CITY OF ROSEBURG
LONG-RANGE WATER SUPPLY PLAN

Project No. 06WA23

July 2009

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

In Association With:

MWH MONTGOMERY WATSON HARZA

LONG-RANGE WATER SUPPLY PLAN

FOR

CITY OF ROSEBURG, OREGON

JULY 2009

Expires 6/30/2010

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REFERENCES

A. Douglas County Water Resources Management Program, Volumes I and II, July, 1989, Douglas County Department of Public Works
B. "Water System Master Plan and Capital Improvement Plan, City of Roseburg, Oregon", June, 1993, Murray, Smith & Associates, Inc.
C. "Water Treatment Facilities Preliminary Design Report, City of Roseburg, Oregon", July, 2009, Murray, Smith & Associates, Inc.

Introduction and Purpose

The City of Roseburg (City) currently supplies drinking water to more than 28,000 people in a water service area that includes all land within the existing City limits and certain areas outside the City limits, and to the Dixonville Water Association. The purpose of this study and report is to forecast the City's future water demands for the next 50 years, identify the current and future water source alternatives that will meet those demands, and develop an action plan to develop and secure those water sources.

Water Demand Forecast

Forecasts of future water demands are determined based upon the previously developed population forecasts as developed in Section 2 along with the present per capita water use characteristics developed above. Included within these per capita rates are all water uses including residential, commercial, municipal, industrial, institutional and unaccounted-for water. Table ES-1 presents a summary of forecasted population and estimated water demands to the year 2058.

Table ES-1
Water Demand Forecast

Year	Population Forecast	Water Demand (mgd)		
		Average Annual[1]	Maximum Monthly[2]	Maximum Daily[3]
2008	31,057	5.8	10.4	11.7
2013	35,138	6.6	11.8	13.2
2018	39,756	7.5	13.3	14.9
2023	44,980	8.5	15.1	16.9
2028	50,891	9.6	17.0	19.1
2033	56,188	10.6	18.8	21.1
2038	62,036	11.7	20.8	23.3
2043	68,493	12.9	22.9	25.8
2048	75,621	14.2	25.3	28.4
2053	83,492	15.7	28.0	31.4
2058	92,182	17.3	30.9	34.7

Notes:
1. Based on a per capita use of 188 gpcd
2. Based on a per capita use of 335 gpcd and maximum monthly to average annual ratio of 1.78.
3. Based on a per capita use of 376 gpcd and maximum daily to average annual ratio of 2.00.

For the purposes of this study the term "demand" refers to all of the water requirements of the system including residential, commercial, municipal, institutional and industrial as well as un-accounted for water. Demands are discussed in terms of gallons per unit of time such as gallons per day (gpd), million gallons per day (mgd), or gallons per minute (gpm). Demands may also be expressed in gallons per capita per day (gpcd).

City Water Rights and Supply on the North Umpqua River

General

The City obtains its water supply from the North Umpqua River at Winchester just downstream of the Winchester Dam. The raw water supply for the Winchester Water Treatment Plant is withdrawn from the river by an intake on the south bank of the river. The City's three water rights on the river total 31.0 cubic feet per second (cfs) or 20.0 million gallons per day (mgd). Section 4 of this report details and summarizes all of the City's water rights in the North Umpqua River basin.

Opportunities for Acquisition of Water Rights in the North Umpqua River Basin

There is the potential for the City to acquire industrial and irrigation water rights in the North Umpqua Basin to be used for municipal purposes at the Winchester Water Treatment Plant. The water laws of the State of Oregon provide mechanisms for accomplishing such acquisitions. There are certain actions that should be undertaken with respect to the City's water rights on the North Umpqua River at Winchester. Due to the presence of instream water rights, the City cannot obtain from the State of Oregon additional water rights on the North Umpqua River with a high reliability during the peak demand summer period. There may be opportunities for the City to obtain senior water rights from irrigation and industrial users within the North Umpqua Basin using the OWRD's transfer process. A recommended acquisition process approach is presented in Section 4 of this report.

Surface Water Availability on the South Umpqua River

General

The potential for the City to obtain additional water rights on the South Umpqua River at the City is important to determine. The OWRD's Water Availability Report System (WARS) was queried as to the availability of water in the South Umpqua River at its mouth, at the confluence with the Umpqua River and above the confluence with Marsters Creek, which is located approximately two miles south of the City. The City's need for additional water rights is during the peak demand period, typically June through August and potentially into early September. For a municipal water supply system, an exceedance level of approximately 95 percent or more is preferable to assure water supply reliability.

An analysis found that there is no water available at or above the 80 percent exceedance level at the mouth or in the stretch of the South Umpqua River above Marsters Creek between July 1 and November 30. In summary, there is no opportunity for the City to obtain additional run of river water rights with a reasonable degree of reliability on the South Umpqua River at Roseburg during the high demand summer period. Water is available during the non-high demand period and to provide for stored water if a reservoir or reservoirs were constructed within the basin.

Acquisition of Stored Water in Existing Projects

General

There is the potential to acquire stored water in two existing reservoir projects located in the South Umpqua Basin, the Galesville Reservoir and the Ben Irving Reservoir. These two projects are discussed in further detail.

Galesville Reservoir

Douglas County owns and operates the multi-purpose Galesville Dam and Reservoir project on Cow Creek through its Natural Resources Division. Cow Creek is a tributary of the South Umpqua River. Construction of the project was completed in 1986. The project is located east of Azalea and is approximately 8 miles southeast of Canyonville. The project is permitted to store up to a total of 42,225 acre-feet (af).

There is substantial uncommitted stored water currently available in the Galesville Reservoir for municipal use. Currently, only approximately 4 percent of the municipal allocation has been committed. The Tri-City Water District, the Cities of Riddle and Glendale, and several small water associations comprise the current municipal contracted allocation. There is also substantial uncommitted stored water under three other allocation blocks (industrial, irrigation, and multiple purpose) that can be transferred and used for municipal purposes subject to approval of the Douglas County Board of Commissioners. There is no ability to reserve stored water in the reservoir. The potential to acquire rights to the future use of stored water at some payment schedule less than a purchase contract could be explored with the Douglas County Board of Commissioners. There is no ability to purchase an equity position in the reservoir project. Water can only be purchased under the provisions of a contract with the County.

Ben Irving (Berry Creek) Reservoir

There is no municipal water available in this reservoir therefore this reservoir is not a potential water supply resource.

Summary

In summary there is no ability to obtain run of river water rights on the South Umpqua River or other tributaries within the basin with a high reliability during the peak demand summer period. The City could pursue the acquisition of water rights within the basin to develop a new supply. The potential for the City to successfully acquire a sufficient number of water rights in the basin which, in the aggregate, would reliably provide this new supply at reasonable cost and with the outcome certain is doubtful. The purchase of stored water in the Galesville Reservoir project is the preferred source of supply in the basin.

Other Water Source Alternatives

There are potential water source alternatives available to the City after the existing water rights on the North Umpqua River at Winchester are fully used. These potential water sources include acquisition of existing water rights, groundwater development, purchase of stored water in existing projects, and construction of a new storage project or projects including conventional and offline storage. While not technically considered new water sources, the implementation of aquifer storage and recovery (ASR), water recycling and reuse, and additional water conservation can extend the City's existing water supply resource and defer the need to develop an additional source or sources. The potential water source alternatives include:

- Acquisition of additional water rights in the North Umpqua River basin for additional supply at Winchester
- Acquisition of water rights in the South Umpqua River basin for future supply
- Acquisition of water rights to replace existing system demands
- Local area groundwater
- Groundwater augmentation of North Umpqua River
- Purchase of existing storage
- Participation in future storage projects
- Construction of new storage
- Offline storage
- Aquifer storage and recovery (ASR)
- Additional water conservation
- Water recycling and reuse

A detailed discussion of these water source alternatives is presented in Section 7 of this report.

Water Source Development Strategy

General

All of the alternatives presented above were reviewed and evaluated as the City will ultimately use all of its available water rights on the North Umpqua River at Winchester. New sources of water supply are needed as this source reaches its capacity.

A key consideration of a water source development strategy is the City's historic use of the North Umpqua River at Winchester as its source since the early years of the development of the City and development of a community water supply system. After the acquisition of the system in 1977, the City made major investments in upgrading this water supply system with the construction of a new river intake and water treatment plant and transmission mains between the plant and the terminal storage facilities on Reservoir Hill.

The most economical approach to water supply for the City in the future is to maximize the development and use of this source and the existing infrastructure. There are substantial economic benefits to deferring the need to develop an alternative source or sources. This source can serve the City until approximately the year 2030 using all of the City's water rights. There is potential to acquire additional water rights within the North Umpqua River basin which could potentially be used at Winchester, thereby expanding further the capacity of this source.

The acquisition of water rights to replace existing system demands, such as for irrigation of City parks, could reduce demands on the system. The implementation by the City of additional water conservation measures as well as implementation of water recycling and reuse systems will also reduce demands. ASR, development of groundwater, and the use of groundwater for flow augmentation in the North Umpqua River basin may offer promise yet need more study. Successfully completing a few or all of these activities will further extend the time when an additional source or sources of supply are needed. Based on the evaluations completed as part of this study, additional water source capacity will be needed by the City in approximately the year 2030.

Long-Range Water Source Strategy

General

Based upon the evaluation of the City's long-range water demands and the review of the Winchester source and other potential water sources, it is recommended that the City adopt a long-range water source development strategy with three key elements which are discussed as follows.

Maximize the Capacity of the North Umpqua River Source at Winchester

In order to maximize the capacity of the North Umpqua River water supply, the City should continue with the recommended actions with respect to two of its water use permits, immediately seek to acquire additional water rights within the North Umpqua River Basin, undertake a study to assess the potential for groundwater augmentation on the North Umpqua River, and acquire additional land adjacent to the Winchester Water Treatment Plant.

Reduce Water Demands Over Time

Opportunities exist for the City to implement programs and projects that could reduce water demands over time. The City continues to fund its main replacement program to reduce water lost to leakage. Water demand reductions could extend the time when a second source or sources are needed. The identified opportunities to reduce water demands are:

- Implement additional water conservation measures
- Develop non-potable water supplies
- Implement recycling and reuse programs

The details and specific recommendations related to these measures are presented in Section 6 of this report.

Plan for an Additional Source or Sources

The forecasts of maximum daily demand have been completed for a 50-year time horizon to the year 2058. In the year 2058, the forecasted maximum daily water demand is approximately 34.7 mgd. Excluding all of the above-described measures to reduce long-term water demands and assuming full development of the City's existing North Umpqua River water rights, the estimated maximum day supply shortfall in the year 2058 will be approximately 14.7 mgd.

Based upon the findings of this study, the existing water rights on the North Umpqua River (20 mgd) will be fully utilized by the year 2030. Implementation of some or all of the demand-reducing measures could potentially result in significant demand reduction. Even the most optimistic projections, however, would not indicate that demands could be reduced from 34.7 mgd to 20.0 mgd, a reduction of approximately 42 percent, within the 50 year planning horizon. An additional supply source or sources may need to be developed and be in service as early as the year 2030.

The potential for development of local area groundwater, ASR, and groundwater augmentation to the North Umpqua River is not known at this time. There is limited information available upon which to judge the potential viability of these options. It is recommended that a feasibility study be conducted within the next 10 years to provide additional information and guidance as to the potential of these resources. If proved to be feasible, any or all of these options could provide some limited supply during peak demand periods and could allow for deferral of development of a second source or sources of supply. It is not likely that groundwater, ASR, and/or groundwater augmentation to the North Umpqua River could provide sufficient capacity to allow for deferral of a second source or sources beyond the study period. For the purposes of this study and until further information indicates otherwise, it is assumed that these three options will not be part of the City's long-range water supply picture. If any or all of the these options are found to be feasible through additional study and evaluation at a later time, it is recommended that the findings of this long-range plan be updated to reflect the impact upon water supply planning, timing, needs and costs.

No additional sources are identified in the North Umpqua River basin. After reviewing all of the alternatives for a future water source in the South Umpqua River basin, the purchase of stored water in the existing Galesville Reservoir is deemed to be the most advantageous to the City, both on the basis of cost and on the basis of certainty of supply. It is recommended that the City select the Galesville Reservoir as its future second source of supply. A detailed discussion of this option is presented below.

Galesville Reservoir Source Development Plan

Development of the Galesville Reservoir source water supply system for the City would consist of the following elements:

- Acquisition of an OWRD permit to divert winter water (December through April) in the South Umpqua River at the point of diversion.
- Acquisition of stored water from Douglas County in the Galesville Reservoir on Cow Creek, a tributary of the South Umpqua River when winter water is not available (May through November).
- Acquisition of an OWRD water use permit at the point of diversion for the stored water.
- Release of stored water from Galesville Reservoir from May through November and transmission of stored water via Cow Creek and South Umpqua River to the point of diversion.
- Diversion of the released stored water at a new river intake on the South Umpqua River.
- Transmission of the raw water to a treatment facility.
- Treatment of the diverted water.
- Pumping of treated water into the City's system.

A new water supply system can be developed on the South Umpqua River using stored water in the Galesville Reservoir to meet peak season water demands. Off-peak season water demands can likely be met using run-of-river water rights. The current estimated project cost to develop such a supply system at an approximate capacity of 7.0 mgd is $33,230,000 including the finished water transmission main. A detailed plan describing and discussing the plan outlined above is presented in Section 7 of this report. The plant will ultimately require expansion to a capacity of approximately 14.7 mgd at an estimated project cost of $14,795,000.

Recommended Water Source Development Plan

The expansion of the existing Winchester Water Treatment Plant to the amount of the City's existing water rights of 20 mgd is forecast to meet maximum day demands until approximately the year 2030. If no additional water rights can be acquired and transferred to Winchester, then an additional source or sources of water supply will be needed by the year 2030 with a maximum day capacity from the new source or sources of 14.7 mgd by the year 2058, the end of the planning period. This assumes that the forecasted maximum day water demands are not reduced over time with the recommended long-term water demand reduction measures.

The additional supply is recommended to be developed prior by the year 2030 using the Galesville Reservoir as the source of supply. The initial Galesville Reservoir supply system capacity is proposed to be 7.0 mgd. This increment of supply is forecasted to be sufficient until approximately the year 2045. An expansion of this supply by the year 2045 to 14.7 mgd will then meet the forecasted maximum daily demands to the year 2058.

Based upon the prior review of the existing water source and the alternative water sources that are potentially available to supply the City's water system and the recommendations of the Water Treatment Facilities Preliminary Design Report, the following water source development plan recommendations are made:

1. Formally adopt this long-range water supply plan to guide the development of water source capacity for the City to the year 2058.

2. Continue with and complete the recommended water rights actions on the City's existing North Umpqua River water rights at Winchester.

3. Commence discussions with holders of significant pre-1974 industrial and irrigation senior water rights in the North Umpqua River basin with the intent to acquire additional water rights for transfer to the water treatment plant at Winchester.

4. Acquire additional senior North Umpqua River basin water rights from willing sellers if available at reasonable terms.

5. Proceed to acquire the easterly 200 feet of Tax Lot 800 adjacent to and west of the existing Winchester plant to provide space for future expansion of the plant beyond the 18 mgd capacity.

6. Undertake and complete the recommendations of the Water Treatment Facilities Preliminary Design Report which includes the following major items:

    a. Undertake regulatory compliance and other immediate recommended actions at the Winchester Water Treatment Plant.

    b. Proceed immediately to expand the City's existing water treatment plant at Winchester from 12 mgd to 18 mgd capacity in accordance with the Preliminary Design Report for the plant.

7. Update the City's Comprehensive Water Master Plan and Capital Improvement Plan.

8. Undertake and complete a Water Management and Conservation Plan in accordance with Oregon Administrative Rule (OAR) 690, Division 86. (This plan is anticipated to be a requirement of the Oregon Water Resources Department's extension of time approval on the City's Permit No. 44018 at Winchester.)

9. Establish a more extensive water conservation program as needed to comply with the requirements of OAR 690, Division 86 and to achieve additional water conservation and water use efficiencies over time.

10. Consider opportunities on a case-by-case basis for development of non-potable water systems using existing water rights in the South Umpqua River basin to reduce existing demands on the system.

11. Adopt the Galesville Reservoir project as the City's long-range second source of water supply. Proceed with the following actions:

    a. Designate the City-owned site of the abandoned North Roseburg sewage treatment plant adjacent to Stewart Park to be the future site of the proposed South Umpqua River Water Treatment Plant including a river intake.

    b. Apply for a water use permit from OWRD to allow diversion of winter water from the South Umpqua River at the proposed location of the future river intake.

    c. Periodically monitor the stored water purchase activity in the Galesville Reservoir.

    d. Initiate discussions with Douglas County to determine if there is a lower cost option available to the City to obtain stored water at an earlier date.

e. Purchase storage in the reservoir at such time as the second source is to be developed or prior to that time if necessary to assure that sufficient storage volume in the project can be acquired to meet the City's needs.

12. Within 10 years, undertake and complete a feasibility study to assess the potential for development of aquifer storage and recovery (ASR) and local area groundwater as well as groundwater augmentation to the North Umpqua River.

Figure ES-1 presents a graphical summary of estimated peak day water demands to the year 2058 and identifies recommended water source improvements to meet these demands.

Summary of Recommendations and Project Cost Estimates

Table ES-2 presents a summary of the estimated project costs for recommended near-term estimated source development and other related activities. Near-term is defined as being within the next 5 years. Several recommended actions are programmatic in nature and developing project cost estimates depends on variables that are not currently known. These programmatic items are noted. Where property is proposed to be purchased, the County's current assessed valuation is used. More accurate cost estimates are listed for certain actions with definitive scopes and outcomes. Table ES-3 presents a summary of the estimated project costs for recommended long-term source development and other related activities.

Conclusions

This supply plan develops population and water demand forecasts to the year 2058 and presents a recommended plan to systematically develop water supplies adequate to meet the estimated water demand forecasts. A number of alternatives are presented and evaluated as part of this work. A key feature of the water supply recommendations presented in this study is the full development of the City's North Umpqua River source to serve as the City's primary water supply until at least the year 2030. It is further recommended that the City develop an additional water supply source from the Galesville Reservoir in the South Umpqua River basin as the North Umpqua River supply source becomes fully utilized.

Plan Adoption

It is recommended that the City adopt this long-range water supply plan to guide the development of water source capacity for the City to the year 2058.

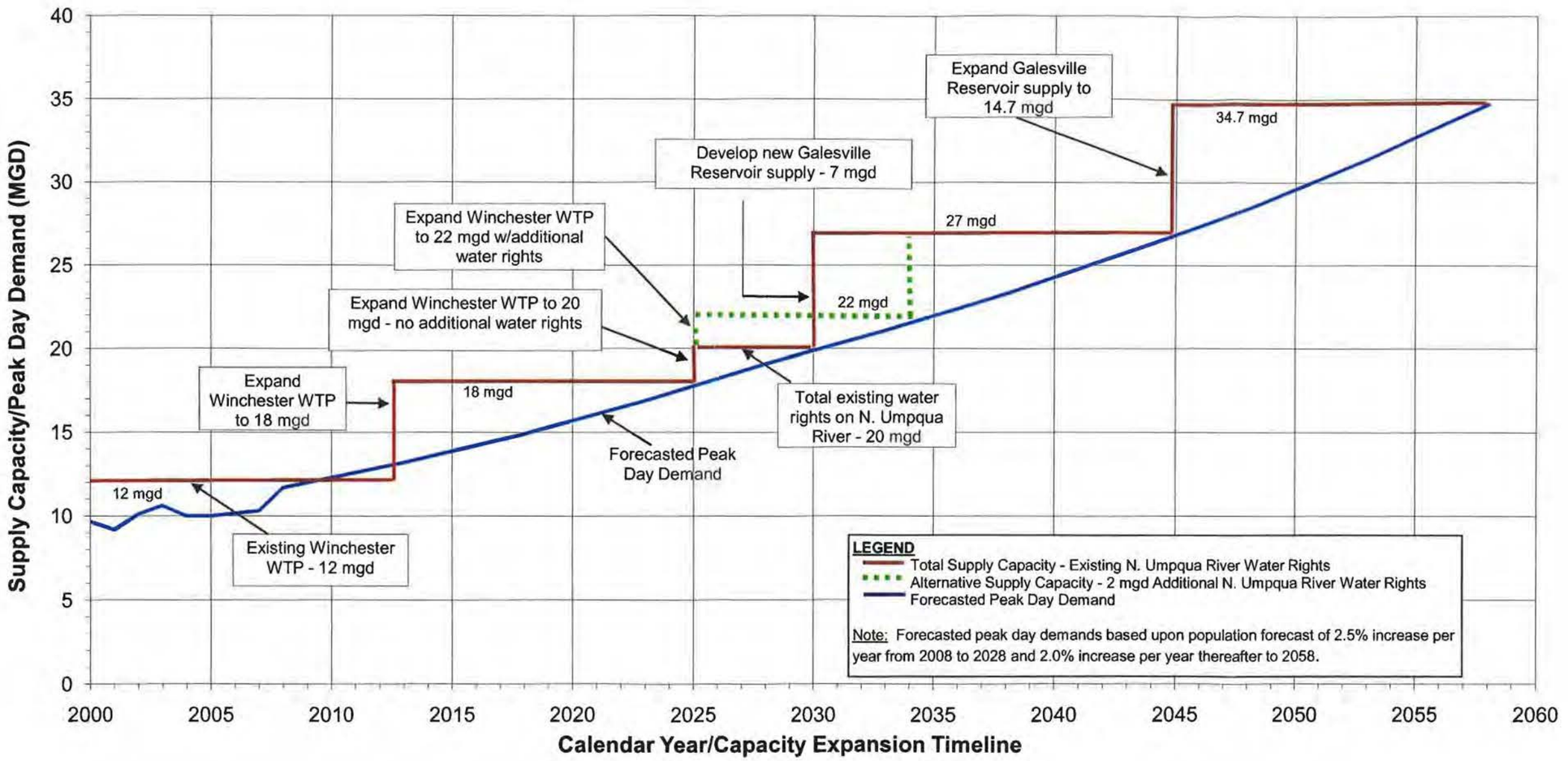
Table ES-2
Project Cost Estimates
Near-Term Water Supply Development Recommendations

Item	Estimated Project Cost, Current $	Implementation Period, years
1. Monitor time extension request for 6 cfs right.	Anticipated to be relatively small.	2009-2010
2. Commence discussions with pre-1974 water rights holders in North Umpqua River basin with intent to acquire North Umpqua River basin water rights.	No estimate. Costs anticipated to be significant.	2009 - 2010
3. Acquire additional senior water rights in North Umpqua River basin.	Costs unknown but will likely be substantial.	2009 - 2011
4. Acquire additional property at Winchester WTP site.	$350,000	2009 - 2010
5. Winchester Water Treatment Plant: a. Undertake regulatory compliance and immediate recommended actions. b. Expand plant to 18 mgd.	 $137,000 $7,600,000	 2009-2010 2009-2012
6. Update Comprehensive Water Master Plan and Capital Improvement Plan.	$119,000	2009
7. Complete a Water Management and Conservation Plan	$35,000	2009-2010
8. Expand water conservation program.	No estimate	Commence in 2009
9. Develop non-potable water systems.	No estimate	As opportunities arise.
10. South Umpqua River Water Supply System: a. Designate City-owned site for future water treatment plant and intake. b. Apply for water use permit for winter water on South Umpqua River. c. Monitor Galesville Reservoir water purchase activity. d. Initiate and complete Douglas County discussions on Galesville Reservoir water purchase terms.	 No cost $7,500 Minimal cost Minimal cost	 2009 2009 Annually 2009-2010

Table ES-3
Project Cost Estimates
Long-Term Water Supply Development Recommendations

Item	Estimated Project Cost, Current $	Implementation Period, years
1. Complete groundwater, ASR, and groundwater augmentation feasibility study.	$60,000	2019
2. Expand Winchester plant from 18 mgd to up to 22 mgd.	$7,700,000	2023-2025
3. Purchase Galesville Reservoir stored water.	$188,000/year	When required.
4. Construct new 7 mgd South Umpqua River Water Treatment Plant.	$33,230,000	2028-2030
5. Construct expansion of South Umpqua River Water Treatment Plant to 14.7 mgd.	$14,795,000	2043-2045

Figure ES-1
City of Roseburg
Water Demand and Water Supply Schedule



Preface

A draft final report was submitted to the City in June, 2008. Prior to adoption of the report, the City corrected the population forecasts to match percentages used in other planning documents to ensure consistency among plans. This resulted in revised water demand forecasts. Murray, Smith & Associates, Inc. (MSA) was authorized to update the prior report to reflect any changes due to these revised population and water demand forecasts. The primary impact of these revisions is to moderately increase the prior forecasted peak day water demands in the latter portion of the 50-year planning period, thereby moderately increasing the initial and ultimate capacity of the recommended future Galesville Reservoir supply system. Most sections of the prior report remain unchanged.

Authorization

In June 2006, the firm of Murray, Smith & Associates, Inc. (MSA) was authorized by the City of Roseburg (City) to undertake and complete this long-range water supply plan for the City's water system.

Purpose

The purpose of this study and report is to forecast the City's future water demands for the next 50 years, identify the current and future water source alternatives that will meet those demands, and develop an action plan to develop and secure those water sources.

Scope

The scope of work for this study includes the following:

- Preparation of long-term forecasts of service area population and water demands.
- Analysis and investigation of water rights in the North Umpqua River basin held by the City and others.
- Development of a water rights strategic plan for the North Umpqua River to maximize this source capacity through the potential acquisition of other rights in the basin.
- Recommendation for the next expansion capacity increment and ultimate capacity of the existing Winchester water treatment plant on the North Umpqua River.
- Determination of the availability and cost of stored water from the Galesville Reservoir project in the South Umpqua Basin.
- Analysis and investigation of water rights in the South Umpqua River basin held by others.

- Development of a water rights strategic plan for the South Umpqua River basin to use the Galesville Reservoir supply and consider the potential acquisition of others rights in the basin.
- Concept development for a second water supply source on the South Umpqua River using Galesville Reservoir water and potentially water rights acquired from others.
- Preparation of conceptual level project cost estimates for development of the South Umpqua River basin water supply system.
- Recommendations for a water supply expansion program from the North Umpqua River and South Umpqua River basins considering existing water rights, the potential to acquire additional water rights, the existing facilities, the expansion costs of the existing facilities, the development costs for a new source or sources, the required implementation schedules for each source, and other factors.
- Recommendations for an implementation program for specific projects, actions and time schedules and estimated project costs for expansion of the North Umpqua River supply system and the South Umpqua River basin source or sources.
- Identification and general description of other potential sources of supply including off-line storage, groundwater, aquifer storage and recovery, and reuse.
- Consideration of conservation as a key element in the long-range water supply plan.
- Preparation of this Long-Range Water Supply Plan which describes and illustrates the results of this study.

Other Report

At the request of the City, a letter report entitled "Conceptual Water Supply Plan, Urban Growth Boundary Area North of North Umpqua River, January 19, 2007" as prepared by Murray, Smith & Associates, Inc., is included in Appendix D. This report provides a conceptual water supply plan if the City were to extend water service to the area within the City's urban growth boundary that is north of the North Umpqua River. This letter report was prepared under a separate agreement between Murray, Smith & Associates, Inc. and the City.

