatment supply, the wells would be able to provide a critical level of service indefinitely as long as fuel could be obtained to run the generators.

Charbonneau Tank

Concurrent to this study, a separate seismic evaluation of the Charbonneau Tank and was completed (see Appendix H). The geotechnical investigation completed as part of this evaluation showed that the tank is at risk during a major earthquake. Mitigating these risks would be almost as expensive as construction a new tank. Given the age of the existing tank (constructed in 1978), rehabilitating the existing tank was not felt to be a cost-effective solution.

As an alternative to replacing the existing tank, Keller Associates also investigated displacing the tank. By providing a secondary 16-inch transmission pipeline to the Charbonneau District via a directional bore under the Willamette River, the City could more effectively use available storage in the B Level pressure zone to service the District. This pipeline could provide the needed fire flows and system

redundancy currently provided by the Charbonneau tank and booster facilities. Displacing the tank would also eliminate energy inefficiencies associated with cycling water through the existing tank (currently requires water that enters the tank to be pumped again into the system). Additionally, operation and maintenance costs associated with the tank and booster facility could be reduced or eliminated. A life-cycle cost comparison shows that the secondary pipeline option will be a better long-term solution for the District (see Appendix E for life cycle costs and Appendices F and G for additional discussion). A summary comparison of the alternatives is shown in Table 3.4. The 16-inch pipeline alternative is a lower-cost alternative when looking at a 20+ year planning period.

TABLE 3.4 – Charbonneau Storage Alternatives

Option	Description	Capital Cost	Annual O&M Cost
1A	Rehabilitate Existing Tank	$ 1,829,000	
	Booster Station & Misc. Upgrades	120,000	
		$ 1,949,000	$ 24,100
1B	Replace Existing Tank	$ 2,284,000	
	Booster Station & Misc. Upgrades	120,000	
		$ 2,404,000	$ 24,100
2	New 16-inch Pipeline Across River	$ 1,532,000	
	Additional Storage in Zone B	700,000	
		$ 2,232,000	$ 3,600

Displacing the Charbonneau Tank will increase the future storage needs by an additional 0.7 MG. This results in a storage need of 9.69 MG if the wells are not accounted for, and 2.77 MG if the preferred wells are accounted for.

Storage Recommendations

Keller Associates understands that the City has already identified a tank site located near the intersection of Tooze and Baker Road, west of the City. The proposed site is capable of holding two reservoirs. The City has already begun pre-engineering to move forward with an initial 3.0 MG storage reservoir, with a second reservoir to follow in the future. This storage reservoir will be located in pressure zone B and will also float on the water system (same overflow elevation as the Elligsen tanks). By maintaining all but the Nike and Canyon Creek wells as backup potable water suppliers, the proposed 3.0 MG storage should be adequate for the City's projected 20-year need, even with the future abandonment of the Charbonneau tank.

Keller Associates further recommends that the City look closely at operation controls in planning and designing the new tank. During portions of the year, the City may want to increase the volume between pump on and off set points. This will ensure a higher tank turnover, which will reduce the potential for water stagnation. Because of differences in locations, size and transmission piping, it is likely that the new water tank will not fill at the same rate as the Elligsen tanks. Altitude valves may be needed at the new tank site and potentially at the existing Elligsen tanks.

3.4 PUMPING FACILITIES

In evaluating the existing booster stations, Keller Associates documented the condition of the existing storage reservoirs and compared firm pumping capacity to existing and project peak demands. Firm capacity refers to the pumping capacity with the largest pump offline.

Physical Conditions

In general, the booster pump stations are in good condition and well maintained, with some components of the Charbonneau Booster Station reaching the end of their useful life. An evaluation of the conditions and recommended upgrades to the existing pumping facilities can be found in Technical Memorandum No. 1.

Capacity

The Charbonneau Booster Station and the B- to- C Booster Station are currently the only two pumping facilities in the distribution system.
The Charbonneau Booster Station runs only periodically because the Charbonneau District can usually receive needed flows and pressures through the PRV connection from Zone B. The Charbonneau tank can be used to augment supply from Zone B. The pumps can be manually turned on (process not currently automated) if the flows and pressures from zone B cannot keep up with the demand in Zone A. The booster station consists of one 40-hp pump and two 75-hp pumps. These pumps pull water from the Charbonneau tank and pump into the Charbonneau system upstream of the PRV. The 40-hp pump can deliver roughly 300 gpm, and the 75-hp pumps can deliver roughly 750 gpm each at the target head of about 300 feet. According to City staff, only one 75-hp and the 40-hp pump have ever been exercised at one time.

The B-to-C Booster Station works together with the C Level Reservoir to meet the pressure and flow needs of the C Level pressure zone. The booster station consists of one 7.5-hp pump, two 25-hp pumps, and one 50-hp pump. These pumps each deliver 50 gpm, 400 gpm, and 800 gpm respectively.

Both booster facilities have a firm capacity greater than what is anticipated to be needed in the 20-year planning period.

Future Booster Station(s)

As development continues to the northeast portion of the study area, another booster station (C-to-D Booster Station) will be required to deliver the necessary pressures. Keller Associates proposes that this booster facility be located near the C Level tank.

An additional temporary booster station may be required to service a portion of land located in the northern reach of the study area and west of the interstate. This area ultimately can be served by the C Level pressure zone, but will require a pipeline crossing of the interstate. A small temporary booster station could allow for development in this area prior to construction of the necessary pipelines connecting the region to the C Level pressure zone.

3.5 DISTRIBUTION SYSTEM EVALUATION

3.5.1 Existing System Evaluation

The physical condition of the existing distribution system was evaluated in connection with this study. The results of this evaluation can be found in Technical Memorandum 1. In general, the distribution system is in good condition. This section summarizes the hydraulic condition of the system.

Available Fire Flow Analysis

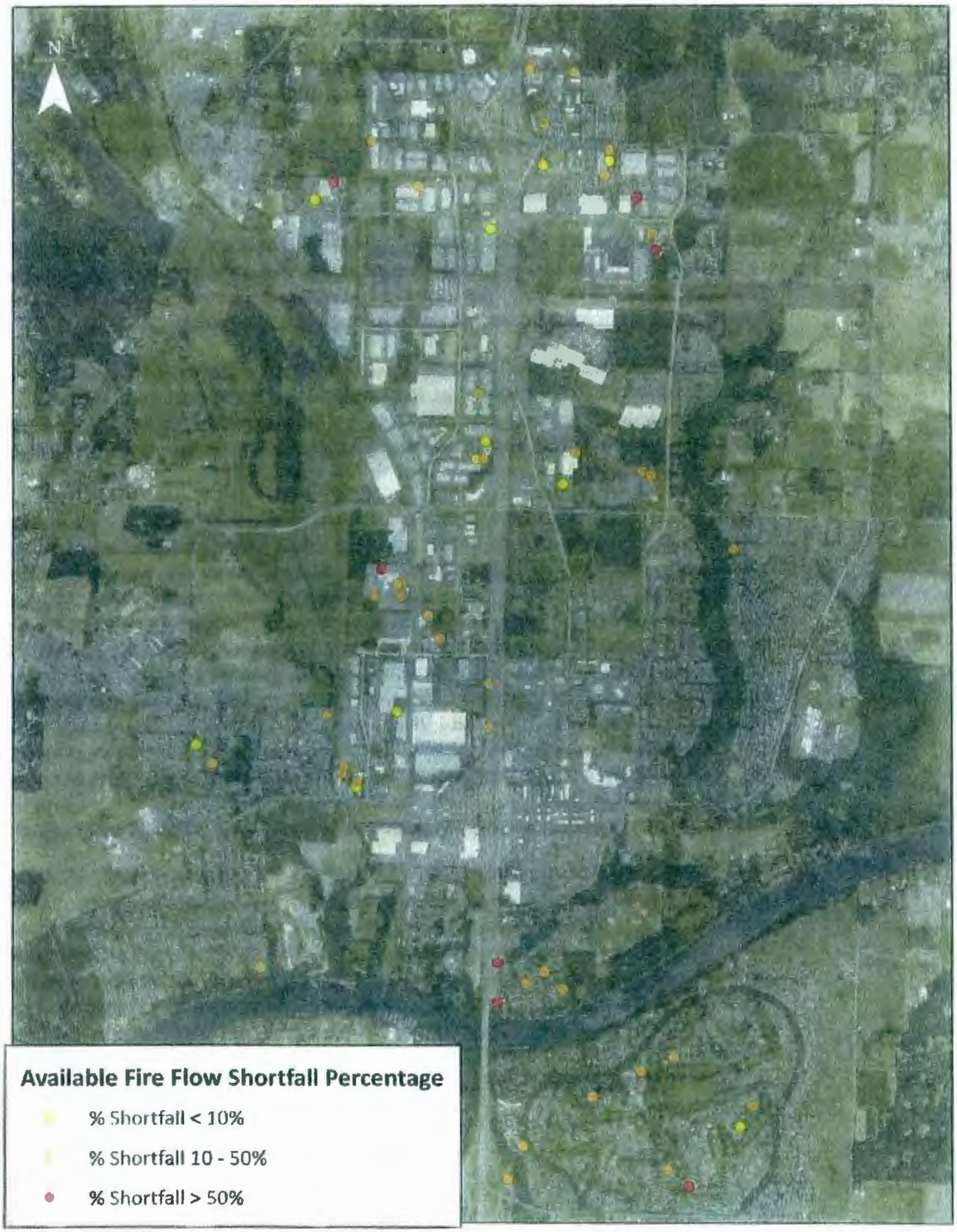
The calibrated water model was employed in evaluating the water system's capability to provide for high water demands in emergency scenarios such as structural fires. The flow rate required at various points in the system was previously determined as described in section 3.1 *Planning Criteria*.

Points on dead-end water lines that are less than 300-feet long and without hydrants were excluded from the evaluation. In consulting with City staff, it was determined that these points do not need to provide fire flow because the flow could be obtained from the main line to which these smaller dead-end lines are connected.

For over 95% of the system, there is more than adequate fire protection. Chart 3.1 highlights points in the system that cannot presently meet the established fire flow standard. Many of these localized deficiencies provide fire flows that are close to the desired standard and can be corrected with minor improvements. For example, a site may be deemed industrial and therefore require a 3,000 gpm demand but can currently provide only 90% of that flow (or falls 10% short). As system improvements are prioritized, minor deficiencies such as these will only be corrected as development or redevelopment occurs. On the other end of spectrum, there may be a residential area needing 1,500 gpm but it can only provide 30% of that flow (or falls 70% short). These deficiencies are higher priority and trigger a capital improvement based solely on the fire flow deficiency. Chart 3.1 breaks the deficiencies down into general categories based on the shortfall percentages.

Each of the failing points highlighted in Chart 3.1 was evaluated with City staff, and local improvements were developed to correct the problems. Other factors than just the local fire flow failure were considered in prioritizing fire flow improvements, such as, proximity to a point in the system providing the full fire flow requirement. For example, a failing hydrant may be less than 100 feet away from a passing hydrant, thereby decreasing the urgency for a system improvement in that area. These improvements are discussed generally in Section 3.5.4 *Recommended Improvements*, identified graphically in Figure 4 in Appendix A, and listed individually in the cost estimates found in Appendix E.

CHART 3.1 - Wilsonville Localized Fire Flow Deficiencies



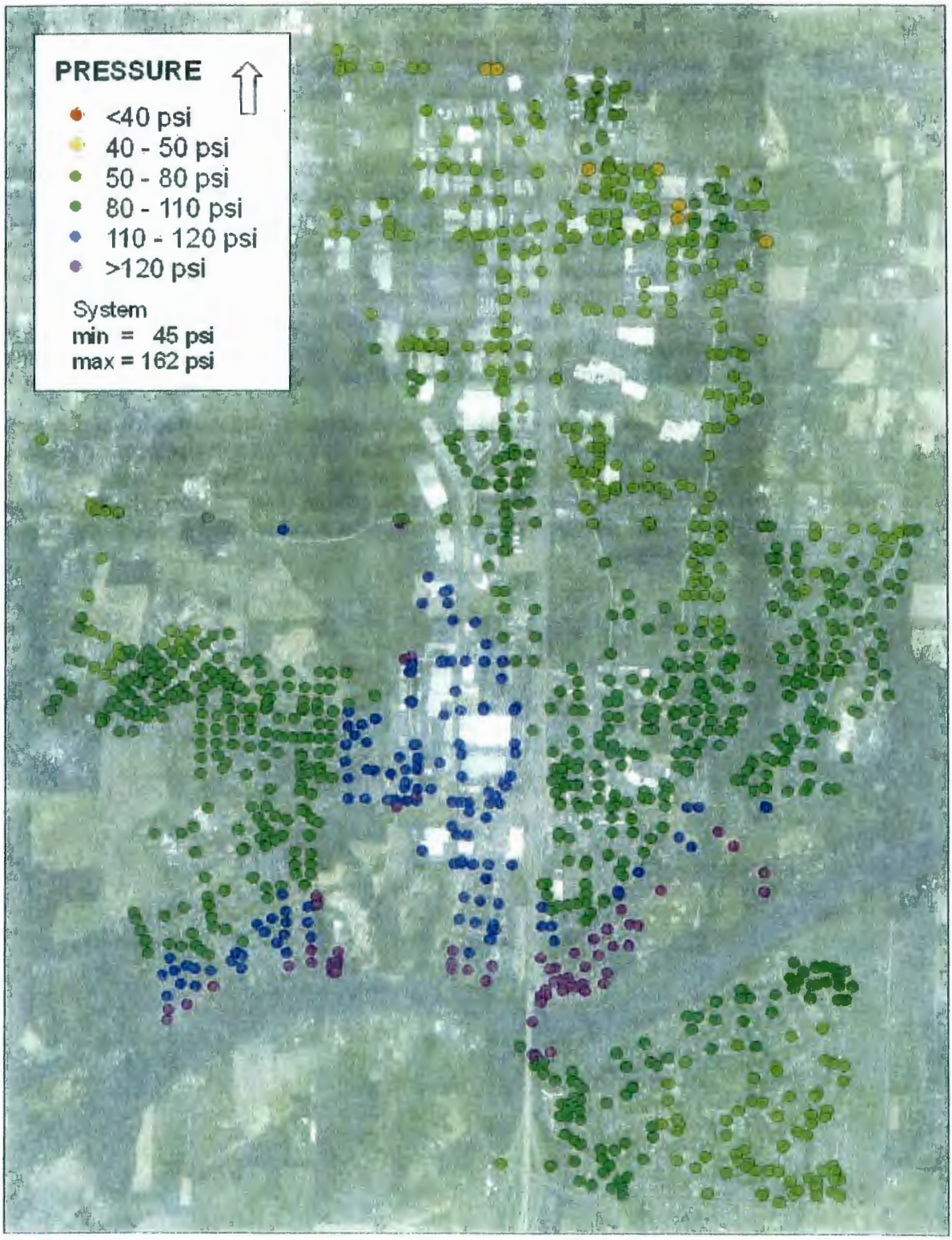
System Pressures

Most modern appliances and plumbing fixtures operate best when water system pressures are between 50 psi and 80 psi. The calibrated water model was employed in evaluating typical water system pressures. Chart 3.2 illustrates the model results for typical water system pressures under an annual average day demand scenario.

Much of Wilsonville's water system will experience water pressure greater than 80 psi. This is because the greater part of Wilsonville is served by the B Level pressure zone. This arrangement is not uncommon for water systems, but does require that individual pressure regulators be installed to regulate customer pressures to below 80 psi. For Wilsonville's system, Keller Associates recommends that individual pressure regulators be installed on all new connections. This will give the City the greatest flexibility in operations, while providing a level of protection to the user. Where future mainline pressures are anticipated to exceed 120 psi, special piping is recommended.

There are also some areas of low pressure in the northern portion of the system. While none of the areas are less than 40 psi, these may be areas the operations crew should monitor as the system continues to evolve. In order to provide water service with pressures greater than 40 psi to the northeast portion of the study area, a new pressure zone will be required (Level D pressure zone).

CHART 3.2 – Wilsonville Typical System Pressures



As shown in Chart 3.2, most of the water system will typically experience water pressure greater than 80 psi. In these areas, individual pressure regulators are recommended for all connections. Where mainline pressures will be more than 120 psi, special piping is recommended. The City typically requires ductile iron pipe, and standard pressure class ductile iron pipe for sizes that would be used in the distribution system is typically rated for 250-350 psi working pressure. There are some 120+ psi locations in the system where unknown pipe materials or materials other than ductile iron pipe are installed. As yet, these installations have not been problematic and are not recommended for replacement. However, if site specific problems should arise, it is recommended that they be replaced with a suitable pressure class pipe. A comparison of Chart 3.2 *Typical System Pressures* and the pipe material figure found in Appendix A reveals portions of the system that may fall into this category.

There are also some areas of low pressure in the northern portion of the system. While none of the areas are less than 40 psi, these may be areas the operations crew should monitor as the system continues to evolve.

Another system pressure standard is that service lines pressures cannot drop below 40 psi under a peak hour demand scenario. The model shows that the City's water system is robust enough to absorb peak hour demands with negligible pressure changes from an annual average day demand scenario.

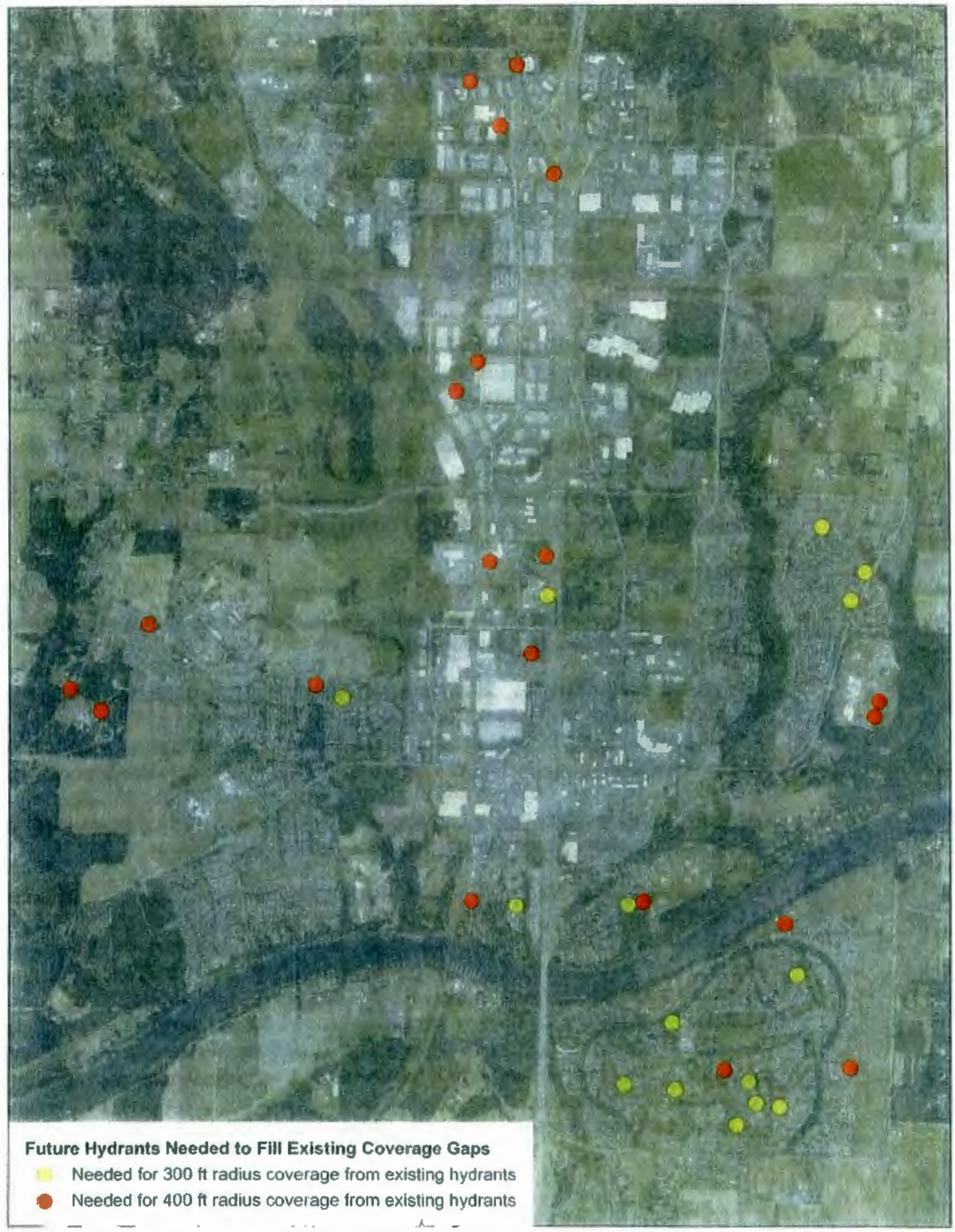
Other System Deficiencies

Other system deficiencies found while evaluating the existing water system include vulnerabilities and inefficiencies.

One of the vulnerabilities discovered in Wilsonville's system was single line (e.g. non-looped) connections to large parts of the system. In the event that the single line were to rupture, the entire downstream area would be without water. Examples of these areas include the single line supplying Zone C north of Elligsen, and the Canyon Creek, Ash Meadow, and Sundial apartments. Each of these locations was reviewed with City staff, and necessary local improvements were developed to address these vulnerabilities.

Other vulnerabilities found in the system were hydrant coverage shortages. For planning purposes, the City elected to set a maximum service area radius of 300 feet from the hydrant consistent with the Tualatin Valley Fire and Rescue (TVF&R) maximum spacing of 600 feet. The more populated sections of the water system were evaluated for coverage, and several gaps were identified (see Chart 3.3). New hydrants, and in some cases new or upsized pipelines, are recommended to provide more coverage in the evaluated areas. An additional 20 hydrants are recommended to provide coverage to structures or areas further than 400 feet from an existing hydrant. Another 15 hydrants are recommended to service areas further than 300 feet from an existing hydrant.

CHART 3.3 – Hydrant Coverage Deficiency Areas



Another potential system deficiency is a section of high velocity flows in the Charbonneau District. Velocities higher than 6 feet per second (fps) can result in unnecessary energy loss and cause excessive wear on the affected piping and equipment. Higher system velocities also increase the potential for damage from transient surges in the water system. In general, velocities are below 6 fps in the City's water system. However, an exception to this trend was discovered in a model evaluation of the Charbonneau system. Velocities of 12 fps were identified in the Charbonneau 4-inch supply line under a peak hour demand scenario.

In evaluating a potential correction for the high velocities in the 4-inch line, it was determined that no improvement is necessary at this time. The system has operated in this fashion for years without problems. Serving a lower pressure zone inherently requires burning energy through a PRV, as is the case with the Charbonneau District. This section of pipe (located in the Charbonneau Booster Pump Building) should be monitored for early wear. If this section proves to be problematic, upsizing the 4-inch line or providing an additional supply point to Charbonneau would decrease velocity through the existing 4-inch connection.

One of the largest inefficiencies found in the water system is the independent well, tank, booster facility in the Charbonneau District. These facilities allow the Charbonneau system to operate independently under emergency conditions, but are rarely used because the system typically operates off the single line feed across the I-5 Bridge crossing the Willamette River. The cost of maintaining the Charbonneau facilities could be eliminated by installing a second connection to the Charbonneau District. This connection could be made using a directional bore to install a 16-inch water line connection under the Willamette River from Rose Lane to French Prairie Road. Additional discussion regarding this improvement and the Charbonneau District's water system can be found in Appendix F.

The improvements identified to address these and other deficiencies are discussed generally in Section 3.5.4 *Recommended Improvements*, identified graphically in Figure 4 in Appendix A, and listed individually in the cost estimates found in Appendix E.

3.5.2 Future System Evaluation

Future System Construction

Starting with the calibrated water model, future water infrastructure was added to the model using existing planning information for areas such as Villebois, Coffee Creek, Brenchley Estates, and Frog Pond. Input from the City served as the basis for such facilities as the future Zone B (West side) storage reservoir location, the Sherwood connection at the intersection of Tooze Road and Westfall Road, and the completion of Segment 3B of the 48-inch transmission main in Kinsman Road.

The planned land use for the study area shown in Figure 2 (Appendix A) provided direction for line sizing and arrangement. Water system demands

were allocated to the future areas using available demand estimates for master planned areas and land use acreage based estimates provided in Chapter 2 *Demand Forecasts*.

The City's 2-foot elevation contour dataset was used to identify the pressure zone best suited to serve future areas. Because the ground elevations in future growth areas in the northeast section of the study area are too high to be serviced by any of the existing pressure zones, Pressure Zone D was created. The target hydraulic grade for Zone D is approximately 590 feet. For evaluation purposes, a Zone D booster station has been modeled at the C Level Reservoir.

Future System Fire Flow and Pressures

The future system infrastructure was developed to ensure adequate fire flow and operating pressures to the intended service areas. The model was used to ensure proper line sizing and pressure zone connection. Figure 4 (Appendix A) illustrates the future system layout with recommended line diameters, and Figure 5 identifies the existing and future pressure zones in the water system.

3.5.3 Recommended Improvements

The recommended improvements resulting from the system evaluation are presented in this section by priority. These improvements are necessary to meet the available fire flow standards and provide hydrant coverage. Also included are the development-driven and City-identified capital improvement projects. Prioritization of the improvements was developed in consultation with City staff.

Priority 1A improvements are those that will likely happen within the next five years, while Priority 1B will occur within the next ten years. These may include projects that improve fire flows that are currently less than 1,000 gpm, or projects that are related to current developments and city-led improvements.

Priority 2 improvements are those that will likely happen within the next twenty years. These may include projects that improve fire flows that are currently greater than 1,000 gpm but less than 1,500 gpm. They may also be development-driven or City-led projects that are considered near-term. Hydrants needed for residential area coverage not tied to a Priority 1 improvement are considered Priority 2.

Priority 3 improvements are those that will happen as development or redevelopment occurs. These are implemented as needed or beyond the 20-year planning horizon and may include improvements intended to correct marginal fire flow deficiencies or poor hydrant coverage in developed industrial and commercial areas. Other future improvements are intended to provide water to currently unserviced areas.

Figure 4 (Appendix A) illustrates the priority improvements. The improvement identifiers on the figure correspond to capital improvement cost information provided in Chapter 5 and Appendix E.

3.6 BACKUP WELL SUPPLY

The City owns and maintains eight potable groundwater wells. These wells once supplied all of the City's drinking water. Since the completion of the water treatment facility, these wells serve only as an emergency backup water supply. These wells include Nike, Canyon Creek, Wiedeman, Boeckman, Geshellschaft, Elligsen, and two additional wells located within the Charbonneau District (Charbonneau wells #2 and #3). A detailed evaluation of these well facilities was documented in Technical Memorandum No. 5 (see Appendix B). The location of these well facilities is illustrated in Attachment 1 of the technical memorandum.
Keller Associates reviewed the well conditions, water rights status, availability of standby power, and water quality with City staff to prioritize which well facilities warrant upgrades and continued maintenance, and which ones should be considered for abandonment or conversion to nonpotable wells that could potentially provide local irrigation needs.

Given the potential for the Charbonneau District to become isolated from the remainder of the system during an earthquake, it was felt that the Charbonneau wells should be maintained as a critical backup supply source. Wiedemann and Geshellshaft wells have historically been good producers and should be maintained. Wiedemann should be equipped with standby power in order to be a more reliable source during an emergency event. The City should continue to take steps to certificate the water right at Geshellshaft (currently the largest producing well in the system). Keller Associates recommends that Elligsen be retained because the water right is certificated and because of its proximity to the storage tanks and Zone C. While there have been some concerns about the poor production capacity of Boeckman, recent pump tests show that it has maintained its historic production rate. Given the relatively new facilities at Boeckman and the presence of standby power, Keller Associates recommends that this facility be retained for the 20-year planning period.

Because of the significant expense to upgrade the Canyon Creek well and its questionable capacity, it may be more cost effective to just abandon this well. However, it may be worthwhile to investigate potential local irrigation uses which would not require standby power upgrades nor the same level of service that is required for potable wells.

The Nike well has historically been a large producer and is the City's only flowing artesian well. The well has poor water quality and in recent years has experienced significant declines in production capacity, believed to be from biofouling of the well screens. Keller Associates recommends that the Nike well be preserved for local irrigation purposes.

The backup wells provide more than just a reliable long-term secondary source of drinking water. Groundwater wells that are equipped with emergency generators can serve to offset emergency storage needs. Impacts on emergency storage requirements are summarized in Section 3.3.

The annual costs to upgrade and maintain all but the Nike and Canyon Creek wells are estimated to be about $95,000 to $105,000 per year.

3.7 CHARBONNEAU DISTRICT SUMMARY

The Charbonneau District is located south of the Willamette River and has several unique issues that justify special consideration within this Master Plan. Water supply to the District comes primarily via a single transmission pipeline. Backup wells, a buried concrete storage tank, and a booster facility are maintained to provide a backup supply to the system and to supplement fire demands.

Because of the potential for the District to become isolated from the rest of the City's water system, Keller Associates considered such an isolation event when evaluating emergency water supply and storage needs. The District's backup wells are capable of sustaining average day demands (but not peak summer demands) during an extended isolation event. Additionally, the existing storage and reservoir are capable of providing volume equivalent of approximately 2,500 gpm of fire protection for a duration of 2 hours. The Charbonneau District represents a significant portion of the City's "older" water system assets, and many of these assets have been targeted in this study for replacement within the 20-year planning period. In addition, many of the pipelines were completed when 4-inch and 6-inch pipeline sizes were used to provide residential fire protection. New fire protection standards generally require minimum pipe diameters of 8 inches. Fire hydrant spacing in many areas also does not meet current City standards. Recommendations to address these deficiencies are summarized in the Capital Improvement Plan. For a more complete evaluation of the Charbonneau District system, including facility replacement needs and recommended improvements, please refer to Appendix F.

4.0 WILLAMETTE RIVER WATER TREATMENT PLANT AND TRANSMISSION PIPELINE

KELLER associates

4.1 OVERVIEW

The purpose of this section is to provide a general overview of improvements necessary to attain a 15 mgd treatment capacity at the Willamette River Water Treatment Plant (WRWTP). It is currently anticipated that the total 15 mgd capacity will be divided between the City of Sherwood (5 mgd) and the City of Wilsonville (10 mgd). Under current planning assumptions, a 15 mgd plant production rate is projected to be necessary by 2020. To achieve finish water flows greater than 15 mgd, a more detailed study specific to the WRWTP is needed. In addition to the current plant capacity, the current transmission capacity evaluation results are presented in this chapter.

4.2 WATER TREATMENT PLANT CONSIDERATIONS

The WRWTP was evaluated for both hydraulic and treatment capacity. The following sections summarize the existing capacities and what improvements are necessary to attain a 15 mgd production rate.

4.2.1 Hydraulic Capacity Evaluation

The plant is designed to treat 15 mgd now and up to 70 mgd in the future at the current plant site. Near the existing plant site is a future "upper plant site" which has room to accommodate a 50-mgd plant. Because of these initial design considerations, much of the plant is hydraulically capable of carrying at least 15 mgd and in many cases 70+ mgd. Hydraulic calculations were performed to confirm the original plant hydraulic design as shown on the hydraulic profile. No significant discrepancies were found. The greatest difference was an isolated 1.64 foot difference at the raw water pump station. This comes from the head loss in a check valve on the pump discharge that may have been excluded from the original hydraulic profile. This has only a minor impact with a slight increase in the pumping head condition for the raw water pumps.

The following subsections summarize the hydraulic capacity of the major plant components with respect to the targeted 15 mgd production rate.

Raw Water Intake and Caisson

The caisson is a 48-foot interior diameter containment located directly beneath the raw water pump station. The caisson is approximately 80-feet deep and is fed by a 72-inch diameter river intake line. The intake line extends approximately 350 feet out into the Willamette River and is equipped with two 66-inch diameter intake screens. The rated capacity for the intake screens as presently installed is 70 mgd.

It should be noted that there is some discrepancy on the intake line size. Most of the record drawings indicated the diameter to be 72-inch. However, a 76-inch diameter is reported in the Operations and Maintenance Manual Section 2, as well as on Sheet 2M-1 of the record drawings.

Raw Water Pump Station

The raw water pump station pulls water from the caisson and delivers pressurized water to the plant for treatment. There are presently 4 pumps installed, with pads and piping for an additional 6 pumps in the future. There are three 7.5-mgd pumps and one 4-mgd pump. One of the 7.5-mgd pumps is a constant speed, and the remaining pumps are equipped with variable speed drives. With the largest pump off-line, the raw water pump station can deliver 19 mgd.

Piping

The internal plant piping that conveys water through the treatment process is not a limiting factor in achieving the targeted 15-mgd rate. A typical hydraulic design constraint for piping is to maintain velocities below 8 fps. The pipeline conveying supply from the raw water booster station through most of the plant is a 54-inch diameter line. At flow rate of 15 mgd, the velocity in this line is 1.5 fps. At a flow rate of 70 mgd, the velocity in the line is 6.8 fps. Near the end of the WTP treatment chain, the main pipe diameter increases to 60 inches. This larger size accommodates flows up to 100 mgd before reaching the 8 fps design constraint. The piping is also large enough to eliminate any concern with excessive friction headloss at the design flow rate.

Influent Meter

The influent flow meter is an ABB MagMaster magnetic flow meter. The meter is located immediately downstream of the raw water pump station along the 54-inch in-plant line. As flow approaches the meter, the pipeline is narrowed down to a 24-inch diameter line to increase the velocity and thereby improve the meter's accuracy. Following the meter, the line is expanded back up to a 54-inch diameter. According to the meter manufacturer's specifications, the velocity through the meter should be greater than 1.64 ft/second (or 3.3 mgd) for optimal accuracy. At 15 mgd, the velocity in the 24-inch line segment is over 7 ft/second. The maximum flow rate for the meter is specified by the manufacturer at 64 mgd. Manufacturer documentation can be found in Appendix G.

Coagulation / Ozone Contact Basins

Because the ozone contact basins and coagulation units are for treatment only, the hydraulic capacity is not the limiting factor for flows of 15+ mgd. The flow capacity limitations are dependent on the treatment constraints of these units.

Dual Media Filters

There are four filter beds, each with six feet of granular activated carbon atop one foot of sand. The underdrain is an engineered system made of plastic blocks with an integrated media support cap. The filters are operated with a constant head which is controlled by an upstream overflow and a downstream weir. The control design for the filter system is defined as constant rate – level controlled.

Because filters function as treatment, their capacity is limited by treatment considerations rather than hydraulics. High flow rates could be pushed through the filters from a hydraulic perspective, but the process water may not receive the full benefit of the filters. The associated piping and channeling are all designed to carry at least 15 mgd, which is the filtration system's rated treatment capacity.

Clearwell

Hydraulically, the clearwell provides a buffer between variations in the plant's production rate and the City's demand rate. Allowing for 1 foot of freeboard, the usable clearwell volume has been calculated at 2.49 MG using AutoCAD and the original record drawings. There are various volumes reported throughout the available documentation on the clearwell, so some effort was made to calculate the volume more precisely by accounting for the volume of the interior support columns and pipe trough intrusions in the clearwell. This calculated volume also accounts for the design minimum water surface elevation of 103 feet in the clearwell.

At this volume, the pumps can deliver the design rate of 15 mgd for 4.6 hours without inflows from the treatment plant. According to the April 7, 2011 Technical Memo on the Clearwell CT Analysis, the City of Wilsonville's current operational goal is to provide at least 2 hours of emergency storage in the event that plant production ceased.

There are also other storage reservoirs throughout the distribution system that can provide the system's storage need without requiring storage from the clearwell. Refer to the storage evaluation found in Chapter 3 of this report for an in-depth storage analysis for the system.

Treatment constraints which prevent using the full clearwell volume as backup storage are addressed in sub-section 4.2.2 of this report.

High Service Pumps

The high service pump station pulls water from the clearwell and delivers it to the City through a 63-inch diameter transmission line. The pump station consists of four pumps. There is one 4-mgd pump, and three 7.5-mgd pumps. One 7.5-mgd pump is a constant speed pump, and the other pumps are equipped with variable frequency drives. With the largest pump offline, the booster station can still deliver 19 mgd. The high service pump station has plumbing and pads for two future pumps.

In the event of a utility power failure, only one pump (the 4.0-mgd variable speed pump) will be operational. The other pumps are not connected to the plant's emergency power system.

A power failure can also lead to surge conditions if the pumps were to suddenly stop while delivering flows between 12.5 to 15 mgd. More information regarding this surge potential can be found in the City of Wilsonville Hydraulic Transient Analysis technical memorandum dated April 6, 2011. A 750-cubic-foot hydropneumatic tank is recommended for protection against transient surge damage for flows greater than 12.5 mgd.

4.2.2 Treatment Capacity Evaluation

The treatment train in the water treatment plan begins with flash mixing and ends with the clearwell. This section presents the results of a treatment capacity evaluation of the WRWTP. The evaluation is limited to the major plant components and therefore excludes auxiliary systems such as backwash and chemical feed.

Flash Mixing Treatment Capacity

Typical design standards for flash mixing address flow rate, nozzle velocity, and mixing energy to ensure adequate flash mixing performance. The current flash mixing process is adequate and within typical design standards, with the exception of the nozzle velocity.

The recommended nozzle velocity is 20-25 fps. The current maximum nozzle velocity is approximately 11 fps (based on a 1,000-gpm flash-mixing pump rate and a 6.25-inch orifice diameter Distribojet spray nozzle).

If the coagulation and clarification process is working well, no changes are recommended. If some improvement in the coagulation and clarification process is desired, reducing the flash mixing nozzle size may improve the mixing and coagulation conditions.

Coagulation and Clarification Treatment Capacity

This is a proprietary process (Actiflo by Kruger), but is rated by the manufacturer to safely accommodate 15 mgd. The two trains can easily treat 7.5 MG each. According to the manufacturer, one train alone can treat 15 mgd temporarily while the other is out of service. No modifications are anticipated in order to be able reach 15 mgd.

Ozone Treatment Capacity

The treatment plant has two ozone generators, each capable of producing 300 pounds per day (which translates to 2.76 mg/L at a flow rate of 15 mgd). A minimum 95% transfer efficiency is standard design criteria. The transfer efficiency rate is the portion of the ozone produced that actually transfers to the water as a residual concentration. A 95% transfer rate on 2.76 mg/L results in more than enough production to reach the targeted residual of 2.0

mg/L. The generators have a 10:1 turn down ratio, so as little as 30 ppd could be produced to accommodate lower plant flow rates.

The intermediate ozone system is intended to provide additional inactivation of Giardia, viruses, and cryptosporidium beyond what is required by state and federal regulations. Ozone can also help minimize aesthetic pollutants that cause taste and odor.

The current operational goal at the plant is to provide a 1-log inactivation of Cryptosporidium with the ozone. In order to achieve inactivation through disinfection, a specific contact time or CT value is needed (where C=residual disinfectant concentration, and T=contact time). The CT is the disinfectant concentration multiplied by effective contact time. By EPA's current standards, the effective contact time in the CT calculation is the time at which 10% of the inlet concentration is observed at the outlet, or commonly referred to as the T_{10}.

According to the EPA CT tables, a 1-log inactivation can be achieved during the summer (15°C design temp) with a CT of 6.2 and during the winter (4.1°C design temp) with a CT of 17.5. With a target concentration of 2.0 mg/L, the T_{10} summer would need to be 3.1 minutes. The T_{10} winter would need to be 8.75 minutes.

The design hydraulic residence time (HRT) in each of the two contact basin trains is 14.5 minutes at 7.5 mgd per train (for a total of 15 mgd). This means the hydraulic efficiency factor (calculated as T_{10}/HRT) for the basins would need to be at least 0.6 in order to achieve the desired CT.

The hydraulic efficiency factor has not yet been determined for the basins. However, the arrangement of the baffles and the geometry of the basins are such that 0.6 is likely achievable. Regardless, this value should be verified with a tracer study and computer modeling.

In summary, the ozone treatment capacity appears to be sufficient to treat up 15 mgd; however, the T_{10}/HRT factor for each contact basin has yet to be verified. The EPA guidance manual recommends that the highest tracer study test flow rate used to determine hydraulic efficiently be at least 91% of the maximum flow rate anticipated in the clearwell. With this standard in mind, the basins will need to have a tracer study performed at a flow rate of at least 6.8 mgd.

Dual Media Filters Treatment Capacity

There are two bays of two filter beds each for a total of four filter beds. The empty bed contact time is 7.5 minutes at the design flow rate of 6 gallons per minute per square foot (gpm/sf). The filter rate can safely increase up to 8 gpm/sf to accommodate one filter out of service. In pilot testing, the filters reliably treated water to plant operation goals up to 12 gpm/sf. Each filter has a treatment capacity of 4 mgd based on 6 gpm/sf, for a total of 16 mgd for four filters.

Clearwell Treatment Capacity

The clearwell functions both as an operational water storage facility and as a finishing disinfection contact chamber. From the total available storage volume, the clearwell provides operational volume and CT volume. Operational storage is used for backwashing the plant filters, other miscellaneous potable uses at the plant, and distribution system demands beyond the plant's production capacity or to provide water during a plant outage. Under current operations, the storage volume is also used to provide for system demands during the night when the plant is off-line. The current operating policy established by the City requires a reserve volume equal to a minimum of two hours at the design maximum flow rate.

Because the storage volume component fluctuates throughout the day, it cannot be counted on to provide the necessary volume for achieving contact time. Therefore, a minimum CT volume must be maintained at all times in order to achieve the required disinfection.

It is important to recognize that the clearwell is the second disinfection process in the WRWTP. The first disinfection process occurs in the ozone contact chambers discussed in this chapter. By EPA standards, only one of these disinfection processes is necessary. However, Oregon regulations do not recognize disinfection before filtration (OAR 333-061-0050). Therefore, the disinfection provided by the ozone contact chambers located upstream of the filters is not formally acknowledged by Oregon regulations despite the fact that the actual benefit of the disinfection is provided.

Just as it is with the ozone contact chambers, the clearwell's disinfection capacity is measured by CT. The CT in the clearwell was recently evaluated and the results were reported in the *CT Analysis Technical Memorandum* (CT Memo) prepared by MWH dated April 7, 2011.

The analysis in the CT Memo is based on assumptions of total contact volume, operating storage requirements, residual chlorine concentration, finish water pH, and hydraulic efficiency. Each of these factors ultimately determines the treatment capacity of the clearwell, and therefore the production capacity of the plant.

Based on the assumptions stated in the CT Memo (pg. 5), the current clearwell capacity is 15 mgd in the summer and 10 mgd in the winter. These parameters are summarized in Table 4.1.

TABLE 4.1 - CT Analysis 1: Summer and Winter

Parameter	Summer/Winter Value	Units	Comments
Total Available Storage Volume	2.9	MG	Accounts for 1-foot freeboard
CT Required	18/39	mg·min/L	Provides 0.5 log Giardia inactivation at given temp (15°C/4°C) and pH (8.0)
C Value	1.0	mg/L	Free chlorine concentration in clear well
Minimum T_{10} Required	18/39	min	Contact time needed to achieve CT
Ratio of T_{10} to HRT	0.16	-	Factor accounts for higher flow rates and conservative assumptions
Minimum HRT Required	111/242	min	Hydraulic residence time needed to achieve CT
Minimum Clearwell Volume	1.16/1.7	MG	Volume in clearwell needed to achieve CT at maximum production rate while meeting operational storage requirement of 2 hours.
Operational Storage Available	1.6/1.1	MG	Volume available to meet the required 2-hour operational storage (Total available volume-Minimum CT volume)
Operational Storage Time at Maximum Flow Rate	2.5/2.6	hrs	Hours of maximum flow rate available from operational storage
Maximum Flow Rate	15/10	mgd	This is the production capacity of the WRWTP and the treatment capacity of the clearwell.

Another analysis presented in the CT Memo (pg. 5) changed the contact time volume to include the volume of the 63-inch transmission line leading from the clearwell to the distribution system turnout at Brockway Drive. Under this analysis, the clearwell capacity is 24.1 mgd in the summer and 15.4 mgd in the winter. As stated in the memo, this would require the installation of a chlorine residual analyzer at Brockway, and temperature and pH probes along the transmission line route. In addition to these items, this option would require the installation of an 8-inch diameter, 1,200-foot return line from the Brockway turnout back to the WRWTP for on-site culinary use.

Yet another analysis presented in the CT Memo (pg. 6) looked at adjusting the finish water pH from the current 8.0 down to 7.5. This would result in a clearwell capacity of 18.6 mgd in the summer and 12.3 mgd in the winter.

Other options presented in the CT Memo for increasing the current clearwell capacity included adding baffling to the clearwell interior to improve the hydraulic efficiency, incorporating UV disinfection after filtration, and pursuing a change to Oregon's post-filtration disinfection regulation which is more stringent than the United States Safe Drinking Water Act.

For the purposes of this master plan, the clearwell assumptions were revisited and analyses were performed using different design assumptions. One of the factors revisited was the total available volume in the current clearwell. After reviewing the original plant record drawings and applying a 1-foot freeboard, it is calculated that the available clearwell volume is approximately 2.5 MG as opposed to the previously assumed 2.9 MG (*Willamette River WTP Operations and Maintenance Manual*, Section 6, pg 6-1).

Another design assumption is the hydraulic efficiency factor or the T_{10}/HRT. A tracer study was completed on the WRWTP clearwell in 2003 to discover how quickly water can pass from the clearwell inlet to the outlet, and therefore how much time the disinfectant in the clearwell has to act on the water. T_{10} represents the time for 10% of the tracer to pass through, while T_{90} is the time at which 90% of the inlet concentration is observed at the outlet. The T_{10} is commonly used as the T in the CT calculation.

The 2003 tracer study resulted in a ratio of the T_{10} over the theoretical residence time (also referred to as the hydraulic residence time or HRT) of 0.16. Previously, this ratio has been used to calculate the required CT volume for flow rates up to 35 mgd, and thereby determine the treatment capacity of the clearwell. However, there are some potential problems with using this ratio in such a manner.

The EPA *Guidance Manual on Disinfection Profiling and Benchmarking* states that the relationship between detention time and flow is proportional but not generally a linear function (USEPA, May 2003, Appendix E.2). In simple terms, this means that the T_{10} ratio will be different for different flow rates. In fact, data from the WRWTP tracer study reveals a T_{10} to HRT ratio of 0.16 at 6,000 gpm, and a T_{10} to HRT ratio of 0.22 at 3,000 gpm. The highest flow rate used to develop the 0.16 factor was 8.6 mgd. Therefore, according to the EPA criteria for tracer study flow rates, the factor of 0.16 T_{10} to HRT should not be applied to flows higher than 9.5 mgd. In order to obtain an acceptable T_{10} to HRT ratio for a design flow of 15 mgd, the tests would need to be performed for flows of at least 9,500 gpm.

Moreover, recent research suggests that using the T_{10} to HRT factor will overestimate the contact time (*Evaluation of Hydraulic Efficiency of Disinfection Systems Based on Residence Time Distribution Curves*, Wilson and Venayagamoorthy, 2010). According to this research, Computational Fluid Dynamic (CFD) modeling will provide the best accuracy in determining the hydraulic efficiency of a clearwell. Alternatively, using at least a T_{10}/ T_{90} ratio will more closely approximate the contact time than the current standard practice. As an example, the original tracer study data on the WRWTP clearwell suggests that the T_{10}/ T_{90} ratio is 0.07, as opposed to 0.16 for the T_{10} to HRT ratio. In short, using the T_{10}/ T_{90} ratio as the hydraulic efficiency factor is more conservative than the current EPA and industry standard of using the T_{10}/ HRT ratio.

Without the benefits of a tracer study at higher flow rates or CFD modeling, it is impossible to determine the actual hydraulic efficiency factor of the clearwell. Analyses were performed using more conservative hydraulic efficiency factors to evaluate the potential impact on the clearwell's capacity, and consequently the WRWTP's capacity.

EPA's minimum hydraulic efficiency factor of 0.10 is defined as typical for unbaffled clearwell conditions such as the clearwell in the WRWTP (EPA *Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources*, Appendix C, Table C-5).

After accounting for the change in the total available volume and hydraulic efficiency factor, the resulting capacity of the clearwell is 12 mgd for the summer (as opposed to the previously assumed 15 mgd) and 7 mgd for the winter (as opposed to the previously assumed 10 mgd) with a chlorine dose of 1 mg/L and a pH of 8.0. Table 4.2 summarizes the values discussed in this section.

TABLE 4.2 – CT Analysis 2: Summer and Winter

Parameter	Summer/Winter Value	Units	Comments
Total Available Storage Volume	2.5	MG	Accounts for 1-foot freeboard
CT Required	18/39	mg·min/L	Provides 0.5 log Giardia inactivation at given temp (15°C/4°C) and pH (8.0)
C Value	1.0	mg/L	Free chlorine concentration in clear well
Minimum T_{10} Required	18/39	min	Contact time needed to achieve CT
Ratio of T_{10} to HRT	0.1	-	Factor accounts for higher flow rates and conservative assumptions
Minimum HRT Required	180/390	min	Hydraulic residence time needed to achieve CT
Minimum Clearwell Volume	1.50/1.91	MG	Volume in clearwell needed to achieve CT at maximum production rate while meeting operational storage requirement of 2 hours.
Operational Storage Available	1.0/0.59	MG	Volume available to meet the required 2-hour operational storage (Total available volume-Minimum CT volume)
Operational Storage Time at Maximum Flow Rate	2	hrs	Hours of maximum flow rate available from operational storage
Maximum Flow Rate	12/7	mgd	This is the production capacity of the WRTP based on the limiting factors on the clearwell.

An alternative analysis performed in connection with this study evaluated the effect of reducing the operating storage requirement from 2 hours at maximum production rate to a reasonable minimum of what is needed for plant operations only. This allows the gravity controlled reservoirs in the distribution system to provide for system demands during plant outages or peak demands. Relying on distribution system storage for distribution system demands is more efficient and streamlined than pumping storage from the treatment plant's clearwell. All pressure zones in the distribution system currently have the capability to be supplied by a gravity reservoir. The reservoir storage volumes will likely need to be expanded as demands grow, but this will be part of the distribution system improvements and not the water treatment plant improvements.

The largest use for treated operational volume at the treatment plant is filter backwash. Because the clearwell is the source for filter backwash water, the operational storage volume maintained in the clearwell at the plant could be based on the maximum filter backwash rate and duration.

One filter can be backwashed at a time without sacrificing the combined 16 mgd filtration rate, because the flow rate to the active filters can be increased

from 4 mgd to 5.33 mgd for short periods of time. At a plant production rate of 15 mgd, only one filter at a time would require a backwashing. An operations-based storage volume could be as outlined in Table 4.3.

TABLE 4.3 – Plant Operational Volume in Clearwell

Parameter	Value
Backwash Rate 1 (gpm/sf)	6
Backwash Rate 2 (gpm/sf)	18
Backwash Duration for Rate 1 (min)	5
Backwash Duration for Rate 2 (min)	8
Single Filter Area (sf)	463
Backwash Volume for One Filter (MG)	0.08
% Additional Volume for Other Plant Needs (assumed as % of backwash volume)	25
Safety Factor	3
Total Operational Volume in Clearwell (MG)	**0.30**

Under this analysis, the operational storage component is reduced to 0.30 MG from the previously assumed 1.25 MG. Table 4.4 summarizes the impact on the clearwell treatment capacity.

TABLE 4.4 – CT Analysis 3: Summer and Winter

Parameter	Summer/Winter Value	Units	Comments
Total Available Storage Volume	2.5	MG	Accounts for 1-foot freeboard
CT Required	18/39	mg·min/L	Provides 0.5 log Giardia inactivation at given temp (15°C/4°C) and pH (8.0)
C Value	1.0	mg/L	Free chlorine concentration in clear well
Minimum T_{10} Required	18/39	min	Contact time needed to achieve CT
Ratio of T_{10} to HRT	0.1	-	Factor accounts for higher flow rates and conservative assumptions
Minimum HRT Required	180/390	min	Hydraulic residence time needed to achieve CT
Minimum Clearwell Volume	2.5/2.5	MG	Volume in clearwell needed to achieve CT at maximum production rate while meeting operational storage requirement of 0.3 MG.
Operational Storage Available	0.3/0.3	MG	Volume available to meet the required 2-hour operational storage (Total available volume-Minimum CT volume)
Maximum Flow Rate	17.5/8.1	mgd	This is the treatment capacity of the clearwell. The plant may have other limiting factors.

As seen in this analysis, modification of the operational storage requirement frees up storage volume in the clearwell to meet the CT storage requirements despite the more conservative design assumptions of a reduced volume and a lower hydraulic efficiency. With these design assumptions in place, the

targeted 15 mgd plant production rate could be supported with volume to spare in the clearwell.

Other design assumptions that could also affect the clearwell disinfection capacity would include a more conservative hydraulic efficiency factor (T_{10}/T_{90}), an increased chlorine residual concentration (>0.1 mg/L), and the effects of an internal clearwell mixing machine.

An analysis using the more conservative T_{10}/T_{90} ratio as the hydraulic efficiency factor for the clearwell was not performed due to the tracer study flows being too low to apply to the targeted 15 mgd plant production rate. This may be a possibility after a new tracer study is completed.

Although not commonly used, an internal clearwell mixing machine may be a means of improving the CT. An analysis of an internal clearwell mixing machine would be specific to the device and would be best performed by the manufacturer through modeling or other means. This analysis is similar to the baffling option presented in the CT Memo in that it would improve the T_{10} in the clearwell and effectively raise the hydraulic efficiency factor.

An analysis of increased chlorine was not performed due to the probable aesthetic water quality impacts.

4.3 TRANSMISSION PIPELINE CONSIDERATIONS

The purpose of the transmission line is to convey water to the system with minimal head loss (to avoid excess pumping costs) and moderate velocity (to avoid system surges and undue stress). Typically, velocities should be less than 8 fps and head loss should be as low as possible, but certainly no more than 10 psi from the treatment plant to the distribution system.

The nearly 4,000-foot, 63-inch steel transmission line from the plant to the distribution system can carry 15 mgd with negligible head loss and 1 fps velocity. At 70 mgd (build-out of the lower site), the transmission would lose less than 2 psi and the velocity would be about 5 fps. At 120 mgd (build-out of the upper and lower site), the transmission would lose less than 5 psi and the velocity would be just under 9 fps.

At Wilsonville Road, the 63-inch transmission line from the WRWTP wyes to two 48-inch transmission lines. Each of the 48-inch steel lines has a design capacity of 40 mgd (5-fps velocity). Currently only one of these 48-inch transmission lines is installed. The final connecting section of this transmission line is currently under design. When completed, this line will carry supply northwest to Sherwood and other turnouts to the Wilsonville distribution system.

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5.0 CAPITAL IMPROVEMENT PLAN

5.1 OVERVIEW

The capital improvement plan is presented in this section. Each improvement is recommended as a means for addressing existing or future needs in the water system. The necessary improvements were identified by evaluating the various system components against the evaluation criteria established in Chapter 3 of this report, as well as local, state, and federal standards.

Priority 1A improvements are those that will likely happen within the next five years, while Priority 1B will occur within the next ten years. These may include projects that improve fire flows that are currently less than 1,000 gpm, or projects that are related to current developments and city-identified priority improvements.

Priority 2 improvements are those that will likely happen within the next twenty years. These include projects that improve fire flows that are currently greater than 1,000 gpm but less than 1,500 gpm. They also be development driven or City-led projects that are considered near-term. Hydrants needed for residential area coverage not tied to a Priority 1 improvement, are considered Priority 2.

Priority 3 improvements are those that will happen as development or redevelopment occurs. These may or may not occur within the 20- year planning horizon. These also include improvements intended to correct marginal fire flow failures or poor hydrant coverage in developed industrial and commercial areas. Other Priority 3 improvements are intended to provide water to currently unserviced areas.

Table 5.2 contains the recommended improvements for the system components of supply, storage, and distribution for the respective priorities. The numeric identifier assigned to the improvements corresponds to the capital improvement plan map found in Appendix A, Figure 4. The primary purpose for the recommended improvements is also noted in the capital improvement tables. The following legend (Table 5.1) summarizes the primary purposes.