General

This section documents information from various sources on the historical and projected future population within the water service area. These population forecasts are then used as the basis for forecasting future water requirements presented in Section 3.

Water Service Area Population

The current water service area population includes the population within the City of Roseburg city limits, the population in the Dixonville Water Association (DWA) and those served outside of the existing City limits.

Two data sources are used to determine the City's historic and current population, the 2000 census and the Population Research Center (PRC) at Portland State University. The 2000 census indicates that the City's population was 20,017 on April 1, 2000. The 1990 census noted the City's population to be 17,069 on April 1, 1990. The annual growth rate over that 10-year period was approximately 1.63 percent per year.

The PRC annually provides population estimates for cities and counties with the state. Table 2-2 shows the PRC's estimates of the City's population as of July 1 of each of the years following the 2000 census through 2008. The PRC is determined to be the best available information for the current population within the City limits.

As stated above, the City serves the DWA which is outside the City limits. The historic data indicates that the number of residential water services within the DWA has remained relatively constant at approximately 400 units. Based on the City's current planning data for the water service area, it is estimated there are approximately 2.3 persons per dwelling unit resulting in an estimated population within the DWA of approximately 920.

The estimated population of the unincorporated area served water by the City was estimated by examining the year 2000 census data and water system mapping. Census area data is organized geographically by tracts, block groups and blocks. These geographical census areas do not necessarily coincide with the water service area boundaries. Census block groups and blocks within which there is water service from the City were identified and the residential population apportioned to best estimate the year 2000 water service area population within the unincorporated area. Table 2-1 summarizes the results of this analysis. In Table 2-2, the estimated served population outside the City limits is then estimated to increase at the same rate as the population within the City limits between 2000 and 2008, 0.674 percent per year.

Table 2-1
Year 2000 Unincorporated Area
Water Service Area Population Estimate

Census Tract	Block Group	Total Block Group Population	Total Water Service Area Population	Estimated Percent of Block Group in Water Service Area
800	1	2,496	748	30.0
800	2	1,312	381	29.0
800	4	1,180	16	1.4
900	2	847	617	72.8
900	3	2,452	2,166	88.3
900	4	1,581	1,379	87.2
1200	1	2,201	258	11.7
1200	2	1,400	754	53.9
1300	3	1,111	159	14.3
1300	4	1,400	40	2.9
1400	3	1,301	50	3.8
1400	6	792	93	11.7
Totals		18,073	6,661	

Table 2-2
Water Service Area Population Estimate Summary

Year	Population Within City Limits	Estimated DWA Population (400 units at 2.3 persons/unit)	Estimated Served Population Outside City Limits	Total Estimated Water Service Area Population
2000	20,125	920	6,661	27,706
2001	20,200	920	6,706	27,826
2002	20,170	920	6,751	27,841
2003	20,480	920	6,796	28,196
2004	20,530	920	6,842	28,292
2005	20,790	920	6,889	28,599
2006	21,050	920	6,935	28,905
2007	21,255	920	6,982	29,157
2008	21,235	920	7,029	29,184

Relevant City Development Policies

In February 2006, the Roseburg City Council approved a resolution adopting an updated annexation policy. Elements of the annexation policy relevant to this study include the following:

1. The City will be the primary provider of municipal water service and other urban services within the Urban Growth Boundary UGB provided the City can offer these services in an efficient and cost-effective manner.
2. Annexation to the City is to be encouraged where the availability of infrastructure and services allows for the development of urban densities and for unincorporated areas that are now receiving some City services, are urban in character, or are logically served by the City because of geographic factors such as drainage basins, boundaries, or environmental constraints.
3. The City shall not initiate annexations proceedings if it cannot provide a full range of City services including water service within approximately a three-year period.
4. Unincorporated islands are discouraged and the City will initiate annexation proceedings on all existing islands as soon as practical.
5. Property owners located outside the City limits who are now served with City water will be encouraged to initiate annexation proceedings.
6. The City Council directed staff to review and prepare a report on contiguous properties that are eligible to be annexed, particularly those properties currently receiving City water.

In summary, the annexation policy is intended to encourage annexations and to extend City services in a logical and financially sound way to areas within the City's UGB.

In February 2006, the City Council also approved a resolution adopting a UGB policy for the City. The policy is intended to provide guidance as to how the UGB is to be expanded in order to protect the community characteristics valued by City residents and to encourage efficient and economical land use in areas most suitable for development. The policy is also intended to support the City's goal of building a complete community by providing jobs and commerce close to where residents live. The policy provides for the maintenance of a 20-year supply of land for future residential, commercial and industrial development within the UGB as is required by state law. Separately from the adoption of the UGB resolution, the City Council directed staff to initiate a specific UGB study of the Charter Oaks area which is located on the westerly limits of the City.

Population Forecasts

Long-term forecasts of a community's population are essential in determining anticipated long-term water demands and in then identifying, acquiring and developing new water sources to meet those demands. A minimum 50 year planning horizon is considered prudent for developing new water sources.

As the coordinating body under Oregon Revised Statutes, Douglas County has adopted for the City of Roseburg UGB a 20-year population forecast to the year 2028. This forecast is based upon a growth rate of 2.5 percent per year from the year 2000 census to the year 2028. The year 2000 census population is the sum of the Roseburg and Roseburg North CDPs (20,017 and 5,473, respectively, for a total population of 25,490.)

Table 2-3 forecasts the year 2000 census population to the year 2028 at a 2.5 percent increase per year.

Table 2-3
Population Forecast to 2028

Year	Population
2000 (base year)	25,490
2008	31,057
2013	35,138
2018	39,756
2023	44,980
2028	50,891

The year 2008 water service area population as shown in Table 2-2 is estimated to be 29,184. The year 2008 UGB population is shown in Table 2-3 to be 31,057. The difference of approximately 1,875 people is the estimated number of residents within the City's UGB who are not provided with City water. It is assumed that the entire population as shown in Table 2-3 will be served in the near term by the extension of water service to all of the population with the City's UGB.

City staff anticipates that the adopted growth rate of 2.5 percent will be revised in the near future. Preliminary discussions with Douglas County indicate that the proposed growth rate will be lower. However, the City also anticipates increased growth in the near future with UGB expansion and annexations. The City should anticipate the impact of this acceleration and provide for expanded water service capacity as needed for water source, treatment, transmission, and storage and distribution facilities.

City population is forecasted from the year 2028 to the year 2058 to provide an estimated population in the remaining portion of the 50-year horizon. Three growth rates are projected from 2028 to 2058 to provide for a "bracketed" growth projection picture consistent with higher and lower growth scenarios. These growth rates are 1.5, 2.0 and 2.5 percent annually. Table 2-4 shows the populations for each of these three growth rates to the year 2058.

Table 2-4
Population Forecasts – 2028 to 2058

Year	Population at 1.5% Growth Rate	Population at 2.0% Growth Rate	Population at 2.5% Growth Rate
2028	50,891	50,891	50,891
2033	54,824	56,188	57,578
2038	59,061	62,036	65,145
2043	63,626	68,493	73,705
2048	68,543	75,621	83,391
2053	73,840	83,492	94,349
2058	79,547	92,182	106,747

For the purposes of this study, the population forecast from 2028 to 2058 at the 2.0 percent growth rate is adopted. Table 2-5 presents the population forecasts adopted for this study for the 50-year planning horizon from 2008 to 2058.

Table 2-5
Adopted Population Forecast – 2008 to 2058

Year	Population
2008	31,057
2013	35,138
2018	39,756
2023	44,980
2028	50,891
2033	56,188
2038	62,036
2043	68,493
2048	75,621
2053	83,492
2058	92,182

Summary

In this section, the estimated existing population within the City's water service area has been documented and a forecast of City population within the 50-year planning horizon is made.

General

Section 2 presented population forecasts for the City of Roseburg's (City) water service area. This section presents a review and analysis of recent historical water demand characteristics for the service area and develops forecasts of future water demands for the next 50 years to the year 2058. The term "demand" refers to all of the water requirements of the system including residential, commercial, municipal, institutional and industrial as well as un-accounted for water. Demands are discussed in terms of gallons per unit of time such as gallons per day (gpd), million gallons per day (mgd), or gallons per minute (gpm). Demands may also be expressed in gallons per capita per day (gpcd). Unaccounted-for water is the difference between total metered flows into the system from the source of supply and the total metered flows leaving the system.

Past and Present Water Demands

Table 3-1 summarizes the system demand characteristics based upon the plant production records from 2000 through 2008. The table includes all of the system demands within the entire water distribution system and includes the demands of the Dixonville Water Association (DWA) as well as services outside of the City limits. The demands include unaccounted-for water. The table also includes an estimate of the served population for each year from data presented in Section 2.

The total amount of water entering the system is measured and recorded at the Winchester Water Treatment Plant using a propeller-type meter located on the finished water transmission main on the plant site. This meter was installed in 1993 under Phase 4 of the plant replacement project. In 2001, a new raw water magnetic-type flow meter was installed on the raw water discharge pipeline leaving the river intake. This type of meter is more accurate than a propeller meter. Through comparison of the raw water and finished water meters and adjustment for in-plant uses, mostly consisting of filter backwash, the plant operators determined that the finished water meter was under-reading the actual plant finished water production. A detailed analysis of the meter records between 2001 through 2005 confirms that the finished water meter is under-reading in the amount of approximately 6.5 percent. For the purposes of this study, therefore, the historical plant finished water flow records from 2000 through 2008 have been corrected to reflect this meter discrepancy. A chart of historical maximum day water demands dating from 1950 is included in Appendix C.

Table 3-1
Historical System Demand Summary

Calendar Year	Estimated Served Population	Annual Demand (mgd)	Maximum Monthly Demand (mgd)	Maximum Daily Demand (mgd)	Ratios to Average Daily Demand		Per Capita Demand, gpcd		
					Maximum Monthly	Maximum Daily	Average Annual	Maximum Monthly	Maximum Daily
2000	27,706	5.27	8.35	9.67	1.59	1.84	190	301	349
2001	27,826	5.17	7.99	9.18	1.55	1.78	186	287	330
2002	27,841	5.34	8.81	10.10	1.65	1.89	192	316	363
2003	28,196	5.41	9.44	10.62	1.74	1.96	192	335	376
2004	28,292	5.28	8.65	10.01	1.64	1.90	187	306	354
2005	28,599	5.14	9.16	10.01	1.78	1.95	180	320	350
2006	28,905	5.40	8.81	10.32	1.63	1.91	187	305	357
2007	29,157	5.40	8.50	10.31	1.57	1.91	185	292	354
2008	29,184	5.53	9.03	9.72	1.63	1.76	190	309	333

Unaccounted-for Water

Unaccounted-for water is that which leaves the system unmetered. This amount includes water used for fire fighting and training, main flushing and unmetered construction uses, main breaks, leaks, unmetered street flushing, unauthorized usage, improperly registering retail meters, and possible unauthorized or unrecorded connections to the system.

The City's 1993 Water System Master Plan determined that the City's unaccounted-for water amount was 12 percent at that time. The public works department's annual report on the water system for fiscal year 2002-2003 evaluated the water production and sales records for the system over the most recent eight years. The percentage of unaccounted-for water for these years ranged from 8 to 13 percent. The average for the eight years was 9.7 percent. These calculations were made using the data from the under-reading finished water meter at the water treatment plant as discussed above. With the adjustment for the meter discrepancy, the adjusted unaccounted-for water percentages range from 14.5 to 19.5 percent with an average of 16.2 percent.

The City has implemented programs to reduce unaccounted-for water. These include prompt attention to repair of leaks, an annual main replacement program to replace older, potentially leaking substandard mains and services, and a meter repair and replacement program. The City has material standards for the construction and the installation of water mains both in private developments and on City projects that minimize the potential for water loss.

Oregon Administrative Rules, Division 86, Water Management and Conservation Plans, sets a goal of 10 percent or less for unaccounted-for water. If a system exceeds this level, a municipal water supplier is required to commence a regularly scheduled and systematic program to detect leaks in the transmission and distribution system using methods and technologies appropriate to the size and capabilities of the supplier. A level of 10 percent or less is considered to be an indication of a very well constructed, operated and maintained water system. The City's attention to leak repair, main replacement, metering and construction quality have obvious benefits as there has been an apparent decline over time of unaccounted-for water in the system. A comprehensive audit of all water uses such as for hydrant flushing, fire fighting and fire department training, as examples, would identify unmetered but authorized water uses in the system that would further reduce the unaccounted-for water percentage.

The City Water Utility has used a systematic program of leak detection to locate, quantify and repair system leaks. One leak detection technique, sonic leak detection, has been performed for the City by specialty contractors. Major quadrants of the system were tested in 1994, 1995, 1996, and 1998, and the information was used to repair found problems. The results of the tests have concluded that, after leaks were repaired, the distribution system is generally in sound condition. Five times since 1998, sonic leak detection services were used on suspect areas within the City with varied results. It is recommended that the City continue using leak detection services as needed on suspect areas of the system, and to consider a

system-wide leak detection program if periodic system water loss audits reveal adjusted leak rates greater than 10 percent of production.

Water Use by Customer Class

An analysis was made of year 2005 water billing records of the City. Water meters are read and billed bimonthly. There are three customer classes, residential, commercial/industrial, and public. Table 3-2 summarizes the year 2005 annual consumption, average monthly consumption, and estimated highest month consumption.

As shown in Table 3-2, the residential class uses approximately 49 percent of the metered water on an annual basis with the commercial/industrial class comprising 34 percent and the public class using 16.8 percent. As illustrated by the ratios of highest month to average annual consumption, water use in all three classes increases in the summer months with residential use increasing the greatest, commercial /industrial increasing about one-half as much as residential use, and public use remaining relatively constant.

Table 3-2
Year 2005 Water Billing Summary

Consumption	Metered Units (1 unit = 100 cu. ft. = 748 gallons)			
	Residential	Commercial - Industrial[2]	Public	Totals
Annual Consumption	1,177,410	813,796	402,562	2,393,768
Per Capita Consumption	41.2	28.5	14.1	83.8
Percent of Total	49.2	34.0	16.8	100.0
Average Monthly Consumption	98,118	67,816	33,547	199,481
Per Capita Consumption	3.4	2.4	1.2	7.0
Percent of Total	49.2	34.0	16.8	100
Estimated Highest Monthly Consumption[1]	160,267	90,550	35,006	285,823
Per Capita Consumption	5.6	3.2	1.2	10.0
Percent of Total	56.0	31.7	12.3	100
Ratio – Highest Month to Average Annual	1.63	1.33	1.04	--

Notes:
1. Highest monthly average of June and July or August and September bimonthly periods.
2. This class includes multi-family residential meters.
3. 2005 served population of 28,599 used.

Water Demand Forecast

Forecasts of future water demands are determined based upon the previously developed population forecasts as developed in Section 2 along with the present per capita water use characteristics developed above. Included within these per capita rates are all water uses including residential, commercial, municipal, industrial, institutional and unaccounted-for water. Water demands are expressed as a flow rate per person over an average increment of time.

Average annual water demand is used to forecast water quantities on an annual basis and is used to estimate annual revenue or average annual power costs. Maximum monthly demand is used to forecast water quantities on a monthly basis and is used to size the capacities of raw water supply sources, including raw water storage facilities. Maximum daily demand is used to size the capacities of the supply source, treatment plant, and transmission system. Peak hour demand is used to size portions of the distribution system that are closer to the customer and is therefore not normally pertinent to the development. Maximum monthly demand, maximum daily demand, and peak hour demand are often expressed as a factor times average annual demand.

Average per capita water use in the system during the period of 2000 through 2008 ranged from 180 to 192 gpcd. There is not any apparent trend in average per capita water use for this six year period. For the purposes of this study, the average annual per capita demand in the future is assumed to be 188 gpcd, the average over this period.

Maximum monthly per capita demands in the system during the same period ranged from 287 to 335 gpcd. The highest monthly per capita amount was recorded in July of 2003. This was an unseasonably hot month which ended in a five day heat wave, July 27 through July 31, with temperatures ranging from 98 to 105 degrees Fahrenheit. For the purposes of this study, this highest maximum monthly demand over the past six year period of 335 gpcd will be used to forecast maximum monthly demands.

Maximum daily per capita demands in the system during the same period ranged from 330 to 376 gpcd in 2003. The highest demand day, July 28, 2003, occurred during the above-described heat wave. For the purposes of this study, the demand of 376 gpcd will be used to forecast maximum daily demands. Discussions with City staff indicate that the July 2003 event represents the best indication of present maximum daily system demands under extreme high temperature conditions and presents a conservative approach to forecasting maximum daily water demands.

Forecasts of water demands within the 50-year planning period are developed based on the demand characteristics presented above and summarized below in Table 3-3.

Table 3-3
Water Demand Forecast

Year	Population Forecast	Water Demand (mgd)		
		Average Annual[1]	Maximum Monthly[2]	Maximum Daily[3]
2008	31,057	5.8	10.4	11.7
2013	35,138	6.6	11.8	13.2
2018	39,756	7.5	13.3	14.9
2023	44,980	8.5	15.1	16.9
2028	50,891	9.6	17.0	19.1
2033	56,188	10.6	18.8	21.1
2038	62,036	11.7	20.8	23.3
2043	68,493	12.9	22.9	25.8
2048	75,621	14.2	25.3	28.4
2053	83,492	15.7	28.0	31.4
2058	92,182	17.3	30.9	34.7

Notes:
1. Based on a per capita use of 188 gpcd
2. Based on a per capita use of 335 gpcd and maximum monthly to average annual ratio of 1.78.
3. Based on a per capita use of 376 gpcd and maximum daily to average annual ratio of 2.00.

Summary

The City's recent historical water demand characteristics have been documented and a 50-year forecast of water demands developed. Over the next 50 years, the City's peak day water demands are anticipated to increase from approximately 11.7 mgd presently (assuming full water service to all residences and facilities within the UGB) to 34.7 mgd in 2058. The City has made substantial progress in reducing unaccounted-for water. The level is still considered higher than desired and the City should continue its efforts to reduce unaccounted-for water.

General

In this section, the City of Roseburg's existing water rights are reviewed and actions recommended with the respect to these rights. In order to maximize the value of the existing Winchester treatment and transmission facilities, the potential for acquisition of other rights in the basin for transfer to and use at the Winchester Water Treatment Plant is investigated. Finally, a water rights strategic plan is presented which identifies "next steps" to obtaining additional water rights within the North Umpqua River Basin.

City Water Rights

The City obtains its water supply from the North Umpqua River at Winchester just downstream of the Winchester Dam. The raw water supply for the Winchester Water Treatment Plant is withdrawn from the river by an intake on the south bank of the river.

Table 4-1 presents a summary of the City's water rights on the North Umpqua River at the treatment plant location. The table summarizes basic information on the rights including the application, permit and certificate identification numbers as assigned by the Oregon Water Resources Department (OWRD), the priority date, the type of use and status of the right, the water body and river mile at the point of diversion, the permitted withdrawal rate, and comments. Also presented are recommended actions which are further described and discussed below.

The City's three primary rights total 31.0 cubic feet per second (cfs) or 20.0 million gallons per day (mgd). The City also has a secondary or supplemental right on the North Umpqua River whose purpose is to provide water supply to the Roberts Creek Water District and the Winston-Dillard Water District in the event that their primary water supplies are insufficient. This permit is only usable under those conditions and within the service area of the two water districts.

Information on each water right was obtained from City records, from a search of OWRD's records for each water right at the agency's Salem headquarters, and from OWRD's Internet-accessible Water Rights Information System (WRIS). A review and evaluation of information obtained was conducted and observations, comments and recommendations on each right are made as follows:

Water Right No. 1: This water right for 12.0 cfs is in certificate status. No actions are recommended with respect to this certificated right.

Table 4-1
Existing Water Rights Summary
North Umpqua River

REF NO.	APP. NO.	PERMIT NO.	CERTIFICATE NO.	PRIORITY DATE	TYPE	STATUS	DIVERSION LOCATION		PERMITTED WITHDRAWAL RATE			COMMENTS/RECOMMENDED ACTIONS
							WATER BODY	RIVER MILE	CFS	GPM	MGD	
1	24798	19329	45930	6/1/1950	MU	C	North Umpqua River	7.0	12.0	5,386	7.76	This certificate supersedes Certificate No. 24412 so as to correctly describe the place of use. Action: None.
2	31576	24914	84826	5/21/1957	MU	C	North Umpqua River	7.0	13.0	5,835	8.40	Certificate issued September 22, 2008. Action: None.
3	58356	44018		2/22/1979	MU	P	North Umpqua River	7.0	6.0	2,693	3.88	Permit extension granted by OWRD for completion of construction by October 1, 2001, and completion of application of water by October 1, 2001. Application for extension of time to October 1, 2032 for completion of construction and application of water submitted in November 2006. OWRD currently processing application. Action: Monitor extension of time application processing. File a COBU on a portion of or all of right when beneficial use can be demonstrated.
	Totals								**31.0**	**13,914**	**20.0**	
4	55991	41514		5/31/1977	MU	P	North Umpqua River	7.0	3.0	1,346	1.94	Permit is for supplemental water supply to the Winston-Dillard Water District (2.0 cfs) and the Roberts Creek Water District (1.0 cfs) through interties. Place of use under this permit is the service areas of both districts. Permit extension granted by OWRD for completion of construction by October 1, 1998, and completion of application of water by October 1, 1998. Permit assigned to Districts in April 2008 since permit has no value to City. Action: No further actions recommended.

Abbreviations:
MU=Municipal, P=Permit, C=Certificate
CFS=cubic feet per second, GPM=gallons per minute, MGD=million gallons per day

Water Right No. 2: This water right for 13.0 cfs is in certificate status. No actions are recommended with respect to this certificated right.

Water Right No. 3: This water right for 6.0 cfs is in permit status. A permit extension was granted by OWRD for completion of construction and completion of application of the water by October 1, 2001. An application for extension of time to October 1, 2032 for completion of construction and application of water was submitted by the City to OWRD in November 2006. OWRD is currently processing the time extension application. It is recommended that the City monitor the permit extension processing. After the anticipated expansion of the Winchester Water Treatment Plant capacity, it is recommended that the City file a Claim of Beneficial Use for a portion of the permit (minimum 25 percent) up to the entire permitted amount, to the extent that beneficial use can be demonstrated.

This right is junior to the 1974 instream right and is subject to regulation in low water periods. Under regulation to satisfy the 1974 instream flow requirements, use of this water right could potentially be curtailed or denied. The watermaster reports that the North Umpqua River has been regulated once in the past nine years. The watermaster indicates that regulation would typically start in mid-to late August and continue until October or later until river flows increase sufficiently.

A prior reliability analysis performed for the City on the North Umpqua River near Winchester indicates that during the peak demand period of June through August, water availability for this right exceeds 95 percent. For the month of September, the instream right steps up and the reliability of supply is approximately 90 percent. For the month of October, the instream right again steps up and the reliability of supply is approximately 90 percent. The City's peak water demands typically occur in the months of July or August so the chances of being regulated off of the river are relatively low based upon this prior analysis. If there were peak demands in early September, the chances of being regulated off of the river would increase somewhat; however treatment plant records indicate a significant demand reduction between August and September.

There is the potential for this water right to be regulated off of the river under extreme low river flow conditions. The City should be prepared to institute a curtailment program to reduce water demands if such an event should occur.

Water Right No. 4: This water right is for supplemental water supply from the City to the Winston-Dillard Water District (2.0 cfs) and the Roberts Creek Water District (1.0 cfs) in case their primary supplies cannot meet their requirements. The place of use under this permit is the service areas of both districts. A permit extension was granted by OWRD for completion of construction and application of the water to October 1, 1998. The City requested that OWRD assign this permit to the two districts since the permit has no value to City. OWRD confirmed with the City in April 2008 that the assignment had been received and recorded. With the assignment, no further actions are recommended with respect to this permit.

Other Municipal Rights

Within the North Umpqua River Basin, there are four agencies that hold municipal rights, the Cities of Roseburg and Sutherlin, the Umpqua Basin Water Association, and the Glide Water Association. All of the water rights held by these agencies are presently being utilized except one held by the City of Sutherlin. Sutherlin has a 3.0 cfs permit on the North Umpqua River approximately eight miles upstream (River Mile 15.2) of the Winchester Water Treatment Plant. Sutherlin is developing this right in an arrangement with the Umpqua Basin Water Association. There are no apparent opportunities at this time to acquire any water rights from any other municipal users in the basin.

Surface Water Availability

The potential for the City to obtain additional water rights on the North Umpqua River at Winchester is important to determine. The OWRD's Water Availability Report System (WARS) was queried as to the availability of water in the North Umpqua River between its mouth and the confluence with Little River, which is located at approximately river mile 29, approximately 22 miles upstream of Winchester. The system indicates water availability at the 50 percent and 80 percent exceedance levels by month of the year. There is no water available at the 80 percent exceedance level in this stretch of the North Umpqua River between June 1 and December 31. There is water available at the 80 percent exceedance level from January 1 through May 1.

The City's need for additional water rights is during the peak demand period, typically June through August and potentially into early September. For a municipal water supply system, an exceedance level of approximately 95 percent or more is preferable to assure water supply reliability. In summary, there appears to be no opportunity for the City to obtain additional run of river water rights on the North Umpqua River at Winchester during the high demand summer period and with a reasonable degree of reliability. Water is available during the non-high demand period and to provide for stored water if a reservoir or reservoirs were constructed within the basin.

Instream Water Rights

There are instream water rights on the North Umpqua River and several of its tributaries. Table 4-2 summarizes relevant instream water rights held by the OWRD on the lower reaches of the North Umpqua River and on Little River. These instream rights are noted in that they may influence the relative value and reliability of consumptive water rights that could potentially be acquired by the City. Only rights senior to the existing 1974 instream rights are considered to have the degree of reliability sufficient for the City's needs at Winchester.

Table 4-2
North Umpqua River and Little River
Instream Water Rights Summary

Certificate No.	Priority Date	Location or Reach	Streamflow (cfs)								
			Jan - Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North Umpqua River											
59800	10/24/1958	Flow at the confluence with Umpqua River	525	525	525	525	525	525	525	525	525
59939[1]	3/26/1974	From Little River to Umpqua River	800	800	600	600	600	750	800	800	800
81500[1]	1/10/1991	From Little River to Umpqua River	1350	1350	1350	1290	996	982	1190	1350	1350
Little River											
59930	3/26/1974	From Cavitt Creek to North Umpqua River	150	100	60	40	20	20	30[2] / 70[3]	150	150
80815[1]	1/10/1991	From Cavitt Creek to North Umpqua River	255	150	100	51.8	30.2	27.3	42.6	255	255

Notes:
1. The instream flows include flows established by earlier dated instream water rights.
2. Flow rate between October 1 and October 15.
3. Flow rate between October 16 and October 31.

Privately Held Water Rights

A review of all privately held water rights in the North Umpqua Basin exceeding 1.0 cfs was made using the WRIS system. The 1.0 cfs level was established as the minimum rate that would likely be practical and economical to investigate further and to possibly acquire. All categories of privately held water rights were investigated and it was determined that only the agricultural and industrial categories included water rights that would be of sufficient size to be of interest to the City. A significant number of agricultural and industrial water rights were identified in the basin that exceeds the 1.0 cfs level. Tables 4-3 and 4-4 summarize key information on identified rights in each of these categories including the seniority of these rights in relation to the relevant existing instream rights.