TABLE 5.1 - Improvement Primary Purpose Legend

Primary Purpose	Explanation Legend
Compliance	An improvement needed to correct an existing condition that is out of compliance with a federal, state, or local regulations
Operations	An improvement that addresses a component's interaction with other components in the system.
Maintenance	An improvement addressing a recurring or chronic maintenance problem. May also be a standard maintenance task.
Replacement	Replacement of a component that is beyond its useful life, undersized, etc.
Growth	Improvements that are necessary due primarily to growth.
Fire Flow	Improvements necessary to provide the targeted fire flow.
Water Quality	Improve the water quality.
Hydrant Coverage	Improve accessibility of fire hydrants to water service area.

The various improvements listed in the capital improvement plan may have a portion of the cost attributed to future growth because they are, at least in part, intended to benefit growth. Where this is the case, the incoming development or redevelopment is responsible for the growth portion of the cost. To assist in future system development charge evaluations, Keller Associates has estimated the portion of the improvement cost that could be attributed to growth.

Each improvement is accompanied by an opinion of probable cost. This is a planning level estimate, based on unit pricing and project budgeting numbers provided by the City. More accurate cost estimates should be obtained at the time of preliminary design for the specific project. Additional details of the cost breakdown for each of the improvements can be found in Appendix E.

Based on the demand projections in this study, water treatment plant expansions may be needed around 2020. However, it should be noted that the capital improvement plan presented in this section contains only those treatment plant improvements necessary to achieve a 15 mgd production rate. For higher rates, a separate master plan is needed, and must be completed before the City's long-range capital improvement plan and associated Rate Study can be determined. These tasks (Treatment Plant Master Plan, and Rate Study) are planned to occur in the next two years.

Additional capital expenses associated with major repairs and replacements of existing water facilities are summarized in Chapter 6.

TABLE 5.2 – Priority Capital Improvements

ID#**	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment %	Growth Apportionment Cost	Operating Fund	Additional Annual O&M
Priority 1A Improvements (by 2017)							
Water Supply							
106	Portable Flow Meter (for well tests)	Operations	$ 13,000	0%	$ -	$ 13,000	$ 1,360
Water Treatment and Transmission							
	Surge Tank	Operations	$ 170,000	100%	$ 170,000	$ -	$ 960
	Clearwell Improvements (assume policy change)	Operations	$ -	100%	$ -	$ -	
Water Storage							
121	C Level Reservoir Security and Sampling Improvements	Operations	$ 18,000	0%	$ -	$ 18,000	$ 640
123	Charbonneau Reservoir Chlorine Monitoring	Operations	$ 7,000	0%	$ -	$ 7,000	$ 960
124	Automated Valve at Tooze/Westfall (West Side Tank)	Operations	$ 58,000	100%	$ 58,000	$ -	$ 580
126	3.0 Million Gallon West Side Tank and 24-inch Transmission (in Pre-design)*	*Growth*	$ 5,840,000	100%	$ 5,840,000	$ -	$ 17,160
126	Elligsen West Tank - Add Altitude Valve	Operations	$ 31,000	100%	$ 31,000	$ -	$ 580
Booster Stations & Turnouts							
140	Charbonneau Booster PRV & SCADA	Operations	$ 22,000	20%	$ 4,400	$ 17,600	$ 920
Water Distribution Piping							
163	18-inch Loop on Barber St. (Montebello to Kinsman)	Growth	$ 371,000	100%	$ 371,000	$ -	$ 320
165	48-inch Transmission on Kinsman St. - Barber to Boeckman (in Design)*	*Growth*	$ 3,960,000	100%	$ 3,960,000	$ -	$ 3,000
	Total Priority 1A Improvements		**$ 10,490,000**		**$ 10,434,400**	**$ 55,600**	**$ 26,480**
Priority 1B Improvements (by 2022)							
Water Supply							
110	Nike Well Telemetry & Misc. Improvements	Operations	$ 35,000	32%	$ 11,300	$ 23,700	$ 420
111	Wiedeman Well Generator & Telemetry	Operations	$ 98,000	12%	$ 11,300	$ 86,700	$ 2,460
112	Boeckman Well Telemetry Upgrade	Operations	$ 26,000	43%	$ 11,300	$ 14,700	$ 420
113	Gesellschaft SCADA & Instrumentation	Operations	$ 32,500	35%	$ 11,300	$ 21,200	$ 420
114	Elligsen Well Instrumentation	Operations	$ 20,000	29%	$ 5,700	$ 14,300	$ 120
Booster Stations & Turnouts							
143	Charbonneau Booster Flow Meter Vault	Replacement/ Operations	$ 29,000	54%	$ 15,700	$ 13,300	$ 380
Water Distribution Piping							
160	8-inch Upgrade on Jackson St.	Fire Flow	$ 64,000	0%	$ -	$ 64,000	$ 100
161	8-inch Upgrade on Evergreen St.	Fire Flow	$ 83,000	0%	$ -	$ 83,000	$ 200
162	8-inch Loop N. of Seely St.	Fire Flow	$ 8,000	0%	$ -	$ 8,000	$ 100
164	10-inch Extension on Montebello St.	Growth (School)	$ 217,000	100%	$ 217,000	$ -	$ 400
166	8-inch Loop between Boberg St. & RR (north of Barber)	Fire Flow	$ 78,000	0%	$ -	$ 78,000	$ 200
167	8-inch Loop on Boones Ferry (north of Barber)	Operations	$ 19,000	0%	$ -	$ 19,000	$ 100
168	10-inch Loop (Appts E. of Canyon Creek/Burns)	Fire Flow	$ 41,000	0%	$ -	$ 41,000	$ 100
169	8-inch Loop between Viahos & Canyon Creek	Fire Flow	$ 42,000	0%	$ -	$ 42,000	$ 100
170	8-inch Upgrade on Metolius cul-de-sac	Fire Flow	$ 54,000	0%	$ -	$ 54,000	$ 100
171	8-inch Loop on Metolius private drive	Operations	$ 20,000	0%	$ -	$ 20,000	$ 100
172	8-inch Upgrade on Middle Greens	Hydrant Coverage	$ 68,000	0%	$ -	$ 68,000	$ 200
173	Fairway Village Hydrant on French Prairie	Hydrant Coverage	$ 10,000	0%	$ -	$ 10,000	$ 100
175	16-inch Willamette River Crossing to Charbonneau District	Displace Charb. Tank	$ 1,532,000	0%	$ -	$ 1,532,000	$ 3,800
	Total Priority 1B Improvements		**$ 2,476,500**		**$ 283,600**	**$ 2,192,900**	**$ 9,520**

* Needed projects previously identified in 2002 Water Master Plan, but not yet completed

** Colored/Bold ID #s are mapped on Figure 4 in Appendix A for reference

NOTE: Costs are in 2012 dollars

TABLE 5.2 – Priority Capital Improvements (Continued)

ID#**	Item	Primary Purpose	Total Estimated Cost	Growth Apportionment %	Growth Apportionment Cost	Operating Fund	Additional Annual O&M
Priority 2 Improvements (by 2030)							
Water Supply							
203	Gesellschaft Well Generator	Operations	$ 78,000	0%	$ -	$ 78,000	$ 2,160
205	Charbonneau Well Mechanical Building	Operations	$ 81,000	0%	$ -	$ 81,000	$ 1,800
	Video Surveillance (various wells)	Operations	$ 22,000	0%	$ -	$ 22,000	$ 3,000
Booster Stations & Turnouts							
241	Meter Valve at Wilsonville Rd turnout	Operations	$ 118,000	0%	$ -	$ 118,000	$ 980
Water Distribution Piping							
260	10-inch Extension on 4th St (E. of Fir)	Fire Flow	$ 69,000	7%	$ 4,900	$ 64,100	$ 200
261	8-inch Loop - Magnolia to Tauchman	Fire Flow	$ 59,000	0%	$ -	$ 59,000	$ 100
262	8-inch Upsize on Olympic cul-de-sac	Fire Flow	$ 44,000	0%	$ -	$ 44,000	$ 100
263	8-inch Loop near Kinsman/Wilsonville	Fire Flow	$ 36,000	0%	$ -	$ 36,000	$ 100
264	10-inch Loop near Kinsman/Gaylord	Fire Flow	$ 82,000	6%	$ 5,200	$ 76,800	$ 200
265	8-inch Upsize on Lancelot	Fire Flow	$ 100,000	0%	$ -	$ 100,000	$ 200
266	Fire Hydrants (main City)	Fire Flow	$ 119,000	0%	$ -	$ 119,000	$ 200
267	Fire Hydrants (Charbonneau)	Fire Flow	$ 46,000	0%	$ -	$ 46,000	$ 100
268	8-inch Loop near Kinsman (between Barber & Boeckman)	Fire Flow	$ 126,000	0%	$ -	$ 126,000	$ 200
269	8-inch Upsize near St. Helens	Fire Flow	$ 26,000	0%	$ -	$ 26,000	$ 100
270	8-inch Loop near Parkway Center/Burns	Fire Flow	$ 66,000	0%	$ -	$ 66,000	$ 100
271	8-inch Loop near Burns/Canyon Creek	Fire Flow	$ 110,000	0%	$ -	$ 110,000	$ 200
272	10 & 8-inch Loop near Parkway/Boeckman	Fire Flow	$ 315,000	4%	$ 12,600	$ 302,400	$ 500
273	12-inch Loop crossing Boeckman	Water Quality	$ 16,000	0%	$ -	$ 16,000	$ 100
274	8-inch Loop at Holly/Parkway	Water Quality	$ 56,000	0%	$ -	$ 56,000	$ 100
275	8-inch Upsize on Wallowa	Fire Flow	$ 62,000	0%	$ -	$ 62,000	$ 100
276	8-inch Upsize on Miami	Fire Flow	$ 68,000	0%	$ -	$ 68,000	$ 200
277	8-inch Extension for hydrant coverage on Lake Bluff	Hydrant Coverage	$ 63,000	0%	$ -	$ 63,000	$ 100
278	8-inch Upsize on Arbor Glen	Hydrant Coverage	$ 92,000	0%	$ -	$ 92,000	$ 200
279	8-inch Loop at Fairway Village	Fire Flow	$ 42,000	0%	$ -	$ 42,000	$ 100
280	8-inch Extension for fire flow - private drive/Boones Bend	Fire Flow	$ 18,000	0%	$ -	$ 18,000	$ 100
281	8-inch Upsize on East Lake	Fire Flow/Hydrant	$ 187,000	0%	$ -	$ 187,000	$ 300
282	8-inch Extension for fire flow on Armitage Pl	Fire Flow	$ 55,000	0%	$ -	$ 55,000	$ 100
283	8-inch Upsize on Lake Point Ct	Hydrant Coverage	$ 56,000	0%	$ -	$ 56,000	$ 100
284	8-inch Loop - Franklin St to Carriage Estates	Water Quality	$ 94,000	0%	$ -	$ 94,000	$ 200
285	8-inch Upgrade on Boones Ferry Rd (south of 2nd St)	Replace/Upsize	$ 44,000	0%	$ -	$ 44,000	$ 100
286	Valves at Commerce Circle & Ridder Rd/Boones Ferry I-5 Crossing	Operations	$ 44,000	0%	$ -	$ 44,000	$ 100
	Total Priority 2 Improvements		$ 2,394,000		$ 22,700	$ 2,371,300	$ 12,140
Priority 3 Development Dependent Improvements (by Build-out)							
Water Distribution Piping							
361	Zone D Booster Station at C Level Tank	Growth	$ 609,000	100%	$ 609,000	$ -	$ 11,000
362	Upsize costs (greater than 8 inches) for future distribution piping	Growth	$ 9,659,000	100%	$ 9,659,000	$ -	$ 39,120
	Total Priority 3 Improvements		$ 10,268,000		$ 10,268,000	$ -	$ 50,120
	TOTAL CAPITAL IMPROVEMENTS (Priority 1-3)		$ 25,628,500		$21,008,700	$ 4,619,800	$ 98,360

* Needed projects previously identified in 2002 Water Master Plan, but not yet completed

** Colored/Bold ID #s are mapped on Figure 4 in Appendix A for reference

NOTE: Costs are in 2012 dollars

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6.0 OPERATIONS, MAINTENANCE, AND REPLACEMENT RECOMMENDATIONS

6.1 OVERVIEW

The City of Wilsonville was recently designated by the Oregon Health Authority, Drinking Water Program as an Outstanding Performer. Keller Associates also acknowledges the efforts of City staff to maintain a quality system.

This section highlights operational and maintenance related recommendations intended to improve or maintain the level of services as it pertains to the City's water distribution system, including booster pumping facilities, PRV stations, storage facilities, pipelines, valves, hydrants, well facilities, and controls. This section also summarizes major repairs and replacements anticipated within the 20-year planning period and provides recommended budgets for annual/recurring maintenance related activities. Operation and maintenance recommendations for the treatment plant are not included in this evaluation.

6.2 MAJOR REPAIRS AND REPLACEMENTS

In addition to the capital improvement projects identified in Chapter 5, Keller Associate identified several major repairs and replacements which are summarized in Table 6.1 (see also Figure 4, Appendix A). These have been organized by priority based on when the improvements are needed.

6.3 ONGOING AND ANNUAL MAINTENANCE COSTS

There are several larger routine maintenance activities, recurring system management related projects, and ongoing replacement/rehabilitation activities that are recommended on an annual or recurring basis. These activities are summarized in Table 6.2. Additional discussion about operational and maintenance activities is presented in the following sections.

TABLE 6.1 – Major Repairs and Replacements

ID#*	Item	Primary Purpose	Total Estimated Cost
Priority 1A (by 2017)			
Water Supply			
100	Nike Well Rehab & Misc. Maintenance	Maintenance	$ 30,000
101	Canyon Creek Well (assumes potential abandonment)	Maintenance	$ 26,000
102	Wiedeman Well Misc. Maintenance	Maintenance	$ 24,000
103	Boeckman Well Rehab Pump	Maintenance	$ 20,000
104	Gesellschaft Building Maintenance	Maintenance	$ 4,500
105	Elligsen Well Compressor & Controls	Maintenance	$ 8,000
Water Storage			
120	Elligsen Res. - Replace Ladder Fall Protection System	Replacement	$ 12,000
123	Charbonneau Reservoir Reseal between Roof and Wall	Maintenance	$ 4,000
Booster Stations & Turnouts			
141	B to C Booster Replacements	Replacement	$ 21,000
142	Painting & Safety Nets at Turnouts	Maintenance	$ 22,000
Priority 1B (by 2022)			
Water Storage			
127	Replace Sealant at Base of C Level Reservoir	Maintenance	$ 7,000
Booster Stations & Turnouts			
144	Replace Cover on Burns PRV	Replacement	$ 9,000
Priority 2 (by 2030)			
Water Supply			
200	Nike Well New Roof and Trim, Paint	Maintenance	$ 13,000
201	Wiedeman Well Replace Metal Siding	Maintenance	$ 20,000
202	Boeckman Well Pump Motor & Replace Roof and Trim	Replacement/ Maintenance	$ 21,000
203	Gesellschaft Well Roof Maintenance	Maintenance	$ 4,000
204	Elligsen Well MCC Replacement & Building Maintenance	Replacement/ Maintenance	$ 22,000
Water Distribution Piping			
287	Replace service lines - Parkway Ave	Replacement	$ 77,000
288	Replace service lines - Wilson cul-de-sacs	Replacement	$ 227,000
289	Replace service lines - Mariners Drive	Replacement	$ 22,000
290	Replace service lines - Old Town	Replacement	$ 15,000
Water Storage			
220	Paint Elligsen Reservoirs (interior)	Maintenance	$ 460,000
221	Paint C Level Reservoir (interior)	Maintenance	$ 180,000
Booster Stations & Turnouts			
240	Relocate Parkway PRV out of Elligsen Rd intersection	Replacement	$ 75,000
Future (beyond 2030)			
Water Supply			
300	Nike Well - Replace MCC	Replacement	$ 15,000
301	Wiedeman Well MCC & Building Maintenance	Maintenance	$ 18,000
302	Gesellschaft Well Building Maintenance	Maintenance	$ 5,000
Water Storage			
320	Paint Elligsen Reservoirs (exterior)	Maintenance	$ 310,000
321	Paint C Level Reservoir (exterior)	Maintenance	$ 115,000
	TOTAL MAJOR REPAIRS AND REPLACEMENTS		**$ 1,786,500**

* Colored/Bold ID #s are mapped on Figure 4 in Appendix A for reference

NOTE: Costs are in 2012 dollars

TABLE 6.2 - Recurring Maintenance Costs

Activity	Budget	Frequency
Wash exterior of aboveground tanks	$5,000/each	Every 5 years
Clean and inspect interior of tanks	$5,000/each	Every 10 years
Pipeline and valve replacement (coordinate with planned street improvements, 1725 feet/year)	$ 173,000	Annual recommended budget for 20-year planning period
Meter replacement (250 meters/year)	$ 50,000	Annual recommended budget (assumes 20-year life)
Hydrant replacement (10 hydrants/year)	$ 30,000	Annual recommended budget
Well hole and facility upgrades/maintenance	$95,000-$105,000	Annual budget (includes 6 wells)
GIS and water model updates	$ 6,000	Recommended annual budget for 3rd party support
Water Master Plan update	$ 150,000	Every 5 years
Water Management and Conservation Plan (WMCP)	$ 20,000	Every 10 years, beginning 2022
WMCP progress reports	$ 5,000	Every 10 years, beginning 2017

6.4 BOOSTER PUMP STATIONS

The B to C Level Booster Pump Station is relatively new (constructed in 1999) and appears to be well maintained. Operation and maintenance related improvements include replacing the exhaust system for the generator and eventually upgrading the chlorine injection pump system to current model (refer to Technical Memorandum No. 1, Appendix B for additional details). Keller Associates recommends that the operations and maintenance manual be periodically updated and that the manufacturer's recommendations be followed for all equipment. Additionally, the City should ensure that each pump is exercised at least monthly and that pump performance is monitored.

The Charbonneau Booster Pump Station is much older than the B to C Level Booster Pump Station. The SCADA system does not currently turn on the booster pumps in the event of a low-pressure event (such as a fire). Automating this process would ensure that water would be provided in the event that the supply pipeline from the distribution system is out of service or not adequate to supply peak fire demands. Keller Associates recommends that the SCADA controls be upgraded to allow this flexibility and that this "alternate" control scenario be periodically tested. This improvement should be coordinated with the recommendation to provide a pressure relief to the pressure zone. The proposed new flow meter and system pressure readings should be integrated into the City's SCADA system. The meter readings should periodically be compared to the total of the individual water meters to quantify unaccounted for water within the District service area.

6.5 TANK FACILITIES

Maintenance recommendations for the tank facilities were also identified in Technical Memorandum No. 1. The exterior of each of the three aboveground reservoirs should be cleaned about every 5 years. Interior cleaning and inspection of each of the four reservoirs should occur every 10 years. Capital improvements recommended in the Technical Memorandum No. 1 will also ensure that the City's assets are maintained.

Keller Associates further recommends that the City look closely at controls in planning and designing the new West Side tank. During portions of the year, the City may want to increase the volume between pump on and off set points. This will ensure a higher tank turnover which will reduce the potential for water stagnation. Because of differences in locations, size and transmission piping, it is likely that the new water tank will not fill at the same rate as the Elligsen tanks. Altitude valves may be needed at the new tank site and potentially at the existing Elligsen tanks. Special care should be taken so that any added control valves would be installed in such a way as to mitigate the potential of creating system pressure surges.

6.6 DISTRIBUTION SYSTEM

Flushing

The City currently has an active flushing program. The program could be enhanced by developing a directional flushing program, which is a systematic approach to exercising valves and hydrants in a way that encourages water to be flushed from one side of the system to the other.

Valve Exercise

All valves should be exercised at least annually.

Pressure Reducing Valves

Pressure reducing valve settings should be checked every 6 to 12 months. The valves should also be refurbished every 2 to 5 years as needed.

Leak Detection

The City currently has an active leak detection and elimination program which should continue as long as unaccounted for water loss exceeds 10 percent of the City's total finish water production.

Meter Testing Program

The City should continue their program of regularly testing and replacing (as required) large diameter flow meters on a 3-year cycle. The City should also begin testing residential meters beginning with 100± meters per year. Records should be kept reporting meter ID, age, and accuracy. The frequency and number of residential meters to be tested should be adjusted based on meter testing results.

Pipeline, Valve, Hydrant and Meter Replacement Programs

The City has been proactive in their replacement programs. Replacement budgets for pipelines, valves, hydrants, and meters were developed in Technical Memorandum No. 1. Replacing older infrastructure will result in less unaccounted for water and continued high levels of service. Emphasis should be given to replacing pipelines in areas with lower levels of fire protection, and where older, more problematic cast iron pipelines exist as reflected on the Priority Improvements Map (Figure 4, Appendix A). Wherever possible, replacements should be coordinated with planned street improvements to minimize construction costs.

Remaining infrastructure life and replacement budgets should be reevaluated every five years.

Unaccounted for Water

Keller Associates recommends that the City continue to track and investigate unaccounted for water. A special, stand-alone study may be needed to fully resolve lingering issues with meter accuracy and unmetered uses. Emphasis should be given to the volume of water, rather than just the percent. Unaccounted for water should be tracked monthly to allow development of winter/summer and 12-month moving averages. Efforts to isolate portions of the City to investigate water loss for geographic regions could be spearheaded by City staff and will take coordination between engineering, water, and billing departments.

6.7 WELL FACILITIES

The well facilities are intended to serve as a backup supply, but have not been used with regularity since the new water treatment plant came on line several years ago. The wells are exercised on a weekly basis for a short period of time, but the operational time is inadequate to ensure the wells can operate in production mode, if needed. To ensure that these facilities are in proper working order for emergency supply, several capital improvements were identified in Technical Memorandum No. 5 (Appendix B). The technical memorandum also identified several operational improvements which include:

- Regular well pump exercise, for longer periods of time, including exercising the pump against back pressures similar to what they would experience if they were to pump into the distribution system.
- Training of operations staff and periodic simulations of emergencies (every 6-12 months). Ideally, these wells could actually be pumped into the system, even if the system is temporarily valved off and the flow is discharged via a nearby hydrant. This will ensure that the facilities are ready when they are needed.
- Upgrades to the SCADA system.
- Annual monitoring of flow capacities, and periodic well casing cleaning/refurbishing to preserve pump delivery capacities.
- Continued servicing of generators.

6.8 MISCELLANEOUS

The City's GIS database and AutoCAD (engineering) database contained different, conflicting and missing data (pipe age, pipe material, meter IDs, etc.). Keller Associates compared and updated the mapping to include a GIS-based map that captured the most updated and accurate data. This file should serve as the starting point for future mapping updates and provide the basis for a single database to be used by engineering and GIS staff. Keller Associates further recommends that the unique water meter ID for every water meter be used both in the billing system and within the GIS. This will allow the City to accurately allocate demands spatially

within a system, which can be helpful in identifying areas where higher water loss may occur and can facilitate future upgrades to the City's water model.

The City's SCADA system should be continually updated to include reporting, trending, alarm features, etc. as needed.

Keller Associates recommends that the City's water model be updated annually and that this water master plan be updated every 3 to 5 years, depending on growth. Additionally, the City's Water Management and Conservation Plan (WMCP), is required by the Oregon Administrative Rules to be updated every ten years, with progress reports completed five years after each WMCP. The current (2004) WMPC is being updated, with completion scheduled for summer/fall 2012. Completing these planning documents in a timely manner will be important in ensuring that future water rights are protected and infrastructure is planned and scheduled to provide for the City's future needs.

6.9 STAFFING AND BUDGET IMPLICATIONS

The scope of this study did not include a rate study or an evaluation of existing and future staffing needs. However, the City should be aware that many of the recommendations may require additional staff time and materials or reallocation of resources. Specific activities anticipated to affect staffing requirements include: additional tracking of unaccounted for water usage, GIS mapping, residential meter testing, developing a directional flushing program, servicing pressure reducing valves, and rehabilitation and replacement of the distribution systems.

In completing any future rate analysis, the City should account for the items identified in the Capital Improvement Plan (Table 5.2), the list of Major Repairs and Replacements (Table 6.1), and the Recurring Maintenance Costs (Table 6.2). Increased staffing and operations and maintenance requirements will also occur as a result of normal growth, and this document assumes the City intends to provide a slightly increased level of service going forward. However, policy decisions made during the annual budget process or during the development of the rate study, or both, will ultimately determine acceptable staffing and budget levels, and the associated timing of certain improvements.

KELLER associates

7.0 POLICIES AND IMPLEMENTATION MEASURES

The City's Comprehensive Plan provides the context within which the water master plan has been developed. Efforts have been made to solicit citizen input and coordinate with other agencies and organizations consistent with Comprehensive Plan Goal 1.2. Planning for the area within the Urban Growth Boundary has been completed consistent with Comprehensive Plan Goal 2.1. This section summarizes recommended policies and implementation measures relative to the water system. Where the 2011 Comprehensive Plan appears to pre-date the January 2002 Water System Master Plan, this section incorporates applicable policy and implementation measures previously recommended. The primary goal of the water master plan is derived from Wilsonville's Comprehensive Plan Goal 3.1 providing for infrastructure in general and is as follows:

> **To assure that good quality public facilities and services are available with adequate capacity to meet community needs, while also assuring that growth does not exceed the community's commitment to provide adequate facilities and services.**

The Comprehensive Plan also provides the following policies that were used to guide this master plan update:

> **Comprehensive Plan Policy 3.1.1.** The City of Wilsonville shall provide public facilities to enhance the health, safety, educational, and recreational aspects of urban living.
>
> **Comprehensive Plan Policy 3.1.2.** The City of Wilsonville shall provide, or coordinate the provision of, facilities and services concurrent with need (created by new development, redevelopment, or upgrades of aging infrastructure).
>
> **Comprehensive Plan Policy 3.1.3.** The City of Wilsonville shall take steps to assure that the parties causing a need for expanded facilities and services, or those benefiting from such facilities and services, pay for them.
>
> **Comprehensive Plan Policy 3.1.5.** The City shall continue to develop, operate and maintain a water system, including wells, pumps, reservoirs, transmission mains and a surface water treatment plant capable of serving all urban development within the incorporated City limits, in conformance with federal, state, and regional water quality standards. The City shall also continue to maintain the lines of the distribution system once they have been installed and accepted by the City.

Policy 3.1.5 provides the most specific direction relative to the water system and includes the following implementation measures:

Implementation Measure 3.1.5.a The City shall review and, where necessary, update the Water System Master Plan to conform to the planned land uses shown in the Comprehensive Plan and any subsequent amendments to the Plan.

Implementation Measure 3.1.5.b All major lines shall be extended in conformance to the line sizes indicated on the Master Plan and, at a minimum, provisions for future system looping shall be made. If the type, scale and/or location of a proposed development negatively impacts other existing properties or warrants minimum fire flows above that currently available to the development, the Development Review Board may require completion of looped water lines, off-site piping, and/or pipeline replacement in conjunction with the development.

Implementation Measure 3.1.5.c Extensions shall be made at the cost of the developer or landowner of the property being served. When a major line is extended that is sized to provide service to lands other than those requiring the initial extension, the City may:

1. Authorize and administer formation of a Local Improvement District to allocate the cost of the line improvements to all properties benefiting from the extension; or
2. Continue to utilize a pay-back system whereby the initial developer may recover an equitable share of the cost of the extension from benefiting property owners/developers as the properties are developed.

Implementation Measure 3.1.5.d All water lines shall be installed in accordance with the City's urban growth policies and Public Works Standards.

Implementation Measure 3.1.5.e The City shall continue to use its Capital Improvements Program to plan and schedule major water system improvements needed to serve continued development (e.g., additional water treatment plant expansions, transmission mains, wells, pumps and reservoirs).

Keller Associates recommends modifying Implementation Measure 3.1.5.b as follows:

Implementation Measure 3.1.5.b All major lines shall be extended in conformance to the line sizes indicated on the Master Plan and, at a minimum, provisions for future system looping shall be made. If the type, scale, and/or location of a proposed development negatively impacts operating pressures or available fire flows to other properties as determined by the City Engineer, the Development Review Board may require completion of looped water lines, off-site facilities, pipelines, and/or facility/pipelines to achieve or maintain minimum pressures or fire flows as a condition of development approval.

Additional recommended policies and implementation measures are presented below. These policies were developed previously as part of the 2002 Water Master Plan, but are not incorporated into the current (January 2011) Comprehensive Plan Update.

Proposed Policy 3.1.6 The City of Wilsonville shall continue a comprehensive water conservation program to make effective use of the water infrastructure, source water supply and treatment processes.

Proposed Implementation Measure 3.1.6.a The City will track system water usage through production metering and service billing records and take appropriate actions to maintain a target annual average unaccounted for water volume of less than 10% of total production.

Proposed Implementation Measure 3.1.6.b The City will maintain other programs and activities as necessary to maintain effective conservation throughout the water system.

Proposed Policy 3.1.7 The City of Wilsonville shall maintain an accurate user demand profile to account for actual and anticipated demand conditions in order to assure an adequately sized water system.

Proposed Implementation Measure 3.1.7.a The City will track system water usage through production metering and service billing records and take appropriate actions to maintain a target annual average unaccounted for water volume of less than 10% of total production.

Proposed Implementation Measure 3.1.7.b The City will maintain other programs and activities as necessary to maintain effective conservation throughout the water system.

Proposed Policy 3.1.8 The City of Wilsonville shall coordinate distribution system improvements with other CIP projects, such as roads, wastewater, and storm water, to save construction costs and minimize public impacts during construction.

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City of Wilsonville

KELLER associates

APPENDIX A – FIGURES

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Figure:	Title:		Prepared for:	
1	Existing City Distribution System	WATER MASTER PLAN	CITY OF WILSONVILLE, OR	KELLER

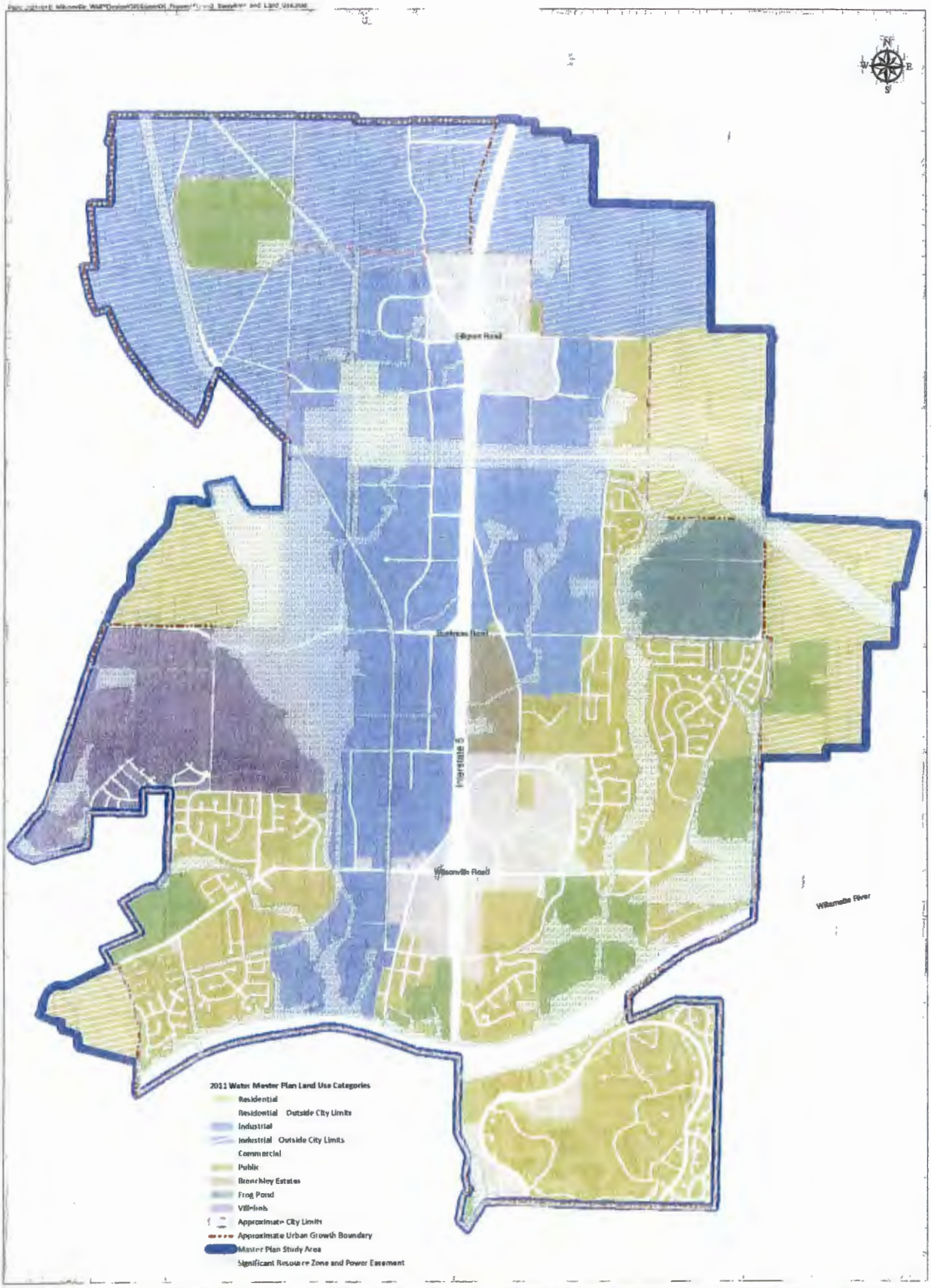


Figure:	Title:		Prepared for:	
2	Study Area & Land Use	WATER FACILITIES MASTER PLAN	CITY OF WILSONVILLE, OREGON	KELLER associates

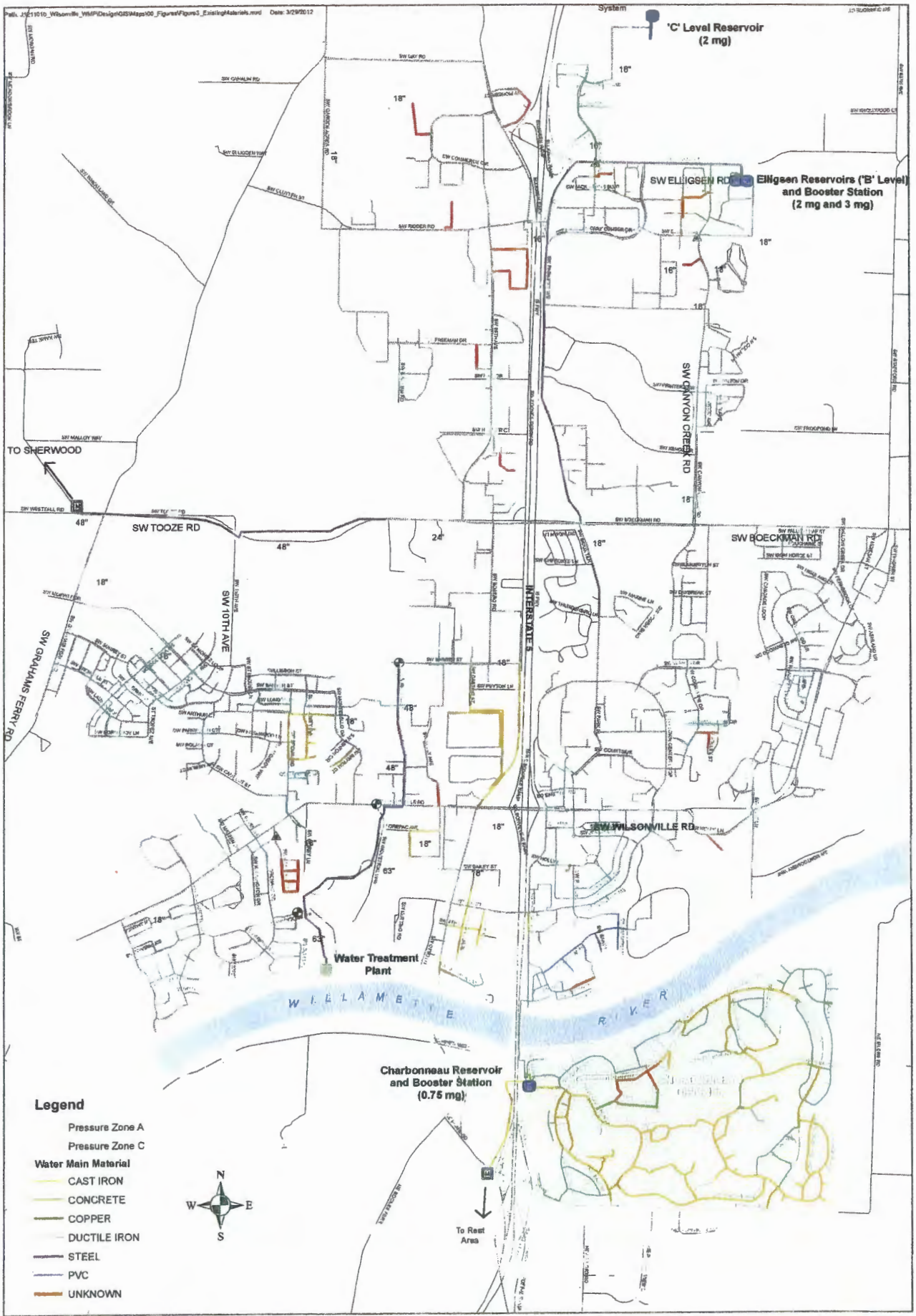


Figure:	Title:		Prepared for:	
3	Existing System: Pipe Materials	WATER MASTER PLAN	CITY OF WILSONVILLE, OR	KELLER

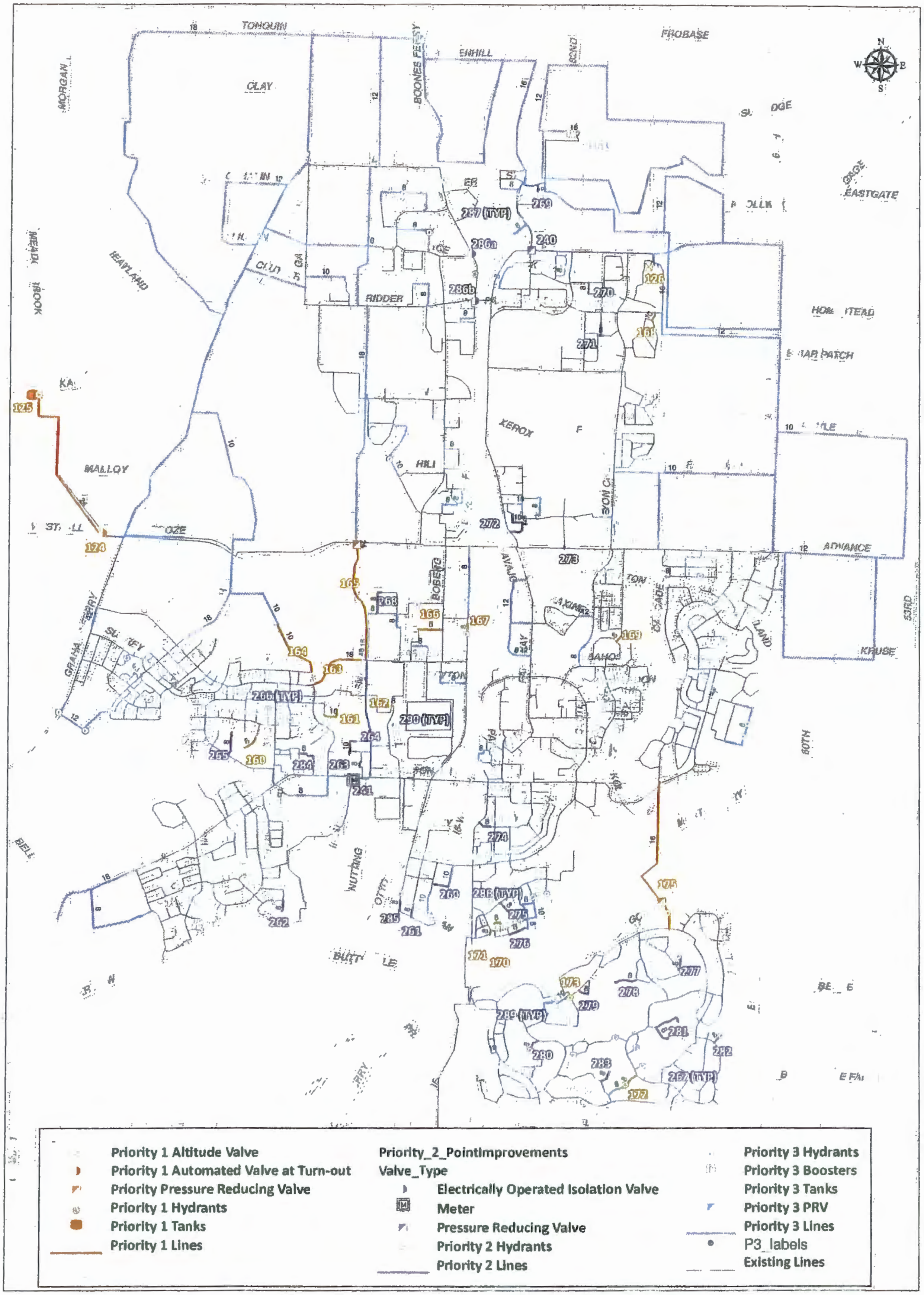
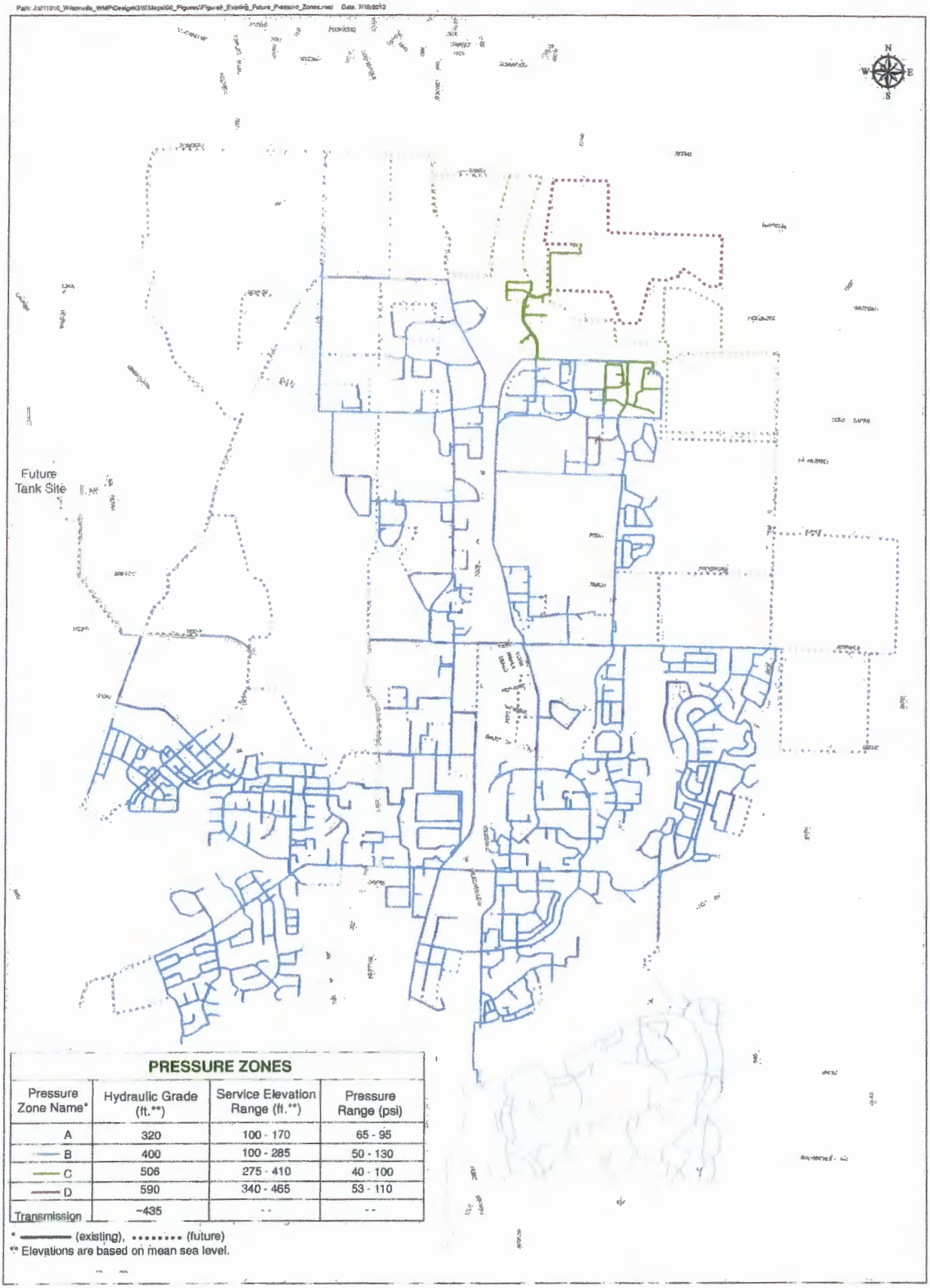


Figure:	Title:		Prepared for:	
4	Priority Improvements and Replacements	WATER FACILITIES MASTER PLAN	CITY OF WILSONVILLE, OREGON	KELLER associates



PRESSURE ZONES

Pressure Zone Name*	Hydraulic Grade (ft.**)	Service Elevation Range (ft.**)	Pressure Range (psi)
A	320	100 - 170	65 - 95
B	400	100 - 285	50 - 130
C	506	275 - 410	40 - 100
D	590	340 - 465	53 - 110
Transmission	~435	--	--

* ——— (existing), ... (future)
** Elevations are based on mean sea level.

Figure:	Title:		Prepared for:	
5	Existing and Future Pressure Zones	WATER FACILITIES MASTER PLAN	CITY OF WILSONVILLE, OREGON	KELLER associates

NOTICE OF DECISION

PLANNING COMMISSION

RECOMMENDATION OF APPROVAL TO CITY COUNCIL

FILE NO.: **LP12-0002**

APPLICANT: **City of Wilsonville**

REQUEST: **Update of the City's Water System Master Plan that documents current water demand, evaluates current system deficiencies, estimates future water demands over a 20-year growth horizon, and estimates the capital and operation costs needed to meet these future demands.**

After conducting a public hearing on July 11, 2012, the Planning Commission voted to recommend this action to the City Council by passing Resolution No. LP12-0002.

The City Council is scheduled to conduct a Public Hearing on this matter on August 20, 2012, at 7:00 p.m., at the Wilsonville City Hall, 29799 SW Town Center Loop East.

For further information, please contact the Wilsonville Planning Division, 29799 SW Town Center Loop East, or telephone (503) 682-4960.

LP12-0002
Water System Master Plan Update
Planning Commission Record Index

Planning Commission Actions from the July 11, 2012 public hearing:

- Notice of Decision
- Resolution No. LP12-0002
- Motion
- Minutes (DRAFT)

Distributed at the July 11, 2012 Planning Commission public hearing:

Exhibit E: An email from Eldon Johansen, dated July 8, 2012, regarding Water System Master Plan
Exhibit F: A letter dated July 9, 2012 from Stanley Wallulis, with attachments.
Exhibit G: Paper copy of the PowerPoint, *Water System Master Plan,* shown at the meeting

Staff Report dated July 3, 2012, for a July 11, 2012 Planning Commission Public Hearing including:

Exhibit A: Water System Master Plan Final Draft dated June 26, 2012 *(Located in the Planning Division.)*
Exhibit B: CD with Water System Master Plan Final Draft and Appendices dated June 26, 2012.
Exhibit C: Proposed Changes to Existing Comprehensive Plan Policies
Exhibit D: An email dated June 21, 2012, from Sherry Oeser of Metro, regarding Wilsonville Water System Master Plan.

LP12-0002
Water System Master Plan Update
Planning Commission Record Index

Planning Commission Actions from the July 11, 2012 public hearing:

- Notice of Decision
- Resolution No. LP12-0002
- Motion
- Minutes (DRAFT)

NOTICE OF DECISION

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PLANNING COMMISSION
RESOLUTION NO. LP12-0002

A WILSONVILLE PLANNING COMMISSION RESOLUTION RECOMMENDING THAT THE CITY COUNCIL ADOPT AN UPDATE OF THE CITY'S WATER SYSTEM MASTER PLAN (PLAN) THAT DOCUMENTS CURRENT WATER DEMAND, EVALUATES CURRENT SYSTEM DEFICIENCIES, ESTIMATES FUTURE WATER DEMANDS OVER A 20-YEAR GROWTH HORIZON, AND ESTIMATES THE CAPITAL AND OPERATION COSTS NEEDED TO MEET THESE FUTURE DEMANDS.

WHEREAS, the Wilsonville Planning Director submitted proposed Ordinance amendments to the Planning Commission, along with a Staff Report, in accordance with the public hearing and notice procedures that are set forth in Sections 4.008, 4.010, 4.011 and 4.012 of the Wilsonville Code (WC); and

WHEREAS, the Planning Commission conducted work sessions on March 14, 2012 and May 9, 2012, and after providing the required notice, held a Public Hearing on July 11, 2012 to review the proposed update to the Water Systems Master Plan and to gather additional testimony and evidence regarding the Plan; and

WHEREAS, the Commission has afforded all interested parties an opportunity to be heard on this subject and has entered all available evidence and testimony into the public record of their proceeding; and

WHEREAS, the Planning Commission has duly considered the subject, including the staff recommendations and all the exhibits and testimony introduced and offered by all interested parties; and

NOW, THEREFORE, BE IT RESOLVED that the Wilsonville Planning Commission does hereby adopt the Staff Report along with the findings and recommendations contained therein and, further, recommends that the Wilsonville City Council approve and adopt the Water System Master Plan update as hereby approved by the Planning Commission; and

BE IT RESOLVED that this Resolution shall be effective upon adoption.

ADOPTED by the Planning Commission of the City of Wilsonville at a regular meeting thereof this 11th day of July, 2012, and filed with the Planning Administrative Assistant on July 12, 2012

Ben Altman

Wilsonville Planning Commission

Attest:

Linda Straessle, Administrative Assistant III

SUMMARY of Votes:

Chair Altman:	Aye
Commissioner Postma:	Aye
Commissioner Dvorak:	Absent
Commissioner Hurley:	Aye
Commissioner Levit:	Aye
Commissioner McGuire:	Aye
Commissioner Phelps:	Aye

PLANNING COMMISSION
WEDNESDAY, JULY 11, 2012
6:00 P.M.

Wilsonville City Hall
29799 SW Town Center Loop East
Wilsonville, Oregon

MOTIONS

VI. PUBLIC HEARING

A. **LP12-0002 - Water System Master Plan update**. The Plan documents current water demand, evaluates current system deficiencies, estimates future water demands over a 20-year growth horizon, and estimates the capital and operation costs needed to meet these future demands. **The Planning Commission action is in the form of a recommendation to the City Council.** (Mende)

The following exhibits were entered into the record:

- Exhibit E: Email from Eldon R. Johansen dated July 8 2012 regarding concerns about how the Water System Master Plan ties into the City planning process and to any pending water rate and SDC study update.
- Exhibit F: Letter from Wallulis & Associates dated July 9, 2012 along with six pages of review notes responding to the Water System Master Plan with resume attached.

Commissioner Postma moved to adopt the Staff Report, with the amended Implementation Measure 3.1.5.b, as stated by Mr. Dan Pauly, and to recommend approval of the Water Master Plan, with modifications of multiple items as follows:

- **Consolidate and simplify the cost benefit analysis for available options to address Charbonneau's short- and long-term supply and flow issues as discussed and addressed by Commissioner Phelps.**
- **Include the note with regard to the chart on Page 17 of the draft Water System Master Plan (Exhibit A) for large capital items listed in Priority Items 1A that were previously included in the prior Master Plan as indicated by Commissioner McGuire.**
- **Include the suggested revisions or corrections as addressed by Commissioner Levit.**
  - * **Correct the third line under ES.2.5 on Page ES.6 to state "(TVWD)".**
  - * **Include Motor Control Center (MCC), used in Table ES.4 for Items 300 & 301, in the table of acronyms.**
- **Include the cost benefit of abandoning versus maintaining wells as noted by Commissioner Hurley.**
- **Include the correction of typographical errors addressed by Mr. Wallulis in Exhibit F.**

Commissioner Hurley seconded the motion, which passed unanimously.

Commissioner Postma moved to adopt Resolution LP12-0002 with the adopted Staff report as amended. Commissioner Hurley seconded the motion, which passed unanimously.

Respectfully submitted,

By Paula Pinyerd of ABC Transcription Services, Inc. for
Linda Straessle, Planning Administrative Assistant

PLANNING COMMISSION
WEDNESDAY, JULY 11, 2012
6:00 P.M.

Wilsonville City Hall
29799 SW Town Center Loop East
Wilsonville, Oregon

Minutes Excerpt

I. CALL TO ORDER - ROLL CALL

Chair Altman called the meeting to order at 6:02 p.m. Those present:

Planning Commission: Ben Altman, Ray Phelps, Eric Postma, Al Levit, and Peter Hurley. Marta McGuire arrived after Item VII.B Commissioner Comments. Amy Dvorak was absent.

City Staff: Barbara Jacobson, Daniel Pauly, Eric Mende and Steve Munsterman

VI. PUBLIC HEARING

A. **LP12-0002 - Water System Master Plan update**. The Plan documents current water demand, evaluates current system deficiencies, estimates future water demands over a 20-year growth horizon, and estimates the capital and operation costs needed to meet these future demands. **The Planning Commission action is in the form of a recommendation to the City Council.** (Mende)

Chair Altman read the Legislative Hearing procedures into the record.

Barbara Jacobson, Assistant City Attorney, noted that the land use notice sent to numerous property owners pursuant to ORS.227.186, notifying people of the public hearing, was properly dated with today's date, but the date in the body of the notice incorrectly stated that this public hearing had taken place on June 13, 2012, which should have been corrected. The only applicable date is July 11, 2012.

Chair Altman called for the Staff report.

Daniel Pauly, Associate Planner, stated the last update to the Water Systems Master Plan was in 2002 and Staff has gathered a large amount of utility data and data from the Public Works crews to gain a comprehensive look at the existing water systems in the community. Forecasting data was also gathered from Metro and past efforts by the City, which included urban reserve areas, to determine the future development needs in each area. The Master Plan update considered maintenance and capital improvements to the current system in light of that forecasted growth, so the Plan would guide water system projects in the community for many years.

Eric Mende, Deputy City Engineer, introduced the Water System Master Plan, noting the extensive community and public involvement prior to the hearing, which included two briefings to the Planning Commission, a public open house held at the Water Treatment Plant and one City Council briefing. Another briefing was scheduled for City Council on July 16, 2012. Staff had taken the required steps to notify the public and obtain significant input on the Master Plan.

- He reviewed the changes made following direction received from the Planning Commission at the last work session as follows:
  - The Executive Summary had been revised to be more friendly and readable for the general public and included a list of acronyms and abbreviations. The Executive Summary also included more focus on the positive aspects of the existing distribution system.
  - Additional text and stronger recommendations for addressing unaccounted for water is included in Chapter 2.3 and Chapter 7 under proposed Policy 3.1.6.
  - Revisions were made to the Capital Improvement Program (CIP) to breakout repair and replacement projects from growth-related capital improvement projects. The capital improvement priority list was also revised to include a category that matches the general 5-year CIP process. This information was included in the Executive Summary as well as in Chapter 5.
  - Additional text was added to Section ES 2.4 of the Executive Summary and Section 3.6 in the main document to reflect the Commission's strong recommendation not to abandon any water rights associated with any wells.
  - Figure 3.1 Localized Fire Flow Deficiencies was corrected to show the short falls as a percentage with the red dots replaced by smaller yellow, orange and purple dots.