Opportunities for Acquisition of Water Rights

There is the potential for the City to acquire industrial and irrigation water rights in the North Umpqua Basin to be used for municipal purposes at the Winchester Water Treatment Plant. The water laws of the State of Oregon provide mechanisms for accomplishing such acquisitions. As shown in Tables 4-3 and 4-4, there are substantial senior industrial and irrigation water rights in the basin that could provide significant additional water rights to the City at Winchester.

Table 4-3
North Umpqua River Basin
Existing Industrial Water Rights Summary

Owner/Contact	Certificate No.	Priority Date	Rate (cfs)	Area (acres)	Purpose	Source River
Evans Products Company	79738	4/2/1951	2.304	--	Maintenance of log pond	North Umpqua
Instream Water Right (OWRD)		10/24/1958				North Umpqua
Roy L. Houck Sons' Corporation	37187	7/22/1964	3.33	--	Production of and washing aggregates	North Umpqua
Instream Water Right (OWRD)		3/26/1974				North Umpqua
WTD Industries, Inc.		12/11/1985	1.0	--	Moisture control for log cold decks; maintenance of fire protection system	North Umpqua
Instream Water Rights (OWRD)		1/10/1991				North Umpqua
Total Industrial Rights – 1.0 CFS or Greater			**6.6**			

Water Right Acquisition Mechanism

The legal mechanism that is applicable under Oregon water law to change or alter water rights is the transfer process as applied to an existing certificated water right. The transfer process must be accomplished if there is a change in any of the following:

- A change in the point of diversion or an alternate point of diversion
- A change in the place of use
- A change in the character of use

The transfer process would be initiated by the owner of the certificated water right who would make application to OWRD using the Department's standard transfer form. The transfer request would then proceed through a technical review and public interest review. Approval by the OWRD of a transfer application would not be assured as it depends upon the outcome of the technical and public interest reviews. If approved, the OWRD would issue a transfer order and cancel the existing certificate. The use of the water in accordance with the terms of the transfer order must be demonstrated within five years. OWRD would then issue a new certificate. Water rights which are in the permit stage are potential acquisition candidates but only if they can be certificated prior to transfer through submittal of a claim of beneficial use and issuance of certificate. Transfers cannot be accomplished on permitted rights.

As noted above, only those certificated rights that are senior to the existing 1974 instream right on the North Umpqua River and its tributaries would be reliable enough to be considered for acquisition. A high reliability is necessary since any acquired rights would be exercised during the peak demand summer period when stream flows are the lowest.

Table 4-4
North Umpqua River Basin
Existing Irrigation Water Rights Summary

Owner/Contact	Certificate No.	Priority Date	Rate (cfs)	Area (acres)	Purpose	Source River/Creek
Lexington Investment Co.	5565	6/17/1921	1.10	89	Irrigation	Fall Creek
Elton V. Jackson	79685	5/10/1950	2.978	240.7	Irrigation	North Umpqua
A.J. Standley	23758	1/31/1951	1.83	148.04	Irrigation	North Umpqua
R.L. Harmon	24223	9/21/1951	1.29	103.5	Irrigation	North Umpqua
Robert Murray	27070	12/14/1954	1.08	86.8	Irrigation	North Umpqua
Peter J. Pon	80522	2/15/1956	0.599	47.73	Irrigation	North Umpqua
Peter J. Pon	81010	2/15/1956	0.589	46.93	Irrigation	North Umpqua
Carlisle G. and Marjorie S. Gilbreath	26968	7/19/1956	1.0	127.2	Irrigation	North Umpqua
R.B. Oliver	68446	12/17/1956	0.92	73.8	Irrigation	North Umpqua
Robert N. Cameron	76261	12/17/1956	0.15	12.1	Irrigation	North Umpqua
Estle L. Paris	35306	1/23/1957	1.20	95.9	Irrigation	Buckhorn Creek and Reservoir
Subtotal Irrigation Rights Prior to 1958			**12.7**			
Instream Water Right (OWRD)		10/24/1958				North Umpqua
Douglas Feldkamp / G.H. Harrell	56199	5/13/1963	1.425	114.14	Irrigation	North Umpqua
G.H. Harrell	57553	5/13/1963	1.408	112.74	Irrigation	North Umpqua
Subtotal Irrigation Rights Between 1958 and 1974			**2.833**			
Instream Water Right (OWRD)		3/26/1974				North Umpqua
Instream Water Right (OWRD)		3/26/1974				Little River
Mark C. Lyman and Mary H. Giddens	80149	8/19/1987	1.01	154.5	Irrigation	North Umpqua
Richard P. Creighton	80168	11/8/1989	1.52	120.4	Irrigation, livestock and domestic	Little River
Long Family Trust		4/17/1990	2.09	166.0	Irrigation, livestock and domestic	North Umpqua
Subtotal Irrigation Rights Between 1974 and 1991			**4.62**			
Instream Water Right (OWRD)		1/10/1991				North Umpqua
Instream Water Right (OWRD)		1/10/1991				Little River
Sonja L. Lindbloom and Carol L. Hamlin		9/25/1991	1.88	150.4	Irrigation	North Umpqua
Total Irrigation Rights – 1.0 CFS or Greater			**22.10**			

Recommended Acquisition Process Approach

The acquisition of a water right is likely to be a time-consuming and potentially expensive process that may not have a successful outcome despite the possible expenditure of substantial funds. The following is a suggested process that the City could undertake in an effort to maximize the potential success of a water rights acquisition program and minimize the program's cost.

It is recommended that the City's water rights acquisition process proceed generally as follows:

1. Meet with representatives of the OWRD to review the City's intents and intended procedures, verify OWRD's submittal and processing requirements, and to establish lines of communications with the Department.
2. Informally contact the owner of each irrigation and industrial certificated water right (generally in the order of highest seniority) to determine the owner's interest in transferring some or all of its rights to the City.
3. Develop a prioritized list of potential acquisition candidates based upon the initial responses of the owners.
4. Perform a detailed investigation of each candidate water right to verify the validity of the certificated water right. The water right must have been used during the last five years or a determination must otherwise be made that the right is not subject to forfeiture. The owner must be able to execute an Evidence of Use Affidavit satisfactory to the OWRD.
5. For those rights that are determined to be valid, enter into negotiations with the owner to determine the compensation and other terms of the acquisition. The compensation to an owner might entail the outright purchase of the property to which the land is attached or simply compensation for an agreement to submit a transfer application.
6. Execute agreements between the water right owners and the City to the extent of the additional total water rights desired to be acquired, the financial capability of the City, and other factors. The agreements should contain appropriate contingencies including the final approval by the OWRD of the transfer, the issuance of a transfer certificate, and the exhaustion of any legal proceedings against the transfer.
7. Proceed with the submittal of the Application for Water Right Transfer and supporting documentation to OWRD for each water right for which agreements have been executed. Monitor the process and respond to OWRD as needed.

Contacts with Existing Water Right Holders

Preliminary contact was made with several water right holders with industrial and irrigation water rights of 1.0 cfs or greater and which are senior to the 1974 instream water rights to assess their interest in the City potentially acquiring their rights. Table 4-5 summarizes the results of these contacts.

Table 4-5
North Umpqua River Basin
Summary of Contacts with Water Rights Owners

Current Owner(s) (Original Certificate Holder)	Cert. No. & Source*	Priority Date	Rate (cfs)	Area (acres)	Purpose	Contact/Comment
Douglas County Forest Products, Inc. (Evans Products Company)	79738	4/2/1951	2.304	--	Maintenance of log pond	Called John Blodgett on 1/18/07. No response.
LTM, Inc., (Tax Lot 300) & Oregon Game Commission (now ODF&W) (Tax Lot 400) (Roy L. Houck Sons' Corporation)	37187	7/22/1964	3.33	--	Production of and washing aggregates	Called Chris Doan at LTM on 1/18/2007 – no response. Called Steve Denney, ODFW SW Region – no interest.
Bean Family LLC – Dianne/Richard Bean and John J. & Kimberly Blodgett (Lexington Investment Co.)	5565 – Fall Creek	6/17/1921	1.10	89	Irrigation	Called Bean Family LLC on 1/18/2007 – no interest. John Blodgett - no response.
Multiple Owners Near Wilbur (Bayliner Marine Corp. et al.) (Elton V. Jackson)	79685	5/10/1950	2.978	240.7	Irrigation	Substantial research required to determine validity of existing right with multiple owners.
Lone Rock Timberland Co./Naralto LLC & Raymond E. & Nancy L. Dube (A.J. Standley)	23758	1/31/1951	1.83	148.04	Irrigation	Called Tim H. at Lone Rock on 1/18/2007 – no interest. Dube parcel too small. No call made.
Donald B. & Elizabeth Harmon, Trustees and Joan Sanstede & Jean C. Bradley, Trustees (R.L. Harmon)	24223	9/21/1951	1.29	103.5	Irrigation	Called Elizabeth Harmon on 1/18/2007 – she may have Donald call back. No contact information for Sanstede.
Andrew Joseph Camozzi III & Beverly Ann Camozzi and Armond R. & Gwen G. Drivon (Robert Murray)	27070	12/14/1954	1.08	86.8	Irrigation	Called Bev Camozzi on 1/18/2007 – possible interest. Drivon not interested.
Peter J. Pon	80522	2/15/1956	0.599	47.73	Irrigation	Subdivided into small parcels. Ownership too distributed. No further action recommended.
Peter J. Pon	81010	2/15/1956	0.589	46.93	Irrigation	Subdivided into small parcels. Ownership too distributed. No further action recommended.
Ethel M. Rose and Gilbert A. Santos, Trustee (Carlisle G. and Marjorie S. Gilbreath)	26968	7/19/1956	1.0	127.2	Irrigation	Called Jim Rose on 1/19/2007.- no interest. Unable to contact Santos.
James R. Wise and Frank A. & Dorothea M. Gross and Carl O. & Lis Ericson, Trustees and Michael D. & Laurel D. Armstrong and Allison C and Toni L. Clough (R.B. Oliver)	68446	12/17/1956	0.92	73.8	Irrigation	Called James Wise on 1/19/2007. Possible interest. No contact information on other owners.
Stanley B. Hendy (deceased) and Scott & Sandra Hendy & Gary Alan Hendy (Estle L. Paris)	35306 – Buckhorn Creek & Reservoir	1/23/1957	1.20	95.9	Irrigation	Called Gary Hendy on 1/19/2007 – no interest.
Multiple owners (Douglas Feldkamp / G.H. Harrell)	56199	5/13/1963	1.425	114.14	Irrigation	Subdivided into approx. 5 acre parcels. Ownership too distributed. No further action recommended.
G.H. Harrell	57553	5/13/1963	1.408	112.74	Irrigation	Unable to locate current water right and ownership information.

Notes:
1. * - North Umpqua River unless noted otherwise.

Summary

There are certain administrative actions that should be undertaken with respect to the City's water rights on the North Umpqua River at Winchester. Due to the presence of instream water rights, the City cannot obtain additional water rights on the North Umpqua River with a high reliability during the peak demand summer period. There may be opportunities for the City to obtain senior water rights from irrigation and industrial users within the North Umpqua Basin using the OWRD's transfer process. A recommended acquisition process approach is presented in this section. The quantity of water rights that may be recommended to be obtained is discussed in Section 7.

General

In this section the potential acquisition of water rights in the South Umpqua River basin is investigated. The availability and estimated cost of stored water in the basin is determined. The storage rights and potentially other acquired rights could provide water for a new water supply system for the City of Roseburg (City). Finally, a water rights strategic plan is prepared which identifies "next steps" to potentially obtaining stored water and other water rights within the South Umpqua River Basin.

Surface Water Availability

The potential for the City to obtain additional water rights on the South Umpqua River at the City is important to determine. The OWRD's Water Availability Report System (WARS) was queried as to the availability of water in the South Umpqua River at its mouth, at the confluence with the Umpqua River and above the confluence with Marsters Creek, which is located approximately two miles south of the City. The system indicates water availability at the 50 percent and 80 percent exceedance levels by month of the year. There is no water available at the 80 percent exceedance level at the mouth or in the stretch of the South Umpqua River above Marsters Creek between July 1 and November 30. There is water available at the 80 percent exceedance level from January 1 through June 30 and from December 1 through December 31.

The City's need for additional water rights is during the peak demand period, typically June through August and potentially into early September. For a municipal water supply system, an exceedance level of approximately 95 percent or more is preferable to assure water supply reliability. In summary, there is no opportunity for the City to obtain additional run of river water rights on the South Umpqua River at Roseburg during the high demand summer period and with a reasonable degree of reliability. Water is available during the non-high demand period and to provide for stored water if a reservoir or reservoirs were constructed within the basin.

Municipal Water Rights

Within the South Umpqua River Basin, there are six agencies that hold municipal certificate rights with flow allocation greater than 1 cfs. These six agencies are: City of Riddle, City of Myrtle Creek, Winston-Dillard Water District, Tri City Water District, City of Glendale and Roberts Creek Water District. Summaries of these water rights, along with the existing water permit rights are listed in Table 5-1. All of these communities are known to be fully using their water rights or intend to do so in the future. It is therefore concluded that there is no opportunity for the City to acquire any of these rights.

Table 5-1
South Umpqua River Basin
Existing Municipal Water Rights Summary

Owner/Contact	Certificate No.	Priority Date	Rate (cfs)	Purpose	Source River/Creek
City of Riddle	1647	4/22/1912	1.0	Municipal supply	Wilson Creek / Russell Creek
City of Myrtle Creek	6073	10/1/1921	1.0	Municipal supply	Harrison Young Branch
City of Myrtle Creek	35212	6/20/1947	3.0	Municipal supply	South Umpqua
City of Riddle	65129	12/11/1947	1.0	Municipal supply	Cow Creek
Winston-Dillard Water District	27637	11/19/1953	1.5	Municipal supply	South Umpqua
Tri City Water District	30263	8/13/1956	1.0	Municipal supply	South Umpqua
City of Glendale	32069	12/30/1959	1.0	Municipal supply	Mill Creek and Mill Creek Reservoir
Roberts Creek Water District	64885	1/26/1973	4.0	Municipal supply	South Umpqua
Total Municipal Certificate Rights			**13.5**		
Owner/Contact	**Permit No.**	**Priority Date**	**Rate (cfs)**	**Purpose**	**Source**
Winston Dillard Water District	S34106	1/23/1969	2.0	Municipal supply	South Umpqua
Tri City Water District	S40699	10/24/1973	3.0	Municipal supply	South Umpqua
City of Canyonville	S43119	10/7/1977	1.0	Municipal supply	Canyon Creek
City of Myrtle Creek	S43121	1/25/1978	1.3368	Municipal supply	A tributary to Harrison Young Brook
City of Riddle	S45405	10/31/1980	3.0	Municipal supply	Cow Creek
City of Myrtle Creek	S52517	12/22/1993	2.23	Municipal supply	Spring 1
Total Municipal Permit Rights			**12.6**		

Instream Water Rights

There are instream water rights on the South Umpqua River and some of its tributaries. Tables 5-2 through 5-4 summarize relevant instream water rights held by the OWRD and the Douglas County Water Resources Survey (DCWRS) on the lower reaches of the South Umpqua River and Cow Creek and on the tributaries. These instream rights are noted in that they may influence the relative value of consumptive water rights that could potentially be acquired by the City. Only rights senior to the existing 1974 instream rights are considered to have the degree of reliability sufficient for the City's needs.

Table 5-2
South Umpqua River and Cow Creek
Instream Water Rights Summary

Cert. No.	Priority Date	Location or Reach	Streamflow (cfs)								
			Jan -Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
South Umpqua River											
59701	10/24/1958	Flow at mouth (confluence with Umpqua River)	60	60	60	60	60	60	60	60	60
59954[1]	3/26/1974	From the mouth to Winston	350	275	225	150	90	90	90[2] / 300[3]	400	350
59955	3/26/1974	From Winston to Cow Creek	350	275	225	120	70	70	90[2] / 250[3]	400	350
59956	3/26/1974	From Cow Creek to Elk Creek	250	180	140	90	60	60	80[2] / 180[3]	300	250
59957	3/26/1974	From Elk Creek to Boulder Creek	180	150	100	80	50	50	50[2] / 100[3]	180	180
59544[1]	11/3/1983	From the mouth to Winston	350	275	225	150	122	122	122[2] / 300[3]	400	350
80821[1]	1/10/1991	From Cow Cr. to Elk Ck.	425	250	168	154	82.5	72.9	110	425	425
Cow Creek											
59699	10/24/1958	Flow at mouth (confluence with South Umpqua)	11	11	11	11	11	11	11	11	11
59910[1]	3/26/1974	From the mouth to Middle Creek	135	100	70	50	20	20	30[2] / 80[3]	150	150
59911	3/26/1974	From Middle Creek to Windy Creek	70	50	35	20	20	20	30[2] / 50[3]	70	70
59912	3/26/1974	From Windy Creek to gaging station south of Galesville Dam	60	40	20	10	10	10	10[2] / 30[3]	60	60
67355[4]	5/6/1981	Cow Creek @ T31S R4W S28	250	250	250	250	250	250	250	250	250
67355[4]	3/8/1983	Cow Creek @ T31S R4W S28	100	100	100	100	100	100	100	100	100
73060[5]	8/21/1990	From Windy Creek to gaging station south of Galesville Dam	0	0	20	10	10	10	10[2] / 30[3]	0	0

Notes:

1. The instream flows include flows established by earlier dated instream water rights.
2. Flow rate between October 1 and October 15.
3. Flow rate between October 16 and October 31.
4. Water right held by Douglas County Water Resources Survey for the purposes of hydroelectric generation and stream temperature control for fish enhancement.
5. Water source is from stored water released from Galesville Reservoir. Flows indicated are total (natural and released) and are not additive to existing Certificate No. 59912.

Table 5-3
Tributaries of South Umpqua River
Instream Water Rights Summary

Cert. No.	Priority Date	Location or Reach	Streamflow (cfs)									
			Jan – Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Deer Creek Tributary to South Umpqua River												
59915	3/26/1974	Flow at the confluence with South Umpqua	30	30	15	10	4	4	4	4^2 / 10^3	30	30
80818[1]	1/10/1991	From South Umpqua to the confluence with North and South Forks	85	58.7	24	10.3	4.5	2.72	2.90	4.8	19.9	85
80820[1]	1/10/1991	Flow in South Fork Deer Creek between Deer Creek and Middle Fork	42	28.1	11.8	4.43	1.86	1.1	1.27	2.2	9.25	42
Lookingglass Creek Tributary to South Umpqua River												
59932	3/26/1974	From South Umpqua to Olalla Creek	90	60	30	15	10	5	5	10^2 / 40^3	90	90
Tenmile Creek Tributary to Lookingglass Creek												
59964	3/26/1974	Flow at the confluence with Lookingglass Creek	40	30	20	10	3	2	2	5^2 / 15^3	30	40
73066[1]	1/10/1991	From Shields Creek to Lookingglass Creek	40	40	17	6.78	2	1.36	1.09	2.14	17.1	45
Boulder Creek Tributary to South Umpqua River												
59897	3/26/1974	Flow at the confluence with South Umpqua	35	35	20	12	5	5	5	10^2 / 20^3	35	35

Notes:
1. The instream flows include flows established by earlier dated instream water rights.
2. Flow rate between October 1 and October 15.
3. Flow rate between October 16 and October 31.

Table 5-4
Tributaries of Cow Creek
Instream Water Rights Summary

Cert. No.	Priority Date	Location or Reach	Streamflow (cfs)									
			Jan – Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Starveout Creek												
59545	3/26/1974	Flow at the confluence with Cow Creek	15	10	8	5	1	1	1	1[1] / 5[2]	15	15
Quines Creek												
59949	3/26/1974	Flow at the confluence with Cow Creek	25	20	15	5	3	3	3	5[1] / 15[2]	25	25
Whitehorse Creek												
59970	3/26/1974	Flow at the confluence with Cow Creek	20	15	10	5	1	1	1	1[1] / 5[2]	15	20

Notes:
1. Flow rate between October 1 and October 15.
2. Flow rate between October 16 and October 31.

Privately Held Water Rights

A review of all privately held water rights in the South Umpqua Basin exceeding 1.0 cfs was made using the WRIS system. The 1.0 cfs level was established as the minimum rate that would likely be practical and economical to investigate further and to ultimately possibly acquire. All categories of privately held water rights were investigated and it was determined that only the industrial and agricultural categories included water rights that would be likely of sufficient size to be of interest to the City. A significant number of industrial and agricultural water rights were identified in the basin that exceed the 1.0 cfs level. Tables 5-5 and 5-6 summarize key information on identified rights in each of these categories including the seniority of these rights in relation to the relevant existing instream rights.

Opportunities for Acquisition of Water Rights

There is the potential for the City to acquire industrial and irrigation water rights in the South Umpqua River Basin to be used for municipal purposes at a new water treatment plant or at the Winchester Water Treatment Plant if the water were pumped to the existing plant site. The water laws of the State of Oregon provide mechanisms for accomplishing such acquisitions. As shown in Tables 5-5 and 5-6, there are substantial senior industrial and irrigation water rights in the basin that could provide significant additional water rights to the City.

Table 5-5
South Umpqua River Basin
Existing Industrial Water Rights Summary

Owner/Contact	Certificate No.	Priority Date	Rate (cfs)	Purpose	Source
Superior Lumber Company	79632	5/10/1898	6.145	Saw mill and domestic	Bear Creek, Woods Creek, North Fork Windy Creek and Windy Creek
C.F. Swigert	9675	12/31/1908	1.0	Saw mill and logging	Susan Creek
Youngs Bay Lumber Co., Inc.	14801	10/4/1943	1.5	Manufacturing (mill pond)	Deer Creek
Roseburg Lumber Co.	52974	7/23/1945	1.56	Wood products manufacturing including log storage	South Umpqua
Rick Schiller / Schiller Enterprises, Inc.	82026	5/21/1946	1.0	General mill use	Deer Creek
Keystone Lumber Co. / R.E. Patez	20897	9/16/1946	1.30	Log pond	South Umpqua
Roseburg Forest Products	76587	8/9/1950	1.51	Manufacturing (log pond, boiler plant and fire protection)	Cow Creek and reservoir
Hanna Nickel Smelting Co. / E.S. Mollard	24238	11/28/1951	3.4	Milling & smelting operation, domestic and fire protection system	Cow Creek
Hanna Nickel Smelting Co.	48232	4/30/1952	3.4	Milling & smelting operation, domestic and fire protection system	Rail Creek / Rail Gulch
Roseburg Sand and Gravel Co.	23826	7/6/1956	1.33	Gravel plant operation	South Umpqua
Subtotal Industrial Rights Prior to 1958			**22.1**		
Instream Water Rights by OWRD		*10/24/1958*			*South Umpqua*
Instream Water Rights by OWRD		*10/24/1958*			*Cow Creek*
Roseburg Lumber Co.	34980	11/12/1963	2.0	Industrial use including fire protection	South Umpqua
Douglas Veneer Co. c/o J.E. Snodgrass	33593	11/18/1963	1.0	Manufacturing (veneer plant operation)	North Fork Deer Creek and reservoir
Gerald & Anna Lu Rannells	67735	1/14/1965	1.0	Washing quartz and silica	South Umpqua

Owner/Contact	Certificate No.	Priority Date	Rate (cfs)	Purpose	Source
Roseburg Lumber Co.	37703	4/27/1967	3.0	Industrial and fire protection	South Umpqua
Subtotal Industrial Rights Between 1958 and 1974			**7.0**		
Instream Water Rights by OWRD		*3/26/1974*			*South Umpqua*
Instream Water Rights by OWRD		*3/26/1974*			*Cow Creek*
Instream Water Rights by OWRD		*3/26/1974*			*Deer Creek*
Instream Water Rights by DCWRS		*5/6/1981*			*Cow Creek*
Instream Water Rights by DCWRS		*3/8/1983*			*Cow Creek*
Instream Water Rights by OWRD		*1/10/1991*			*North Fork Deer Creek*
Total Industrial Certificate Rights – 1.0 CFS or Greater			**29.1**		

Owner/Contact	Permit No.	Priority Date	Rate (cfs)	Purpose	Source
Roseburg Forest Products / Dillard Lumber Co.	S16335	5/16/1945	1.34	Log pond	South Umpqua
Instream Water Rights by OWRD		*10/24/1958*			*South Umpqua*
Instream Water Rights by OWRD		*10/24/1958*			*Cow Creek*
Instream Water Rights by OWRD		*3/26/1974*			*South Umpqua*
Instream Water Rights by OWRD		*3/26/1974*			*Cow Creek*
Instream Water Rights by DCWRS		*5/6/1981*			*Cow Creek*
Instream Water Rights by DCWRS		*3/8/1983*			*Cow Creek*
Instream Water Rights by OWRD		*11/3/1983*			*South Umpqua*
Douglas County Water Resources Survey	S49934	12/1/1986	1.2	Industrial	Cow Creek
Douglas County Water Resources Survey	S50868	11/24/1987	1.1	Road maintenance and industrial use	Cow Creek and Galesville Reservoir
Instream Water Rights by OWRD		*8/21/1990*			*Cow Creek*
Instream Water Rights by OWRD		*1/10/1991*			*South Umpqua*
Total Industrial Permit Rights – 1.0 CFS or Greater			**3.6**		

Table 5-6
South Umpqua River Basin
Existing Irrigation Water Rights Summary

Owner/Contact	Certificate No.	Priority Date	Rate (cfs)	Area (acre)	Purpose	Source
B.F. Nichols	9658	12/31/1898	**1.08**	14.7	Power Development and Irrigation	Nichols Creek
C.O. Garrett	9624	9/30/1901	**1**	70.3	Irrigation	Cow Creek
John, George, Louie, Barney, Garrett and Wm. Oldenberg / Rena Vandermullen	9659	9/30/1907	**1.03**	72	Irrigation, domestic and livestock	Cow Creek
J.A. Warren	9684	9/30/1907	**1**	70	Irrigation, domestic and livestock	Cow Creek
Estate of C.E. Johns	9642	9/30/1907	**0.99**	69.92	Irrigation	Cow Creek
T.C. and A.E. Johns / Dale Johns	9646	9/30/1907	**0.94**	65.5	Irrigation	Cow Creek
Azelia River Ranch / C.R. Thomas	3201	12/22/1909	**2.56**	205	Irrigation	Cow Creek
Louis F. Anderson	50332	7/21/1911	**1.34**	107.2	Irrigation	Cow Creek
South Side Ditch Company / William G. Bare	36138	8/20/1917	**1.59**	127.0	Irrigation	Cow Creek
J.L. Clough	80544	10/28/1919	**2.375**	190.0	Irrigation	South Umpqua
Herman Oden / Sam Whitsett	4901	11/17/1919	**1.5**	130	Irrigation	South Fork Deer Creek
Mrs. F.A. Moan	39246	12/29/1924	**1.0**	80.0	Irrigation and domestic	Louis Creek
John J. Rathkey	11187	3/22/1926	**5.19**	15	Power Development and Irrigation	Tenmile Creek
J.H. Booth	73635	8/20/1926	**1.05**	83.8	Irrigation	South Umpqua
Fred E. and T.A. Verry	9504	8/15/1928	**2.0**	128	Domestic and Irrigation	Rail Creek / Rail Gulch
E.R. Kenny	51726	11/8/1930	**1.25**	85.0	Irrigation	South Umpqua
C.E. Marks	12377	8/15/1934	**1.04**	82.2	Irrigation	South Umpqua
Fred Wollenberg, C/O Mrs. N.W. Baum	20585	10/25/1935	**1.22**	85.4	Irrigation	Cow Creek
Milo Academy, Inc.	23986	9/10/1946	**1.38**	110.4	Irrigation	South Umpqua
Lawrence Michaels	23441	10/28/1949	**1.53**	122.3	Irrigation	South Umpqua
Willis E. or Dora Mae Campbell	72460	5/12/1952	**1.20**	94.9	Irrigation and domestic	South Umpqua and unnamed stream
Wm. P. Weaver	29340	3/25/1953	**1.68**	134.5	Irrigation	South Umpqua
J. Ira McNutt	28556	9/2/1954	**3.21**	256.7	Irrigation	South Umpqua