Jeff Bledsoe, Keller & Associates, presented the Water System Master Plan via PowerPoint with the following key additional comments and addressed questions from the Commission as noted:

- Overall, Wilsonville's current water system is in very good condition, and probably one of the best systems he has seen, which was a testament to City Staff as well as those involved in previous water system planning efforts for the City.
- A Master Plan update was required because the existing Plan is outdated and the new Water Treatment Plant created major changes to the demands in the system. Residents no longer have to deal with moratorium conditions, declining aquifers, or water use restrictions. Updating the Master Plan also met the Comprehensive Plan Goal 3.1 to assure good quality facilities and services are available.
- Full development of all the City's build out areas were considered, using both population and commercial growth projections, to predict corresponding water flows and demands.
- The City currently has more than 100 miles of distribution piping, most of which is relatively new in the last 30 years. Three main pressure zones provide water to the citizens: a small pressure zone in the north, the main pressure zone, referred to as Level B and the third zone is in the Charbonneau District.
- He confirmed that even with the water treatment plant, the four storage reservoirs are still needed for emergency storage and handling peaks that occur throughout the day.
- Substantial data was used in the water usage analysis, which considered how water usage varies throughout the seasons, times of the day, and according to land use.
  - Wilsonville has a lot of commercial water usage, which reflected the type of land use in the community. Compared to other cities similar in size, Wilsonville had a disproportionate amount of commercial water usage.
  - The difference between the water sold and the water produced, shown on Slide 5, indicated the unaccounted for water, which has been between 15% and 17% over the last couple of years. Typically, unaccounted for water should be below 10%.
  - The consultants have worked with the City in trying to identify the sources for the unaccounted for water. One potential source was the large meter that meters the water leaving the water treatment plant, which may account for as much as 3% of the unaccounted for water. Addressing other identified sources could bring the amount of unaccounted for water down to about 13.5%. The Master Plan identifies specific steps the City should take to reduce unaccounted for water further.
- He agreed irrigation might be related to a large portion of the unaccounted for water. The study found a large account with a meter that was not working and had not been recording the water usage for some time. That account also had a lot of irrigation water usage. With increased water usage in the summer, there is a larger potential for more unaccounted for water in the summer.

- Mr. Mende added that most of the system is metered, including most of the irrigation usage. Larger commercial and industrial properties have both a domestic meter and an irrigation meter, which was why meters were looked at specifically as a potential large source of the errors being seen. As far as irrigation usage, both single- and multi-family properties, except large apartment complexes, do not have individual irrigation meters.

Commissioner Hurley asked if the City would consider physically looking at smaller commercial accounts by hand to see if their water usage made sense. Comparing usage to five or ten years ago might reveal some obvious discrepancies. The city was small enough that a hand tally should only take a week to complete.

- Mr. Bledsoe stated the larger meters are being checked and calibrated. Often, problems are tied to larger meters, such as the meters being oversized. These ideas have been discussed with the City, which had a good vision about how to move forward.
- Mr. Mende said discussions would return to the issue of unaccounted for water when finances, capital improvements and operating costs are discussed. Steve Munsterman from Public Works could address any specific technical questions.

Commissioner Levit noted the apparent spike in the summer with irrigation was proportionally no different from water usage in April or May. Water usage was consistent through the year in terms of a percentage.

- Mr. Bledsoe explained another recommendation was that the City track usage as a volume, not necessarily just as a percentage, and to do a 12-month moving average. Water usage in April and May is almost identical to water usage in October. Sometimes billing cycles do not match the demand. Therefore, a 12-month moving average provides a better picture of actual water loss.

Commissioner Phelps:

- Asked how unaccounted for water compared to other metered services like gas and electricity. Having unaccounted for water at 15 to 17 percent was surprising and seemed high. He questioned if there could be a quality issue related to meter maintenance.
    - Mr. Bledsoe replied he did not know about the losses related to gas and electric, but 10 percent was the standard for unaccounted for water established by State. Some formulas establish the lower limit that a city could really attain. Considering the City's system pressures, the miles of pipe and the number of service lines some leaks have to be anticipated; even pinhole leaks on 107 miles of pipe add up. The analysis for Wilsonville showed a lower limit of about 5 percent, so getting below 10 percent is the target, but getting below 5 percent was not very realistic. Some communities are much worse than Wilsonville, such as Stayton, which was at 35 percent; Amity at 40 percent and Gates at 20 percent.
- Noted the rate payers were paying for that 17 percent loss, so the City should probably be more aggressive to reduce the loss to 10 percent or less.

Mr. Bledsoe continued his presentation, discussing the methodology used to project water system demands for the future and noting the average daily demand could potentially grow from 2.2 million gallons per day (mgd) to 28 mgd, which also included Sherwood. Excluding Sherwood's use, Wilsonville's demand would be about 8 mgd for build out.

- He confirmed that the 2.9 and 3.5 percent reflected the compound annual residential and nonresidential growth rates, respectively. Sherwood was factored in because of the demand placed on Wilsonville's water system in terms of the main transmission pipeline from the plant and the plant itself.
- Mr. Mende explained that the City of Sherwood currently owns only 5 mgd, but the City projects Sherwood would purchase additional water rights, which are available for purchase through the Tualatin Valley Water District. The City of Wilsonville owns 20 mgd of water rights. The source of water would still be the Willamette River at the Treatment Plant, where the water would still be treated and then transmitted through the 48- or 63-inch transmission line to Sherwood's pipeline, which does have the capacity. He confirmed that Tualatin Valley Water District was not currently drawing any water.

Commissioner Levit confirmed that a linear growth model was used because nothing better was available and noted the report said that things had changed below what the previous expectations were possibly due to conservation measures. He asked if a substantial amount would be gained by future conservation measures, notwithstanding the unaccounted for water.

- Mr. Mende explained the study did assume a linear growth rate by averaging or taking the data from 2000 to 2010 and turning it into a linear growth rate. The growth rate that was estimated in the 2002 master plan was significantly higher and showed water usage in 2010 at an average of 8 to 9 mgd; however, the city was currently using about 3.1 mgd. The previous growth assumptions were very aggressive and did not hold true, so the methodology was changed to use actual growth rate numbers. While the last few years have been a bit of an economic downturn for growth of Wilsonville, those years were preceded by boom growths. Based on averages, Staff was comfortable with the growth assumptions.
- Mr. Bledsoe added the projected population for 2030 was consistent with other planning documents adopted by the City. He explained that some reduction in demands per capita could be achieved through conservation. However, the study did not assume any reductions moving forward to be conservative. It is common for communities to achieve 5 percent to 15 percent reduction based on education, improved irrigation practices, etc. Conservation is encouraged and is one of the recommended Comprehensive Master Plan policies.
- Mr. Mende explained the previous per capita usage estimates were changed based on what has occurred over the last ten years. The significant amount of conservation due to water saving measures, conservation and low water usage toilets and showerheads, was taken into account, but no additional conservation measures were assumed.
- Mr. Bledsoe noted increased water rates are the most effective means of reducing water consumption; however, a rate analysis was not part of this study. Many communities have inclining blocks of rates that encourage conservation.

Mr. Bledsoe explained that as the distribution system was evaluated, a model was created using GIS that linked demands to parcels throughout the system, resulting in a highly accurate distribution of those demands and a very good calibration of the system, meaning field conditions were matched very well to the model conditions.

- The system had no pressure deficiencies, even in peak hour conditions.
- Less than 5 percent of the pipelines, node or junctions had fire flow deficiencies. The desired amounts were 1,500 gallons per minute (gpm) for residential areas and 3,000 gpm for commercial and industrial areas.
  - The deficient areas with a greater than 50 percent shortfall were shown in magenta on Figure 3.1 Localized Fire Flow Deficiencies (Slide 7). Many of these areas were close to other areas that meet fire criteria. Localized improvements could be completed to bring the entire system up to standard.
- In terms of water storage, the water treatment plant should be designed to handle only a high average or daily peak demand. Any extra demand that might occur, like when everyone turns their sprinklers on or when people get home in the evenings, should be handled by peaking storage.
- Operating storage is the difference between the on and offset points in the tank, and 10 percent is good to encourage circulation in the tanks. Fire storage is governed by the fire authority for the City of Wilsonville, which is 3,000 gpm for four hours, in addition to the emergency storage. For Wilsonville, emergency storage was calculated using two days of average day demand instead of three, because Wilsonville has backup wells that provide an alternative source of water. Wilsonville also has a state of the art treatment plant with a lot of redundancy and backup built within it. Sherwood and Tigard also have comparable emergency storage requirements.
- Using the capacity of the backup wells was recommended as a lower cost alternative to building additional storage to reduce the projected future storage requirements. Maintaining and keeping the wells in service would lower the demand for new storage from about 9 million gallons to a little more than 2 million gallons.
  - With the planned construction of 3 million gallons of additional storage, the City would be in position to meet the 20-year projected need.

    - Mr. Mende noted Table 3.1 of the Master Plan showed the planning criteria that drove the entire evaluation of the water system. Every community had the same general pressure requirements, as well as a 1,500-gpm fire flow requirement for residential areas. All the communities were in the same general ballpark as far as the gpm required for fire flow in commercial areas, the differences could be due to engineering preferences.
- Following the wells' evaluation, the team recommended that the City continue to maintain the wells currently in service, however, a couple wells were questionable in terms of future production. It was recommended that the City repurpose some of those wells instead of abandoning them. Water rights would need to be considered regarding any changes to ensure that those rights were retained.

Commissioner Phelps asked if the City could afford this much redundancy or backup.

- Mr. Bledsoe explained that in this case, the 20-year projected cost would be about $100,000 per year to maintain the wells, which is a lower cost alternative compared to constructing a six million gallon storage tank. The City would have the benefit of having backup in more than one location. Wells are indefinite; if something happened that resulted in no service for up to five days, as long as power could be provided to the wells, which would have backup generators, the City could provide some level of service. He confirmed the needed capital improvements were reflected in the $100,000 average cost per year.

Commissioner Postma asked if rights to the wells included an element to maintain the wells for the sake of maintaining the water rights. The $100,000 cost could be considered as maintenance of water rights that the City might lose if the wells were abandoned.

- Mr. Bledsoe agreed, adding the City had to do certain things to retain the water rights, which might not ever be perfected unless the wells were put into full production. One purpose of the Water Management and Conservation Plan was to retain the water rights.

Mr. Bledsoe returned to his presentation, stating that the water treatment plant evaluation identified a couple item that require more exploration as the City moved forward later with a Water Treatment Plant Master Plan.

- Some policy decisions could affect the capacity of the clearwell storage facility. A tracer study was recommended that might influence the rate of capacity of clearwell storage. Minor modifications could address the concern to provide a full 15 mgd capacity at the plant.
- Providing a surge tank would avoid a water hammer when pumps are turned off, which could create negative pressure that is hazardous for large pipes. As demands in the system increase, this improvement would need to be implemented.
- The Charbonneau District was evaluated more closely in light of some specific concerns seen within the district.
    - A disproportionate amount of pipeline problems were associated with the cast iron pipe and some lines need to be replaced, particularly those constructed in the early 1970s.
    - The District is isolated from the rest of the city with one supply line and a backup system that consists of a couple of wells, a booster station and a tank. A seismic evaluation revealed that the tank was at risk and had the potential to settle up to eight inches in an earthquake. While settling would not cause a catastrophic failure, it would make the tank useless. An earthquake could result in the loss of the pipeline supply across the bridge.
    - The two recommended options to provide backup included rehabilitate or replace the tank or constructing a secondary pipeline under the Willamette River to supply to the Charbonneau District, which was the more cost-effective option based on a 20-year lifecycle analysis.
    - He confirmed that burrowing a pipeline beneath the river would be more reliable than hanging the pipeline from the I-5 Bridge, since the pipeline would not be subject to issues regarding the bridge itself. A new pipeline would be conducted with HDP (high density polyethylene) material. HDP is black plastic that is very resilient and highly flexible, making it much more reliable in an earthquake.

Commissioner Postma asked if the eventual abandonment of the current storage facility was being recommended, adding the pipeline and then a new storage facility for Charbonneau at some point in time.

- Mr. Bledsoe explained that 2 million gallons was still needed within the 20-year planning period. Constructing 3 million gallons, as is currently planned, and abandoning the tank would still meet projected future needs. If a line broke, no storage would exist under this scenario on that side of the river. The wells would always be retained as backup, which provide about 350 gpm, which is enough water to meet minimal in-house demand, not irrigation.

Chair Altman confirmed the intention would be to keep the line on the bridge and disconnect the reservoir, which would create a loop system to Charbonneau that did not currently exist.

- Mr. Mende added that in addition to Option 1 and Option 2, there were Options 1A and 1B. Replacing the tank and rehabilitating the existing tank were both considered. Both of those options were more expensive than drilling a new pipeline under the river. The pipeline would eventually replace the tank over time. The wells would stay. There would be no reason to disconnect the tank until it was no longer usable. The line over the bridge would stay as well. The analysis assumed that if a large enough earthquake did occur, it would break the existing pipe across the Boone Bridge.

Commissioner Postma:

- Asked how long the district would have storage if a large earthquake did occur.
  - Mr. Mende explained that a 6.7 earthquake would damage the tank beyond repair. The seismic analysis showed Wilsonville could get a 7.1 earthquake, so the City was relying on the wells regardless. The City can either rely on the wells completely with no pipeline under the river, or the replace tank to make it seismically safe, or put a pipeline under the river. He noted this was a technical evaluation, the large earthquake might never happen but the policy or financial decision still needed discussion.
- Understood if a catastrophic event occurred prior to building a new pipeline under the river, the City would be relying on the wells in Charbonneau, which would keep a minimal amount of water flowing.
  - Mr. Bledsoe agreed the recommendation was a risk reduction. If the tank were up to current seismic code or if the pipeline were in place, the City would have the additional redundancy as well as fire protection. The purpose of the tank improvement was to provide the same level of service being provided everywhere else in the community for that type of event.
  - Mr. Mende explained if there were a major fire, the wells could not put out enough water to satisfy fire flow demands in Charbonneau and also supply limited day-to-day usage of the residents without a tank in place.
- Stated it seemed odd that those larger events in Charbonneau were lower on the capital improvement priority list than other concerns.
  - Mr. Bledsoe explained that after seismic report was completed, the issue was moved up to a Priority 1B, which was within the first ten years. It would take time to get permits, designs, and get it built. Even if started today, the entire process, including construction, might take five years.

Mr. Bledsoe continued the PowerPoint presentation, noting the minor revision made to Comprehensive Plan Policy 3.1.5.b regarding the City's authority to request offsite improvements, and reviewing the three additional policies that were recommended. These policies addressed conservation, tracking water usage throughout the season, and coordinating with other infrastructure improvements. He agreed coordinating the storm water and water infrastructure improvements in Charbonneau made sense.

Mr. Pauly noted Implementation Measure 3.1.5.b had been revised and was different from the measures noted in the PowerPoint and on Page 2 of 11 in the Executive Summary. He read the revised Implementation Measure 3.1.5.b into the record as follows, "All major lines shall be extended in conformance to the lines sizes indicated in the Master Plan and, at a minimum, provisions for future system looping shall be made. If the type, scale, and/or location of a proposed development negatively impacts operating pressures or available fire flows to

other ***existing*** properties ~~or warrants off-site improvements to achieve or maintain minimum pressures or fire flows~~ ***as determined by the City Engineer,*** the Development Review Board may require completion of looped water lines, off-site facilities, pipelines, and/or facility/pipelines ~~upgrades in conjunction with the development~~ ***to achieve or maintain minimum pressures or fire flows as a condition of development approval.***"

Chair Altman said that was consistent with the concurrency policy structure. He inquired if requiring that adequate fire flows be available prior to issuance of construction permits could also be an option. This would enable the applicant to either add adequate fire flow themselves or coordinate with the City. Identifying a system deficiency and doing offsite improvements that might be beyond the demand created by the applicant was a concern. A secondary edit would allow the Development Review Board (DRB) to add a condition to require the fire flow, and then work out whether the applicant fronts the cost with a payback or uses the other options available in the process. Such an edit would avoid simply attaching a condition to a specific development to do offsite improvements.

- Ms. Jacobson stated the newly revised language of Policy 3.1.5.b provided that the DRB "may" consider the requirement. At the time of application, the proportionality and Dolan findings would have to be reviewed, but the DRB would have the flexibility to do it or suggest something else.

Commissioner Levit confirmed these policies were automatically adopted into the Comprehensive Plan and no further action would be required.

Mr. Bledsoe and Mr. Mende continued with the presentation and displayed the Water Facilities Master Plan map indicating the future improvements for the City of Wilsonville, which were color coded by priority. Improvement projects shown in blue would be completed in coordination with development. Projects shown in orange were Priority 1 projects and those indicated by small purple dots primarily regarded fire protection.

- Capital improvements recommended for the first ten years were organized into Priority 1A and Priority 1B categories. Many minor distribution piping improvements were in Priority 1B with the pipeline to the Charbonneau District being the big ticket item. Priority 1A's big ticket items included the 48-in transmission line and the new 3 million gallon reservoir, which would provide for the City's 20-year need. The 48-in transmission line was in the design stage, and both items had been carried forward as part of the previous master plan. Land for the reservoir would be purchased within the next couple of months and the design would start in the next couple of years. The vast majority of the Priority 1A capital improvements were already planned and budgeted, and built into the rate structure and system development charges (SDCs) equations. Once the Priority 1A items were completed, very few big ticket items remained Capital improvements moving forward were very nominal compared to many other communities.
- Priority 2 Improvements slated for 2020 to 2030 were mostly pipeline projects with a few other minor improvements at some of the pumping facilities.
- Recurring maintenance costs included maintaining wells, replacing pipes and meters, and inspection programs to ensure the facilities continue the same level of service. The City would need to consider the identified costs and the current budget when doing the rate analysis. Currently, very little was being allocated for some of the well maintenance, so keeping those facilities going would be an added cost. Very little was also being allocated toward pipeline replacement. Being proactive and replacing the pipelines on an ongoing basis would save the City money in the long run.
- Mr. Mende clarified that the recommended $365,000 maintenance replacement budget in the Master Plan reflected the total budget, not the increase in the maintenance budget. Many maintenance and replacement items were already being implemented. The annual increase would be between $65,000 and $80,000 per year, which was about an 8 percent annual increase in the water distribution budget.

Commissioner McGuire believed it was important to identify the two major CIP projects carried forward and being implemented from the previous master plan with a different color and a footnote to clarify that they were

not new projects. Some people would look at the updated Master Plan without any prior knowledge of all of the planning and efforts that occurred before.

Chair Altman believed clarifying that the $365,000 was not new costs was important for Council, the Budget Committee as well as citizens.

Commissioner Hurley suggested revising page 13 of the Executive Summary to add a section under Water Supply to show the costs if the City did and did not abandon the Canyon Creek Well. The potential cost for abandonment was $26,000, so adding a section that identifies the cost if the well is not abandoned might be a good idea. This information would be good for Council and the Budget Committee.

- Mr. Bledsoe noted that making the well usable would cost more than $300,000.

Commissioner Postma noted some things were not in the CIP. He was glad to see the revisions made to the fire flow deficiencies chart, but some neighborhoods had a large percentage of needed improvements to address fire flow issues. He asked where correcting fire flow issues fit into the CIP and what the plan was for those issues.

- Mr. Bledsoe explained that with each dot on the chart, the consultants, Mr. Mende, and Interim City Engineer Steve Adams looked at the land use; the proximity to another hydrant with adequate flow; the potential for some type of redevelopment and then gave a higher priority to commercial over residential because commercial demands are higher. Based on those criteria, the decisions regarding when the improvements should be made was determined for each individual area. Most of the fire-related improvements were not health hazard concerns, so they did not usually make the Priority 1A list. The Oregon Department of Water Resources and Drinking Water Division would not require the City to provide a certain level of fire protection, so the more urgent fire protection improvements were included in Priority 1B, and the rest were in Priority 2. All the improvements were included on the CIP charts. The items identified in purple on Figure 4 (Slide 13) addressed the dots on the fire flow deficiencies chart.

Commissioner Levit noted the designation of radius for each hydrant was fine in an open field, but asked how that translated into a street network.

- Mr. Bledsoe explained that circles were used to evaluate proximities and then each dot was reviewed with City Staff to determine what areas were not covered. For example, if a structure was not being covered, they considered the structure's proximity to a hydrant when determining if a new hydrant was needed. In light of the street network, the structure could be within the 300-foot radius, but it might take 400 feet of hose to go around structures. That level of detail was not considered in the Master Plan.
- Mr. Mende believed the fire department standard was a 300-foot hose lay. Some locations were considered where hydrants were 500 feet apart, but they were on either side of a major building, so the fire standard was met and those dots were removed from the deficiency chart.

Commissioner Hurley asked if the City had some kind of constrictive rate structure for higher water use.

- Mr. Mende replied that an inverted block structure on water rates was included in the Master Plan that differed for both commercial and residential customers. As residential customers use more water, residents would still pay less than commercial water consumers. The base rate for commercial was also higher. The esoteric nature of the rate structure was one reason the rate study was not included within this technical document.

Commissioner Levit:

- Noted at the top of Page ES.5 the draft talked about replacing the cast iron pipe and some of the steel pipe. Approximately 32,800 feet of pipeline was in the second line; however, the draft stated 34,500 feet needed to be replaced.
  - Mr. Bledsoe confirmed 1,700 feet of steel pipe was included in the 34,500 feet.
- Noted that the third line on Page ES.6 under ES.2.5 should state (TVWD); the V was missing.

- Recognized that two different priorities were being addressed in Priority 1 on Page ES.8, which regarded increasing fire flows currently less than 1,000 gpm, and later discussion about improving to between 1,000 gpm and 1,500 gpm.
- Noted Items 300 & 301 in Table ES.4 used MCC and asked what that meant.
  - Mr. Bledsoe replied MCC meant Motor Control Center, which would be added to table of acronyms.
- Asked if the first paragraph in Table 2.6 on Page 2-9, which stated the water bottling plant gets its water at an irrigation rate, was correct.
  - Mr. Bledsoe did not know if the plant was billed at an irrigation rate, but the plant has an irrigation account because it did not contribute to the sewer. The City did not have a separate billing structure for customers that fully consume water. The estimated irrigation usage was not assumed in Table 2.6 for those four months. Irrigation usage was not based on the irrigation accounts, but on the total system demand as opposed to the winter demand because a huge number of residents have irrigation demands but no separate irrigation meter.
- Noted someone on his street was taking small tanker loads of water from the hydrant for dust control at a horse farm. Tanker after tanker of water had been being taken for weeks and weeks. He was not sure how that usage was accounted for by City. The City said it was aware of this when it was happening a couple years ago.
  - Mr. Mende explained anyone taking water out of City hydrants is supposed to have a bulk water permit issued from Public Works, which allows for payment of the water. A meter is issued to the permit holder as part of the bulk water permit.
- Noted that Table 3.1 on Page 3-2 discussed velocities and the maximum for pipes under 12 inches as 10+ feet per second; however, Charbonneau's 4-inch pipe flow was 12½ feet per second.
  - Mr. Bledsoe agreed Charbonneau's pipe did exceed the maximum, which was something the consultants recommended the City monitor. The pressure regulating valve needed higher flows to maintain pressures. The valve was in a pipe segment located inside a building, making it easy to monitor. He noted the 10 feet per second was a guide, but 20+ feet per second was needed for fire conditions. The goal was to avoid having a pipeline in the distribution system that regularly exceeds 10 feet per second, which indicates that a parallel line or larger pipeline was needed. Water flow became more turbulent, velocities increase, and there was potential for surge and water hammer problems. It was also a flag for a lot of head loss or efficiencies in the system. High velocities would let indicate the need for more transmission, but Wilsonville had a lot of transmission capacity.
- Asked if laminar flow, not turbulent flow, was used to measure flow, and was that a factor when trying to calibrate some of the pumps.
  - Mr. Bledsoe stated every meter was a bit different. A guideline was used for upstream and downstream pipe segments. Turbulence might be less critical for certain types of meters. Usually, laminar flow was recommended, but it would not be a factor in measurement problems. Turbulence is usually introduced when going through fittings and turns.
- Inquired about the City maintaining lines at more than 80 psi. Most homes operate better at less than 80 psi, so are residents advised to install pressure regulating valves?
  - Mr. Bledsoe replied the City requires pressure regulators when the pressures are higher; much of the system has pressure regulators. He was not sure if the pressure regulators are located in the meter vault or in residents' homes. It is not uncommon for cities to have large areas with pressures above 80 psi and every resident has a pressure regulator on their system. Some communities make pressure regulators a policy, regardless of the system pressure, to transfer risk to the homeowner.
  - Steve Munsterman, Public Works Supervisor - Water, clarified that the pressure regulating valves used by homeowners and business owners could be placed anywhere from a garage to right outside the meter vault. People are encouraged and builders know that pressure regulators need to be installed. Residents do not always know they have them, which can create problems when the pressure drops or increases and they realize the regulators have to be replaced. Pressure regulators are also used in the system to control pressure differences due to elevation changes. The City owns and maintains these pressure

regulators. Older homes should all have pressure regulators. Homeowners could tell a regulator is needed if they have singing pipes, surging water pressure or other issues.

Mr. Pauly entered the following exhibits into the record:

Exhibit E: Email from Eldon R. Johansen dated July 8 2012 regarding concerns about how the Water System Master Plan ties into the City planning process and to any pending water rate and SDC study update.

Exhibit F: Letter from Wallulis & Associates dated July 9, 2012, along with six pages of review notes responding to the Water System Master Plan, and his resume.

Chair Altman opened public testimony regarding the Water System Master Plan Update at 7:35 p.m.

Stanley Wallulis, 7725 SW Village Green Circle, Charbonneau, reviewed the comments and concerns presented in his letter to Mr. Mende dated July 9, 2012 (Exhibit F) and discussed his work experiences in other jurisdictions and how other communities resolved water issues. He noted the availability of water in Charbonneau that could be used to fill fire trucks should there be a major fire, as well as meeting water demands.

Chair Altman:

- Understood Mr. Wallulis' written testimony and oral presentation primary focused on the proposals for Charbonneau and that he believed the City could provide water to Charbonneau through less expensive means than what was proposed.
  - Mr. Wallulis agreed. He cited Item 4 in Appendix H on Page 24 and noted the City would not only have the river crossing, but would also have to build another reservoir.
- Clarified the Master Plan already included providing an additional reservoir on the west side of town, not in Charbonneau, that would provide the needed replacement storage. If the Charbonneau tank ultimately went away, the new reservoir that was already planned would replace it.
  - Mr. Wallulis stated additional testing was needed and should be budgeted to determine the subsurface conditions under the reservoir in case the City considered doing repairs and improving the tank. This should be done before deciding to abandon the tank. Charbonneau would not grow; it was maxed out, so he did not believe a lot of expense was necessary to service the Charbonneau District.

Commissioner Phelps asked if Mr. Wallulis was suggesting the second pipe not be built and that the wells were sufficient regardless of the level of catastrophic events.

- Mr. Wallulis confirmed that was his opinion. He explained that the present tank and booster pumps were adequate if minor adjustments were made to bring them up to Code. There were two additional wells by the tank. If it was really a question of getting more supply, he suggested building wells in Charbonneau, which would be a lot less expensive.

Chair Altman confirmed Mr. Wallulis was suggesting that the ponds on the golf course, which are fed by river water, could be tapped to provide an adequate emergency supply that was not considered in the Master Plan.

- Mr. Wallulis noted that other areas build ponds to serve as fire protection and many ponds already exist in Charbonneau.

Clifford Engel, 8180 SW Fairway Dr. Wilsonville, noted the Water Usage Analysis chart showing the difference between what was being metered and what was being used. Charbonneau had many 35- and 40-year old irrigation systems used for the residences as well as the common areas. The common area between his condominium and the one next door uses much more water than it takes to put an inch of water on the lawn because the area is a swamp in the middle of summer.

- He suspected that while the residences in Charbonneau were metered, the District itself might not be metered. He suggested the City try to find these unmetered irrigation systems. There could be many broken pipes, which would be less expensive to fix than continuing to pump water that was not needed. Because the common areas are not metered, the wasted water was not being accounted for and the residents pay for this with higher rates.
- He noted how high his water bill was when he incorrectly installed a watering system in his backyard. A lot of water can be wasted in a very short time.

There was no further public testimony.

Chair Altman inquired about Exhibit E. He understood Mr. Johansen wanted to make sure the City was still covering development requirements, and Chair Altman believed the policy structure being added might address his concerns.

Mr. Mende stated he would address Exhibits E and F. He thanked Mr. Engel for pointing out the issue with the common areas in Charbonneau and confirmed it was another potential source for unaccounted for water. The irrigation system in Charbonneau was not considered and would definitely be researched further. Most of the irrigation in Charbonneau was on a private district, but it was still an issue worth considering.

Mr. Bledsoe added one recommendation in the Master Plan was to partition the City up and use meters to see if certain areas were more subject to water loss than other areas. One recommendation was to meter the water going to Charbonneau, so the City could compare the amount of water sent to the district to the sum of all of the individual meters in Charbonneau to determine what water loss might be occurring.

Commissioner McGuire asked if Villebois was set up the same way. Like Charbonneau, Villebois has a number of privately-owned common spaces, some of which would transition to the City. She asked if Villebois had a general meter for entire development and noted common areas in Villebois were overwatered as well.

- Mr. Bledsoe explained that it was not uncommon for a homeowners association (HOA) to have their own account. The City would bill a HOA with its own meter and homeowners' HOA dues typically include water.
- Mr. Munsterman stated that to the best of his knowledge, every water service in the city was metered. Villebois was an area the City had the best handle on because it was all new. The City has had Staff members on the water crew for 16 and 25 years who have a good idea about the metering system. If there is a green spot in an area with no meter, it is pretty simple to figure it out. All City accounts are metered as well, in fact, the City bills the City for water.
  - Charbonneau's irrigation district previously only provided water to the golf course, but that changed to cover the cost of replacement so the burden was not totally on the golf course members and the HOA is being charged. While areas inside one's private courtyard might be watered off the home system, the area outside the courtyard is watered off a common system. The golf course is watered off another section, but any use of City water is metered.

Mr. Engle explained if a condition caused by a gradual leak had been occurring for sometime, the City might not see much difference because the measurements are based on prior leaks during the heavy watering season.

- Mr. Munsterman stated it was not always possible to know what is leaking when there was no separate irrigation account. The City is happy to help people figure what might be causing a leak if their bill doubles.

Mr. Engle suggested the City send a notice to Charbonneau stating the City would begin assessing individual homes to pay for leaks if they could not be found; he assured the City would get many reports in just one week.

- Mr. Munsterman noted leak detection was covered in the main document. The City contracts with a leak detection company that surveys a one quarter to one third of the City's system every year and not a lot of

leaks are found. The City was fairly good at finding and repairing leaks and no active leaks exist at this time. The City surveys all new construction and everything still under warranty so leaks can be repaired by the builder.

- Mr. Bledsoe added that of the 30 water studies he has done, Wilsonville was the most proactive with regard to leak detection and elimination.

Mr. Mende addressed the comments and concerns discussed in Exhibits E and F as follows:

- Exhibit E regarded Mr. Johansen's concerns, which included how to meet demands, how the DRB evaluates demands, and the requirements the City places on a development to ensure specific capacities. He cited Mr. Johansen's email stating, "In general, the statements on water and sewer were casual until we approached capacity. Then, we provided specific capacities and previously approved water requirements." This was a true statement and the City would like to keep it that way.
  - In the analysis, the City looked at current conditions, and the water needed to accommodate the growth rate over a 5- to 20-year period, which provided a macro view of the water demand over the long term without looking at each individual development. If the City had enough water for the forecasted growth of 2.9% residential and 3.5% commercial, the water supply would be accurate.
  - A hydraulic model has been prepared to study individual developments, such as a large industrial user like Coca-Cola. Specific nodes within that distribution system could be taken into account to ensure the City did have the capacity, flow and pressure.
- Mr. Johansen's second concern regarded the water SDCs; however, a rate study component was not included in this Master Plan for a couple of reasons.
  - First, this Master Plan was primarily intended to be a technical document that did not get into the economics of different alternatives but recommend, from an engineering and technical standpoint, what was the best and most economical way to move forward and maintain the current system.
  - The second reason was that this distribution system was only half of the equation; to fully develop a rate study, the Water Treatment Plant improvements would need to be built into the rate study. The Master Plan for the Water Treatment Plant was last updated in 2004. A long-term look was needed to determine improvements for the Water Treatment Plant. Short-term improvements were addressed on an interim basis to achieve 15 mgd for both Wilsonville and Sherwood. The Water Treatment Plant Master Plan update would involve multiple entities, including the Tualatin Valley Water District and the City of Sherwood.
  - He clarified that an 18-in line was installed across the wetlands along the Montebello alignment. An additional 18-in line was planned to follow the Barber St alignment that would hang from the bottom of the bridge and connect directly to the 18-in Barber Street line, which goes out to Graham's Ferry and then north. The parallel 18-in line was needed after the reorganization of Ville bois for the new school to ensure that section of town is looped.
- With regard to Mr. Wallulis' letter (Exhibit F), he had addressed comments about SDCs and the rate study, which paralleled Mr. Johansen's.
  - Most comments on the first couple of pages regarded the Executive Summary, and Mr. Wallulis did find a couple typos, such as Item 2 having to do with annual demand, which should be daily.
  - He clarified that Proposed Policy 3.1.7, in Item 19, was the tracking system and metering data for all the billing data, which was discussed as part of the unaccounted for water, as well as the City's approach for addressing the issue and maintaining an accurate profile of water usage.
  - Item 16 are in regards to system development charges.
- Mr. Wallulis' comments on the Executive Summary requested quite a bit of significant technical detail, but the Planning Commission had asked that the technical detail be removed from the Executive Summary to make it more readable for the public. Most all the detail requested by Mr. Wallulis was located in the main text of the document, but would not be included in the Executive Summary.
- Mr. Wallulis' comments noted in red regarded the 16-in water line crossing to Charbonneau and his suggestion that additional economic analysis be considered. Mr. Mende believed the basis of the economic

analysis had been covered as a comparison to repairs or replacements of the tank and well system. Mr. Wallulis' evaluation of the upgrade costs did not consider the cost of seismic retrofit, which was a late addition that was not incorporated into the earlier Master Plan draft.

- Mr. Bledsoe noted that rehabilitating the tank would cost $1.8 million and when added to the $265,000, it became quite a bit more costly to keep the status quo and meet current Code.

Commissioner Phelps:

- Stated the recommended, most cost effective way to serve Charbonneau did not add up. There were concerns about putting the pipeline through the river because the City might lose the bridge, yet the bridge supposedly has been retrofitted for earthquakes. Then, the Commission has heard that plenty of standby water exists on the golf course. He did not oppose the current recommendation, but wanted to know if service in Charbonneau could be maintained by taking advantage of what already exists in Charbonneau, or putting the water line across the river and reducing the reliance on wells.
  - Mr. Bledsoe explained there were two scenarios. The first scenario was to provide the same level of service in Charbonneau that the City targets for the rest of the community, which included fire protection and demand in an emergency event, and the second was to have secondary supply sources. To provide the same level of service, the following options were considered: replace the tank at Charbonneau, rehabilitate the tank at Charbonneau or put in the pipeline.
    - The lifecycle analysis in Appendix E showed that building the pipeline and some extra storage would cost the same as rehabilitating the tank at 20 years. With a 40-year lifecycle cost, the tank would cost even more; therefore, the pipeline was more cost effective over a 40-year span. The pipeline was longer-term investment than 20 years. The breakeven point of fixing the tank versus installing the pipeline was about 20 years out, when the annual cost savings would pay for the investment.
- Understood the investment now would benefit the community for more than 20 years, but the City would breakeven at 20 years. The tank might last 20 years, then the pipeline would take over and become more cost efficient after that 20th year. Doing nothing for 20 years would only delay installment of the pipeline, which could cost more money in 20 years.
  - Mr. Bledsoe noted there would be some cost because doing nothing for 20 years would require more investment in the booster station to keep it going, etc. The cost breakdown was added to Appendix E.
  - Mr. Mende added the main premise of the analysis was to treat Charbonneau the same as other parts of the city. If the decision was made that Charbonneau was to have a less secure system than the rest of the city, then the City could save money.
- Responded less secure was in the eye of the beholder and becomes art rather than science at some point. He wanted to know where this recommendation is cost beneficial. The cost benefit question would be raised at future conversation levels and he wanted to know how that question would be addressed. He was not able to get at the information he needed to address his question.

Commissioner Levit confirmed the ponds would be not be used for potable water, only for fire protection, so if the tank was not usable, the wells would not be adequate.

Commissioner Hurley understood the other part of the question was what if the tank was not rehabilitated and the pipe was not built, but more was invested to recharge the wells only in Charbonneau.

- Mr. Bledsoe responded it would be hard to get adequate production if any new wells were like the existing wells, one well put out 80 gpm and another, 300 gpm. Residential fire protection requires 1,500 gpm and larger facilities require 2,500 gpm, which would require a lot of big wells. The study did not consider using the ponds anywhere in the system.
- Mr. Mende noted the ponds were privately owned and an agreement would be required between the City and private owners with the water rights, which was possible.

Commissioner McGuire commented that the logistics of getting water from a pond versus a direct source would affect fire protection.

- Mr. Bledsoe explained commercial entities that use ponds as their source must maintain the ponds and make sure water was in the pond year round. In addition, there was usually a direct connection to a hydrant that puts the pond water within proximity of the structure as directed by the fire department, such as that a 300-ft radius. Water in a pond a quarter mile away could still be hauled, but it would not meet the same level of service provided to other areas of the community.

Commissioner Levit believed there might be an impact on fire insurance rates for homeowners dependent on a pond rather than a full hydrant system.

- Commissioner Postma replied that insurance companies did not do that type of independent analysis.
- Mr. Bledsoe added the ISO ratings for a neighborhood were not that specific.

Mr. Mende concluded his responses to items in Exhibit F with these comments:

- Many comments regarded terminology, like turnouts, and the acronyms and abbreviations would be modified accordingly.
- He clarified that the footages associated with various improvements were included in the estimates in the appendices and that the summary tables in Chapters 5 and 6 only looked at projects and costs, so adding that level of detail would not be included in those chapters.
- He believed the remaining Mr. Wallulis' comments were addressed during the Staff report and questions.

Chair Altman closed the public hearing at 8:27 p.m. and called for Commission discussion.

Ms. Jacobson advised the Commission about procedural process given the discussion regarding the recommended changes. She noted Commissioners McGuire and Hurley each made changes that could easily be incorporated, as well as the language revision by Mr. Pauly. Some of the responses to issues raised in the letter would not necessarily result in changes to the Staff report, but were just explanations. She suggested the Commissioners indicate which comments they would like addressed tonight, adding the Commission had the option to request another version of the Staff report.

Commissioner Postma understood Mr. Mende intended to incorporate some typographical/correction items raised by Mr. Wallulis and asked how best to differentiate those for the sake of clarification based on the laundry list of suggested changes.

- Mr. Mende stated Ms. Jacobson addressed two or three specific changes requested by the Planning Commission. While Staff had presented the analysis, Commissioner Phelps also wanted clarification about the least cost option for Charbonneau.

Commissioner Postma:

- Suggested addressing Commissioner Phelps concern by stating that additional discussion of a cost benefit analysis of multiple options for Charbonneau be included in the recommendation for approval. The technical corrections made by Commissioner Levit were easy to include because of specific indications already on the record; however, Mr. Mende did not confirm which specific changes should be made from Mr. Wallulis' notes and which were questions; the discussion became a bit confusing.
  - Mr. Mende clarified the typographical errors and other fixes did not need to be stated as a condition.
- Recommended stating, "Mr. Willulis' comments based upon typographical errors or corrections that need to be made" as opposed to comments.

Commissioner Phelps stated he would like to see the cost benefit analysis as characterized by Commissioner Postma.

Commissioner Postma agreed it was not easily digestible. There should be a pros discussion of the different options that were considered and that the recommended option was the best cost benefit analysis because of X, Y, and Z.

- Mr. Bledsoe reiterated the cost benefit analysis was already included, but information was spread throughout the document.

Chair Altman understood the need was to consolidate that cost benefit analysis information into the Staff report that would go forward to Council.

Mr. Mende understood that the Staff report would then include a cost benefit analysis for providing fire flow service to the Charbonneau District using both public and private water ownership and both underground and surface sources.

Commissioner Phelps:

- Explained that he wanted the cost benefit of no new water line versus a new water line. He would like all of that information in one place where it was easy to see.
  - Mr. Mende explained that with his suggested language, any source of water could be used and wells and ponds could be built in to do a new cost benefit analysis that would go beyond the one already done for the pipeline versus –
  - Mr. Bledsoe interjected, asking if the analysis should involve just the pipe versus the tank.
  - Ms. Jacobson believed Commissioner Phelps wanted a cost benefit analysis to determine if it was more cost beneficial to have a pipe or use what exists and not have a pipe.
- Agreed Ms. Jacobson's summary was correct; all he wanted to know was whether the City needed a pipe.

Commissioner Postma thanked the team, City Staff and Consultants, for making the Master Plan more readable. The City had an obligation to its citizens to make sure the Master Plan could be read and understood by anyone. The changes made for a better document, which was incredibly useful.

- He agreed with Commissioner Phelps on the issue of Charbonneau. More discussion about the cost benefit analysis was important because it would show which items the Commission believes the Council should consider.
- The lost water issue had been discussed ad nauseum. Discussion at a previous work session included the idea that the cost of unaccounted for water was not necessarily passed on to certain residents or businesses and he disagreed. Lost water had to be accounted for and there would be an increase for everyone because the system as a whole must pick up the slack in order to cover that production. Sherwood would now have to share in the lost water expense, despite the fact that Sherwood has a brand new facility. Eventually, Sherwood would speak up about having to pay for the City's water loss. Even though the City is aggressive in preventing and repairing leaks, the lost water issue still needed to be resolved because that loss was paid for by everyone. It was hard to hear that the City was doing great with leaks and meters, so Staff did not think it was a problem. It was important to track down where the lost water was going. He did not know where those costs fit into the equation, but he believed the City should continue to be sensitive the issue.

Commissioner Levit believed the team did a pretty thorough job of trying to evaluate the water system, which was not an easy task because the system is underground. It was important to understand what would be checked. However, City Council would have to follow up on those things if the Commission approved the changes tonight.

- His one concern was focusing on just one cost benefit analysis when a case could be made for doing or not doing every item on the list, though that level of justification was unwarranted, not that it should not be done, but the Commission was not focusing on each and every item.

Chair Altman noted that specific testimony was given raising the issue and proposing alternatives that were never addressed. The Commission had heard the comments and Staff was looking at the issue, which seemed to be the cost benefit of making those improvements to Charbonneau and the best way to do so. He was comfortable with that approach. The only reason the analysis was being done was that specific testimony raised the issue; no other testimony was given about other areas in town.

Commissioner Phelps confirmed he was concerned about the cost benefit analysis before, but the public testimony solidified his concerns. He noted the biggest cost elements in the Master Plan revolved around Charbonneau. The City needed to make sure that much money must be spent in order to do the job right.

Chair Altman echoed his appreciation for the revised and simplified Executive Summary, and particularly the fire flow exhibit.

Commissioner Postma moved to adopt the Staff Report, with the amended Implementation Measure 3.1.5.b, as stated by Mr. Dan Pauly, and to recommend approval of the Water Master Plan, with modifications of multiple items as follows:

- **Consolidate and simplify the cost benefit analysis for available options to address Charbonneau's short- and long-term supply and flow issues as discussed and addressed by Commissioner Phelps.**
- **Include the note with regard to the chart on Page 17 of the draft Water System Master Plan (Exhibit A) for large capital items listed in Priority Items 1A that were previously included in the prior Master Plan as indicated by Commissioner McGuire.**
- **Include the suggested revisions or corrections as addressed by Commissioner Levit.**
- **Correct the third line under ES.2.5 on Page ES.6 to state "(TVWD)".**
- **Include Motor Control Center (MCC), used in Table ES.4 for Items 300 & 301, in the table of acronyms.**
- **Include the cost benefit of abandoning versus maintaining wells as noted by Commissioner Hurley.**
- **Include the correction of typographical errors addressed by Mr. Wallulis in Exhibit F.**

Commissioner Hurley seconded the motion, which passed unanimously.

Commissioner Postma moved to adopt Resolution LP12-0002 with the adopted Staff report as amended. Commissioner Hurley seconded the motion, which passed unanimously.

Mr. Mende stated that he expected someone to ask why Technical Memos 1, 3 and 5 were included in Appendix B, but not Technical Memos 2 and 4, and explained that they were rolled into Technical Memos 1, 3 and 5.

Commissioner Levit noted that the Commission just approved changes with a cost benefit analysis, but no recommendation was made about how the cost benefit analysis was to be utilized.

- Mr. Bledsoe reiterated that the cost benefit analysis had already been completed, but only needed to be summarized in a way that was easy to follow. He confirmed that the Master Plan recommended the pipeline versus the reservoir.
- Mr. Mende added that the Master Plan now goes to Council where other considerations, in addition to the technical basis behind the improvements, were being recommended, such as a future rate study. The timing for the recommended improvements might be changed.

LP12-0002
Water System Master Plan Update
Planning Commission Record Index

Distributed at the July 11, 2012 Planning Commission public hearing:

Exhibit E: An email from Eldon Johansen, dated July 8, 2012, regarding Water System Master Plan

Exhibit F: A letter dated July 9, 2012 from Stanley Wallulis, with attachments.

Exhibit G: Paper copy of the PowerPoint, *Water System Master Plan*, shown at the meeting

Mende, Eric

From: Eldon R. Johansen <erjohansen5@comcast.net>
Sent: Sunday, July 08, 2012 4:30 PM
To: Mende, Eric
Subject: Water System Master Plan

Exhibit E

Eric, I thank you for pointing out that the Water System Master Plan was on the City web site. I have briefly reviewed the draft document and want to provide my initial impressions. My overall impression is that the engineering analysis is thorough and presented very well. My concerns are about the way this document ties to the City planning process and also to the update of any pending Water Rate and Systems Development Charge Study.

What are demands? The planning approval process may have changed since I was involved, but prior to a project receiving Stage II approval The Community Development Director or an Engineering Representative had to state that after the developer fulfilled his conditions of approval there would be sufficient traffic level of service, water supply, sewer service and storm drainage facilities. In general the statement on water and sewer were casual until we approached capacity and then we provided specific capacities and previously approved water requirements. We would recommend disapproval if capacity was not available. In most cases we would get to this level before we could prove to Council and the community that added capacity needed to be provided. In calculating the demands on the system we included the following:

Capacity being used at that time,

Approved agreements to provide capacity. I think this included Coca Cola and the Department of Corrections.

Water for facilities that had meters, but no water use at that time and could begin using water at any time.

Water for any project with prior Stage II approval which did not have meters in place.

In looking at Table ES.2 Future Water Demands and the backup tables that were used to develop Table ES-2, it appears that the table includes water production which would be expected to actually occur in the projected year. As development continues, without the other demands there is no easy way to tell where the City stands now on storage and for future specific development approvals and when we will trigger a need for added storage or production. If the rules for Stage II approvals have changed this may not be a factor any longer.

Relationship of Water Systems Development Charges to Water Systems Master Plan. Identifying projects which are classified as all or in part capacity related has helped when it comes time to develop SDC's. The last time I checked the city had separate categories for single family, multi-family, commercial, industrial and irrigation with government and churches generally lumped into the commercial category. The single family residential category includes irrigation water. Multi-family, commercial and industrial do not. There are five separate peaking factors to make sure each category SDC represents the demand on the system for that category. The grouping into residential and non-residential works fine for the Water Systems Master plan, but not for the System Development Charge. If possible please include a disclaimer on Table ES.2 mentioning that a more detailed refinement will be done for Systems Development Charges.

Other. I am glad you had more current figures to determine the peaking factors. I am sure yours are more realistic figures than our figures from the mid 80's which was about the only time we had records when water restrictions were not in place.

I also recognize the earlier projections for water consumption on future commercial and industrial developments need to come down. When we looked at the figures from an even earlier study it appeared that the figures were high to minimize future requirements for parallel lines as the area developed beyond the original planned area. On industrial

developments we were concerned that developments could convert from warehouse to light manufacturing and only dropped about 20%. On commercial developments we thought that commercial developments in Wilsonville would gradually acquire the characteristics of more urban commercial areas with increased water use and also dropped the figure by a relatively small percentage.

My memory is again hazy, but I thought we had put in an 18 inch water line from the vicinity of Montebello and Barber to Kinsman a block or so south of Barber to provide capacity to continue development in Villebois. This is listed on Table ES.3 as Project 163 and seems to serve the same purpose as the previously installed line. It seems like when I retired, Michael Bowers was left with getting the final agreement on payment worked out with the developers.

Eric, thank you for the opportunity to review the document and provide a little bit of historical perspective. My memory of the ties between the water moratorium, the Water Systems Master Plan and the Water rate and SDC Study are hazy and I hope I got it right.

Eldon Johansen
503-682-8721

Exhibit F

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WILSONVILLE, OREGON 97070
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REGISTRATIONS, CERTIFICATIONS
OREGON: ENVIRONMENTAL ENGINEER
CIVIL ENGINEER
CONTROL ENGINEER
WATER RIGHTS EXAMINER
ENERGY AUDITOR
LAND SURVEYOR
PREVIOUSLY REGISTERED AS PROFESSIONAL ENGINEER IN:
WASHINGTON, ALASKA
CALIFORNIA & FLORIDA

July 9, 2012

Mr. Eric Mende, Deputy City Engineer
29799 SW Town Center Loop E
Wilsonville, Oregon 97070

Re: Update of the City of Wilsonville's Water Systems Master Plan

Dear Mr. Mende,

As you may recall, I called you last Thursday about the "Notice of Public Hearing" on the above captioned subject inquiring about the apparent conflict of a hearing on June 13, 2012. You informed me that this was a misprint.

I have subsequently downloaded the captioned Plan. By placing many other commitments on the "back burner" I started a review to provide requested input on the Plan which contains 176 pages of printed material. I have done this by squeezing in some time on longer than normal days, at different intervals to at least scan the Plan. This effort was made to enable me to ASAP convey my input to you, other city staff, Planning Commission and consultant prior to the hearing this coming Wednesday. I don't appreciate being "blind sighted" and I am sure others do not either. Please include copies of this letter and notes for the Planning Commissioners for the meeting, and if they have not had the agenda sent to them yet, include it with the agenda.

First of all the Plan contains a wealth of information and innovative ideas. To extol them would not have allowed me time to address the concerns that I had in the limited time and provide this input.

The first thing I noticed was that the Consultant was not retained to provide information on how the proposed improvements are going to be paid for. In these types of Plans funding is one of the very significant plan elements that all parties normally **want to know how much up front**: e.g. water rates, sinking funds, bond issues, grants, etc.

I cannot recall a single master plan that my Firm prepared which did not include this element, except when it had been commissioned to some other entity to prepare it simultaneously. Whenever possible, time permitting, we would recommend the sinking fund approach. Other times it was necessary to prepare: bond schedules for different scenarios e.g. probable range of interest rates; different retirement periods; plus water rate scheduling (timing and rates) for the required funding.

(over)

Unfortunately this City has adopted a process where the Planning Commission is charged with responsibility of making recommendations on major future projects without any knowledge on how the project would be funded and its effects on water rates. This does limit the breadth of open discussion, but reminds me of Nancy Pelosi, previous leader of the Senate, when she said about the Abama-Care: we have to pass this 2,700 +/- page bill to know what is in it (paraphrased). The Democratic House and Senate passed the bill with the overwhelming majority of the members voting for it, had never having read the bill in its entirety.

I am attaching 6 pages of notes taken from perusing the Plan. These notes contain considerable duplication reducing actual amount of actual input. Unfortunately the time between receiving the notice and the hearing did not permit time for a more in depth review of 176 pages of material in the Plan. While there is nothing in the Plan about funding there is enough information about costs that they should be red flagged.

In reviewing the Plan, the comments in the attached notes were made in the same manner, as I previously have done when reviewing draft plans prepared by one of my staff engineers.

The review will show that I personally have some strong preferences for some terminology that others may not share. Other than that caveat, the notes are based on info taken from the draft plan and inferences that can rise from that data. I made more suggestions in the Executive Summary then the other segments, because it is targeted for a broader audience, that may not be accustomed to reading engineering reports and the terminology used.

In the past when major projects of this type were considered by the City, there has been a group of engineers and scientists here in Charbonneau that reviewed and commented on such projects. I did not have the free time to contact or schedule meetings with any of these fellow professionals. I will not be able to contact any of them until I take care of issues and prior commitments that were placed on the "back burner" four days ago and need urgent addressing.

It took me three and a half days to review the 176 pages in the Plan and you have 3 days to review only 6 pages with a lot of duplication in it. I have provided you with a proportionally a lot more time to review my 6 pages of notes than I had reviewing the 176 page Plan. There are areas that I feel need to be opened up for discussion and modification, in my notes, these are highlighted in red print .

I am also including a copy of my resume, to provide some documentation about my current and previous experience and qualifications as a professional in different disciplines.

Very truly yours,

Stanley Wallis

Stanley Wallis, P.E. P.L.S., W.R.E, E.A.

Encl. Wilsonville Water Master Plan - my notes, 6 pages.
My Resume

cc: File -Wilsonville Proposed Water Master Plan

WILSONVILLE WATER STUDY BY KELLER ASSOCIATES

Review notes by Stanley Wallulis in response to requested input. -- July 9, 2012.

EXECUTIVE SUMMARY

1. Pg. 2 - Clearwell – "or add baffles" – query: baffles for CT ?
2. Pg. 2 - Chart states **annual** demand; should be **daily,** plus add: 1 cubic foot. = .748 gal.
3. Pg. 2 - Residential water demand – demographics, river water irrigation ?
4. Pg. 3 – "delivery points ("turnouts")." vs. branch connections (tees, crosses, etc.)
5. Pg. 4 - Hydraulic model, modeling on what data? 1 sentence of info would be helpful.
6. Pg. 4 – City's 4 reservoirs includes Charbonneau tank?
7. Pg. 4 – Service levels should identify different msl elevations (upper/lower) for each zone.
8. Pg. 5 - Problems with cast iron pipe? A general explanation would be enlightening.
9. Pg. 5 – Meter testing 100 meter annually sampled vs Implementing a 7 +/- year cycling of all meters for system accuracy (unaccounted waters) including large meters which have failed significantly; and equitably generating more revenue.
10.
11. Pg. 6 – Hydrant spacing 300' how rigid is this distance, number required.
12. Pg. 6 – Identify Cities wells w/undesirable characteristics, e.g. odor, taste, yield, remedies, etc.
13. Pg. 7 - hydropneumatic tank, 750 cubic feet = 5,620 gal; should be identified as a surge tank as later identified in add typical size dia. & height to convey physical size.
14. Pg. 7 - Charbonneau tank at risk from earthquake. Foundation soils have lots of clay, seismic basis documented ?
15. Pg. 7 - Charbonneau tank – abandon tank (size ?) & booster station, why – justification ???
16. Pg. 8 - Some improvements justify "system development charges" – Philosophically originally (SDCs) were targeted at the influx of newcomers coming into the city. In reality studies have shown in several cases, the majority of sales in new or upscale areas, are to existing residents in the community upgrading to better homes. It is my personal opinion, that in the interests of equity, a policy should be made to eliminate these charges for existing residents moving to better homes and levied at the time of sales (homes only) against the truly new residents.
17. Pg. 9 – Chart ES-3 without quantities is meaningless as to the scope.
18. Pg. 10 - Continuation of Chart ES-3 , same as above.
19. Pg. 11 – What does the "**Proposed Policy 3.1.7"** maintain accurate demand profile consist of??
20. Pg. 13 - What does line 142 in the chart on this page "safety nets" mean/include.
21. Pg. 13 -Chart on this page also needs quantities to be meaningful e.g. number of services, etc.