Owner/Contact	Certificate No.	Priority Date	Rate (cfs)	Area (acre)	Purpose	Source
E.P. and Oran Standley	22257	1/16/1956	**1.28**	102.4	Irrigation	South Umpqua
Subtotal Irrigation Rights Prior to 1958			**38**			
Instream Water Rights by OWRD		*10/24/1958*				*South Umpqua*
Instream Water Rights by OWRD		*10/24/1958*				*Cow Creek*
Morgan & Engle, Inc.	49239	4/18/1962	**1.10**	106.7	Irrigation	South Umpqua
Jack Anderson	37188	7/1/1964	**1.22**	102.9	Irrigation	South Umpqua
Green Valley Farms	37096	7/26/1965	**1.26**	153.8	Irrigation	South Umpqua
Donald B. Kruse / H.B. Kruse	38691	4/11/1967	**1.19**	94.8	Irrigation	Lookingglass Creek
Green Valley Farms	46661	12/27/1968	**1.35**	108.0	Irrigation	South Umpqua
Christensen Brothers	44285	5/17/1971	**1.25**	100.0	Irrigation	South Umpqua
Donald W. Lilja	51758	3/30/1973	**1.29**	103.5	Irrigation	South Umpqua
Dean A. and Margaret R. Brookey	54389	8/27/1973	**1.11**	89.1	Irrigation	South Umpqua
Subtotal Irrigation Rights Between 1958 and 1974			**9.77**			
Instream Water Rights by OWRD		*3/26/1974*				*South Umpqua*
Instream Water Rights by OWRD		*3/26/1974*				*Cow Creek*
Instream Water Rights by OWRD		*3/26/1974*				*Lookingglass Creek*
Instream Water Rights by OWRD		*3/26/1974*				*Tenmile Creek*
Instream Water Rights by OWRD		*3/26/1974*				*Deer Creek*
Ronald A. Moore / Joseph L. & Evelyn Sonka	75905	4/28/1978	**1.98**	158.3	Irrigation	South Umpqua
Estate of Kenneth P. Kokos / TK Ranch / Jean Kokos	54811	11/14/1978	**1.4**	128.1	Irrigation	South Umpqua
Morgan & Engle, Inc.	67517	12/14/1979	**1.68**	134.3	Irrigation	South Umpqua
Subtotal Irrigation Rights Between 1974 and 1981			**5.1**			
Instream Water Rights by DCWRS		*5/6/1981*				*Cow Creek*
Instream Water Rights by DCWRS		*3/8/1983*				*Cow Creek*
Instream Water Rights by OWRD		*11/3/1983*				*South Umpqua*
Instream Water Rights by OWRD		*8/21/1990*				*Cow Creek*
Instream Water Rights by OWRD		*1/10/1991*				*South Umpqua*
Instream Water Rights by OWRD		*1/10/1991*				*South Fork Deer Creek*
Instream Water Rights by OWRD		*1/10/1991*				*Tenmile Creek*
Total Irrigation Certificate Rights – 1.0 CFS or Greater			**53**			
Instream Water Rights by OWRD		*10/24/1958*				*South Umpqua*

Owner/Contact	Certificate No.	Priority Date	Rate (cfs)	Area (acre)	Purpose	Source
Instream Water Rights by OWRD		*10/24/1958*				*Cow Creek*
Instream Water Rights by OWRD		*3/26/1974*				*South Umpqua*
Instream Water Rights by OWRD		*3/26/1974*				*Cow Creek*
Robert & Helen Sanclemente / Green Valley Farms	S42819	12/16/1977	**1.16**	101.7	Irrigation	South Umpqua
Marvin Ginsburg / H. Gus Underhofler / Champion International Corp.	S45400	10/14/1980	**1.53**	107.0	Irrigation	Cow Creek
Instream Water Rights by DCWRS		*5/6/1981*				*Cow Creek*
Hayden L. & Roi Jean Laurance	S45965	5/31/1981	**1.19**	95.4	Irrigation	South Umpqua
Instream Water Rights by DCWRS		*3/8/1983*				*Cow Creek*
Instream Water Rights by OWRD		*11/3/1983*				*South Umpqua*
Instream Water Rights by OWRD		*8/21/1990*				*Cow Creek*
Instream Water Rights by OWRD		*1/10/1991*				*South Umpqua*
Wayne Parker	S53193	5/3/1996	**1.0**	80.0	Irrigation	South Umpqua
Total Irrigation Permit Rights – 1.0 CFS or Greater			**4.9**			

As noted above, only those certificated rights that are senior to the existing 1974 instream rights on the South Umpqua River and its tributaries would be reliable enough to be considered for acquisition. A high reliability is necessary since any acquired rights would be exercised during the peak demand summer period when stream flows are the lowest.

Water Right Acquisition Mechanism

The legal mechanism that is applicable under Oregon water law to change or alter water rights is the transfer process as applied to an existing certificated water right. The transfer process must be accomplished if there is a change in any of the following:

- A change in the point of diversion or an alternate point of diversion
- A change in the place of use
- A change in the character of use

The transfer process would be initiated by the owner of the certificated water right who would make application to OWRD using the Department's standard transfer form. The transfer request would then proceed through a technical review and public interest review. Approval by the OWRD of a transfer application would not be assured as it depends upon the outcome of the technical and public interest reviews. If approved, the OWRD would issue a transfer order and cancel the existing certificate. The use of the water in accordance with the terms of the transfer order must be demonstrated within five years. OWRD would then issue a new certificate. Water rights which are in the permit stage are potential acquisition

candidates but only if they can be certificated prior to transfer through submittal of a claim of beneficial use and issuance of certificate. Transfers cannot be accomplished on permitted rights.

Recommended Acquisition Process Approach

The acquisition of a water right is likely to be a time-consuming and potentially expensive process that may not have a successful outcome despite the possible expenditure of substantial funds. The following is a suggested process that the City could undertake in an effort to maximize the potential success of a water rights acquisition program and minimize the program's cost.

It is recommended that the City's water rights acquisition process proceed generally as follows:

1. Meet with representatives of the OWRD to review the City's intents and intended procedures, verify OWRD's submittal and processing requirements, and to establish lines of communications with the Department.
2. Informally contact the owner of each irrigation and industrial certificated water right (generally in the order of highest seniority) to determine the owner's interest in transferring some or all of its rights to the City.
3. Develop a prioritized list of potential acquisition candidates based upon the initial responses of the owners.
4. Perform a detailed investigation of each candidate water right to verify the validity of the certificated water right. The water right must have been used during the last five years or a determination must otherwise be made that the right is not subject to forfeiture. The owner must be able to execute an Evidence of Use Affidavit satisfactory to the OWRD.
5. For those rights that are determined to be valid, enter into negotiations with the owner to determine the compensation and other terms of the acquisition. The compensation to an owner might entail the outright purchase of the property to which the land is attached or simply compensation for an agreement to submit a transfer application.
6. Execute agreements between the water right owners and the City to the extent of the additional total water rights desired to be acquired, the financial capability of the City, and other factors. The agreements should contain appropriate contingencies including the final approval by the OWRD of the transfer, the issuance of a transfer certificate, and the exhaustion of any legal proceedings against the transfer.
7. Proceed with the submittal of the Application for Water Right Transfer and supporting documentation to OWRD for each water right for which agreements have been executed. Monitor the process and respond to OWRD as needed.

Acquisition of Stored Water in Existing Projects

General

There is the potential to acquire stored water in two existing reservoir projects located in the South Umpqua Basin, the Galesville Reservoir and the Ben Irving Reservoir. These two projects are discussed in further detail.

Galesville Reservoir

Douglas County owns and operates the multi-purpose Galesville Dam and Reservoir project on Cow Creek through its Natural Resources Division. Cow Creek is a tributary of the South Umpqua River. Construction of the project was completed in 1986. The project is located east of Azalea and is approximately 8 miles southeast of Canyonville. The project is permitted to store up to a total of 42,225 acre-feet (af). The storage allocation, the amount of each allocation that is committed, and the remaining available storage is summarized in Table 5-7. This data is current as of November 8, 2005.

Table 5-7
Galesville Reservoir Storage Allocation Summary

Allocation (Block) Description	Total Storage, af	Committed Storage, af	Available Storage, af
Municipal	4,450	185	4,265
Fish Enhancement	4,000	4,000	0
Industrial	2,400	1,024	1,376
Irrigation	10,951	3,099	7,852
Recreation	16,424	16,424	0
Multiple Purpose	4,000	0	4,000
Totals	42,225	24,732	17,493

There is substantial uncommitted stored water currently available in the Galesville Reservoir for municipal use. Currently, only approximately 4 percent of the municipal allocation has been committed. The Tri-City Water District, the Cities of Riddle and Glendale, and several small water associations comprise the current municipal contracted allocation. There is also substantial uncommitted stored water under three other allocation blocks (industrial, irrigation, and multiple purpose) that can be transferred and used for municipal purposes subject to approval of the Douglas County Board of Commissioners. There is no ability to reserve stored water in the reservoir. The potential to acquire rights to the future use of stored water at some payment schedule less than a purchase contract could be explored with the Douglas County Board of Commissioners. There is no ability to purchase an equity position in the reservoir project. Water can only be purchased under the provisions of a contract with the County.

Stored water can be acquired through execution of an agreement for purchase of water with Douglas County. A copy of the agreement form is included in the Appendix. The agreement has an initial 10-year term with provisions for five successive 10-year period extensions for a total of 60 years. The County manages all permitting related to the stored water in the reservoir. The water purchaser must obtain a water use permit for the water diverted from the river or stream. The annual cost of the water is adjusted every ten years as part of the renewal process. Historically, the water cost has increased approximately 10 percent upon renewal. The annual cost must be paid whether or not the purchaser uses any of the stored water. The County agrees to deliver the contracted amount to the point of diversion and increases the releases at the reservoir for transmission losses. County staff assumes transmission losses of approximately 7 percent in the operation of the project. The hydrologic reliability of storage in the reservoir could not be determined from available information.

The current purchase cost of water as revised on July 11, 2005, is shown in Table 5-8.

Table 5-8
Galesville Reservoir Municipal Storage
Annual Water Purchase Cost Summary

Storage Volume, af	Annual Cost
Minimum of 5 af	$385.00
5 – 10 af	$385 + $71/af over 5 af
10 – 100 af	$742.50 + $66/af over 10 af
Over 100 af	$6,682.50 + $60.50/af over 100 af

Ben Irving (Berry Creek) Reservoir

There is no municipal water available in this reservoir therefore this reservoir is not a potential water supply resource.

Summary

There is no ability to obtain run of river water rights on the South Umpqua River or other tributaries within the basin with a high reliability during the peak demand summer period. The City could pursue the acquisition of water rights within the basin to develop a new supply. The potential for the City to successfully acquire a sufficient number of water rights in the basin which, in the aggregate, would reliably provide this new supply at reasonable cost and with the outcome certain is doubtful. The purchase of stored water in the Galesville Reservoir project is the preferred source of supply in the basin.

SECTION 6
ALTERNATIVE WATER SOURCES

General

This section presents a review of the potential water source alternatives available to the City after the existing water rights on the North Umpqua River at Winchester are fully used. These potential water sources include acquisition of existing water rights, groundwater development, purchase of stored water in existing projects, and construction of a new storage project or projects including conventional and offline storage. While not technically considered new water sources, the implementation of aquifer storage and recovery (ASR), water recycling and reuse, and additional water conservation can extend the City's existing water supply resource and defer the need to develop an additional source or sources.

Acquisition of Additional Water Rights in the North Umpqua River Basin for Additional Supply at Winchester

As described in the prior sections, the North Umpqua River has been the City's water source since a water supply system was developed to serve the City. The City has 20 mgd of water rights on the river. There appear to be opportunities to potentially acquire additional water rights within the basin that could be transferred to the Winchester Water Treatment Plant site. Acquisition of additional water rights could allow further expansion and use of the existing infrastructure, including the water treatment and the transmission facilities, to provide additional increments of water supply. Acquisition of rights senior to the existing 1974 instream rights in the basin could reduce the City's vulnerability to the regulation of its 6 cfs right that is junior to the 1974 instream right.

Acquisition of Water Rights in the South Umpqua River Basin for Future Supply

Other than the acquisition of stored water in existing projects, which is discussed later in this section, the practical opportunities for development of additional water supply in the South Umpqua River basin should be considered to be limited. While acquisition of existing water rights in the basin sufficient to meet long-term needs is theoretically possible, the practical ability to aggregate sufficient water rights for the City's needs would likely prove to be very difficult and costly.

Acquisition of Water Rights to Replace Existing System Demands

Water rights could potentially be acquired on existing waterways and non-potable water systems developed to replace existing water demands on the City's system. There are a number of non-potable water uses that could potentially be removed from the City's system. These include such uses as irrigation, industrial processes and other non-potable water uses. The City could actively seek to acquire such rights. The City has been approached on at least one occasion with an offer to sell water under such a right or to sell the water right itself that

could be used for such purposes. The opportunities for such arrangements or acquisitions may be limited due to the limited number of water rights senior to instream rights and the lack of water availability during peak water demand months for rights junior to instream rights.

Local Area Groundwater

The aquifer in the area of the North Umpqua Basin north of the City and west of the mouth of Little River is identified by the U.S. Geological Survey (USGS) as the Marine Sedimentary aquifer unit, comprised of Tertiary rocks. This aquifer has generally low permeability and recharge with well yields being generally less than 20 gpm. The aquifer in the area of the lower end of the South Umpqua Basin is similarly identified by the USGS as the same aquifer unit with similar low permeability and recharge characteristics.

A preliminary review of well logs in the area indicates that there are wells with yields of up to approximately 300 gpm. A groundwater feasibility study is recommended to be completed to assess the potential for groundwater development within the Roseburg area and if it should be considered further as a potential water supply source for the City. This study can be accomplished along with a feasibility study for aquifer storage and recovery (ASR) as is discussed below.

Groundwater Augmentation of North Umpqua River

A groundwater supply could potentially be developed upstream of Winchester within the North Umpqua River basin and conceivably very high in the basin. The supply would then be discharged to a lake or the river or a tributary of the river. The water could then be diverted at Winchester for treatment. The potential feasibility of a groundwater augmentation system on the North Umpqua River for use as additional supply at Winchester will need further study. This study can be accomplished along with the local area groundwater study for the immediate area of the City and the ASR study.

Purchase of Existing Storage

The only existing water project from which municipal water can be purchased at this time is the Galesville Reservoir project. This project currently has substantial available water that the City can purchase through a contract.

Participation in Future Storage Projects

Douglas County's Water Resources Management Program identifies several future dam and reservoir projects from which the City could obtain municipal water supply. Two of the proposed projects, the Deer Creek project and the Deer Butte project, are multipurpose projects which include municipal water storage.

The Deer Creek project would have a storage reservoir of approximately 12,000 af. Deer Creek flows through the City and is tributary to the South Umpqua River. The Deer Butte project would have a storage reservoir of approximately 40,000 af. The project would be located on Elk Creek, a tributary to the South Umpqua River.

Neither of these projects is proceeding at this time. There could be other as yet unidentified projects that could be developed in the future that could provide municipal supply also. The evaluation of the City's potential participation on either of these above-described projects or in other projects will depend upon the project details which require further study and development. For the purposes of this report, it is assumed that these future storage projects will not be accomplished within the time frame of this study.

Construction of New Storage

The City could consider constructing new storage within the North or South Umpqua River basins in order to develop a future supply. The present worth value of the cost of purchased water from the Galesville Reservoir can be compared to the current estimated costs of constructing a new reservoir and dam. A present worth analysis is performed based upon the following assumptions:

- Estimated annual average cost of purchase of stored water in the Galesville Reservoir of $61.00 per af
- A 60-year analysis period consistent with the maximum Galesville purchase contract period
- A discount rate of 4 percent approximating the current cost of municipal bonded debt
- A present worth factor of 22.623 (4 percent over 60 years)
- Inflation is ignored

Based upon the above assumptions, the present worth value of the purchased Galesville water is approximately $1,380 per af. This value can be contrasted to the observed cost range of dam and reservoir projects that have been recently completed or which are presently being planned, designed or constructed. Dam and reservoir projects will vary widely in cost depending upon a multitude of factors including site conditions, environmental impacts and mitigation requirements, permitting and approval requirements, available grant and loan funding, and so forth. Recent experience indicates that a range of from approximately $3,000 to $4,000 per af for "average" conditions can be expected. Where site conditions are more complex, the costs can be substantially greater. Purchase of existing storage is highly likely to be the most advantageous to the City over constructing new storage unless the purchase cost of existing storage were to increase substantially.

Offline Storage

The City could consider constructing offline storage in order to develop a future supply. Offline storage is a dam and reservoir facility that is developed at a suitable site but not located within a defined waterway. The facility does not receive significant inflow from the

upstream drainage area as with typical storage projects constructed on waterways. The offline reservoir must be filled by diversion or pumping from another water body. Typically, diverted winter water flows from a nearby waterway are used to fill the offline storage facility. The stored water is then used during peak demand periods after treatment.

Offline dams and reservoirs can generally be constructed more readily and at lower cost compared to projects constructed on waterways. The related diversion facilities – gravity or pumped – can add significantly to the complexity and cost of offline storage facilities. Conceptual level analysis and recent experience with similar facilities indicates that a similar cost range can be expected as noted above for conventional new storage projects. Purchase of existing storage is highly likely to be the most advantageous to the City over constructing new offline storage.

Aquifer Storage and Recovery (ASR)

General

The City could potentially benefit from ASR by using this resource to meet its peak long-term water supply requirements.

Definition of ASR

ASR is the underground storage of treated drinking water in a suitable aquifer injected through a well or wells and the subsequent recovery of the water from the same well or wells. Generally, no re-treatment of the recovered water is required other than disinfection. An aquifer is an underground geologic formation or geologic unit that can store and transmit water at rates fast enough to supply reasonable amounts to wells.

Potential ASR Benefits

ASR offers certain benefits over traditional methods of water storage because larger volumes of water can be stored underground without potential environmental and other impacts associated with the development of surface storage facilities. Injection of treated surface water may also improve the quality of water produced by the well because the high quality treated water may displace the native groundwater away from the well. Over time, a storage zone is developed that may consist of a high percentage of treated surface water. Existing subsurface conditions may also adversely affect the quality of injected water through chemical reactions with underground formations. The outer portion of the storage zone can be considered a buffer zone consisting of a mixture of native groundwater and stored surface water. The injected water typically remains relatively close to the injection well because groundwater generally tends to move very slowly.

State of Oregon ASR Development Regulations

The OWRD is the lead permitting agency for ASR, whereas the Oregon Department of Environmental Quality (DEQ) and the Oregon Health Division (OHD) provide review and

comment on ASR projects. DEQ has additional permitting requirements based on the federally mandated Underground Injection Control (UIC) program and they have jurisdiction over wastewater discharge permits. Pilot testing is required by the ASR rules, specifically Oregon Administrative Rules (OAR) 690-350-0010 through 0130, and is permitted under a Limited License permit issued by OWRD for a period of up to 5 years.

Pilot testing at an ASR well generally consists of monitoring well performance, water level changes, and water quality changes during a series of injection and recovery tests that normally involves storage and recovery of 50 to 100 million gallons of water during each yearly cycle. Multiple wells within the same aquifer may be tested under a single Limited License permit. Several critical permits and approvals are required in order to develop an ASR project. These include the following:

- Limited License permit issued by OWRD for injection and recovery of water for ASR testing.
- Approved UIC registration issued by the DEQ.
- A wastewater discharge permit obtained from DEQ for disposal of well redevelopment water. This permit may be part of an existing City National Pollutant Discharge Elimination System (NPDES) permit.
- Approved ASR well and wellhead design from the OHD.

Preliminary Hydrogeologic Evaluation

The first step in developing an ASR program is to conduct a preliminary hydrogeologic evaluation to assess the development potential of local aquifers for groundwater extraction and ASR development to supplement existing water supplies. The objectives of this evaluation are typically as follows:

- Identify a target aquifer to conduct ASR.
- Assess the productivity of aquifers in the area.
- Evaluate the availability of new groundwater resources for potential development.
- Assess potential hydrogeologic constraints to injecting, storing and recovering treated surface water under an ASR program.
- Complete a literature study of potential water quality issues that could affect development of a groundwater supply and/or ASR system.
- Identify opportunities and constraints with respect to hydrogeology for developing ASR.

The preliminary hydrogeologic report is conducted using available information. There is typically a high level of uncertainty and risk associated with development of an ASR program at this stage because of this limited information and data. Reducing these risks and uncertainties can be accomplished through drilling an exploratory test well and other efforts.

ASR Program Elements

After completion of a hydrogeologic feasibility study and a decision to proceed with the next steps, the typical basic elements of developing an ASR program are as follows:

- Conduct a test well feasibility study. If successful, proceed to the next steps.
- Acquire an ASR Limited License and discharge permits.
- Construct the ASR well.
- Conduct pilot testing of the ASR well.
- Implement a wellhead protection program.
- Construct additional infrastructure improvements including injection and pumping facilities, wellhouse and connections to the existing system.
- Commence full-scale water injection and recovery operations.

ASR System Project Costs

ASR systems are highly site-specific in their nature and therefore the cost to develop an ASR system can be highly variable. Some of the variability factors include the nature and capacity of the aquifer, the capacity of the system to be developed, the geographical extent of the system, the proximity to the existing distribution system, and the recovery water treatment requirements. For conceptual level planning purposes, project costs for an ASR system including investigations and testing, engineering, construction and appropriate contingencies can be anticipated to be in a cost range of $1.4 to $2.1 million per mgd capacity. An initial combined ASR and groundwater feasibility study typically costs in the range of $10,000. Completion of an ASR test well program including engineering, test well construction, and test results analysis and reporting may cost in the range of $150,000 to $200,000.

Summary

A feasibility study is recommended to be undertaken to determine the potential viability of ASR for the City. The study can then guide the City on whether to proceed or not with a test well program and possible development of a full-scale ASR production well. Only further analysis and, ultimately exploratory drilling and testing, can confirm the viability of ASR. This study will incorporate a groundwater analysis also.

Additional Water Conservation

The American Water Works Association (AWWA) Manual of Water Supply Practices M52, "Water Conservation Programs – A Planning Manual", offers excellent guidance on the planning for and development of a water conservation program. The following discussion is excerpted from that manual.

Water conservation should be a key component of an overall water resources plan. Conservation programs that are carefully designed and implemented can bring many benefits to a community's water system. Among these are the efficient utilization of available sources

of supply, public recognition and participation, and improved support for water pricing adjustments.

A common perception is that water conservation means restricting or curtailing customer use as a temporary response to a drought or supply failure or other water shortage event. Although water use restrictions are a useful short-term management tool, most water conservation programs emphasize long-term improvements in water use efficiency while maintaining quality of life standards. Water conservation is fundamentally doing more with less and not doing without.

There are many reasons to pursue the wise use of water and establish a water conservation program. The specific reasons will vary for each water utility and the appropriate level of conservation should be tailored based upon local needs and characteristics. Some reasons that might apply to the City and its citizens and businesses include the following:

- Cost savings through reduced water production and distribution system costs.
- Stretching of existing supplies to serve a greater population.
- Economic development where more economic activity can occur on the same water resource.
- Potentially deferring future water supply expansions and projects.
- Addressing regulatory agency requirements that may require water conservation plans and implementation progress to qualify for water use permits, grants and loans.
- Public support where demonstration of efficient use of existing water supplies is demanded before support is offered on expansion of new supplies.
- Wastewater treatment and disposal benefits through reduced wastewater flows.

Water conservation measures should be tailored to the local community and system to develop the most effective program. General conservation methods, both as implemented through internal utility actions and through customer participation, include the following:

- Basic Measures
    - Public education
    - Codes and standards
    - Water waste restrictions
    - Consumption-based metering and billing
    - Water distribution system improvements (leakage and loss reduction)

- Advanced Measures
    - Irrigation efficiency improvements
    - New home xeriscaping (low water use landscaping)
    - Large landscape irrigation improvements
    - Residential home water use efficiencies
    - Large commercial efficiency projects
    - Small commercial efficiency projects
    - Municipal and publicly owned building interior and exterior rétrofits

- Low-flush toilets and other low-use water use appliance replacements
- Commercial landscape ordinances
- Industrial and institution efficiency projects
- Conservation rate structure using water budgets (consumption benchmarking tool against local standard) versus individual customer

The water demand reductions that can be anticipated from implementation of a water conservation program are difficult to predict and can vary widely depending upon many factors including the extent of the program, the opportunities that are available in the local area, and the measures implemented. The water providers' consortium in the Portland metropolitan area implemented a regional water conservation program over a decade ago and some providers have initiated additional conservation measures within their systems. No definitive studies have been conducted to attempt to quantify the demand reduction resulting from this program. Anecdotal evidence indicates that overall peak daily demand for water in the region may have been reduced in the 5 to 10 percent range. There is little doubt that further expansion of a conservation program at some level will reduce water demands.

The City will eventually be required through the water rights processing of the OWRD to undertake and complete a Water Management and Conservation Plan in accordance with Oregon Administrative Rule 690, Division 86. This rule requires the City to plan and implement water conservation measures. This plan is best and most efficiently completed as part of a water master plan update process.

Water Recycling and Reuse

Water recycling is reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing, and replenishing a groundwater basin. A common type of recycled water is water that has been reclaimed from municipal wastewater. The term water recycling is generally used synonymously with water reclamation and water reuse.

Recycled water can satisfy most water demands as long the water has been adequately treated to ensure that the water quality is appropriate for the use and meets all regulatory requirements. For the City, the use of recycled wastewater could be a means to reduce certain demands on the system and to extend the City's water supply capacity.

The most likely opportunities for the use of recycled water within the City's water service area to reduce current and future water demands are anticipated to be related to irrigation. Recycled water could be used, for example, for irrigation of institutional grounds, school grounds, parks and playgrounds, cemeteries, freeway and street medians, golf courses, commercial developments, and common grounds in planned residential areas.

The ability to develop a recycled water system is dependent upon the availability of wastewater effluent to supply the system. The system costs will be dictated by the capacity of the system, the level of treatment required, the extent of the transmission and distribution system, and other factors. The unit costs of such a system can be anticipated to be high

relative to other sources. The feasibility, costs and benefits of developing a recycled water system for the City is best determined through further detailed study of such a program specifically designed to suit the City's needs.