CHAPTER 1 - **EXISTING SYSTEM DESCRIPTION**

1. Pg. 1 – "turnouts" what are these: branches to the existing distribution system; or connection points for other future entities, etc. Turnouts are a terminology usually used when removing/closing side gates along open flowing irrigation ditches, or gates on dams.

2. Pg. 2 – Pressure zone levels A, B, C, & D should identify the areas served by delineating the (upper & lower elevations) of each zone and identified on a map.

3. Pg. 2 – "Turn outs" in lieu of this terminology I prefer either: "junction" or "branch" and a indicative of a more continuous/permanent connection with the use of a cross (partial), tee, wye, fittings, etc.

4. Pg. 2 – Are the blow offs at hydrants operated manually or are they pressure relief valves that release water automatically and how is the water disposed of?

CHAPTER 2 - **DEMAND FORECASTS**

1. Pg. 10 – Water Losses of 17.5% too high. What is the history of meter maintenance, system monitoring techniques?

2. Pg. 12 – "turnouts" already stated previously.

3. Pg. 13 - "turnouts" already stated previously.

4. Pg. 14 - "turnouts" already stated previously.

CHAPTER 3 - **SYSTEM ANALYSIS**

1. Pg. 1 – "City is able to deliver water during high demand periods even when **one of the pumps servicing the area is off-line**". Should I interpret the above underlined to mean – [any one of the system pumps servicing any, or all of the areas is offline]?

2. Pg. 2 – Add "PDD" under the listed abbreviations.

3. Pg. 3 – "Dummy pipes" should be defined.

4. Pg. 4 - "turnouts" already stated previously.

5. Pg. 5 – Paragraph 2 "below 80 psi" should read above 80 psi.

6. Pg. 12 – Chart 3.2 (map) – lines delineating pressure zones would be a nice addition. No area on the map shows locations with pressure less than 40 psi.

Pg. 15 –

8. Pg. 15 – 2nd paragraph is "590 feet" a msl datum or some other datum.

CHAPTER 4 - ---- TREATMENT PLANT AND TRANSMISSION PIPELINE

1. Pg. 6 – Last paragraph. The addition of "effective" to the clear well (before) **storage size** would be beneficial to ordinary inquisitive citizen reading the entire Plan.

2. Pg. 7 – -"turnouts" already stated previously.

3. Pg. 11 -"turnouts" already stated previously.

CHAPTER 5 - CAPITAL IMPROVEMENT PLAN

1. Pg. 3 - Table 5-2. Twice - "turnouts" already stated previously.

2. Pg. 3 - Table 5-2. 24" [illegible] river crossing to Charbonneau – [illegible] $1,632,000 is a very questionable project.

3. Pg. 4- Table 5-2. "turnouts" already stated previously.

4. Pg. 4 - Table 5-2. Water Distribution Piping – adding footages would help in conveying scope.

CHAPTER 6 - OPERATIONS, MAINTENANCE, AND REPLACEMENT ------

1. Pg. 2 - Table 6.1 - "turnouts" already stated previously.

2. Pg. 2 – Table 6.1 - Water Distribution Piping – adding quantities would help in conveying scope.

3. Pg. 3 – "6.4" Are there plans to incorporate Charbonneau's wells into the SCADA system?

4. Pg. 4 – Meter testing. Suggest a more aggressive testing of all meters e.g. 7 year +/- cycle.

CHAPTER 7 - POLICIES AND IMPLEMENTATION MEASURES – NO COMMENTS

APPENDIX A – MAPS AND FIGURES

1. Presently there was limited time to review in depth the maps and figures and provide input prior to the July 11th meeting. I did notice the following 2 items in a quick scan as follows in #2 & #3 below.

2. Pg. 6 – Figure #5 gives numerical values for pressure zones A, B, C, & D but does not:
   a). identify the datum or give ranges as of upper and lower for surface elevations or
   b) for the hydraulic head operating ranges.

3. Pg. 6 – Figure 5 -

APPENDIX B - EXISTING DISTRIBUTION SYSTEM CONDITIONS EVALUATION

TECHNICAL MEMORANDUM #1

1. Pg. 2 - "turnouts" already stated previously, **but additionally defined this time as "delivery points".**

2. Pg. 5 – Water meter testing cycle of 20 years. Where did this cycling basis come from?

3. Pg. 7 – C level reservoir overflow elevation duly noted as 507.5 feet assumed msl, OK??.

4. Pg. 8 – Suggest adding "by a PRV valve" after **"break head" or** state to raise/lower pressure with a PRV.

5. Pg. 9 – A seismic analysis has not been performed for the Charbonneau Reservoir duly noted.

6. Pg. 11 - "turnouts" already stated previously.

7. Pg. 13 - "turnouts" already stated previously, **but now includes PRV valves & flow meters and on pg. 14 other configurations.**

TECHNICAL MEMORANDUM #3

1. Pg. 21 – City's very conservative storage duly noted. "For this planning effort, a recommended emergency storage volume equal to twice the average day demand was used. City staff recommended that this volume not be "nested" or overlapping with fire storage, but that it be provided in addition to the other storage components." Plus City staff insistence on excluding the use of City's wells that are equipped with standby power.

2. Pg 22 – Use of City's wells to meet emergency conditions in lieu of above storage:
   Use of the City's 8 wells reduces required of 2.16 MG of storage & reduces capital costs by: $4,000,000.
   Other scenarios, even using fewer wells in an emergency would save millions of $.
   Plus if the wells are renovated to their previous yields all additional storage requirements would be eliminated, resulting in saving approximately $ 8,000,000 +/-. Since the City has essentially stopped using the wells the regional well water table levels has been reported to have risen significantly. This could result in higher yields for short durations with acceptable levels of drawdown than when they were used as the sole principal source.
   The intertie with the City of Tualatin should also be factored in this Plan the possibility of another way of meeting supply to all the City zones in an emergency.

3. Pg. 24 – Based on the above, how can the expenditure of $ 5,800,000 for the proposed reservoir at Booze Road, be justified.

This raises the question; has the City staff purposely insisted on and manipulated (raised) storage requirements and insisted on not including the available supply from the City's 8 wells was to provide an artificial basis for justifying the Booze Road expenditures or just Empire Building? If so are there other areas where staff input has resulted in bloating the immediate need for projects and their attendant costs?

Combining the two above highly questionable project's costs (in gold figures in red), we have a total of +/- $ 13,800,000. By adding the highly questionable cost of constructing a Willamette River crossing in order to Charbonneau from Table 5-2 above at a cost of $ 1,533,240, the total cost for all the highly questionable projects becomes $ 5,332,040. **Hey this isn't "chump change".**

TECHNICAL MEMORANDUM #5

1. Pg. 27 – "Telemetry". Why is it required to manually open a valve on the discharge line instead of controlling backflow by a check or control valve ?

2. Pg. 33 – Nike Well – Hydrogen sulfide can usually removed by a simple aeration facility.

3. Pg. 34 – Pump Test – Is the stated back pressure stated herein the pressure at which the drawdown stabilizes?

4. Pg. 43 – **Description of all 8 pumps:** the Geshellshaft Well from the abbreviated description is vertical line shaft turbine pump; the two Charbonneau well pumps are described as submersible pumps; the other 5 are described only as "well pump" settings and could be interpreted as either submersibles (with motors immediately above the pump bowls) or line shaft turbines (with pump bowls only).

APPENDIX D – MODEL MAP IS NOT REPRODUCIBLY READABLE

APPENDIX E – COST ESTIMATES (LAND PLAN AMENDMENT) THERE IS NO APPENDIX E.

1. Pg. 1 – "break head" recommend change to: "reduce (or increase) pressure through a pressure reducing valve(s)".

2. Pg. 5 – Table 2 – Would like more info on 234 feet of 12" dia. concrete pipe.

3. Pg. 8 – Chart #3 – Should add a legend for the different colors.

4. Pg. 9 – Chart #4 – Complete replacement of undersized feed lines to fire hydrants is not necessary. Only a sufficient length of 8" should be used to replace undersized pipe to reduce the friction losses (pressure) enough to provide the minimum required flow. This will not only reduce the cost but also the disruption to abutting homes and the mess.

5. Pg. 9 – Comments about a new 16" intertie line in red print shown below is commendable and should be redundantly stated in other places where the 16" intertie line is discussed.
To do – life cycle analysis for both options – look at risk costs (potential new well drilling /rehab, potential major tank upgrades . . .)

6. Pg. 9 – "1.4 SUMMARY OF RECOMMENDATIONS AND COSTS - In summary, the Charbonneau District has adequate well supply, storage, and booster pumping capacity to meet existing and future needs."

7. Pg. 10 – Chart #3 – The recommended present and future estimated costs to up date the presently supply source to Charbonneau is $264,000 vs the estimated cost of the proposed 16" intertie line (river crossing) to Charbonneau is $ 1,533,200.

In the process of designing and building of our home in Charbonneau over 24 years ago, I did conduct a research on the geology of the area. There was a woeful lack of information on the existence of faults (cracks in the underlying formations). The underlying basalt formations were too deep to economically provide foundation support for the home, so I designed concrete reinforced with steel, foundations.

In 1993 an earthquake centered near Scott Mills, Oregon was recorded with a magnitude of 5.6 and I felt it here in Charbonneau. I was reading the morning paper in our home at the time when it hit, I continued to sit in my chair, confident our home would ride out the quake in fine shape, my wife however from another part of the house bolted out to the back yard. The quake at our home felt similar to sitting in boat on a placid lake and a large fast boat went by and caused swells. My first response to the quake was to check for any leaks in the water and gas service lines and then for cracks on the exterior of our all brick home. Everything checked out just fine.

The upshot of this is the present reservoir servicing Charbonneau and the freeway bridge across the river experienced the same affects of the quake without any damage. The freeway bridge has since had additional improvements made to make it even more quake proof. The proposed 16" intertie across the river, of course not being built, has not been so tested, and with the lack (assumed still) of geological information on existing faults in our area it may have failed if built.

RESUME OF

STANLEY G. WALLULIS, P.E., P.L.S., W.R.E., & E.A.

7725 SW Village Greens Circle, Wilsonville, OR 97070

Phone: 503-694-1309, Cell 541-429-1725

1. PROFESSIONAL STATUS.

Active Registrations in the State of Oregon:

Professional Engineer, Civil, Environmental & Control Engineering #3758.
Registered Professional Land Surveyor #1326.
Certified Water Rights Examiner, State of Oregon #138.
Certified Energy Auditor by the Oregon Department of Energy.

Retired Registrations in good standing.

Professional Engineer in the State of California #040095.
Professional Engineer in the State of Alaska #5924.
Professional Engineer in the State of Washington. #6792.
Professional Engineer in the State of Florida #35933.

2. FORMAL EDUCATION.

Graduate of Oregon State University, with a Bachelor of Science Degree.

3. TECHNOLOGY TRANSFER SEMINARS AND SYMPOSIUMS.

Meeting ongoing "Continuing Professional Education Requirements" by attending one or more:

Seminars and symposiums sponsored by state, federal, and qualified voluntary associations for water, wastewater, streets, roads, and related engineering disciplines.

4. PARTICIPATION IN PROPOSED REGULATORY ENACTMENTS.

Attendance at public workshops and hearings, where governmental agencies request public comments on their proposed rules and regulations that have an impact on water, wastewater, streets, municipal infrastructure and land use.

5. PROFESSIONAL MUNICIPAL EXPERIENCE.

Two years as Assistant City Engineer for the City of Pendleton, Oregon.
Three years Utility Engineer (water & wastewater) for City of Corvallis, Oregon & metro area.
Directed a staff of 60 professional, technical & clerical personnel with annual budgets in the millions.

6. PROFESSIONAL PRIVATE PRACTICE EXPERIENCE, 51 years.

Responsibilities as the owner/president of a consulting engineering firm servicing public and private clients on several types of diverse projects.

a. **Client contact,**
b. **Project presentations at public hearings,**
c. **Act as client representative before state and federal agencies,**
d. **Prepare and author municipal comprehensive plans,**
e. **Public work projects from conception through completion and start-up,**
f. **Preparation of project cost estimates,**
g. **Determination of debt service requirements,**
h. **Propose revenue financing alternatives,**
i. **Project scheduled replacement costs,**
j. **Project annual operational costs,**
k. **Prepare operation and maintenance manuals, and**
l. **Supervision of professional supporting disciplines, technical and clerical staff.**

(OVER)

7. GRANT EXPERIENCE AND ADMINISTRATION WITH PUBLIC AGENCIES:

A variety of State and Federal grant funding programs have been utilized in the construction of several public works projects. Grant funded projects have been constructed for the cities of Pendleton, Hermiston, Pilot Rock, Prairie City, Boardman, Echo, Lostine, and Elgin.

Agencies that have provided or administered grant funding on the above and other projects include:

Federal Department of Transportation
Oregon Department of Transportation
U.S. Public Health Service
U.S. Economic Development Administration
U.S. Environmental Protection Agency
U.S. Bureau of Reclamation
Farmers Home Administration
Federal Housing Administration
Federal Housing and Urban Development
Federal Department of Energy
Oregon Department of Environmental Quality
Oregon Water Resources Department
Oregon Department of Labor
Oregon Department of Health
U.S. Army Corps of Engineers.

8. CIVIC INVOLVEMENT HISTORY.

City of Pendleton Fringe Area Planning Committee.
Pendleton Community Hospital Fund Raising Committee.
City of Pendleton Building Appeals Committee.
City of Pendleton Budget Committee.
Blue Mountain Community College Curriculum Advisory Committee.
Director of the Eastern Oregon Chapter of AWWA.
Chairman of Umatilla County Planning Commission.
City of Pendleton Off Street Parking Committee.
For State of Oregon Water Resources Commission: Umatilla Sub-basin Committee.

9. LETTERS OF COMMENDATION.

***Hermiston Projects -- Tom Harper, former City Manager**
Hermiston Project — EPA Project Liaison Officer on Artificial Recharge Project.

***Pendleton Projects -- Joe Mclaughlin, former Mayor**
***Pendleton Projects -- Gerald (Jerry) Odman, Former Public Works Director**

***Prairie City Projects – Zelma Woods, former City Recorder**

Pilot Rock Projects -- Duane R. Cole, former Administrator
Lostine Project -- Marthanne Stone, former City Recorder

City of Corvallis Utility Engineer -- Alton R. Andrews, former Utility Engineer
City of Corvallis Utility Engineer -- Floyd W. Collins, former Utility Director

Schroeder Construction – Jim Schroeder, Owner, Developer & Builder

***Multiple letters from same client for different projects.**

Copies of the above letters are available upon request. Additional letters are also available.

Exhibit G

WATER SYSTEM MASTER PLAN

PRESENTED TO: CITY OF WILSONVILLE PLANNING COMMISSION
PUBLIC HEARING

July 11, 2012

KELLER associates

Purposes of Water Master Plan

- Meet Comprehensive Plan / City Council Goals and Policies

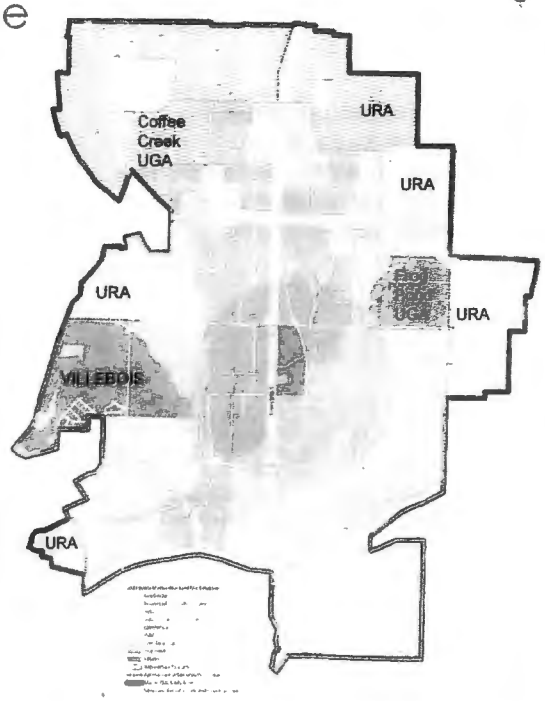
  Goal 3.1 **"To assure that good quality public facilities** and services are available with adequate capacity to meet community needs, while also assuring that growth does not exceed the community's commitment to provide adequate facilities and services."

- Update Previous Planning Effort
  - Previous plan is 10 years old
  - Previous plan predates the water treatment plant

Exhibit G

Study Area / Land Use

- Includes urban growth area (UGA)
- Includes Urban Reserve Areas (URA)
- 20-year and build-out projections
- Special resource areas and utility corridors not included



Current Water System Overview

- Water treatment plant (15 mgd)
- Four storage reservoirs (total 7.6 mg effective storage)
- Two booster stations
- Three pressure zones
- Distribution system piping (107 miles)
- **Overall system is in good condition!**

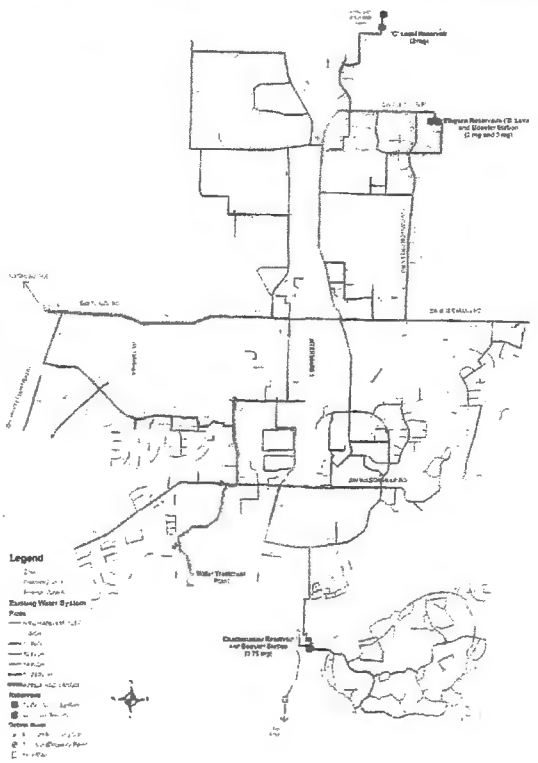
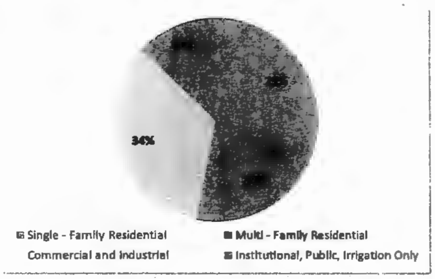


Exhibit G

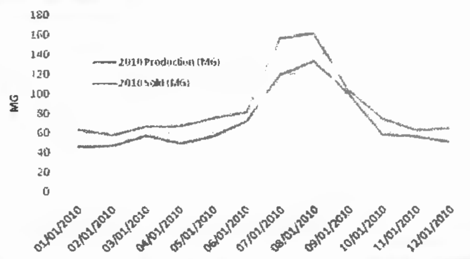
Water Usage Analysis

- Residential, commercial, industrial usage
- Irrigation estimated separately
- Water loss (unaccounted for water) exceeds 10%



Water Loss (Unaccounted For Water)

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1,016	1,130	1,153	1,143	1,120	1,030
[illegible]	938	1,060	1,000	961	919	846
[illegible]	3.5	3.5	3.5	3.5	4.1	3.4
[illegible]	74	67	150	179	197	181
[illegible]	7.3%	5.9%	13.0%	15.7%	17.6%	17.5%



[illegible]

Water Demand Methodology

- Used 2005-2009 average per capita demands to establish baseline 2010 demand (average 3.20 mgd)
- Growth assumptions based on census data
  - Residential growth rate of 2.9%
  - Nonresidential growth rate of 3.5%
  - Additional industrial reserve of 1 mgd
- [illegible]
- [illegible] irrigation use
  - Flows per household for residential
  - Flows per acre for nonresidential

Future Demand Projections

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	19,525	22,625	25,986	29,979	34,585	52,400
[illegible]	**7,873**	**9,083**	**10,478**	**12,088**	**13,946**	**21,129**
[illegible]						
[illegible]	1.70	1.96	2.26	2.60	3.00	4.21
[illegible]	3.62	4.17	4.82	5.56	6.41	8.74
[illegible]	6.16	7.10	8.19	9.45	10.9	14.86
[illegible]						
[illegible]*	1129	1314	1499	1718	1979	2372
[illegible]	1.60	1.79	2.12	2.52	2.89	3.09
[illegible]	3.08	3.66	4.35	5.16	6.13	6.35
[illegible]	5.24	6.23	7.40	8.79	10.4	10.80
[illegible]						
[illegible]	0.00	0.50	0.75	1.00	1.00	1.00
[illegible]	0.00	5.00	5.00	10.0	10.0	20.0
[illegible]						
[illegible]	3.20	9.24	10.1	16.1	17.0	28.3
[illegible]	6.70	13.3	14.9	21.7	22.5	36.1
[illegible]	11.4	18.8	21.3	29.2	32.3	45.7

*Includes commercial and industrial acreage; excludes public acreage

Distribution System Evaluation

- Good system pressures
- Generally good pipe age / conditions
- Localized fire flow deficiencies in some locations
  - Less than 5% of area
  - Undersized pipelines
  - Inadequate looping
- An additional 35 hydrants are recommended to meet current hydrant coverage standards

Localized Fire Flow Deficiencies

Water Storage Evaluation

- Existing and future storage needs (no wells,

Storage Component	Year 2030	Year Build
Operating Storage[1] (MG)	0.87	1.17
Backup Storage[2] (MG)	0.98	1.75
Fire Storage[3] (MG)	0.72	0.72
Emergency Storage[4] (MG)	6.40	14.00
Total Storage Required (MG)	8.97	17.64
Less Storage Available (MG)	-8.70	-8.70
Storage Need (MG)	0.27	8.95

1. Operating storage recommendation is 10% of effective volume. For year 2030, it includes an additional 10% storage for the currently proposed 3 MG new tank.
2. Based on Wilsonville demand pattern, assumes supply equals max day demand.
3. Assumes 3000 gpm for 4 hours.
4. Assumes City desires to provide 2 times the average day demand

- Emergency storage requirements could be reduced by 6.9+ MG with existing backup wells
- Recommendations
  - Construct additional 3.0 MG storage near intersection of Tooze Road and Baker Road (currently planned)
  - Retain functionality of back-up wells where cost-effective

Well Evaluation

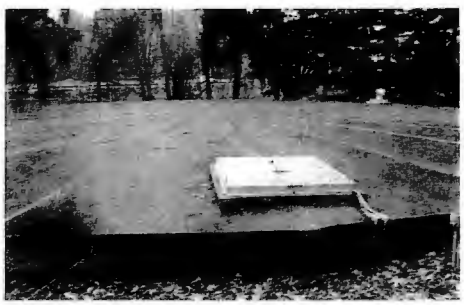
- Eight wells
- Prior to water treatment plant, wells provided City's potable water supply
- Wells have been maintained in good condition, but need upgrades
- Production capacity has declined in most wells—need rehabilitation
- Wells serve important role as long-term backup supply
- Consider repurposing use of Nike Well.
- Investigate transfer of Canyon Creek Well water right.

Water Treatment Plant Evaluation

- Evaluation limited to review of hydraulic and process capacities
  - Treatment plant master plan update - 2014
- Facilities largely capable of handling 15+ mgd
  - Tracer study
  - Clearwell / disinfection modifications after 12 mgd
  - Surge protection on transmission line after 12.5 mgd

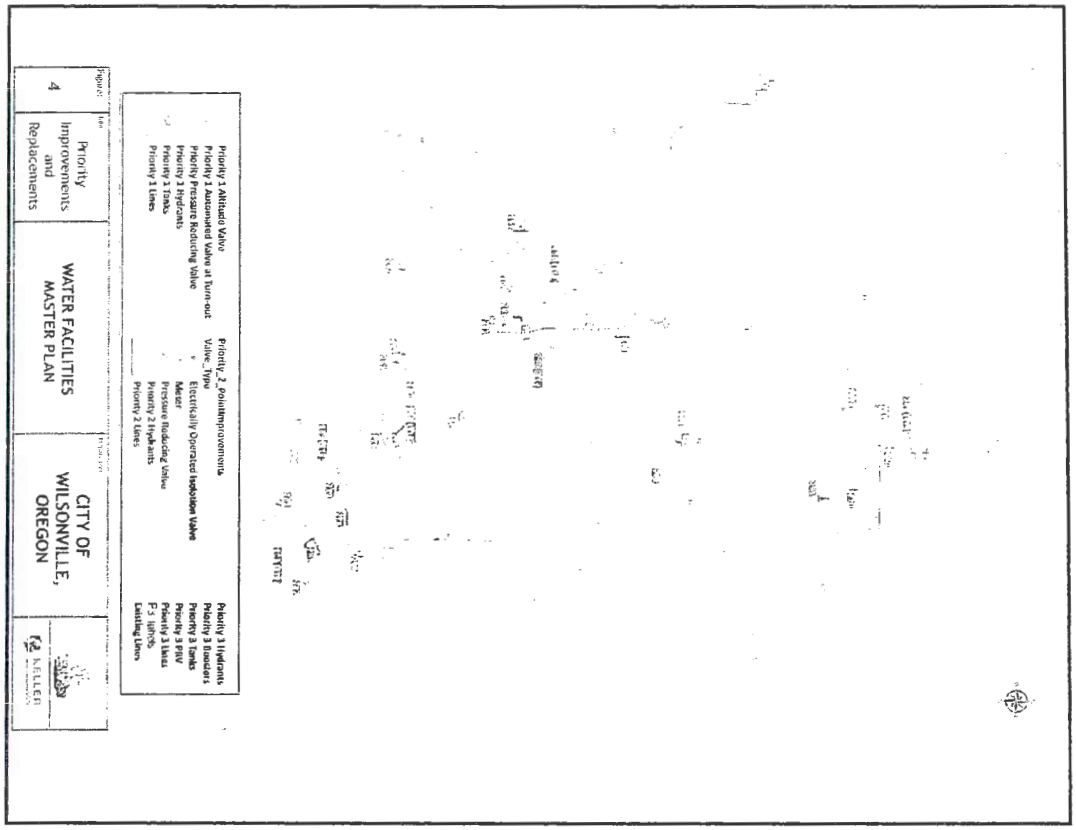
Charbonneau District

- Predominately cast iron piping which is 40+ years old and needs replacement
- District is at risk of becoming isolated from City during major earthquake
  - Current wells, storage, and pumping capacities meet District needs
- Seismic evaluation shows Charbonneau tank structure is also at risk during major earthquake
  - Two long-term options to address seismic risk
  - Option 1 – replace or rehabilitate tank; maintaining existing wells and booster pump station
  - Options 2 – construct secondary pipeline under Willamette River



Goals / Policies / Implementation Measures

- Recommended clarifying text for implementation measure 3.1.5.b
- Recommended three additional policies
  - Policy 3.1.6 - The City of Wilsonville shall continue a comprehensive water conservation program to make effective use of the water infrastructure, source water supply and treatment processes.
  - Policy 3.1.7 - The City of Wilsonville shall maintain an accurate user demand profile to account for actual and anticipated demand conditions in order to assure an adequately sized water system.
  - Policy 3.1.8 - The City of Wilsonville shall coordinate distribution system improvements with other CIP projects, such as roads, wastewater, and storm water, to save construction costs and minimize public impacts during construction.



Capital Improvement Plan

Priority 1A Improvements (by 2017)

106	Portable Flow Meter (for well tests)	$13,000
	Surge Tank	$170,000
	Clearwell Improvements (assume policy change)	--
121	C Level Reservoir Security and Sampling Improv.	$18,000
123	Charbonneau Reservoir Chlorine Monitoring	7,000
124	Automated Valve at Tooze/Westfall (West Side Tank)	58,000
125	3.0 Million Gallon West Side Tank & 24-inch Transmission	5,840,000
126	Elligsen West Tank – Add Altitude Valve	31,000
140	Charbonneau Booster PRV & SCADA	$22,000
163	18-inch loop on Barber St. (Montebello to Kinsman)	$371,000
165	48-inch Transmission on Kinsman St. – Barber to Boeckman (in design)	3,960,000
	TOTAL PRIORITY 1A IMPROVEMENTS	$10,490,000

Priority 1B Improvements (by 2022)

110	Nike Well Telemetry & Misc. Improvements	$35,000
111	Wiedeman Well Generator & Telemetry	98,000
112	Boeckman Well Telemetry Upgrade	26,000
113	Gesellschaft SCADA & Instrumentation	32,500
114	Elligsen Well Instrumentation	20,000
143	Charbonneau Booster Flow Meter Vault	$29,000
160	8-inch Upgrade on Jackson Street	$64,000
161	8-inch Upgrade on Evergreen Street	83,000
162	8-inch Loop North of Seely Street	8,000
164	10-inch Extension on Montebello Street	217,000
166	8-inch Loop between Boberg St. & RR (N. of Barber)	78,000
167	8-inch Loop on Boones Ferry (north of Barber)	19,000
168	10-inch Loop (Appts E. of Canyon Creek/Burns)	41,000
169	8-inch Loop between Vlahos & Canyon Creek	42,000
170	8-inch Upgrade on Metolius cul-de-sac	54,000
171	8-inch Loop on Metolius private drive	20,000
172	8-inch Upgrade on Middle Greens	68,000
173	Fairway Village Hydrant on French Prairie	10,000
175	16-inch Willamette River Crossing to Charbonneau District	1,532,000
	TOTAL PRIORITY 1B IMPROVEMENTS	$2,476,500

Capital Improvement Plan (continued)

Priority 2 Improvements (by 2030)

203	Gesellschaft Well Generator	$78,000
205	Charbonneau Well Mechanical Building	81,000
	Video Surveillance (various wells)	22,000
241	Meter Valve and Wilsonville Rd Turnout	$118,000
260	10-inch Extension on 4th Street (E. of Fir)	$69,000
261	8-inch Loop – Magnolia to Tauchman	59,000
262	8-inch Upsize on Olympic Cul-de-sac	44,000
263	8-inch Loop near Kinsman / Wilsonville	36,000
264	10-inch Loop near Kinsman / Gaylord	82,000
265	8-inch Upsize on Lancelot	100,000
266	Fire Hydrants (main City)	119,000
267	Fire Hydrants (Charbonneau)	46,000
268	8-inch Loop near Kinsman (between Barber & Boeckman)	126,000
269	8-inch Upsize near St. Helens	26,000
270	8-inch Loop near Parkway Center / Burns	66,000
271	8-inch Loop near Burns / Canyon Creek	110,000
272	10 & 8-inch Loop near Parkway / Boeckman	$315,000
273	12-inch Loop Crossing Boeckman	16,000
274	8-inch Loop at Holly / Parkway	56,000
275	8-inch Upsize at Wallowa	62,000
276	8-inch Upsize on Miami	68,000
277	8-inch Extension for Hydrant Coverage on Lake Bluff	63,000
278	8-inch Upsize an Arbor Glen	92,000
279	8-inch Loop on Fairway Village	42,000
280	8-inch Extension for Fire Flow – Private Drive / Boones Bend	18,000
281	8-inch Upsize on East Lake	187,000
282	8-inch Extension for Fire Flow on Armitage Place	55,000
283	8-inch Upsize on Lake Point Ct.	56,000
284	8-inch Loop Franklin St. to Carriage Estates	94,000
285	8-inch Upgrade on Boones Ferry Road (S. of 2nd St.)	44,000
286	Valves at Commerce Circle and Ridder Road / Boones Ferry I-5 Crossing	44,000
	TOTAL PRIORITY 2 IMPROVEMENTS	$2,394,000

Priority 3 improvements (not shown) include development related projects such as pipeline upsize costs and Zone D booster station

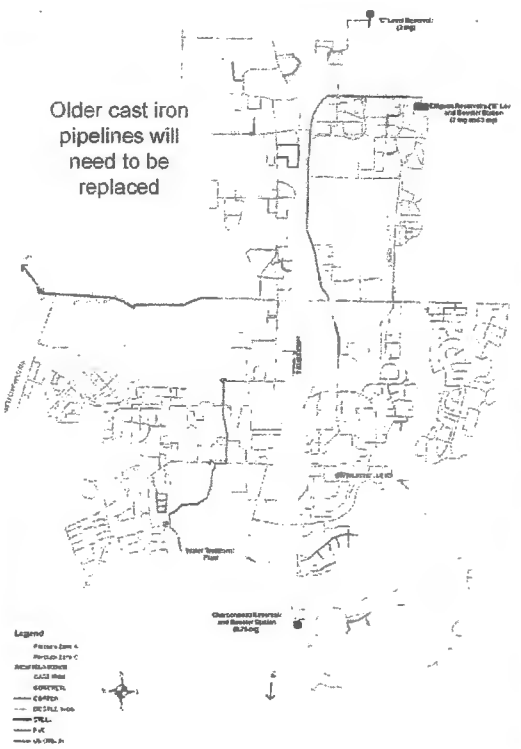
Recurring Maintenance Costs

- Identified approximately $1.8 million in specific repair/replacement projects
- Recommended recurring maintenance budgets

	$5,000 / each	Every 5 years
	$5,000 / each	Every 10 years
	$173,000	Annual recommended budget for 20-year planning period
	$50,000	Annual recommended budget (assumes 20-year life)
	$30,000	Annual recommended budget
	$95,000-$105,000	Annual budget (includes 6 wells only)
	$6,000	Recommended annual budget for 3rd party support
	$150,000	Every 5 years
	$20,000	Every 10 years, beginning 2022
	$5,000	Every 10 years, beginning 2017

*Recommended maintenance and replacement annual budget of about $365K/year

Older cast iron pipelines will need to be replaced



LP12-0002
Water System Master Plan Update
Planning Commission Record Index

Staff Report dated July 3, 2012, for a July 11, 2012 Planning Commission Public Hearing including:

Exhibit A:	Water System Master Plan Final Draft dated June 26, 2012 *(Located in the Planning Division.)*
Exhibit B:	CD with Water System Master Plan Final Draft and Appendices dated June 26, 2012.
Exhibit C:	Proposed Changes to Existing Comprehensive Plan Policies
Exhibit D:	An email dated June 21, 2012, from Sherry Oeser of Metro, regarding Wilsonville Water System Master Plan.

City of
WILSONVILLE
in OREGON

PLANNING COMISSION MEETING
STAFF REPORT

Meeting Date: July 11, 2012	**Subject:** Update of the City's Water System Master Plan **Staff Member:** Chris Neamtzu, Planning Director and Amanda Hoffman, Assistant Planner **Department:** Community Development
Action Required	**Advisory Board/Commission Recommendation**
☐ Motion ☒ Public Hearing Date: 7/11/12 ☐ Ordinance 1st Reading Date: ☐ Ordinance 2nd Reading Date: ☐ Resolution ☐ Information or Direction ☐ Information Only ☐ Council Direction ☐ Consent Agenda	☐ Approval ☐ Denial ☐ None Forwarded ☒ Not Applicable **Comments:** The Planning Commission action is in the form of a recommendation to the City Council

Staff Recommendation:
Staff respectfully recommends that the Planning Commission conduct the public hearing on the proposed Master Plan, and forward a recommendation of approval to the City Council.

Recommended Language for Motion:
The Planning Commission recommends approval of the Water System Master Plan to the City Council (with or without specific changes).

PROJECT / ISSUE RELATES TO:		
☒Council Goals/Priorities B. Ensure efficient, cost effective and sustainable development and infrastructure.	☒Adopted Master Plan(s) Update to the 2002 Water System Master Plan	☐Not Applicable

ISSUE BEFORE THE COMMISSION:
The Commission is reviewing an update to the 2002 Water System Master Plan. The purpose of this Master Plan Update is to document current water demand, evaluate current system deficiencies, estimate future water demands over a 20-year growth horizon, and estimate the capital and operation costs needed to meet future demands. The current Plan is a major revision and update to the 2002 Master Plan which was completed before the Willamette River Water Treatment Plant began operation.

Overall, the City Water System is in very good shape. Most of the distribution system is less than 30 years old, there are adequate storage facilities for emergencies, more than adequate water rights for the long term, and the water treatment plant is state-of-the art. The biggest concerns are: keeping up with growth, what to do with the existing wells – which have not been adequately maintained over the last ten years, improving fire hydrant coverage and fire flows in selected parts of the City, and addressing a number of systemic issues in the Charbonneau District.

The Master Plan has been re-organized based on Planning Commission input. A user-friendly section on acronyms and abbreviations has been added to provide important information for the casual reviewer. A succinct executive summary highlighting key categories has been added bringing all of the critical themes together into one easy to read section. Project lists have been compiled for repairs, replacements, maintenance and Capital Improvements. Lastly, a section on the proposed Comprehensive Plan policies has been included.

There are a number of policy issues that are included with this Master Plan update that warrant mention.

1. This Master Plan uses a methodology to estimate growth in water demand that is not consistent with the methodology used by METRO for estimating growth in population and employment, which is in turn used by METRO and the City for Urban Growth Planning and Transportation Master Planning. The METRO methodology was found to be overly conservative, resulting in unrealistic future water demand estimates, and correspondingly higher future Capital and O&M requirements.
2. Four changes are recommended to *Comprehensive Plan* Goal 3.1. (see Chapter 7):
    a. The Plan recommends a text addition to Implementation Measure 3.1.5.b to include the completion of <u>off-site facilities or upgrades</u> as potential Conditions of Approval for developments if the development negatively impacts fire flows to existing properties.
    b. The plan recommends a new Policy 3.1.6 to continue the City's existing water conservation program.
    c. The Plan recommends a new Policy 3.1.7 to maintain an accurate user demand profile via metering of actual usage.
    d. The Plan recommends a new Policy 3.1.8 to coordinate distribution system improvements with other CIP projects to save construction costs and minimize public impacts.

The strikethrough and bold version of the Comprehensive Policies can be found as Exhibit C. When finally adopted, the Water System Master Plan will become a sub-element of the City's Comprehensive Plan.

EXECUTIVE SUMMARY:
The City of Wilsonville authorized Keller Associates, Inc. to complete a Water System Master Plan in February 2011. The previous master plan was completed in 2002. Over the course of the last decade, many changes have occurred to the water system, including the completion of the state-of-the-art surface water treatment plant that has displaced the City's groundwater wells as the primary water supply. The primary purpose of the planning effort includes the following:

- Update water system demands and demand projections for an expanded study area, including water sales to the City of Sherwood.
- Update the planning criteria used to evaluate system performance and prioritize improvements.
- Update the existing water distribution system hydraulic computer model.
- Evaluate the current condition of the City's water system assets.
- Identify existing and anticipated future deficiencies.
- Update the City's capital improvement plan as it pertains to the water distribution system (pipelines, wells, booster stations, and tanks).
- Provide a review of existing water treatment facilities and identify potential bottlenecks that would need to be addressed to reach a 15 million gallon a day (mgd) treatment capacity.
- Propose new Comprehensive Plan policies.

EXPECTED RESULTS:
The purpose of the Master Plan is to document the current condition and demand of the Water System, predict future demand, and evaluate the cost and timing of necessary operational, maintenance, and capital improvements over the next twenty years. Adoption of the Master Plan will allow the project team to advance into a rate study later this year or next year.

TIMELINE:
Planning Commission Work Sessions March 14, 2012 and May 19, 2012
Planning Commission Public Hearing July 11, 2012
City Council Work Sessions March 19 and July 16, 2012
City Council Hearing and Adoption-August and/or September
Rate Study-After Council Adoption

CURRENT YEAR BUDGET IMPACTS:
Creation and adoption of the Water System Master Plan is an approved Capital Project (#1082).

FINANCIAL REVIEW / COMMENTS:
Reviewed by: _____ Date: _____

A lower Capital Improvement Estimate could reduce SDC and User Fee calculations contained in a revised Rate Study – to be performed late 2012 or in 2013. The Capital Plan is minimal ($9.5M of $13M 10 year CIP is already budgeted for West Side Reservoir and Segment 3b line).

LEGAL REVIEW / COMMENT:
Reviewed by: _____ Date: _____

COMMUNITY INVOLVEMENT PROCESS:
The following community involvement process was conducted:

- Planning Commission Work Session on March 14th and May 9th.
- External technical reviewers include the City of Sherwood, Tualatin Valley Water District, and Veolia Water.
- Open House was held on May 9, 2012
- Public input is being solicited through the City's website.
- City Council Work Session March 19th and scheduled for July 16, 2012
- Articles were published in the Boones Ferry Messenger
- Direct mailing was done to the Chamber and the 30 largest water users in the City.
- City-wide Ballot Measure 56 notice was provided (>4,500 notices)

Following the Ballot Measure 56 notice there were approximately 8 inquiries both by phone, and in person. Citizens generally sought to understand the legalistic language required to be included at the heading of the notice. To date, no specific comments have been provided for the Commission's consideration related to the Master Plan and there appears to be no areas of controversy. Affected external agencies (Metro, TVWD, Veolia, and the City of Sherwood) were also provided the opportunity to review and comment. At the time of preparation of this staff report, specific comments had not been provided.

POTENTIAL IMPACTS or BENEFIT TO THE COMMUNITY (businesses, neighborhoods, protected and other groups):
Not included with this Master Planning effort is a future rate study that could have an effect on future water rates either negative or positive. A current Master Plan provides the City and its customers with important information about the condition of this critical infrastructure segment. A complete snapshot of system needs allows for important Capital Improvement project prioritization and execution. The Water System Master Plan will improve or maintain the level of services as it pertains to the City's water distribution system and extends the planning period to 2030.

ALTERNATIVES:
Utility Master Plans should be updated no later than every 10 years due to rapidly changing conditions in the community. While doing nothing was an alternative, it would not have been in the best interest of the community's healthy welfare or safety.

CITY MANAGER COMMENT:

EXHIBITS:

Exhibit A: Water System Master Plan Final Draft dated June 26, 2012 (included under separate cover)

Exhibit B: CD with Water System Master Plan Final Draft and Appendices dated June 26, 2012.

Exhibit C: Proposed Changes to Existing Comprehensive Plan Policies

Exhibit D: An email dated June 21, 2012, from Sherry Oeser of Metro, regarding Wilsonville Water System Master Plan.

CONCLUSIONARY FINDINGS

STATEWIDE PLANNING GOALS

Statewide Planning Goal #1 - Citizen Involvement (OAR 660-015-0000(1)): *To develop a citizen involvement program that insures the opportunity for citizens to be involved in all phases of the planning process.*

Response: Work sessions were held with both the Planning Commission and City Council. Staff also conducted a public open house. A web page was created specifically for the purpose of collecting comments on the draft Master Plan. The City of Wilsonville has provided notice of public hearings before the Planning Commission consistent with the Planning and Land Development Ordinance requirements. Such notices were posted in the newspaper, and were provided to 4,511 property owners within the City limits, a list of interested agencies, emailed to 7 people, and were posted in three locations throughout the City and on the website. The City has conducted an extensive public involvement process. To date, there has been minimal interest in the Plan and there appears to be no major areas of controversy. At the upcoming public hearing, the public will be afforded an opportunity to provide public testimony to the Planning Commission as part of deliberations on this matter. The City Council will also hold a public hearing on this proposal. **This goal is met.**

Statewide Planning Goal #11 – Public Facilities and Services (OAR 660-015-0000(11)): *It is the purpose of Goal 11 to plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development. Cities are required to develop public facilities plans for their UGBs.*

Response: The development of a Water System Master Plan is consistent with the requirements for a water system under Statewide Planning Goal 11. This update will document the current condition of the water system, predict future demand, and evaluate the cost and timing of necessary operational, maintenance, and capital improvements over the next 20 years. **This goal is met.**

COMPREHENSIVE PLAN

In recognition of Statewide Planning Goals and to provide a framework for development of park and recreation facilities, the following policy and implementation measures have been established:

GOAL 1.1 To encourage and provide means for interested parties to be involved in land use planning processes, on individual cases and City-wide programs and policies.

Policy 1.1.1 The City of Wilsonville shall provide opportunities for a wide range of public involvement in City planning programs and processes.

Response: On March 14, and May 9, 2012 the Planning Commission conducted work sessions on the concepts contained in the proposed Master Plan. On March 19th the City Council conducted a worksession. Public notice of the public hearing was mailed to all property owners in the City via a Ballot 56 notice, as well as to agencies and interested individuals. **The above criteria are supported by the Planning Commission process.**

Implementation Measure 1.1.1.a Provide for early public involvement to address neighborhood or community concerns regarding Comprehensive Plan and Development Code changes. Whenever practical to do so, City staff will provide information for public review while it is still in "draft" form, thereby allowing for community involvement before decisions have been made.

Response: The Planning Commission practice is to conduct a minimum of one work session per legislation agenda item allowing for early involvement into the concepts being proposed. This item has had numerous work sessions. This item was discussed at both the March 14, and May 9, 2012 Planning Commission meetings, the March 19th City Council meeting and a Public Open House that was held on May 9, 2012. Draft versions of the proposed Master Plan have been available in paper and digital form, as well as on the city web site. **This criterion is met.**

Implementation Measure 1.1.1.e Encourage the participation of individuals who meet any of the following criteria:

1. *They reside within the City of Wilsonville.*
2. *They are employers or employees within the City of Wilsonville.*
3. *They own real property within the City of Wilsonville.*
4. *They reside or own property within the City's planning area or Urban Growth Boundary adjacent to Wilsonville.*

Response: Through the work-sessions, public notification and public hearing schedule, the City has encouraged the participation of a wide variety of individuals addressing the groups listed above. **This criterion is met.**

Implementation Measure 1.1.1.f Establish and maintain procedures that will allow any interested parties to supply information.

Response: The established procedures, public notification process and enhanced city web site notifications all allow interested parties to supply information. The City's Citizen Request Module (CRM) provides another venue for citizens to comment on projects. **This criterion is met.**

GOAL 1.2: For Wilsonville to have an interested, informed, and involved citizenry.

Policy 1.2.1 The City of Wilsonville shall provide user-friendly information to assist the public in participating in City planning programs and processes.

Response: Through the work session schedule, public hearing notices, available Planning Commission meeting minutes and staff reports on the city web site, the City has informed and encouraged the participation of a wide variety of individuals. **This criterion is met.**

GOAL 3.1: To assure that good quality public facilities and service s are available with adequate capacity to meet community needs, while also assuring that growth does not exceed the community's commitment to provide adequate facilities and services.

Policy 3.1.1 The City of Wilsonville shall provide public facilities to enhance the health, safety, educational, and recreational aspects of urban living.

Response: The purpose of this Master Plan update is to document current condition and demand of the Water System in order to provide for future growth. The Plan recommends maintaining wells as backup supply for emergencies, additional hydrants and looping in some areas and a new 16" pipeline under the river to Charbonneau. **The plan supports the above criteria.**

Implementation Measure 3.1.1.a The City will continue to prepare and implement master plans for facilities/services, as sub-elements of the City's Comprehensive Plan. Facilities/services will be designed and constructed to help implement the City's Comprehensive Plan.

Response: The City is proposing this Master Plan update in order to carry out and be consistent with the policies of the Comprehensive Plan. One of the biggest challenges the Plan presents is keeping up with growth, addressing deteriorating Charbonneau infrastructure and improving fire-flow in certain areas. **This criterion is satisfied.**

Policy 3.1.5 The City shall continue to develop, operate and maintain a water system, including wells, pumps, reservoirs, transmission mains and a surface water treatment plant capable of serving all urban development within the incorporated City limits, in conformance with federal, state, and regional water quality standards. The City shall also continue to maintain the lines of the distribution system once they have been installed and accepted by the City.

Response: The City has continued to operate and maintain the existing water system consistent with Federal, State and Regional Water quality standards and is working on improving that system by updating the Master Plan. In general, the current condition of the Wilsonville

distribution, treatment and storage infrastructure is very good. No major pressure or volume deficiencies were identified and there are currently no major facility deficiencies. However, a large excess capacity does not exist either, and increased capital and O&M spending will be needed to keep pace with growth in order to avoid future deficiencies. **The Plan supports the above criterion.**

Implementation Measure 3.1.5.a The City shall review and, where necessary, update the Water System Master Plan to conform to the planned land uses shown in the Comprehensive Plan and any subsequent amendments to the Plan.

Response: This proposal is to update the Water System Master Plan, therefore **this criterion is met.**

GENERAL CONCLUSIONARY SUMMARY OF FINDINGS

- The Master Plan is consistent with the Comprehensive Plan goals and policies.
- In general, the current condition of the Wilsonville distribution, treatment, and storage infrastructure is very good.
- Future demand growth is based on actual demand growth from 2000 to 2010.
- Approval of the Master Plan extends the planning period to 2030.
- The City has more than adequate water resources (e.g., water rights) to meet all estimated future demands for a build-out population of 52,400.
- Capital Plan is minimal.
- Biggest concerns are keeping up with growth, addressing deteriorating Charbonneau infrastructure, and improving fire flow in certain areas.
- Plan recommends maintaining wells as backup supply for emergencies.
- Plan recommends additional hydrants and looping in some areas.
- Plan recommends new 16" pipeline under the river to Charbonneau.
- Plan recommends increased O&M costs.
- Rate study will follow the approval of the Master Plan-late 2012 or in 2013.

As is evidenced by the staff report and findings contained herein, the proposal to update the City's Water System Master Plan is consistent with the applicable statewide planning goals and criteria contained in the Comprehensive Plan.

EXHIBITS:

Exhibit A: Water System Master Plan Final Draft dated June 26, 2012 (included under separate cover)

Exhibit B: CD with Water System Master Plan Final Draft and Appendices dated June 26, 2012.

Exhibit C: Proposed Changes to Existing Comprehensive Plan Policies

Exhibit D: An email dated June 21, 2012, from Sherry Oeser of Metro, regarding Wilsonville Water System Master Plan.

PROPOSED CHANGES TO EXISTING POLICIES IN THE COMPREHENISVE PLAN

The proposed changes to the existing Comprehensive Plan are shown in under-lined text. There are no proposed deletions from the existing text.

Policy 3.1.5 The City shall continue to develop, operate and maintain a water system, including wells, pumps, reservoirs, transmission mains and a surface water treatment plant capable of serving all urban development within the incorporated City limits, in conformance with federal, state, and regional water quality standards. The City shall also continue to maintain the lines of the distribution system once they have been installed and accepted by the City.

Implementation Measure 3.1.5.a The City shall review and, where necessary, update the Water System Master Plan to conform to the planned land uses shown in the Comprehensive Plan and any subsequent amendments to the Plan.

Implementation Measure 3.1.5.b All major lines shall be extended in conformance to the line sizes indicated on the Master Plan and, at a minimum, provisions for future system looping shall be made. If the type, scale, and/or location of a proposed development negatively impacts operating pressures or available fire flows to other existing properties or warrants off-site improvements to achieve or maintain minimum pressures or fire flows, the Development Review Board may require completion of looped water lines, off-site facilities, pipelines, and/or facility/pipeline upgrades in conjunction with the development.

Implementation Measure 3.1.5.c Extensions shall be made at the cost of the developer or landowner of the property being served. When a major line is extended that is sized to provide service to lands other than those requiring the initial extension, the City may:

1. Authorize and administer formation of a Local Improvement District to allocate the cost of the line improvements to all properties benefiting from the extension; or
2. Continue to utilize a pay-back system whereby the initial developer may recover an equitable share of the cost of the extension from benefiting property owners/developers as the properties are developed.

Implementation Measure 3.1.5.d. All water lines shall be installed in accordance with the City's urban growth policies and Public Works Standards.

Implementation Measure 3.1.5.e The City shall continue to use its Capital Improvements Program to plan and schedule major water system improvements needed to serve continued development (e.g., additional water treatment plant expansions, transmission mains, wells, pumps and reservoirs).

Policy 3.1.6 The City of Wilsonville shall continue a comprehensive water conservation program to make effective use of the water infrastructure, source water supply and treatment processes.

Implementation Measure 3.1.6.a The City will track system water usage through production metering and service billing records and take appropriate actions to maintain a target annual average unaccounted for water volume of less than 10% of total production.

Implementation Measure 3.1.6.b The City will maintain other programs and activities as necessary to maintain effective conservation throughout the water system.

Policy 3.1.7 The City of Wilsonville shall maintain an accurate user demand profile to account for actual and anticipated demand conditions in order to assure an adequately sized water system.

Implementation Measure 3.1.7.a The City will track system water usage through production metering and service billing records and take appropriate actions to maintain a target annual average unaccounted for water volume of less than 10% of total production.

Implementation Measure 3.1.7.b The City will maintain other programs and activities as necessary to maintain effective conservation throughout the water system.

Policy 3.1.8 The City of Wilsonville shall coordinate distribution system improvements with other CIP projects, such as roads, wastewater, and storm water, to save construction costs and minimize public impacts during construction.

Subject: Wilsonville Water System Master Plan

From: Sherry Oeser [mailto:Sherry.Oeser@oregonmetro.gov]
Sent: Thursday, June 21, 2012 2:30 PM
To: Mende, Eric
Subject: Wilsonville Water System Master Plan

I've reviewed the update of the City's Water System Master Plan and it looks like you've appropriately taken into consideration urban reserve areas in your planning and I have no other comments on the plan.

Sherry Oeser
Principal Regional Planner

Metro
600 NE Grand Ave
Portland, OR 97232-2736
503-797-1721
www.oregonmetro.gov

Metro | Making a great place

King, Sandy

From: King, Sandy
Sent: Wednesday, August 08, 2012 8:45 AM
To: 'Dtessler@theram.com'; 'swallulis@gmail.com'; 'engel1@heavanet.com'
Subject: Public Hearing Notice for Water System Master Plan
Attachments: Water System Master Plan.pdf

The public hearing notice for the Water System Master Plan public hearing is attached. The City Council will hold their hearing on Monday, August 20, 2012 beginning at 7 p.m. in the Council Chambers at City Hall, 29799 SW Town Center Loop East.

If you have questions please do not hesitate to contact me.

Sandra C. King, MMC
City Recorder
City of Wilsonville
503-570-1506

First	Last	Company	Address	City
Dean	Tessler	Ram International	29800 SW Boones Ferry Rd	Wilsonville
Stanley	Wallulis		7725 SW Village Greens Circle	Wilsonville
Cliff	Engel		8180 SW Fairway Dr.	Wilsonville

State	Zip	Email	Comments
OR	97070	Dtessler@theram.com	Signed in at 7/11 PH
OR	97070	swallulis@gmail.com	written & oral testimony submitted for 7/11 PH
OR	97070	engel1@hevanet.com	Testified at 7/11 PH

CITY OF WILSONVILLE
CITY COUNCIL
NOTICE OF PUBLIC HEARING

PUBLIC NOTICE IS HEREBY GIVEN that the Wilsonville City Council will conduct a public hearing on, Monday, August 20, 2012 beginning at 7 p.m. at City Hall, 29799 SW Town Center Loop, Wilsonville, Oregon.

The purpose of this public hearing is to consider public testimony on:

An Update of the City's Water System Master Plan that documents current water demand, evaluates current system deficiencies, estimates future water demands over a 20-year growth horizon, and estimates the capital and operation costs needed to meet these future demands.

Copies may be obtained at a cost of 25 cents per page, at City Hall or by calling the City Recorder at 503-570-1506 and requesting a copy to be mailed to you.

Specific suggestions or questions concerning the proposed ordinance may be directed to Eric Mende, Deputy City Engineer, 503-570-1538. Public testimony, both oral and written will be accepted at the public hearing. Written statements are encouraged and may be submitted to Sandra C. King, MMC, City Recorder, 29799 SW Town Center Loop E, Wilsonville, OR 97070.

Assistive listening devices are available for persons with impaired hearing and can be scheduled for this meeting. The City will endeavor to provide qualified sign language interpreters without cost if requested at least 48 hours prior to the meeting. To obtain such services call the office of the City Recorder at 682-1011.

Published in the Wilsonville Spokesman August 7, and August 14, 2012.

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LAND CONSERVATION
AND DEVELOPMENT

CITY OF WILSONVILLE
29799 SW TOWN CENTER LP E
WILSONVILLE OR 97070

TO:

Plan Amendment Specialist
DLCD
635 Capitol Street, NE, Suite 150
Salem OR 97301-2540