Supply From Adjacent Water Provider

The Umpqua Basin Water Association (UBWA) serves areas adjacent to the City and within some portions of the City's Urban Growth Boundary. Through agreement with the City, the Association could provide water to certain areas, thus relieving the City of the need to allocate supply capacity to those certain areas. As an example, the provision of water service to the area within the City's urban growth boundary that lies north of the North Umpqua River is a City responsibility. That area is presently served by the Association. The City could provide water service to the area by contract with the UBWA and the continued use of Association facilities.

Summary

Potential future water sources for the City's water system have been identified and described. These sources have included acquisition of existing water rights, groundwater development, groundwater augmentation on North Umpqua River, purchase of stored water in existing projects, and construction of a new storage project or projects including conventional and offline storage. Aquifer storage and recovery (ASR), groundwater, groundwater augmentation, water recycling and reuse, and additional water conservation have been identified as potential elements of the City's long-range water supply program. The City could rely upon the Umpqua Basin Water Association to provide supply to certain portions of the City's water service area. The suitability of each to meet the City's needs has been discussed with respect to their potential for future implementation by the City. In Chapter 7, the viable future water source alternatives are integrated into a long-range water supply program.

General

In this section, the City of Roseburg's long-term water supply options are reviewed and evaluated. As presented in previous sections, the City will ultimately use all of its available water rights on the North Umpqua River at Winchester. New sources of water supply are needed as this source reaches its capacity. Among these potential water sources is the acquisition of existing water rights, groundwater development, groundwater augmentation to the North Umpqua River, purchase of stored water in existing projects, and construction of a new storage project or projects including conventional and offline storage. While not technically considered new water sources, an aquifer storage and recovery (ASR) program, water recycling and reuse, and additional water conservation can extend the City's existing water supply resource.

Water Source Development Strategy

The City's water supply system has used the North Umpqua River at Winchester as its source since the early years of the development of the City and development of a community water supply system. After the acquisition of the system in 1977, the City made major investments in upgrading this water supply system with the construction of a new river intake and water treatment plant and transmission mains between the plant and the terminal storage facilities on Reservoir Hill.

The most economical approach to water supply for the City in the future is to maximize the development and use of this source and the existing infrastructure. There are substantial economic benefits to deferring the need to develop an alternative source or sources. This source can serve the City until approximately the year 2030 when water demands are forecast to exceed the City's existing water rights on the North Umpqua River. There is potential to acquire additional water rights within the North Umpqua River basin which could potentially be used at Winchester, thereby expanding further the capacity of this source.

The acquisition of water rights to replace existing system demands, such as for irrigation of City parks, could reduce demands on the system. The implementation by the City of additional water conservation measures as well as implementation of water recycling and reuse systems will also reduce demands. ASR, development of groundwater, and the use of groundwater for flow augmentation in the North Umpqua River basin may offer promise yet need more study. Successfully completing a few or all of these activities will further extend the time when an additional source or sources of supply are needed.

Figure 7-1 illustrates the forecasted peak day water demands to the year 2058 as developed in Section 3. The figure also indicates the City's 20 million gallons per day (mgd) of water rights at Winchester. As indicated on the figure, additional water supply beyond the existing water rights will be needed in approximately the year 2030.

Based upon the evaluation of the City's long-range water demands and the review of the Winchester source and other potential water sources, it is recommended that the City adopt a long-range water source development strategy as follows:

- Maximize the capacity of the North Umpqua River source at Winchester
- Reduce water demands over time
- Plan for an additional source or sources

Detailed discussion of each element of this recommended strategy is presented as follows.

Maximization of North Umpqua River Source at Winchester

General

The maximization of the North Umpqua River source at Winchester consists of several elements including the following:

- Complete recommended actions on existing water use permits.
- Possibly acquire additional water rights in the North Umpqua River basin for use at the Winchester Water Treatment Plant.
- Consider the acquisition of additional land for expansion of the Winchester Water Treatment Plant beyond 18 mgd.

These elements are discussed below.

Water Use Permit Actions

Section 4 reviewed the City's existing water rights at Winchester and recommended certain actions with respect to one of these rights. It is recommended that the City monitor OWRD's processing of the City's application for a time extension on the 6.0 cfs permit.

Acquisition of Additional Water Rights in the North Umpqua River Basin

Section 4 reviewed the existing water rights in the North Umpqua River Basin and identified several senior water rights that could potentially be acquired by the City for use at Winchester. It is strongly recommended that the City immediately pursue the acquisition of additional water rights in the North Umpqua River basin for use at Winchester. The potential success of this effort cannot be predicted; however, the economic incentives to the City are substantial if development of a second source or sources such as supply development on the South Umpqua River can be deferred. For the purposes of this report and for future planning, it is assumed that the City could potentially obtain up to 2 mgd of additional water rights at Winchester. This is a very preliminary assessment based upon limited contacts with water rights owners.

Winchester Water Treatment Plant Capacity Expansion

A separately prepared document, Preliminary Design Report, Winchester Water Treatment Plant Expansion, has evaluated the existing plant and developed recommendations for its expansion. An initial expansion to 18 mgd capacity is recommended. This expansion will provide for the City's forecasted water demands until approximately the year 2025. At that time, the City will have 2 mgd of water rights in the North Umpqua River that remain undeveloped. If the City can obtain additional water rights in the basin that can be used at the Winchester site, then the amount of undeveloped water rights would be increased.

The Preliminary Design Report has identified the potential need to acquire additional property to the west of the existing plant site. The pros and cons of this acquisition are reviewed in the Preliminary Design report. Based upon the anticipated need for the property to expand the plant beyond 18 mgd and the potential to develop additional supply at Winchester beyond the current 20 mgd of water rights, it is recommended that additional property be acquired.

Summary of Recommended Actions

In order to maximize the capacity of the North Umpqua River water supply, the City should continue with the recommended actions with respect to one of its primary water use permits, immediately seek to acquire additional water rights within the North Umpqua River Basin, undertake a study to assess the potential for groundwater augmentation on the North Umpqua River, and acquire additional land adjacent to the Winchester Water Treatment Plant.

Long-Term Water Demand Reduction Measures

General

Opportunities exist for the City to implement programs and projects that could reduce water demands over time. The City continues to fund its main replacement program to reduce water lost to leakage. Water demand reductions could extend the time when a second source or sources are needed. The identified opportunities to reduce water demands are:

- Implement additional water conservation measures
- Develop non-potable water supplies
- Implement recycling and reuse programs

Details of these elements are discussed below.

Additional Water Conservation Measures

In Section 6, a discussion of additional water conservation measures is presented. It is recommended that, over time, the City implement additional water conservation measures beyond the City's current programs. Any water demand reductions that can be achieved by additional conservation will potentially allow deferral of the development of an additional source or sources. Furthermore, water conservation requirements are anticipated to become more stringent through actions of the OWRD with respect to the City's water rights as well as potentially other regulatory agencies.

Develop Non-Potable Water Supplies

As discussed in Section 6, there are potential opportunities to develop non-potable water supplies that could be used to replace current demands on the City's drinking water system. The City should consider any opportunities for acquisition of water or water rights in the South Umpqua River basin that would support the development of non-potable water systems that could be used to replace current demands on the City's system such as for irrigation purposes. Each opportunity will have unique characteristics and the economic and other factors will need to be evaluated on a case by case basis to determine the implementation viability of each option. The need to acquire a second source or sources could be deferred if such systems could be developed. The potential for development of such supplies and systems is considered to be speculative.

Implement Recycling and Reuse

The ability to develop a recycled water system is dependent upon the availability of wastewater effluent to supply the system. The system costs will be dictated by the capacity of the system, the level of treatment required, the extent of the transmission and distribution system, and other factors. The unit cost of water from such a system can be expected to be high. A study would be needed to determine the feasibility and costs and benefits of developing a recycled water system. Since the potential for development of such a system and the costs are not known at this time, this report does not assume any demand reduction for development of such a system. A study would be needed to assess the feasibility of a recycling and reuse system.

Summary of Water Demand Reduction Measures

There are opportunities for water demand reduction through additional conservation programs as well as the potential development of non-potable supplies to replace existing demands on the City's system. It is recommended that additional conservation program measures be implemented. Non-potable water supplies should be implemented where water rights are available or a supply is offered to the City and where there is economic justification for the project. Recycling and reuse should be considered as part of the City's 50-year water supply plan.

Future Water Source Plan

General

The forecasts of maximum daily demand have been completed for a 50-year time horizon to the year 2058. In the year 2058, the forecasted maximum daily water demand is approximately 34.7 mgd. Excluding all of the above-described measures to reduce long-term water demands and assuming full development of the City's existing North Umpqua River water rights, the estimated maximum day supply shortfall in the year 2058 will be approximately 14.7 mgd.

Based upon the findings of this study, the existing water rights on the North Umpqua River will be fully developed by the year 2030. Implementation of some or all of the demand-reducing measures could potentially result in significant demand reduction. Even the most optimistic projections, however, would not indicate that demands could be reduced from 34.7 mgd to 20.0 mgd, a reduction of approximately 42 percent, within the 50 year planning horizon. An additional supply source or sources may need to be developed and be in service as early as the year 2030.

The potential for development of local area groundwater, ASR, and groundwater augmentation to the North Umpqua River is not known at this time. There is limited information available upon which to judge the potential viability of these options. It is recommended that a feasibility study be conducted within the next 10 years to provide additional information and guidance as to the potential of these resources. If proved to be feasible, any or all of these options could provide some limited supply during peak demand periods and could allow for deferral of development of a second source or sources of supply. It is not likely that groundwater, ASR, and/or groundwater augmentation to the North Umpqua River could provide sufficient capacity to allow for deferral of a second source or sources to beyond the study period. For the purposes of this study and until further information indicates otherwise, it is assumed that these three options will not be part of the City's long-range water supply picture. If any or all of the these options are found to be feasible through additional study and evaluation at a later time, it is recommended that the findings of this long-range plan be updated to reflect the impact upon water supply planning timing needs and costs.

Section 6 has reviewed the other potential water sources. No additional sources are identified in the North Umpqua River Basin. It is recommended that the City look to the South Umpqua River Basin for a future second water supply. The opportunities for water supply within the basin include:

Future Water Source Plan

General

The forecasts of maximum daily demand have been completed for a 50-year time horizon to the year 2058. In the year 2058, the forecasted maximum daily water demand is approximately 34.7 mgd. Excluding all of the above-described measures to reduce long-term water demands and assuming full development of the City's existing North Umpqua River water rights, the estimated maximum day supply shortfall in the year 2058 will be approximately 14.7 mgd.

Based upon the findings of this study, the existing water rights on the North Umpqua River will be fully developed by the year 2030. Implementation of some or all of the demand-reducing measures could potentially result in significant demand reduction. Even the most optimistic projections, however, would not indicate that demands could be reduced from 34.7 mgd to 20.0 mgd, a reduction of approximately 42 percent, within the 50 year planning horizon. An additional supply source or sources may need to be developed and be in service as early as the year 2030.

The potential for development of local area groundwater, ASR, and groundwater augmentation to the North Umpqua River is not known at this time. There is limited information available upon which to judge the potential viability of these options. It is recommended that a feasibility study be conducted within the next 10 years to provide additional information and guidance as to the potential of these resources. If proved to be feasible, any or all of these options could provide some limited supply during peak demand periods and could allow for deferral of development of a second source or sources of supply. It is not likely that groundwater, ASR, and/or groundwater augmentation to the North Umpqua River could provide sufficient capacity to allow for deferral of a second source or sources to beyond the study period. For the purposes of this study and until further information indicates otherwise, it is assumed that these three options will not be part of the City's long-range water supply picture. If any or all of the these options are found to be feasible through additional study and evaluation at a later time, it is recommended that the findings of this long-range plan be updated to reflect the impact upon water supply planning timing needs and costs.

Section 6 has reviewed the other potential water sources. No additional sources are identified in the North Umpqua River Basin. It is recommended that the City look to the South Umpqua River Basin for a future second water supply. The opportunities for water supply within the basin include:

- Purchase existing storage
- Acquire water rights
- Construct new storage
- Participate in a future multipurpose storage project or projects

These alternatives are discussed below.

Purchase of Existing Storage

The only currently available storage source for the needed quantity of supply is the Galesville Reservoir on the South Umpqua River. Section 6 has described the available storage and cost of this alternative.

Acquire Water Rights

It is not recommended that the City attempt to aggregate up to 14.7 mgd of senior water rights in the South Umpqua River basin. The reasons for this recommendation are a) the great uncertainty that the full amount of acquisitions can be actually accomplished, b) the inability to predict the cost of the acquisitions, c) the potential large number of acquisitions, and, d) the uncertainty of timing of the need to develop the South Umpqua River source.

Construct New Storage

As noted in Section 6, the cost to develop new storage, either conventional or offline, is substantially greater than buying existing storage, specifically in the Galesville Reservoir. Obtaining government grants and/or attractive financing could make construction of new storage more competitive.

Participate in Future Storage Projects

The City could participate in presently identified multipurpose storage projects such as the Deer Creek or Deer Butte projects or some future as yet unidentified storage project in the South Umpqua River basin. Such a project would likely receive government grants and/or financing, such as through the Bureau of Reclamation, which could make the cost of developing this storage relatively attractive and more competitive. It is doubtful, however, that the costs would ever be as competitive as the purchase of storage in an existing project. In addition, there is no certainty that any additional storage projects will be constructed within the basin and within the planning period for this study.

Summary of Long-Range Future Source Options

After reviewing all of the alternatives for a future water source, the purchase of stored water in the existing Galesville Reservoir is deemed to be the most advantageous to the City, both on the basis of cost and on the basis of certainty of supply. It is recommended that the City select the Galesville Reservoir as its future second source of supply. A detailed discussion of this option is presented below.

Galesville Reservoir Source Development Plan

General

Development of the Galesville Reservoir source water supply system for the City would consist of the following elements:

- Acquisition of an OWRD permit to divert winter water (December through April) in the South Umpqua River at the point of diversion.
- Acquisition of stored water from Douglas County in the Galesville Reservoir on Cow Creek, a tributary of the South Umpqua River when winter water is not available (May through November).
- Acquisition of an OWRD water use permit at the point of diversion for the stored water.
- Release of stored water from Galesville Reservoir from May through November and transmission of stored water via Cow Creek and South Umpqua River to the point of diversion.
- Diversion of the released stored water at a new river intake on the South Umpqua River.
- Transmission of the raw water to a treatment facility.
- Treatment of the diverted water.
- Pumping of treated water into the City's system.

These elements are discussed below.

Acquisition of New Water Right on South Umpqua River

A review of the OWRD's Water Availability Report System on the South Umpqua River at its mouth indicates that there is water currently available in the river at the 80 percent exceedance level from December through April. A high exceedance level is needed for a municipal supply; therefore, for the purposes of this study, it is assumed that water is currently available in the river from December through April.

The City can apply for a water right on the South Umpqua River to supply a new water treatment plant directly from the river during this five month winter period. Water supply from storage would not be required during this period. The City should consider applying for this winter water permit at this time.

Estimated Volume of Required Storage

The County will administer all OWRD water rights permitting for the stored water. Based upon the availability of water in the South Umpqua River as described above, the estimated required volume of storage in the Galesville Reservoir must be determined. Several assumptions are made in order to determine this volume. They are as follows:

- The Winchester supply source has a maximum capacity of 20 mgd.
- The required volume is as measured at the point of diversion.
- The required volume is based upon the year 2058 forecasted water demands.
- The transmission losses between the Galesville Reservoir and point of diversion will accrue to Douglas County, the owner of the Galesville project.
- Storage releases will be required to meet the water demands at the new point of diversion for the months of May through November.

Table 7-1 summarizes the calculations which determine the City's estimated required storage volume need in the Galesville project. With the assumptions as noted above, the City's estimated required storage volume need in the Galesville Reservoir in the year 2058 is calculated to be approximately 3,071 acre-feet which can be rounded to approximately 3,100 acre-feet for planning purposes.

At the time of actual purchase of storage, detailed analyses should be performed to confirm the actual required volume. The timing of the purchase should be periodically evaluated. These analyses prior to storage purchase should address at least the following:

- The hydrologic reliability of the Galesville project which could not be determined from existing information. Provisions for an additional volume allowance would be prudent if the hydrologic reliability of the stored supply is not sufficient for municipal water supply purposes.
- Confirmation of the purchase contract terms with the County including the assumption of transmission losses by the County.
- Confirmation of the ultimate capacity of the Winchester source, water system demands, the required capacity of a new South Umpqua water treatment plant, phasing of the new water supply capacity, and other relevant factors.
- Confirmation of the operating parameters of the new treatment plant, i.e. year round operation or seasonal operation.
- Confirmation of the water release scheduling from the Galesville Reservoir project.

Table 7-1
Galesville Reservoir
Estimated Year 2058 Storage Requirement

	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Estimated Monthly Demands, mgd	12.1	12.1	12.7	13.1	14.8	19.3	30.9	30.9	22.7	15.5	13.0	13.0	--
Supply Source:													
Winchester WTP, mgd	10.4	10.1	10.7	11.1	12.8	17.3	20.0	20.0	20.0	13.5	11.0	11.0	
S. Umpqua Supply, mgd	2.0	2.0	2.0	2.0	2.0	2.0	10.9	10.9	2.7	2.0	2.0	2.0	
Water Required from Storage, af	0	0	0	0	190	184	1,037	1,037	249	190	184	0	3,071

Acquisition of Stored Water

The City can acquire stored water in the Galesville Reservoir through the execution of a purchase contract with Douglas County. The County administers all OWRD water rights permitting related to the storage of water in the reservoir. The City will need to obtain an OWRD water use permit to divert and use the stored water at the point of diversion. This permit does not need to be acquired until such time as the second source diversion and treatment facilities are developed.

The cost and other provisions of this contract have been previously discussed. The availability of water has been identified and the current interest in the available water discussed. With a decision by the City to consider the Galesville Reservoir as its second long-term water source, the question arises as to when the City should commit to the purchase of water to develop this supply system.

The current purchase price of the estimated volume of 3,100 af that would be purchased is $188,421 per year with an estimated 10 percent cost increase at every 10-year renewal. While the City could commit to this purchase now, it could be considered to be premature for several reasons. These include:

- The current availability of substantial quantities of stored water in the Galesville Reservoir.
- The current lack of significant interest by others in contracting for this water.
- The ultimate maximum capacity that can be developed from the North Umpqua River source is uncertain.
- The inherent variability of population growth and demand forecasts.
- The effectiveness of long-term water demand reduction measures.

Considering these above factors, it is recommended that the City not purchase stored water in the Galesville project at this time. The City should periodically monitor the interests of others in acquiring stored water and defer the purchase decision until the need for and timing of the development of this second source is more firmly established. The amount of the remaining municipal allocation in the project as well as the ability of the County to move storage from other blocks into the municipal category currently result in ample available storage.

It is likely that enough water to satisfy the City's needs will be available by the time the City must decide on a future water source beyond the North Umpqua River. If it is determined, however, through monitoring of activity with the County's Natural Resources Division that contracting for water by others could potentially jeopardize the City's ability to acquire it's desired volume, then the City should proceed with acquisition of storage, even if it would not immediately be released, diverted, treated and used.

As noted previously, under current procedures, stored water cannot be reserved and full payment is required annually for the contracted allocation. There may be the possibility that an alternative, lower-cost arrangement could be negotiated with the County. An arrangement could be advantageous to both parties whereby the City could enter into an agreement to secure stored water at a lower cost but at an earlier date than the water may be needed. The County's project would benefit from additional income at an earlier date. Alternatively, there may be a possibility of entering into an agreement for stored water similar to an option agreement or an agreement for the right of first refusal. It is recommended that the City explore these questions with the County's project staff.

Release and Transmission of Stored Water

Due to the large distance from the Galesville Reservoir to the City, the downstream creek and river system is recommended as the only practical approach to transmitting the water to the City. The use of a piped system is not economically feasible. The release of stored water to Cow Creek would be scheduled with the staff of the Natural Resources Division.

Diversion and Treatment of Released Stored Water

The diversion of the released water would be accomplished using a river intake on the South Umpqua River near the City. The diverted stored water could then be pumped to a new water treatment plant or potentially pumped to the Winchester Water Treatment Plant for treatment. It is recommended that the intake be located upstream of the discharge of the Roseburg Urban Sanitary Authority (RUSA) wastewater treatment plant discharge to the South Umpqua River.

A raw water transmission main up to approximately 6 miles long and approximately 36 inches in diameter would be needed to transmit approximately 14.7 mgd of raw water north to the Winchester Water Treatment Plant site. An equally sized finished water transmission main would need to be constructed to transmit the water south back to the City's terminal reservoirs at Reservoir Hill. The estimated conceptual level project cost of a new 36-inch diameter raw water transmission main running from an intake located on the South Umpqua River at the southerly edge of the City to Winchester is approximately $14,000,000. The estimated conceptual level project cost of a new 36-inch diameter raw water transmission main approximately 4.5 miles long running from the Winchester site to the terminal reservoirs on Reservoir Hill is approximately $11,000,000. The total conceptual level project cost of raw and finished water transmission is thus approximately $24,000,000.

Considering the substantial cost for transmission facilities to treat the Galesville Reservoir water at Winchester, this alternative should be dropped from further consideration. The Galesville Reservoir water supply should be treated at a separate new treatment plant located on the South Umpqua River.

Intake and Water Treatment Plant

A conceptual plan for a future water treatment plant on the South Umpqua River is developed in a technical memorandum included in the Appendix. The facility would have an initial capacity of 7 mgd to provide additional supply in approximately the year 2030 and an ultimate capacity of 14.7 mgd to supply domestic water requirements to the year 2058.

The facility would include a river intake and the following treatment processes:

- Rapid mix
- Flocculation and sedimentation
- Intermediate ozonation
- Granular media filtration with a deep bed of granular activated carbon (GAC)
- Ultraviolet (UV) disinfection
- Free chlorine for distribution system disinfection residual
- Treated water storage (clearwell)

The facility would include a high service pumping station and a transmission pipeline would need to be constructed to transmit treated water to the City's terminal reservoirs on Reservoir Hill. The facility would require a site with an estimated land area of approximately 3 acres.

Intake and Water Treatment Plant Site Selection

A review of Douglas County tax lot and aerial mapping was made to locate on a preliminary basis potential sites for an intake and water treatment plant on the South Umpqua River. Discussions were conducted with City staff as to the potential availability of City-owned lands that might be suitable for the proposed facilities.

Based upon the information collected, it was determined that the site of the City's abandoned North Roseburg sewage treatment plant would be a likely potential site for a future South Umpqua River intake and treatment plant. This site is at the southeast corner of Stewart Park on the north bank of the South Umpqua River. The City owns two contiguous tax lots at this location, Tax Lot 500 with an area of 4.48 acres and Tax Lot 501 with an area of 1.01 acres. Excluding the river bank area and the park roadway along the south boundary of Tax Lot 500, there is likely a usable area of at least 3 acres at this location. If a small amount of additional lands would need to be acquired adjacent to these two parcels to accommodate t, they could be acquired from City-owned property to the west (Tax Lot 100 – Stewart Park) and/or to the east (Tax Lot 400 – Gaddis Park). Treated water from this site could be transmitted to existing mains in Stewart Parkway to the west, Harvard Avenue to the south, Garden Valley Road to the north possibly through the Veterans Administration property, or to the east through Riverfront Park and Gaddis Park to existing mains below Reservoir Hill.

Riverfront Park also presents an opportunity for the intake and treatment plant. Riverfront Park extends easterly along the north bank of the South Umpqua River between Stewart Park and I-5. The park is located on Tax Lot 400 with an area of 30.80 acres. The park is undeveloped. Treated water from this site could be transmitted to the existing system similarly to the above described site.

Gaddis Park is located on the north bank of the South Umpqua River directly east of I-5 and extends easterly to the railroad and NE College Drive. The park consists of two parcels. Tax Lot 3600 contains 2.83 acres and Tax Lot 3700 contains 16.34 acres. The park is presently substantially developed. Treated water from this site could be transmitted to existing mains below Reservoir Hill.

The existing abandoned sewage treatment plant site appears to present the best choice for a new water treatment plant as it would have little to no impact upon existing park lands. It is recommended that the City retain the two tax lots for the future site of the South Umpqua River Water Treatment Plant.

Conceptual Plan of Galesville Reservoir Supply System

Figure 7-2 illustrates the basic elements of the proposed Galesville Reservoir Supply System as discussed above.

Conceptual Level Cost Estimate for Galesville Reservoir Supply System

The current estimated project cost of the new plant with an initial capacity of 7 mgd and including the finished water transmission main connection to the existing system is $33,230,000. The current estimated project cost to expand the plant to 14.7 mgd is $14,795,000.

Summary

A new water supply system can be developed on the South Umpqua River using stored water in the Galesville Reservoir to meet peak season water demands. Off-peak season water demands can likely be met using run-of-river water rights. The current estimated project cost to develop the initial phase of such a supply system is $33,230,000 including the finished water transmission main.

Recommended Water Source Development Plan

Based upon the prior review of the existing water source and the alternative water sources that are potentially available to supply the City's water system and the recommendations of the Water Treatment Facilities Preliminary Design Report, the following water source development plan recommendations are made:

1. Continue with and complete the recommended water rights actions on the City's existing North Umpqua River water rights at Winchester.

2. Commence discussions with holders of significant pre-1974 industrial and irrigation senior water rights in the North Umpqua River basin with the intent to acquire additional water rights for transfer to the water treatment plant at Winchester.

3. Acquire additional senior North Umpqua River basin water rights from willing sellers if available at reasonable terms.

4. If additional water rights or additional water supplies can be acquired at the Winchester site, proceed to acquire the easterly 200 feet of Tax Lot 800 adjacent to and west of the existing Winchester plant to provide space for future expansion of the plant beyond the 18 mgd capacity.

5. Undertake and complete the recommendations of the Water Treatment Facilities Preliminary Design Report which includes the following major items:

    a. Undertake regulatory compliance and other immediate recommended actions at the Winchester Water Treatment Plant.

    b. Proceed immediately to expand the City's existing water treatment plant at Winchester from 12 mgd to 18 mgd capacity in accordance with the Preliminary Design report for the plant.

6. Update the City's Comprehensive Water Master Plan and Capital Improvement Plan. (This work is presently underway.)

7. Undertake and complete a Water Management and Conservation Plan in accordance with Oregon Administrative Rule (OAR) 690, Division 86. (This plan is anticipated to be a requirement of the Oregon Water Resources Department's extension of time approval on the City's Permit No. 44018 at Winchester.)

8. Establish a more extensive water conservation program as needed to comply with the requirements of OAR 690, Division 86 and to achieve additional water conservation and water use efficiencies over time.

9. Consider opportunities on a case-by-case basis for development of non-potable water systems using existing water rights in the South Umpqua River basin to reduce existing demands on the system.

10. Adopt the Galesville Reservoir project as the City's long-range second source of water supply. Proceed with the following actions:

a. Designate the City-owned site of the abandoned North Roseburg sewage treatment plant adjacent to Stewart Park to be the future site of the proposed South Umpqua River Water Treatment Plant including a river intake.

b. Apply for a water use permit from OWRD to allow diversion of winter water from the South Umpqua River at the proposed location of the future river intake.

c. Periodically monitor the stored water purchase activity in the Galesville Reservoir.

d. Initiate discussions with Douglas County to determine if there is a lower cost option available to the City to obtain stored water at an earlier date.

e. Purchase storage in the reservoir at such time as the second source is to be developed or prior to that time if necessary to assure that sufficient storage volume in the project can be acquired to meet the City's needs.

11. Within 10 years, undertake and complete a feasibility study to assess the potential for development of aquifer storage and recovery (ASR) and local area groundwater as well as groundwater augmentation to the North Umpqua River.

Recommended Water Source Increments to Meet Long-Range Water Demands

Figure 7-1 illustrates the forecasted maximum daily water demands from present to the year 2058 as developed in Section 3. Also illustrated is the current 12 mgd capacity of the existing Winchester water treatment plant and the City's existing water rights at Winchester of 20 mgd.

With maximum daily water demands currently approaching the plant capacity, expansion of the plant to 18 mgd is shown to be completed and in service in the year 2012. This expansion of the plant is forecasted to meet maximum day demands until approximately the year 2025. By that year, the capacity of the plant will need to be expanded to the full amount of the City's North Umpqua River water rights at Winchester. If no other water rights can be obtained in the North Umpqua River basin and transferred to Winchester, then the plant expansion will be an additional 2.0 mgd for a total capacity of 20 mgd.

If the City is able to acquire additional water rights at Winchester, then the plant expansion is shown to be to the maximum of the remaining rights, i.e. 2.0 mgd, plus the additional acquired rights. An additional 2 mgd of water rights is assumed to be potentially acquired. The actual water rights acquired could be more or less than this amount. The plant's ultimate capacity using conventional treatment technology is approximately 22 mgd.

If no additional water rights can be acquired and transferred to Winchester, then an additional source or sources of water supply will be needed by the year 2030 with a maximum day capacity from the new source or sources of 14.7 mgd by the year 2058, the end of the planning period. This assumes that the forecasted maximum day water demands are not reduced over time with the recommended long-term water demand reduction measures.

The additional supply is recommended to be developed by the year 2030 using the Galesville Reservoir as the source of supply. The initial Galesville Reservoir supply system capacity is indicated at 7.0 mgd. This increment of supply is forecasted to be sufficient until approximately the year 2045. A 7.7 mgd expansion of this supply by the year 2045 to 14.7 mgd will then meet the forecasted maximum daily demands to the year 2058.

As Figure 7-1 illustrates, any additional supply that can be developed from the Winchester site can defer the required development of the second source of supply. Each additional 1.0 mgd water right increment that is acquired for use at Winchester, for example, will meet the forecasted demand growth for approximately 2.3 additional years. Likewise, each 1.0 mgd of water demand that can be removed from the system (such as through development of non-potable water supplies for irrigation, reduced pipe leakage, conservation, etc.) will defer the need for supply expansion for about 2.3 years.

Update of 1993 Comprehensive Water System Master Plan and Capital Improvement Plan

The City's existing water master plan and capital improvement plan is over 15 years old and is due for updating, particularly in light of the recommendations of this long-range water supply plan and the anticipated growth in the community. Water system master plans are generally recommended to be updated every 5 to 7 years. The updated plan is also important to the rate setting process as well as for establishing system development charges. Work completed as part of this long-range water supply plan will be integrated into and will form the early sections of an update of the master plan document. The water treatment plant Preliminary Design Report will also be incorporated into the master plan update. The water master plan and capital improvement plan update is presently underway.

Summary of Recommendations and Cost Estimates

Table 7-2 presents a summary of the estimated project costs for recommended near-term estimated source development and other related activities. Near-term is defined as being within the next 5 years. Several recommended actions are programmatic in nature and developing project cost estimates depends on variables that are not currently known. These programmatic items are noted. Where property is proposed to be purchased, the County's current assessed valuation is shown. More accurate cost estimates are listed for certain actions with definitive scopes and outcomes.

Table 7-3 presents a summary of the estimated costs for recommended long-term source development and other related activities.

The estimated project costs for construction presented in this report include provisions for estimated construction costs plus allowances for construction contingencies, engineering, administration, permitting and approvals, and other project-related costs. An indexing method to adjust present estimates into the future is useful. The Engineering News Record (ENR) Construction Cost Index (CCI) is a commonly used index for this purpose. For purposes of cost estimate updating, the April 2009 ENR CCI for Seattle, Washington, the closest construction market index, is 8704.50.

Table 7-2
Project Cost Estimates
Near-Term Water Supply Development Recommendations

Item	Estimated Project Cost, Current $	Implementation Period, years
1. Monitor time extension request for 6 cfs right.	Anticipated to be relatively small.	2009-2010
2. Commence discussions with pre-1974 water rights holders in North Umpqua River basin with intent to acquire North Umpqua River basin water rights.	No estimate. Costs anticipated to be significant.	2009 - 2010
3. Acquire additional senior water rights in North Umpqua River basin.	Costs unknown but will likely be substantial.	2009 - 2011
4. Acquire additional property at Winchester WTP site.	$350,000	2009 - 2010
5. Winchester Water Treatment Plant: a. Undertake regulatory compliance and immediate recommended actions. b. Expand plant to 18 mgd.	 $137,000 $7,600,000	 2009-2010 2009-2012
6. Update Comprehensive Water Master Plan and Capital Improvement Plan.	$119,000	2009
7. Complete a Water Management and Conservation Plan	$35,000	2009-2010
8. Expand water conservation program.	No estimate	Commence in 2009
9. Develop non-potable water systems.	No estimate	As opportunities arise.
10. South Umpqua River Water Supply System: a. Designate City-owned site for future water treatment plant and intake. b. Apply for water use permit for winter water on South Umpqua River. c. Monitor Galesville Reservoir water purchase activity. d. Initiate and complete Douglas County discussions on Galesville Reservoir water purchase terms.	 No cost $7,500 Minimal cost Minimal cost	 2009 2009 Annually 2009-2010

Table 7-3
Project Cost Estimates
Long-Term Water Supply Development Recommendations

Item	Estimated Project Cost, Current $	Implementation Period, years
1. Complete groundwater, ASR, and groundwater augmentation feasibility study.	$60,000	2019
2. Expand Winchester plant from 18 mgd to up to 22 mgd.	$7,700,000	2023-2025
3. Purchase Galesville Reservoir stored water.	$188,000/year	When required.
4. Construct new 7 mgd South Umpqua River Water Treatment Plant.	$33,230,000	2028-2030
5. Construct expansion of South Umpqua River Water Treatment Plant to 14.7 mgd.	$14,795,000	2043-2045

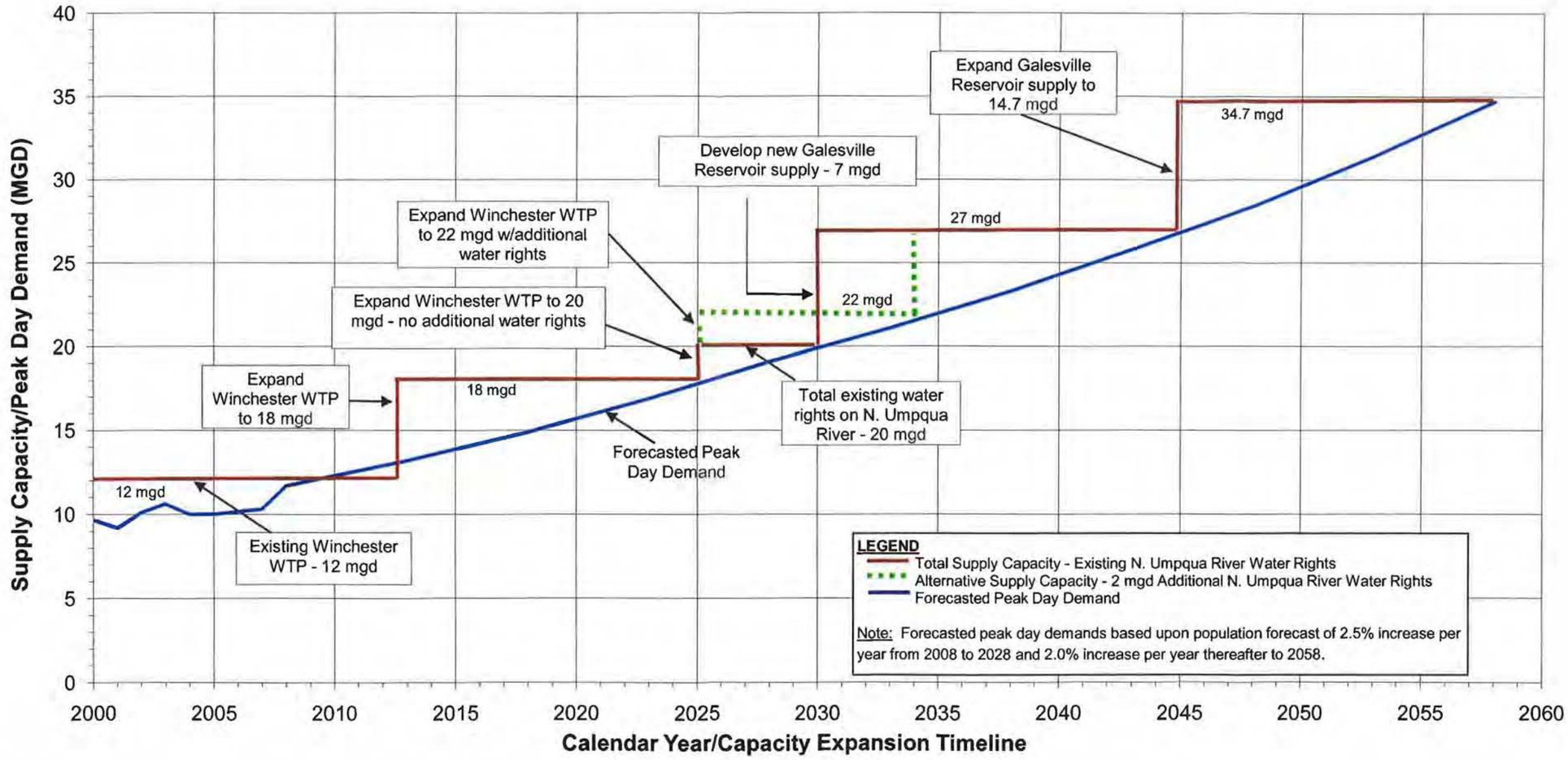
Conclusions

This supply plan develops population and water demand forecasts to the year 2058 and presents a recommended plan to systematically develop water supplies adequate to meet the estimated water demand forecasts. A number of alternatives are presented and evaluated as part of this work. A key feature of the water supply recommendations presented in this study is the full development of the North Umpqua River to serve as the City's primary water supply to at least the year 2030. With the full development of the North Umpqua River supply source, it is recommended that the City pursue the development of an additional water supply source on the South Umpqua River.

Plan Adoption

It is recommended that the City adopt this long-range water supply plan to guide the development of water source capacity for the City to the year 2058.

Figure 7-1
City of Roseburg
Water Demand and Water Supply Schedule



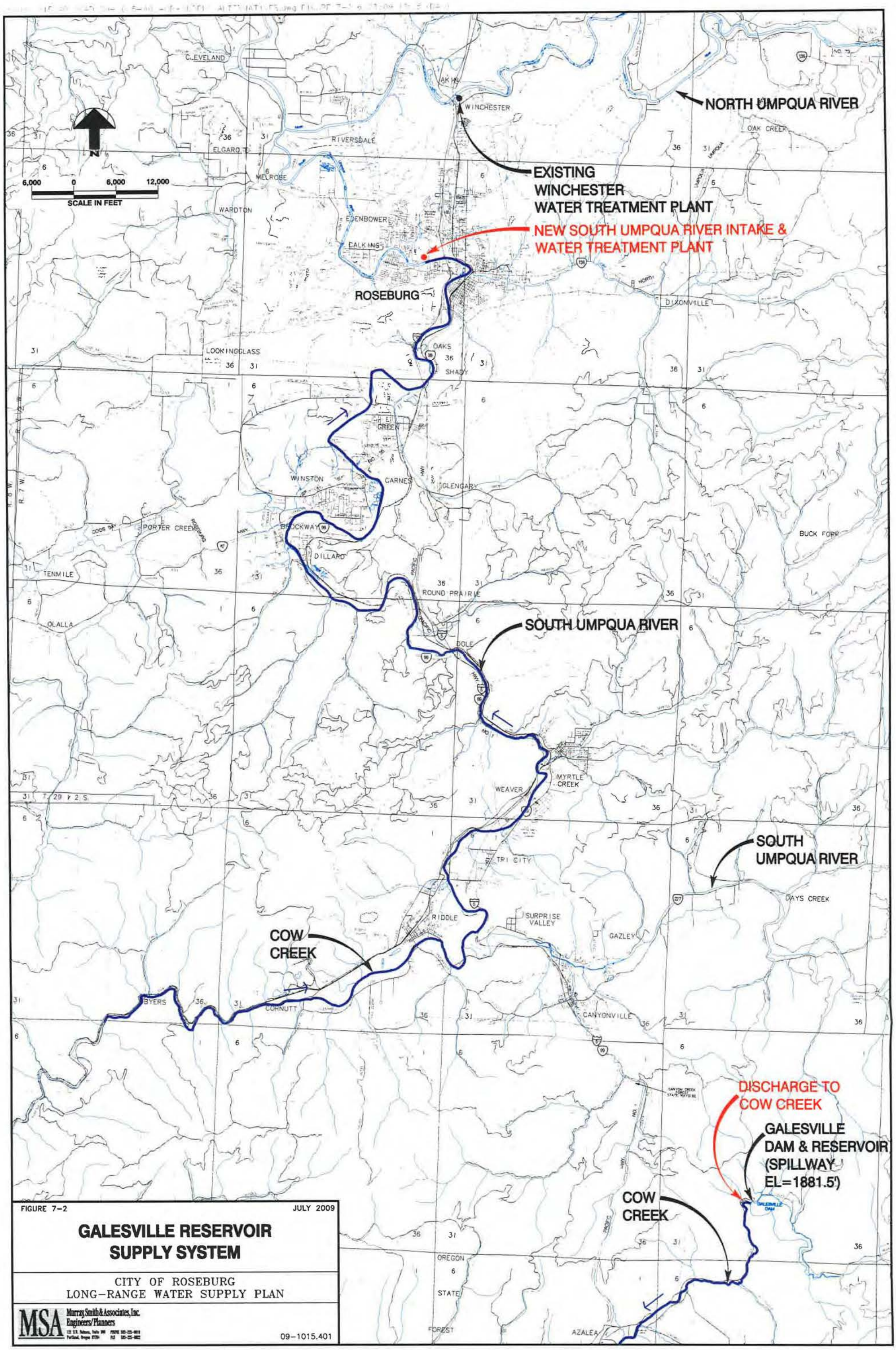


FIGURE 7-2 JULY 2009

GALESVILLE RESERVOIR SUPPLY SYSTEM

CITY OF ROSEBURG
LONG-RANGE WATER SUPPLY PLAN

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

09-1015.401

CONTRACT FOR PURCHASE OF MUNICIPAL, QUASI MUNICIPAL OR GROUP DOMESTIC WATER FROM GALESVILLE PROJECT

This contract is made on _____, 20____, between Douglas County, a political subdivision of the State of Oregon, (County), and _____ _____, (Customer).

COUNTY AND CUSTOMER AGREE:

1. TERM AND RENEWAL:

1.1. The initial term of this contract shall begin on _____, 20____ and end on December 31, 20____, unless it is sooner terminated as provided herein.

1.2. As used in this contract, unless the context clearly indicates otherwise, "term" or "term of this contract" shall mean both the initial term and any extension.

1.3. Customer shall have the right to extend the term of this contract for five successive periods of ten years each upon the following conditions:

1.3.1. Approximately ninety days prior to expiration of the then current contract term, County shall notify Customer in writing that Customer has the right to extend the term at the price set pursuant to section 11.

1.3.2. Customer may elect to extend the contract term by written notice to County within thirty days after County gives notice of the right to extend. Concurrently with written notice of extension Customer may request the Board of Commissioners to review and reduce the price of water in accordance with subsection 11.4.

1.3.3. No other act or agreement shall be required of the parties to effect the extension after Customer gives proper notice of election to extend the contract term. Each extension shall take effect on January 1 after Customer gives notice of extension.

1.3.4. Each extension shall commence on the day following the termination date of the initial term or the preceding extension.

1.4. The provisions of this contract shall apply to any extension except for changes in the purchase price pursuant to section 11; modifications required to comply with federal or state statutes, regulations, or administrative rules; or modifications required to comply with any contract between County and the United States concerning the Galesville Project.

1.5. Customer shall not be entitled to extend the term of this contract if Customer is in default under this contract at the time extension is requested by Customer.

2. AUTHORITY OF PUBLIC WORKS DIRECTOR:

2.1. The Director of the County Public Works Department (the Director) has authority to administer this contract on behalf of County.

2.2. The Director may delegate authority to administer this contract to the Manager of the County Public Works Department, Natural Resources Division, (the Division Manager), except for authority to establish the price of water under section 11 of this contract. The Director shall retain the right to supersede any decision of the Division Manager in the administration and interpretation of this contract.

2.3. References to the Director in this contract shall be deemed to include the Division Manager, to the extent the Director has delegated authority to the Division Manager.

3. WATER ALLOCATION: Each year during the term of this contract, County shall allocate _____ acre feet of storage capacity in the Galesville Reservoir for Customer.

4. PERMITS AND CERTIFICATES OF WATER RIGHTS:

4.1. County shall file and maintain any reservoir water right permit (County's permit) and certificate to store water in the Galesville reservoir (County's certificate) allocated for the Customer's use, as required by the State of Oregon Water Resources Department or its successor (the State).

4.2. Customer, at Customer's expense, shall be responsible for obtaining any permit (Customer's permit) and certificate of water rights (Customer's certificate) for use of the stored water allocated under this contract as required by the State.

4.3. Within 6 months after the effective date of this contract, Customer shall provide County with a copy of the application map provided to the State.

5. RELEASE OF WATER:

5.1. Subject to the provisions of this contract, County will release into the natural channel of Cow Creek water comprising the allocation described in section 3. Water released for Customer's allocation shall be measured and delivered to Customer's point of diversion of record by County with equipment installed and maintained by County.

5.2. County shall report to the State of Oregon all allocated water stored and distributed to Customer's point of diversion of record, including reasonable losses. Customer shall report all water use as described on Customer's water right of record to County no later than November 30th of each year and as may be required by the State.

5.3. The obligations of County to allocate capacity may be restricted by any lawful order, regulation, or ruling of any governmental agency or provisions of a contract between County and the United States. Such legal restrictions may impair the County's ability to perform its obligations under this contract. In that event, County shall be relieved of its obligations to the extent necessary to comply with the legal restrictions. Customer's payments under this contract shall be reduced proportionally to any reduction in Customer's allocation resulting from such legal restrictions.

5.4. Notwithstanding any other provision of this contract, County may suspend release and delivery of water to Customer upon written notice to Customer if Customer fails to make any payment for such water when due.

6. DIVERSION AND USE OF WATER:

6.1. Customer shall be wholly responsible for taking, diverting, conveying and utilizing its water and shall bear all losses from Customer's point of diversion.

6.2. Customer shall divert the water it is entitled to receive under this contract in accordance with schedules developed by the Customer and County.

6.3. The water diverted by Customer may be measured by County at the point of diversion. The point of diversion shall be accessible for inspection and measurement of water at all reasonable times by County. Any easement necessary for County to gain access to the point of diversion shall be provided by Customer when requested by County.

6.4. The water shall be utilized for municipal, quasi-municipal or group domestic uses. Customer shall utilize the water only for the uses and only on the real property described in Customer's permit and certificate.

6.5 Customer shall be responsible for purchase and installation of a meter or other suitable measuring device if required by the Oregon State Water Resources Department (OWRD). Once installed, it shall be the Customer's responsibility to maintain such device in good working order. If requested by OWRD, Customer shall maintain a record of the amount of water use and report water use on such periodic schedule as may be established by OWRD.

6.6 If required, Customer shall purchase, install, maintain and operate fish screening equipment and by-pass devices to prevent fish from entering the diversion. Any required screens and/or by-pass devices shall be in place, functional and approved by the requirer, prior to diversion of any water, under this contract.

7. QUALITY OF WATER: County shall operate and maintain the Galesville dam, reservoir, and related facilities in a reasonable and prudent manner, and shall endeavor in good faith to take adequate measures to maintain the quality of raw stored water at the facilities. County is under no obligation to construct or furnish water treatment facilities to maintain or improve the quality of water. **COUNTY MAKES NO WARRANTIES, EXPRESS OR IMPLIED REGARDING THE QUALITY OF WATER RELEASED AND DELIVERED FROM GALESVILLE DAM, RESERVOIR, AND RELATED FACILITIES.**

8. WATER SHORTAGES: In any year in which a water shortage in the Galesville reservoir occurs, County shall apportion the available water supply among Customer and other users who are entitled to receive water from the reservoir. The quantity of water to be furnished for irrigation shall first be reduced as necessary, but not greater than 15%. Any further reduction in the reservoir water supply shall be shared by Customer and all other users entitled to water from the reservoir in the same proportion that the entitlement of each user, including Customer's entitlement under this contract, bears to the total entitlements of all users.

9. WATER CONSERVATION: Customer acknowledges the critical need for water conservation in the Umpqua River basin. Customer shall implement reasonable and prudent water conservation measures for municipal activities.

10. COMPLIANCE WITH LAW: This contract will be governed by and construed in accordance with laws of the State of Oregon. Each party shall perform its obligations in accordance with all applicable state, federal and local laws, rules and regulations now, or hereafter in effect.

11. PRICE OF WATER:

11.1. During the initial term, the price for the allocation stated in section 3 shall be $_____ per year.

11.2. For each discrete ten year extension of the contract term, Customer shall pay the then current rate as established by County in accordance with this section. Notice of the right to extend under subsection 1.3.1 shall state the price of water during the extension.

11.3. The Director shall periodically review and adjust the price for water taking into account the following factors:

11.3.1. The current cost of operating and maintaining the Galesville dam, reservoir, and related facilities;

11.3.2. The projected costs for operating, maintaining, and replacing Galesville water storage and delivery facilities; and

11.3.3. The price of water sold by similar facilities for similar uses.

11.4. Customer may request the Board of Commissioners to review and reduce the price of water established by the Director. Such request shall be in writing and shall be given with the notice of Customer's election to extend the contract term. After considering the factors listed in subsection 11.3, the Board of Commissioners may reduce or affirm the price established by the Director. If the Board of Commissioners fails to take any action on Customer's request to review and reduce the price of water within 30 days after Customer makes the request, the request shall be deemed denied. If Customer is not satisfied with the action of the Board of Commissioners, Customer may rescind Customer's election to extend the contract term and cancel the contract by written notice to County within sixty days after Customer requests the Board of Commissioners to review and reduce the price.

12. PAYMENT:

12.1. Customer shall pay County the annual price established by section 11 for the allocation stated in section 3 regardless of whether Customer uses any or all of the water allocated. Except as provided in subsection 12.2, payment shall be made no later than March 31 of each year.

12.2. If this contract is dated after March 2 in the year for which water is first to be released then the amount due for the first year only shall be payable within 30 days after the date the contract is signed by County.

12.3. Interest shall accrue on late payments at the rate of eighteen percent per annum commencing the day after the date payment is due. Customer shall pay all interest upon the request of County.

13. LIMITATIONS ON LIABILITY:

13.1. County shall not be liable for damages or other expenses sustained by Customer resulting from shortages in the quantity of water available for release, or interruptions in water deliveries to Customer, if such shortages or interruptions in deliveries are caused partially or entirely by hostile diversion, accidental damage to County facilities, operational failure of County facilities, or any cause beyond County's control.

13.2. Notwithstanding any other provision of this contract, County shall not be liable to Customer for damages caused by failure to comply with any obligation of County under this contract, if such failure results from lack of appropriation of funds necessary to perform such obligation pursuant to ORS 294.305 et seq. (Local Budget Law).

13.3. In no event shall County be liable to Customer for any indirect, special, or consequential damages even if Customer previously advised County of the possibility of such damages.

14. DEFAULT:

14.1. There shall be a default under this contract if either party materially fails to comply with any provision of this contract within thirty days after the other party gives written notice specifying the breach. If the breach specified in the notice cannot be completely cured within the thirty day period, no default shall occur if the party receiving the notice begins curative action within the thirty day period and thereafter proceeds with reasonable diligence and in good faith to cure the breach as soon as practicable.

14.2 If a default occurs, the party injured by the default may elect to terminate this contract and pursue any equitable or legal rights and remedies available under Oregon law, except that Customer's remedies shall be subject to the limitations on damages stated in section 13.

14.3. Any litigation arising out of this contract shall be conducted in the Circuit Court of the State of Oregon for Douglas County.

15. SEVERABILITY: If any provision of this contract is held to be invalid, that provision shall not affect any other provision of this contract. This contract shall be construed as if such invalid provision had never been included.

16. NO WAIVER: No provision of this contract shall be waived unless the waiver is written and signed by the party that waives its rights. Any waiver of a breach, whether express or implied, shall not constitute waiver of any other breach.

17. SUCCESSORS: The successors, assigns, and legal representatives of Customer and County shall be subject to all provisions of this contact. Customer shall not assign Customer's rights or obligations under this contract without prior written consent of County.

18. NOTICES:

18.1. Any notice required to be given under this contract shall be in writing and shall be given by personal delivery or mail, except that any notice required by law shall be given in the manner specified in the applicable law.

18.2. Notices to County shall be directed to Thomas R. Manton, Division Manager, Douglas County Public Works Department, Natural Resources Division, Room 306 Douglas County Courthouse, 1036 SE Douglas Street, Roseburg, OR, 97470.

18.3. Notices to Customer shall be directed to:

_____

_____

19. ENTIRE AGREEMENT: This contract is the final and complete agreement of the parties and supersedes all prior and existing written or oral understandings. No modification of this contract shall be valid unless it is in writing and signed by the parties.

CUSTOMER

Name _____

By _____

Title _____

Fed. ID No. _____

BOARD OF COUNTY COMMISSIONERS OF DOUGLAS COUNTY, OREGON

By _____
Robert G. Paul, PE, Public Works Director Authority to sign agreement granted by Order of the Board of Commissioners dated June 26, 2002

FOR COUNTY USE ONLY:

REVIEWED AS TO CONTENT	**REVIEWED AS TO FORM**
By _____ Manager, Natural Resources Division	By _____ Office of County Counsel
Date _____	Date _____
Coding _____	

TECHNICAL MEMORANDUM

MWH

To: **Phil Smith, MSA**

Date: Nov. 22, 2006 – Original
June 18, 2009 - Updated

From: **Jude Grounds and Pete Kreft**

Reference: 1530640

Reviewed: **Kathryn Mallon**

Subject: **City of Roseburg**
Long-Term Water Supply Plan, Conceptual Plan for a South Umpqua River WTP

Preface

The original version of this Technical Memorandum (TM) was completed in November 2006. The Long-Term Water Supply Plan and Water System Master Plan were never formally adopted by the City of Roseburg at that time. MWH was then requested to update this Technical Memorandum after the City revised its long-term population and water demand forecasts.

The original capacities for the proposed future South Umpqua River WTP were 6 mgd initial and 13 mgd ultimate. This updated TM uses a 7 mgd initial capacity and 14.7 mgd ultimate capacity. The design criteria and preliminary plant layout have been modified accordingly. The preliminary project cost estimates have also been adjusted to 2009 values to account for the higher capacities, as well as to account for cost escalations since 2006.

Introduction

The long-term water supply plan being completed for the City of Roseburg identifies a potential shortage of potable water supply beginning as early as 2030, depending on growth and increased water demands and available water from the existing North Umpqua River supply and treatment system at Winchester.

This Technical Memorandum presents a conceptual plan for a future water treatment plant on the South Umpqua River. The capacity of this supply for planning purposes was identified as 7 mgd initially and 14.7 mgd ultimately. Preliminary design criteria were developed for the entire supply system, from a river intake through the treatment plant, and then through high service pumping and finished water transmission to connect to the City's water distribution system. The primary purposes of this effort were two-fold:

- Develop a planning-level project cost estimate for the initial 7 mgd supply increment, and
- Determine the approximate land requirements for the new plant and intake

Water Quality and Treatment Goals

The raw water quality and the required treated water quality goals will define the types of treatment processes which should be considered. The treatment processes selected impact the cost and space requirements for the plant.

The South Umpqua River is presumed to be a moderate quality, low turbidity supply subject to seasonal turbidity spikes and taste and odor events. The South Umpqua River water quality is substantially poorer than the North Umpqua River from a drinking water quality perspective. Low flows during the summer create many of reasons for the presumed poorer water quality.

Table 1 summarizes several relevant South Umpqua River water quality parameters as reported in the 1989 Douglas County Water Management Plan (WMP). The Douglas County WMP also notes that turbidity levels are within typical ranges for the area and the general presence of heavy metals and other toxic substances are either non-detect, or well below recommended levels for public safety, though no specific compounds are explicitly identified. In addition, the WMP lists a total of 13 waste discharge permits for the South Umpqua River at the time of publication in 1989.

Table 2 presents treated water quality goals developed for the South Umpqua River WTP. These goals attempt to account for both existing and projected future water quality regulations. Also included in the table is a summary of corresponding treatment technologies appropriate for meeting these goals. The range of technologies presented has been narrowed to a list most appropriate for consideration at the South Umpqua River WTP, based on the performance of these technologies on rivers of similar water quality.

Based on the data presented in **Table 2**, the South Umpqua River WTP could be developed around either a membrane filtration or conventional filtration "backbone". Alternative process trains for each of these treatment technologies are presented in the following section.

Treatment Process Alternatives

For the purposes of this conceptual plan, one membrane and one conventional filtration process train (both capable of producing equivalent water quality) were developed for comparison. A brief discussion of each follows.

Membrane Treatment. Membrane technology is evolving and membrane treatment is growing in popularity throughout the industry. The Preliminary Design Report for the expansion of the City's Winchester WTP presents background information on the potential use of membrane filtration for the North Umpqua River supply. **Figure 1** presents a treatment flowchart for a membrane treatment process capable of meeting the water quality goals/standards established for the South Umpqua River WTP.

Though it is likely that membrane technology will be as commonplace as conventional treatment if/when the South Umpqua River WTP is constructed, for the sake of master planning, we recommend focusing on the conventional treatment train. This alternative represents the largest footprint, and the costs associated with conventional treatment will be greater than, or equal to, that of the membrane filtration train.

Conventional Treatment. Figure 1 also presents a treatment flowchart for a conventional treatment process capable of meeting the water quality standards established for the South Umpqua River WTP. As

mentioned above, this alternative represents a very robust and cost competitive approach to meeting the projected water quality goals/standards, and is therefore recommended for further analysis.

In addition, this treatment alternative positions the City to comply with potential future regulations for emerging contaminants and pathogens. The Water Industry's understanding of the treatment technologies needed to remove emerging contaminants is in its infancy. **Table 3** represents a summary of the anticipated performance of different types of drinking water processes for removal of various classes of compounds based on the most recent industry research. As highlighted in the table, the recommended process train contains five of the processes listed in the table; both Activated Carbon and Biological Activated Carbon filtration processes are highly rated for many of the classes of emerging contaminants. Researchers have concluded that in general, advanced treatment technologies such as activated carbon, high-pressure membrane processes (such as nanofiltration or reverse osmosis), and advanced oxidation (such as ozone or UV with hydrogen peroxide) are effective in the removal of many trace contaminants. However, no single treatment process has been demonstrated to be consistently effective in removing all of the emerging contaminants currently targeted due to the extremely wide range in their physical-chemical properties. As a result, it is anticipated that future drinking water treatment facilities will likely include one or more advanced treatment modules added to existing/new conventional treatment plants creating multi-barriers to a full range of potential existing and emerging contaminants.

Therefore, the proposed treatment processes for the South Umpqua River WTP include the following primary treatment processes:

- Rapid Mix
- Flocculation/Sedimentation
- Intermediate Ozonation
- Granular Media Filtration with a Deep Bed of Granular Activated Carbon (GAC)
- Ultraviolet (UV) Disinfection
- Free Chlorine for Distribution System Residual
- Treated Water Storage

One of the key benefits of the recommended treatment approach is the combination of three different disinfection processes; each with varying strengths and weaknesses as summarized in **Table 4**. Inclusion of each of these processes will position the plant well for addressing emerging pathogens should they become regulated in the future.

The inclusion of intermediate ozonation provides a strong oxidant for multiple purposes including taste and odor control and organics/SOC control. The use of GAC as the primary filter media provides adsorption capabilities for a multitude of organics and taste and odor compounds.

Design Criteria & Site Layout

Preliminary design criteria were developed for the recommended conventional treatment plant alternative in order to develop an opinion of probable cost (see **Table 5**). A "generic" site layout (**Figure 2**) was developed to determine the land requirements for such a plant. Below is a summary of key assumptions in the plant layout.

- The plant and river intake will be located on a site adjacent to the South Umpqua River (exact site not determined). This results in a short length of raw water pipeline and is similar to the layout at the Winchester WTP.

- The intake/raw water pumping system could be a "tower" similar to the Winchester plant, or could use cylindrical screens and a lower-profile pumping station, depending on the elevations and site constraints.
- The Administration/Operations Building is connected to the filter building, clearwell and high service pump station, similar to the Winchester Plant configuration.
- The flocculation/sedimentation basins are physically separated from the main plant building and do not have plate settlers, thereby requiring more space than at the Winchester plant.
- The solids handling/dewatering processes uses multiple lagoons which require the most space but are less expensive compared to mechanical dewatering systems.
- It was assumed that 4,000 feet of 30-inch finished water transmission pipeline, sized for the ultimate plant capacity, is required to deliver the water to the City's existing transmission system.

Approximately 3 acres are required for the plant (not including the land required for the intake and the raw water pipeline to the plant). Land for the plant should be set aside or acquired either now or in the future, preferably on the north or east side of the South Umpqua River to avoid a river crossing of the finished water transmission main. It is likely that this space requirement can be accommodated on City-owned property within the site of the City's abandoned North Roseburg sewage treatment plant at the southeast corner of Stewart Park or within Riverfront Park or Gaddis Park immediately upstream.

Estimated Costs

Table 6 presents a planning-level project cost estimate for the initial 7 mgd capacity plant in Year 2009 dollars. **Table 7** presents a planning-level project cost estimate for the expansion of the plant to 14.7 mgd capacity in Year 2009 dollars. The actual cost to implement the project phases will need to be escalated. Annual O&M cost estimates were not developed as part of this effort.

Operational Considerations

When this plant is constructed, its operations will need to be integrated with the Winchester WTP. Initially, the added capacity will likely only be required during the peak summer demand period. The City will have to decide whether to use the South Umpqua River WTP as a peaking facility (to operate only during the Summer months) or whether to operate it year-round as does the Winchester WTP. In either event, the City will likely have to increase its staff for plant O&M.

The recommended conventional plant is capable of being "mothballed" for months at a time for use as a peaking facility, which would mimic the operational strategy of the Medford Water Commission's Rogue River WTP. The challenge with this approach is how to hire/keep operators for the short operational season.

Table 1: Historical Water Quality – South Umpqua River

Water Quality Parameter	Units	Treated Water Quality Goal	Comments
Temperature	°F	5 - 10 (Winter Min) 20 – 25 (Summer Max)	• Typical for PNW
Total Nitrogen	mg/L	0.05 – 0.1 (Canyonville) 0.05 – 0.25 (Melrose Bridge)	• Indicative of agricultural run-off and/or municipal discharge
Total Phosphorous	mg/L	0.01 – 0.1 (Canyonville) 0.03 – 0.4 (Melrose Bridge)	• Indicative of agricultural run-off and/or municipal discharge • Typically limiting nutrient in stream. Levels exceed EPA guidelines for microbial/algae control.
Fecal *Coliform*	#/100mL	< 0.2 (typical) <0.7 (winter run-off)	• Indicative of agricultural run-off and/or municipal discharge • Potential indicator for *Cryptosporidium*

Table 2: Summary of Treatment Goals and Feasible Process Alternatives

Water Quality Parameter	Units	Projected Treated Water Quality Regulation	Most Feasible Process Alternatives
General			
Turbidity	NTU	≤ 0.1 each filter – 95% of filter run time (1): ≤ 0.3 100% of time	• Granular Filtration w/ Filter to Waste • Membrane Filtration
Particles	#/mL	< 50 - 95% of filter run time	• Granular Filtration w/ Filter to Waste • Membrane Filtration
Total Organic Carbon	mg/L	35% reduction	• Metal Coagulation
Pathogens			
Total/Fecal Coliform	#/100mL	0% positive leaving plant	• Ozone • Free Chlorine
Viruses		2-log removal	• Conventional Treatment with Media Filtration • Membrane Filtration
Viruses		>2 – log inactivation	• Ozone • Free Chlorine
Giardia		2.5-log removal	• Conventional Treatment with Media Filtration (+ particle count study) • Membrane Filtration
Giardia		>0.5-log inactivation	• Ozone • UV Light • Free Chlorine • Membrane Filtration
Cryptosporidium		3-log removal	• Conventional Treatment with Media Filtration (+ particle count study) • Membrane Filtration
Cryptosporidium		1-log inactivation	• Ozone • UV Light
Disinfection By-Products			
Chlorination By-Products	ug/L	< 80 THMs <60 ug/L HAAs	• Metal Coagulation • Free Chlorine Disinfection
Ozonation By-Products	ug/L	< 10 ug/L Bromate	• No Treatment Needed
SOCs, VOCs, IOCs			
SOCs (including Dioxin)	µg/L	Non-detect	• PAC (Continuous) • GAC Filter
VOCs	µg/L	Non-detect	• PAC (Continuous) • GAC Filter
IOCs	µg/L	< 50% MCL	• Metal Coagulation
Arsenic	µg/L	< 5	• Metal Coagulation

Table 2: Summary of Treatment Goals and Feasible Process Alternatives (Cont.)

Water Quality Parameter	Units	Projected Treated Water Quality Regulation	Most Feasible Process Alternatives
Corrosion Control			
Alkalinity	mg/L - CaCO3	> 20	• Caustic Soda
pH	-	> 7.5	• Caustic Soda
Taste and Odors			
Odors	TON	< 3	• Ozone • PAC • GAC Filter Adsorber • UV w/ Peroxide
MIB/Geosmin	ng/L	< 5	• Ozone • PAC • GAC Filter Adsorber • UV w/ Peroxide

SES AND OPERATIONS USED FOR REMOVAL OF EMERGING CONTAMINANTS

ɔn	AC	BAC	O_3/AOPs	UV/AOPs	Cl_2/ClO_2	Coagulation/ Flocculation	Softening/ Metal oxides	NF	RO
	E	E	L-E	E	P-E	P	G	G	E
ıicals	E	E	F-G	E	P	P-L	P-L	E	E
	E	E	E	E	E	P	P-L	G	E
	G	G	P	P	P	F-G	F-G	G	E
	P-L	F	P	P	P	P	G	G	E
lics	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
;	F-G	E	L-E	F-G	P-G	P-L	P-L	E	E
nts	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
tory	E	G-E	E	E	P-F	P	P-L	G-E	E
ors	E	E	E	F-G	P-F	P	P-L	G-E	E
nedia	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
ıtrol	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
sks	G-E	G-E	L-E	E	P-F	P-L	P-L	G-E	E
;	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
ıls	G-E	G-E	L-E	F-G	P-F	P-L	P-L	G-E	E
rgents	E	E	F-G	F-G	P	P-L	P-L	E	E

(70-90%); F: fair (40-70%); L: low (20-40%); P: poor (<20%). (Date Source: Snyder et. al., 2003)

yellow are included in the recommended Conventional Filtration Alternative Process Train.

ɔn Process (e.g.Hydrogen Peroxide Addition)
ted Carbon

tors
ducts

PhACs – Pharamceuticals
NF – Nanofiltration
O3 – Ozone
RO – Reverse Osmosis
UV – Ultraviolet Light

Table 4: Comparison of Disinfection Alternatives

Water Quality Parameter	UV Light	Ozone	Free Chlorine
Virus	-	o	+
Bacteria	o	+	+
Protozoa	+	- / o	-

Table 5: South Umpqua River WTP – Design Criteria

Item	Unit	Value	Value
General			
Total Nominal Plant Capacity	mgd	7.0	14.7
Average Annual Plant Flow	mgd	3.0	6.0
Minimum Total Plant Flow	mgd	1.0	2.0
Intake Screens			
Type of Screens	-	Fixed	Fixed
Number of Screens	No.	2	2
Screen Capacity (ea)	mgd	7.5	7.5
Screen Area (Approach Velocity @ 0.35 fps)	sf	35	35
Cleaning System			
Type	-	Air Burst	Air Burst
Receiver Tank Volume	gal	2,200	2,200
Cleaning Frequency	#/day	2	2
Compressor Capacity	cfm	200	200
Compressor Size	HP	10	10
Raw Water Pump Station			
Firm Capacity	mgd	7.5	15.0
Number Pumps	No.	2+1	4+1
Type		Vertical Turbine	Vertical Turbine
Pump Flow, each	mgd	3.75	3.75
TDH	ft	50	50
Motor Size	HP	50	50
Drives	-	Variable Speed	Variable Speed
Raw Water Meter			
Type		Mag	Mag
Number	No.	1	1
Meter Size	in	12	12
Flow Range	mgd	1 to 15	1 to 15
Flash Mix			
Type		Pumped Diffuser	Pumped Diffuser
Pump Type		Horz. End Suction	Horz. End Suction
Number	No.	1 + 1	2 + 1
Pump Flow, each	gpm	450	450
TDH	ft	40	40

Table 5: South Umpqua River WTP – Design Criteria (Cont.)

Item	Unit	Value	Value
Flash Mix (Cont.)			
Motor Size	HP	5	5
Nozzle Type	degree	90 deg. Full Cone	90 deg. Full Cone
Pressure requirement	psi	15	15
Nozzle Size	in	2.5	3.5
Nozzle Velocity	fps	30	30
Flocculation Basin			
Number Basins	No.	2	4
Stages of Flocculation	No.	3	3
Basin Dimensions (each Stage)	ft x ft	12 x 24	12 x 24
Side Water Depth	ft	13	13
Volume (each Stage)	gal	28,000	28,000
Total Flocculation Time (at Nominal Plant Flow)	min	35	33
Flocculators			
Type	-	Vertical-Shaft (VFD)	Vertical-Shaft (VFD)
Number (each Stage)	No.	2	2
Number (each Basin)	No.	6	6
Total Number	No.	12	24
Mixing Energy (G)			
First Stage	sec^{-1}	35 - 70	35 - 70
Second Stage	sec^{-1}	20 - 40	20 - 40
Third Stage	sec^{-1}	10 - 20	10 - 20
Flocculator Power (ea)			
First Stage	hp	1	1
Second Stage	hp	0.75	0.75
Third Stage	hp	0.5	0.5
Sedimentation Basin			
Number of Basins	No.	2	4
Basin Dimensions	ft x ft	24 x 100	24 x 100
Ave Side Water Depth	ft	14	14
Volume (each Basin)	gal	251,500	251,500
Detention Time	min	104	98
Surface Loading Rate	gpm/sf	1.0	1.1
Weir Overflow Rate	gpm/lf	101	106
Sludge Withdrawal	-	Chain-and-Flight	Chain-and-Flight

Table 5: South Umpqua River WTP – Design Criteria (Cont.)

Item	Unit	Value	Value
Ozone System			
Ozone Contactor			
No. of Contactors	No.	2	2
Type of Contactor	-	Serpentine (Side-stream Injection)	Serpentine (Side-stream Injection)
Capacity per Contactor	mgd	3.75	7.5
Basin Dimensions	ft x ft	12 x 20	12 x 40
Ave Side Water Depth	ft	12	12
Volume (each Basin)	gal	21,500	43,000
Contact Time (@ Nominal Flow)	min	8.8	8.3
Estimated Hydraulic Efficiency (T10/T)	-	0.7	0.7
Side-stream Injection Pumps			
Number	No.	2 + 1	2 + 1
Flow per Pump	gpm	225	500
TDH	ft	20	20
Motor Size	hp	2	2
Ozone Generation			
Transfer efficiency	%	93%	93%
Max Dose (transferred) at 8% Concentration	mg/L	1.4	1.4
Ave Dose	mg/L	0.8	0.8
No. of generators	No.	1 + 1	2 + 1
Capacity, ea (@ 8%)	ppd	100	100
Liquid Oxygen Feed System			
Number Storage Tanks	No.	1	1
Volume per Tank	gal	3,000	3,000
Days Storage (ave dose x peak flow)	days	33	15
No. Vaporizors	No.	1+1	1+1
Filters			
Number Filters		4	8
Capacity per Filter	mgd	2.1	2.1
Type		GAC Dual Media	GAC Dual Media
Filter Size			
Area per Filter	sf	289	289
Dimensions	ft x ft	17' x 17'	17' x 17'
Filtration Rate			
All Filters in Service	gpm/sf	4.2	4.4
1 Filter Out of Service	gpm/sf	5.6	5.0

Table 5: South Umpqua River WTP – Design Criteria (Cont.)

Item	Unit	Value	Value
Filters (Cont.)			
Underdrain Type		Plastic Block /IMS	Plastic Block w/IMS
Media Design			
GAC			
Depth	in	86	86
Effective Size	mm	1.4	1.4
Specific Gravity	-	1.4	1.4
Uniformity Coefficient	-	<1.3	<1.3
Sand			
Depth	in	12	12
Effective Size	mm	0.55	0.55
Uniformity Coefficient	-	<1.4	<1.4
Total L/d	-	2,120	2,120
Nominal Empty Bed Contact Time (w/ 1 Filter OOS)	min	9.6	10.7
Filter-to-waste			
Type	-	Pumped Recycle	Pumped Recycle
Pump Type	-	Horz. Centrifugal	Horz. Centrifugal
Number	No.	1 + 1	1 + 1
Max F-T-W Flow	gpm	1,460	1,460
TDH	ft	15	15
Horsepower	hp	40	10
Backwash			
Type	-	Water + Air	Water + Air
Air Scour Blowers			
Type	-	Positive Displacement	Positive Displacement
Number	-	1+1	1+1
Air Rate	cfm/sf	3	3
Capacity	cfm	870	870
Pressure	psi	8.0	8.0
Motor Size	hp	75	75
Drive Type	-	Const. Speed	Const. Speed
Backwash Supply Pump Station			
Peak Backwash Water Loading Rate	gpm/sf	20	20
Pump Type	-	Vertical Turbine	Vertical Turbine
Number	No.	1 + 1	1 + 1
Flow	gpm	5,800	5,800
TDH	ft	45	45

Table 5: South Umpqua River WTP – Design Criteria (Cont.)

Item	Unit	Value	Value
Filters (Cont.)			
Horsepower	hp	125	125
Drive Type	-	Variable Speed	Variable Speed
Backwash Wastewater Equalization			
Basin Type		Rectangular	Rectangular
No. of Basins	No.	1	2
Backwash Waste Volume	gal/BW	34,700	34,700
Backwash Storage	No. BWs	2	2
Tank Size	ft x ft	28 x 28	28 x 28
Operating Depth	ft	12	12
Equalization Pumps (to Clarification)			
Type	-	Vertical Turbine	Vertical Turbine
Number	No.	2 + 1	2 + 1
Time to Recycle 1 BW	min	90	90
Flow	gpm	390	390
TDH	ft	10	10
Horsepower	hp	3.0	3.0
Drive Type	-	Variable Speed	Variable Speed
UV Disinfection			
Type		Low-Pressure High Output	Low-Pressure High Output
Design Disinfection Requirement (*Cryptosporidium*)	log	1	1
UV Design Dose	mJ/cm2	24	24
Number of Reactors	No.	1 + 1	2 + 1
Capacity per Reactor	mgd	7.5	7.5
No. of Lamp Rows per Reactor	No.	2 + 1	2 + 1
No. of Lamps per Row	No.	14	14
Total No. of Lamps/Reactor	No.	42	42
Input Power per Lamp	W	350	350
Total Installed Electrical Load	kW	14.7	29.4
Cleaning Type	-	Food-Grade Acid	Food-Grade Acid
Tank Size	gal	100	100
Buried Treated Water Storage			
Type		Rectangular	Rectangular
Number Tanks	No.	1.25	1.25
Total Volume	MG	1	1
Water Depth	ft	20	20

Table 5: South Umpqua River WTP – Design Criteria (Cont.)

Item	Unit	Value	Value
Buried Treated Water Storage (Cont.)			
Estimated Hydraulic Efficiency (T10/T)	-	0.6	0.6
Contact Time (@ Nominal Flow)	hrs	4.3	2.0
High Service Pump Station			
Type	-	Vertical Turbine	Vertical Turbine
No. Pumps	No.	2 + 1	4 + 1
Capacity	mgd	3.75	3.75
TDH	ft	250	250
Motor Size	hp	250	250
Drive Type	-	Variable Speed	Variable Speed
Finished Water Flow Meter			
Type	-	Mag	Mag
Number	No.	1	1
Meter Size	in	12	12
Flow Range	mgd	1 to 15	1 to 15
Solids and Residuals Handling			
General			
Solids Production			
Max Sludge Production (Summer)	ppd dry	950	2,000
Max Sludge Production (Winter @ Min Flow)	ppd dry	250	500
Backwash Waste Water Clarifier			
Type	-	Clarifier/Thickener	Clarifier/Thickener
Number	#	1	2
Diameter	ft	14	14
Solids Loading Rate (max w/ 1 out of service))	ppd/sf	4	4
Thickened Solids Concentration	%	2	2
Thickened Solids Generation (Ave)	gpm	2.3	4.6
Lagoon Sludge Drying Beds			
Number	-	3	4
Solids Capacity (each)	ton	36	36
Size (each)	ft x ft	50 x 200	50 x 200
Area (each)	sf	10,000	10,000
Total Area	sf	30,000	40,000
Access Ramp Slope (V:H)	-	1 : 10	1 : 10

Table 5: South Umpqua River WTP – Design Criteria (Cont.)

Item	Unit	Value	Value
Solids and Residual Handling (Cont.)			
Side Wall Slope (V:H)	-	2.5 : 1	2.5 : 1
Decant Pump Station			
Type	-	Submersible	Submersible
Number	No.	1 + 1	1 + 1
Design Flow Rate	gpm	50	50
Design TDH	ft	25	25
Horsepower	hp	1	1
Chemical Feed Systems			
Alum			
Min Dose	mg/L	5	5
Average Dose	mg/L	15	15
Max Dose	mg/L	30	30
No. Storage Tanks	No.	2	3
Storage Volume (each)	gal	1,500	1,500
Days Storage (Ave Dose x Max Flow)	days	19	14
Caustic Soda (25%)			
Min Dose	mg/L	2	2
Average Dose	mg/L	7	7
Max Dose	mg/L	20	20
No. Storage Tanks	No.	1	2
Storage Volume (each)	gal	1,000	1,000
Days Storage (Ave Dose x Max Flow)	days	15	15
Sodium Hypochlorite			
Min Dose	mg/L	0.7	0.7
Average Dose	mg/L	1.5	1.5
Max Dose	mg/L	2	2
No. Storage Tanks	No.	2	3
Storage Volume (each)	gal	1,000	1,000
Days Storage (Ave Dose x Max Flow)	days	19	14
Calcium Thiosulfate			
Min Dose	mg/L	0.1	0.1
Average Dose	mg/L	0.25	0.25
Max Dose	mg/L	0.5	0.5
No. Storage Drums	No.	1	2
Storage Volume (each)	gal	55	55

Table 5: South Umpqua River WTP – Design Criteria (Cont.)

Item	Unit	Value	Value
Chemical Feed Systems (Cont.)			
Days Storage (Ave Dose x Max Flow)	days	13	13
Cationic Polymer			
Min Dose	mg/L	0.1	0.1
Average Dose	mg/L	0.12	0.12
Max Dose	mg/L	0.5	0.5
No. Dry Feeders	No.	1 + 1	1 + 1
Maximum Feed Rate	ppd	15	15
Filter Aid Polymer			
Min Dose	mg/L	0.005	0.005
Average Dose	mg/L	0.01	0.01
Max Dose	mg/L	0.05	0.05
No. Storage Tanks	No.	1	1
Storage Volume (each)	gal	55	55
Days Storage (Ave Dose x Max Flow)	days	800	382
Thickener Polymer			
Min Dose	lb/dry ton	6	6
Average Dose	lb/dry ton	7	7
Max Dose	lb/dry ton	10	10
No. Storage Tanks	No.	1	1
Storage Volume (each)	gal	55	55

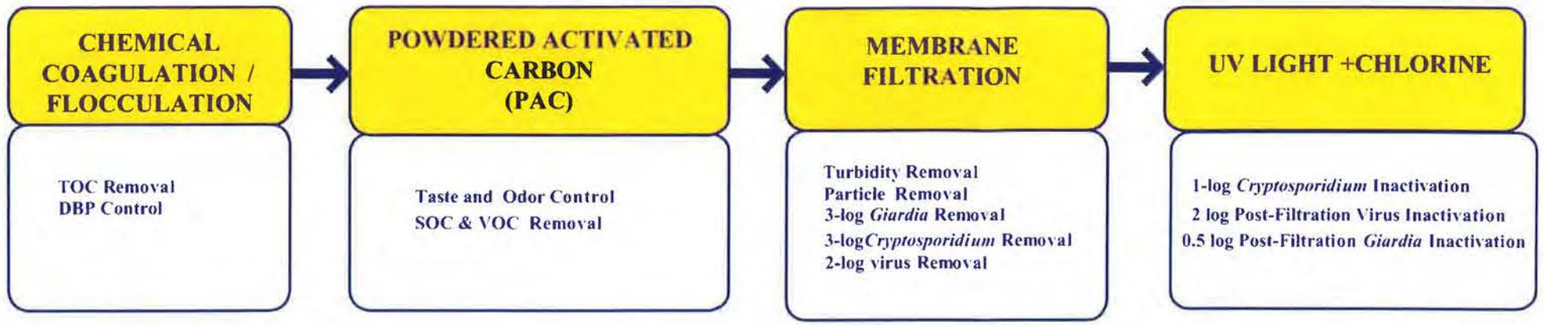
Table 6: Planning Level Estimate of Project Cost – Initial 7 mgd Plant (2009 dollars)

Facility	Initial Capacity
Raw Water Intake and Pump Station	$1,750,000
Influent Flow Metering and Flash Mix Facilities	$375,000
Flocculation/Sedimentation Basin	$1,500,000
Ozone Facilities	$1,100,000
Filters	$3,000,000
UV Disinfection Facilities	$1,150,000
Treated Water Storage	$1,450,000
High Service Pump Station and Metering	$700,000
Finished Water Transmission Pipeline (4,000 ft. – 30" dia.)	$1,800,000
Chemical Storage and Feed Facilities	$600,000
Backwash Equalization Basin and Pump Station	$350,000
Backwash Wastewater Clarification	$300,000
Sludge Drying Lagoons and Decant Pump Station	$450,000
New Admin & Laboratory Facilities	$350,000
Engine Generator/Backup Power Facilities	$450,000
Landscaping	$175,000
Subtotal	**$15,500,000**
Mobilization and General Conditions (@15%)	$2,320,000
Electrical (@ 12%)	$1,850,000
Site Civil and Yard Piping (@ 15%)	$2,320,000
Instrumentation (@ 6%)	$930,000
Subtotal	**$22,920,000**
Engineering, CMS, Legal, Admin + Contingencies (@ 45%)	$10,310,000
TOTAL	**$33,230,000**

Table 7: Planning Level Estimate of Project Cost for Expansion from 7 to 14.7 mgd (2009 dollars)

Facility	Expanded Capacity
Raw Water Intake and Pump Station	$300,000
Influent Flow Metering and Flash Mix Facilities	$90,000
Flocculation/Sedimentation Basin	$1,450,000
Ozone Facilities	$500,000
Filters	$2,700,000
UV Disinfection Facilities	$400,000
Treated Water Storage	$0
High Service Pump Station and Metering	$350,000
Finished Water Transmission Pipeline	$0
Chemical Storage and Feed Facilities	$200,000
Backwash Equalization Basin and Pump Station	$250,000
Backwash Wastewater Clarification	$250,000
Sludge Drying Lagoons and Decant Pump Station	$200,000
New Admin & Laboratory Facilities	$0
Engine Generator/Backup Power Facilities	$125,000
Landscaping	$75,000
SubTotal	**$6,890,000**
Mobilization and General Conditions (@15%)	$1,030,000
Electrical (@ 12%)	$830,000
Site Civil and Yard Piping (@ 15%)	$1,030,000
Instrumentation (@ 6%)	$415,000
SubTotal	**$10,195,000**
Engineering, CMS, Legal, Admin + Contingencies (@ 45%)	$4,600,000
TOTAL	**$14,795,000**

MEMBRANE FILTRATION



CONVENTIONAL FILTRATION

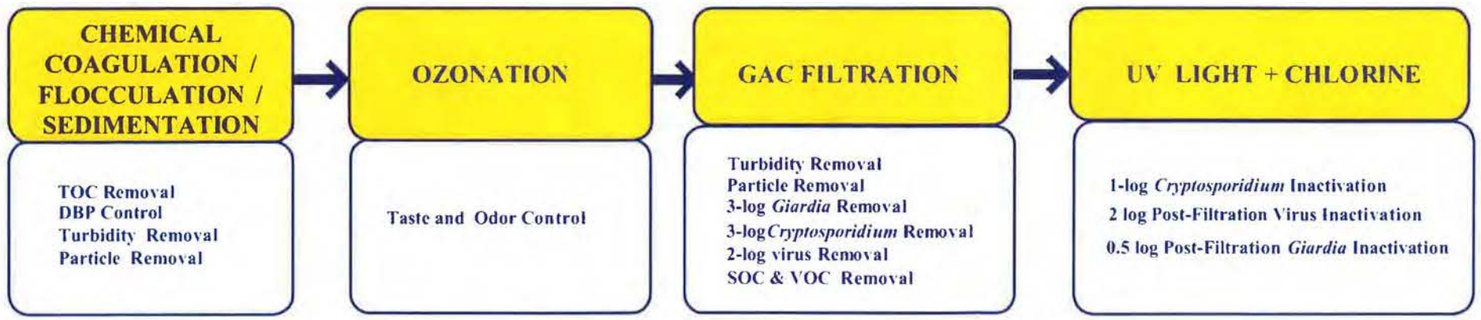


FIGURE 1
CITY OF ROSEBURG
SOUTH UMPQUA RIVER WTP
PROCESS TRAIN ALTERNATIVES

SOUTH UMPQUA RIVER

1. RIVER INTAKE
2. FLOCCULATION/SEDIMENTATION BASINS
3. OZONATION BASINS
4. FILTERS
5. UV DISINFECTION
6. ADMINISTRATION BUILDING/CLEARWELL
7. HIGH SERVICE PUMP STATION
8. EQUALIZATION BASIN
9. BWW CLARIFICATION
10. LAGOONS

REV	DATE	BY	DESCRIPTION

SCALE 1" = 20'

WARNING 0 ½ 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED MWH
DRAWN MWH
CHECKED MWH

SUBMITTED BY
(PROJECT MANAGER'S NAME) LICENSE NO. DATE
(COMPANY OFFICER'S NAME) LICENSE NO. DATE

MWH Portland Oregon

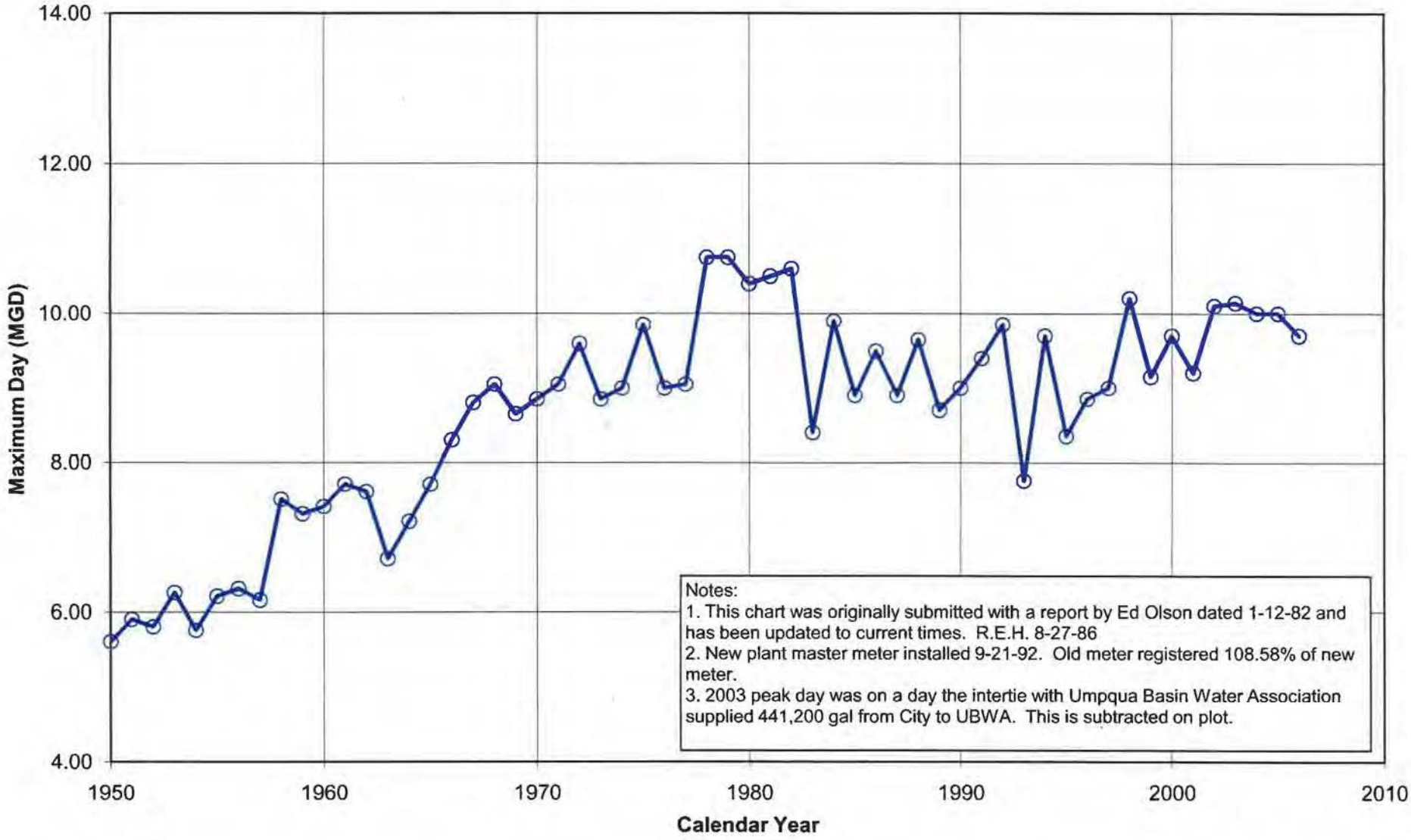
CIVIL
SOUTH UMPQUA RIVER WTP
PRELIMINARY SITE LAYOUT

FIGURE 2

MSA

APPENDIX C

Graph #6
City of Roseburg
Maximum Day Water Demands
Prepared By: Ed Olson - 1-12-82
Updated By: Richard E. Hutton



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

121 S.W. Salmon, Suite 900 • Portland, Oregon 97204-2919 • PHONE 503.225.9010 • FAX 503.225.9022

06-0814.101
January 19, 2007

Mr. Dick Hutton, P.E.
Civil Engineer
City of Roseburg
900 SE Douglas Avenue
Roseburg, OR 97470

Re: Conceptual Water Supply Plan, Urban Growth Boundary Area North of North Umpqua River

Dear Dick:

The following is our report documenting our conceptual analysis of and plan for providing City water supply to the City's urban growth boundary area north of the North Umpqua River.

Introduction and Purpose

As authorized by the City of Roseburg, Murray, Smith & Associates, Inc. (MSA) has prepared this letter report to provide a conceptual water supply plan for the City's proposed water service north of the North Umpqua River. The scope of work for this plan was covered under Task B of the MSA proposal dated August 31, 2006 and under the City's Work Plan Amendment 2 dated September 28, 2006. This water supply plan includes development of a conceptual water supply system configuration for the proposed service area, estimates of water demands for facility sizing, and a preparation of conceptual-level project cost estimates for the proposed facilities. The existing facilities of the Umpqua Basin Water Association located within the proposed service area are also identified and evaluated.

Proposed Water Service Area

The City is considering extending water service to the area within the City's urban growth boundary that is located north of the North Umpqua River, north of Winchester. The proposed water service area, which is the area within the urban growth boundary, is shown on Figure 1. The proposed service area, approximately 914 acres in size, is comprised of industrial, public reserve, residential and commercially zoned properties. The land uses and approximate acreage of each zone within the proposed service area are presented on Table 1.

Table 1
Land Use Summary

Zoning Category	Zoning Code	Permitted Land Use Examples	Acreage (Acres)
Heavy Industry	M3	Aggregate and mineral resource processing, manufacturing, fabricating, salvage and wrecking yard, slaughterhouse, etc.	528.67
Medium Industry	M2	Bottling work, equipment storage yard, freight and truck yard, lumber yard, welding and machine shop, storage and warehouse, concrete batching, etc.	84.32
Public Reserve	PR	Farm uses, public and semipublic buildings, cemetery, church, fairground, golf course, hospital, school, etc.	109.57
Single-Family Residential	R1	Single-family dwelling, public and semipublic uses, park, playground, community center, etc.	151.41
Rural Residential	5R	Single-family dwelling, limited farm uses, park, playground, public golf course, forest uses, etc.	22.11
Community Commercial	C2	Department store, grocery store, bank, automobile service station, medical clinic, restaurant, office supply store, theater, etc.	9.51
General Commercial	C3	Agricultural and machinery supply shops, nursery, automobile repair and parts, building supply store, business, professional and medical offices, hotel, etc.	8.00
		Total Acreage of Proposed Service Area	**913.59**

Existing Umpqua Basin Water Association Water System Facilities

Water service within the proposed service area is currently provided by the Umpqua Basin Water Association (UBWA). The 1998 UBWA Water Master Plan, which included mapping of the existing water supply system within the proposed service area, was reviewed. The existing UBWA distribution system in the area consists of pipelines ranging from 3-inches to 12-inches in diameter with pipeline materials consisting of ductile iron, asbestos cement, PVC and steel. The existing distribution system is served by two reservoirs, the College Tank and the Wilbur Tank. The College Tank is a 300,000 gallon steel tank, that is located just north of the North Umpqua River between I-5 and the Umpqua Community College. The Wilbur Tank is a 200,000 gallon steel tank situated just north of the proposed service area and directly west of I-5. Both reservoirs have an overflow elevation of 699 feet. The locations of these two reservoirs and the existing UBWA distribution pipelines in the proposed service area are shown on Figure 2. These reservoirs are supplied from the UBWA's water treatment plant on the North Umpqua River downstream of Winchester.

Conceptual Water Supply System

General

Water supply from the City's existing system to the proposed service area is best accomplished by extending a new water main into the service area from a connection to the existing transmission system at or near the intersection of Highway 99 and Pioneer Way. A storage reservoir is recommended to serve the new service area. Figure 3 illustrates the proposed basic water supply system to the area. Existing UBWA mains in the area could be connected to the new supply system if they are of proper size, of suitable materials and construction and can be removed from the UBWA system without adverse impact on UBWA's water supply system serving areas outside of the City's proposed water service area. Additional distribution mains would be needed as the area develops.

Estimated Maximum Day Water Demands

The water demands that could be experienced in the service area are not easily predicted at this time. About two-thirds of the service area is zoned for heavy industrial and medium industrial uses which can have widely variable water demands. For the purposes of this conceptual plan, the maximum daily water demand within the proposed service area at full development is estimated to be up to 5,000 gallons per acre per day (gpad) or approximately 4.6 million gallons per day (mgd) or 3,200 gpm.

Estimated Reservoir Capacity

Water storage facilities are provided to meet three major storage requirements – equalization storage, emergency storage and fire flow demand storage. The total storage required is the sum of these three elements.

Equalization storage is required to meet water system demands in excess of delivery capacity from the supply source to the reservoir. Equalization storage volume is assumed to be 25 percent of the maximum daily demand. The recommended equalization storage capacity in the proposed reservoir is 1.15 million gallons. Emergency storage is provided to supply water from storage during emergency situations such as pipeline failures, equipment failures, power outages or natural disasters. Similar to the equalization storage, the emergency storage volume is assumed to be 25 percent of the daily peak demand. The recommended emergency storage capacity in the proposed reservoir is 1.15 million gallons.

The maximum single fire flow demand in the service area is assumed to be 4,500 gallons per minute (gpm) for a four hour duration. The fire flow storage therefore accounts for 1.08 million gallons of storage capacity. The total minimum recommended storage capacity for the proposed service area is the sum of the equalization, emergency, and fire flow requirements or approximately 3.38 million gallons (mg). The nominal reservoir sizing is recommended to be 3.5 mg.

Proposed New Reservoir Site

As shown on Figure 3, the proposed reservoir is located in the area where it will provide the same elevation as the City's existing main pressure zone reservoirs, which have an overflow elevation of approximately 710 feet. With the assumption of a 30 foot deep reservoir, the proposed reservoir site is proposed to be located so that the reservoir bottom will be at approximate 680 foot elevation.

Transmission Main Sizing

A preliminary conceptual level hydraulic analysis on the proposed transmission main within the proposed service area was conducted to estimate the transmission main size. An 18-inch diameter transmission main between the proposed reservoir and the proposed point of connection to the existing City transmission mains was determined based upon the assumed maximum fire flow, the estimated maximum daily demand and a minimum residual pressure of 20 pounds per square inch at the highest approximate service elevation in the proposed service area, approximately 600 feet.

Transmission Main Crossing of the North Umpqua River

The proposed transmission main will need to cross the North Umpqua River at Winchester. The crossing can be either under-river or over-river. The over-river crossing across the North Umpqua River would be accomplished by attaching the proposed transmission main beneath one of the two I-5 bridges, either the northbound or the southbound span. Preliminary field inspection indicates that this approach would be technically feasible. An extensive approval process with ODOT will be required for a bridge crossing.

An under-river crossing can be accomplished by open trenching, directional drilling or tunneling. A directionally drilled crossing of a small diameter utility was recently accomplished directly east of the east (northbound) I-5 bridge. The feasibility of directional drilling is governed by the suitability of the subsurface materials for this construction technique. The crossing could be accomplished by tunneling but this would likely be the most expensive approach. Open cutting a trench across the river would be feasible but may present insurmountable permitting challenges.

Further analysis of the river crossing options is needed to determine the most preferable and economical approach. For the purposes of this conceptual report, it is assumed that the North Umpqua River crossing will be accomplished by the over-river crossing alternative, attaching the transmission main to one of the I-5 bridges. A budget is established assuming this approach. Further analysis with additional data including geotechnical drilling and permitting requirements review may indicate that an under-river crossing may be the preferable option.

Project Cost Estimate

To assist the City in preliminary planning and budgeting for the potential development of a water supply system north of the North Umpqua River, conceptual level project cost estimates have been developed. These cost estimates are based upon recent experience with construction costs for similar work in the region and assume improvements will be accomplished by private contractors. Cost estimates represent opinions of costs only, acknowledging that final costs will vary depending on actual labor and material costs, site conditions, market conditions for construction, regulatory factors, final project scope, project schedule and other factors.

The preliminary project cost estimates presented in this report include estimated construction costs plus an aggregate 30 percent allowance for contingencies, engineering, administration and other project-related costs. Since construction costs change periodically, an indexing method to adjust present estimates in the future is useful. The Engineering News Record (ENR) Construction Cost Index (CCI) is a commonly used index for this purpose. ENR provides monthly index estimates for 20 major U.S. metropolitan areas. For future reference, the November 2006 ENR CCI of 8655.83 for the Seattle, Washington area construction market (the nearest market ENR monitors) may be used in the future to update cost estimates in this report.

The cost estimates presented herein are preliminary and conceptual in nature and should be updated as more detailed system planning and preliminary engineering is completed to provide more refined estimates of future budgeting needs. Table 2 presents a preliminary project cost estimate for the proposed facilities.

Table 2
Preliminary Project Cost Estimate

Description	Estimated Cost
Estimated Construction Costs	
18-inch Ductile Iron Transmission Main (16,500' - 18-in. dia. at $175/LF)	$2,900,000
18-inch Steel Pipe - I-5 Bridge Crossing (1000' - 18-in. dia. at $800/LF)	$800,000
3.5 MG Steel Reservoir ($1.05/gallon)	$3,700,000
Total Estimated Construction Cost	$7,400,000
Construction Contingency, Engineering, Other Project Costs (30%)	$2,200,000
Total Estimated Project Cost	**$9,600,000**

Thank you very much for the opportunity to prepare this report. If you have any questions or need any further information, please don't hesitate to contact us.

Sincerely.

MURRAY, SMITH & ASSOCIATES, INC.

Philip H. Smith, P.E.
President

PHS:TK:sel

Attachments

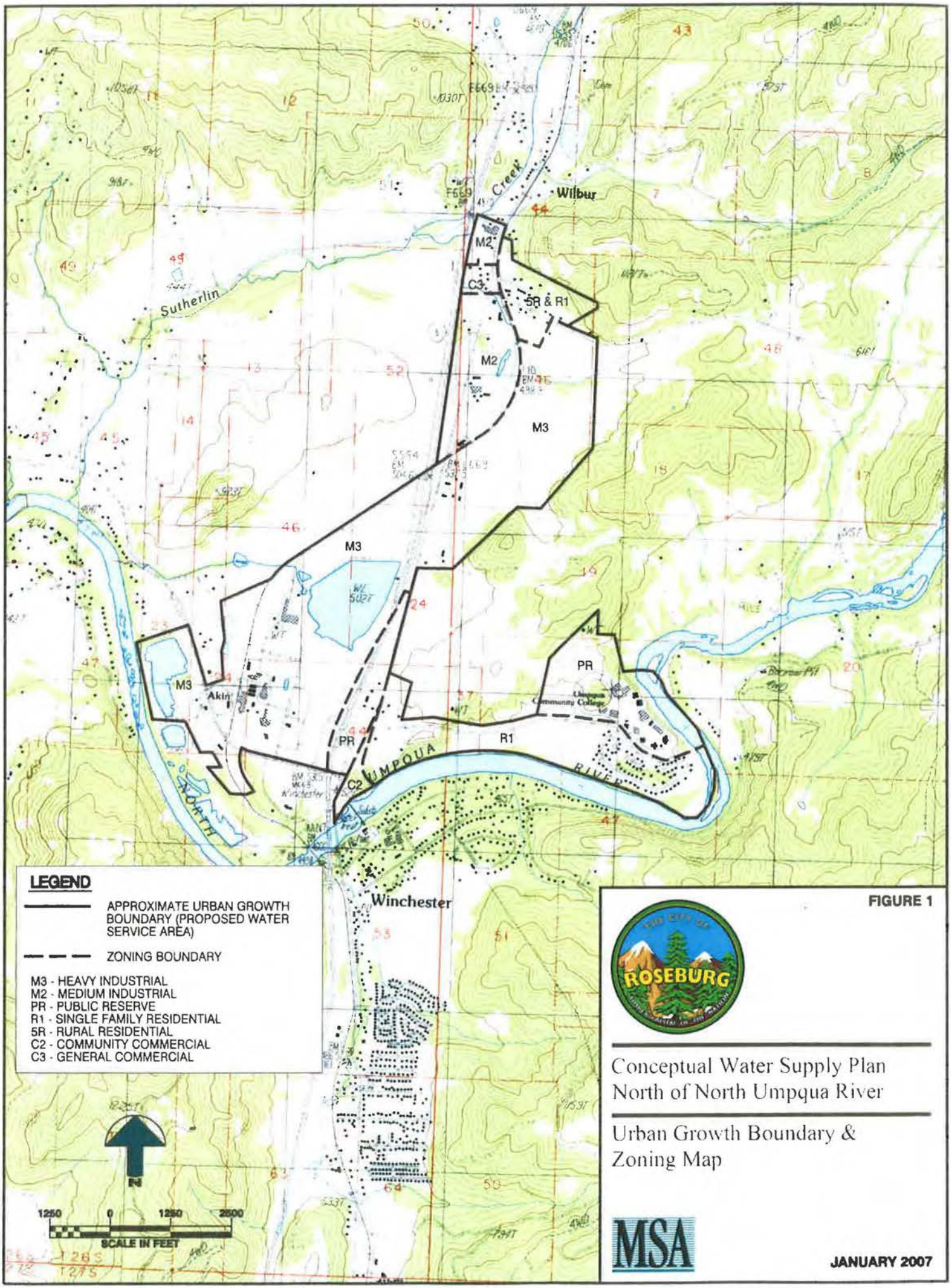


FIGURE 1

THE CITY OF ROSEBURG

Conceptual Water Supply Plan North of North Umpqua River

Urban Growth Boundary & Zoning Map

MSA

JANUARY 2007

FIGURE 2

THE CITY OF ROSEBURG

Conceptual Water Supply Plan
North of North Umpqua River

Existing Umpqua Basin Water Association Distribution System

MSA

JANUARY 2007

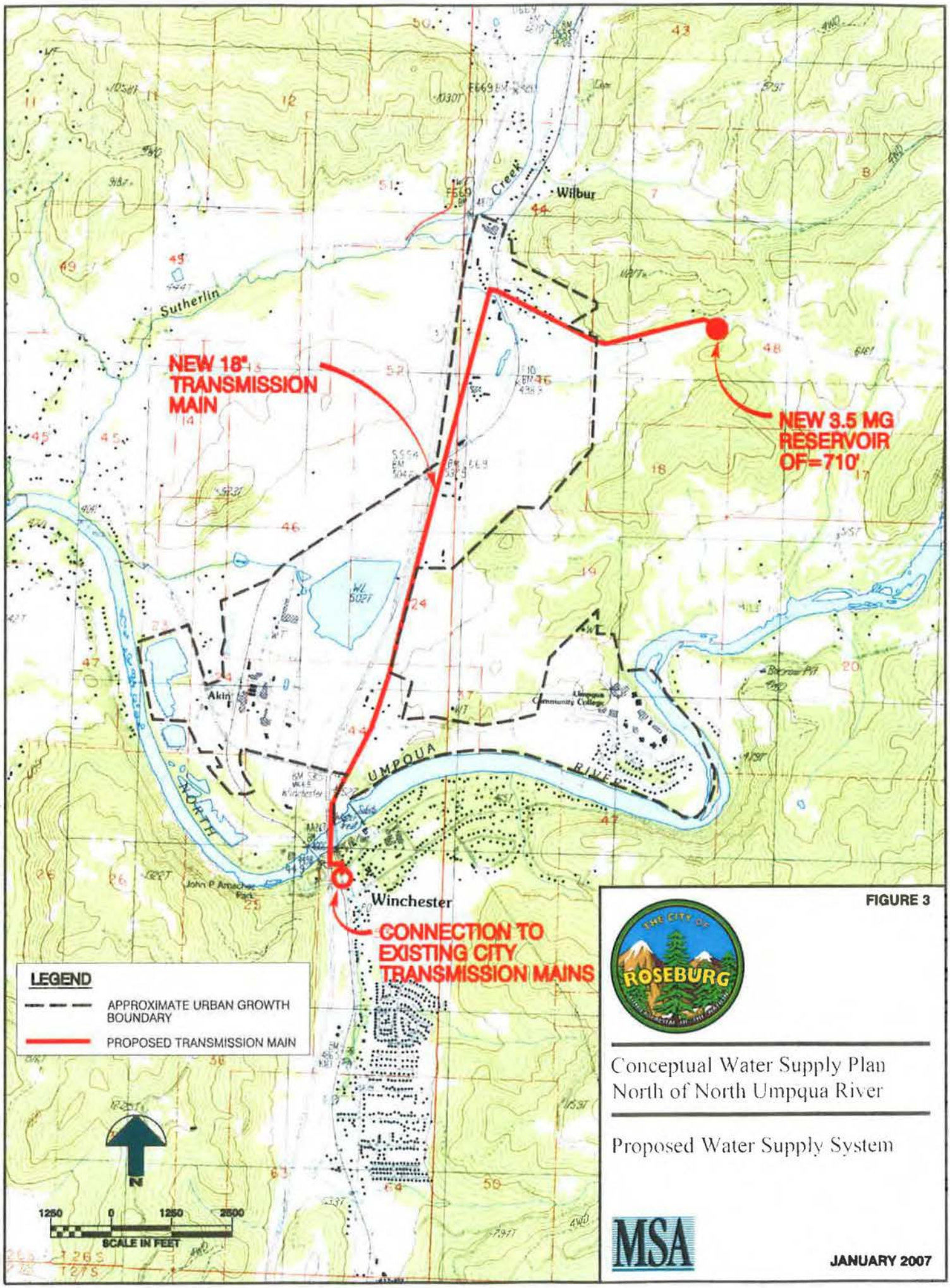


FIGURE 3

THE CITY OF ROSEBURG

Conceptual Water Supply Plan
North of North Umpqua River

Proposed Water Supply System

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