



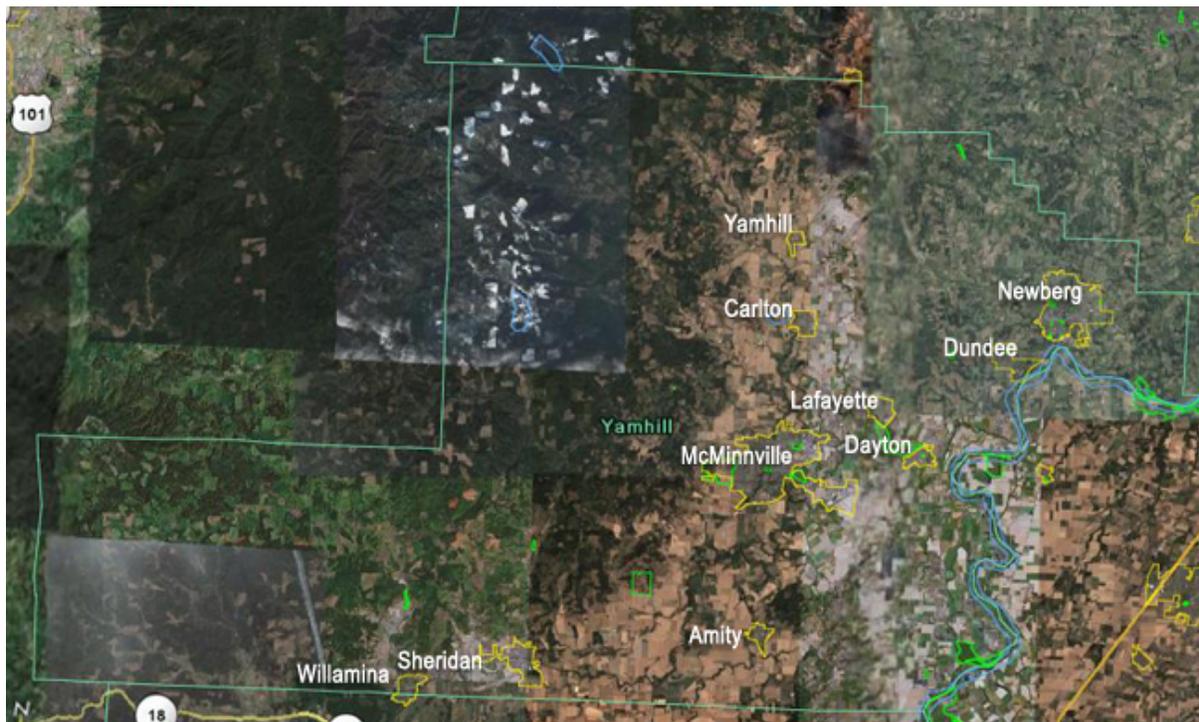
Yamhill County Water Supply Analysis

Presented to:

Yamhill County Water Task Force

FINAL

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1.0 BACKGROUND INFORMATION

1.1 Introduction

Like many areas in Oregon, Yamhill County is anticipating significant growth over the next 50 years. More than half the county population, which totals over 90,000, is located in two main population centers – the cities of McMinnville and Newberg. The remaining population is largely dispersed within smaller cities and the unincorporated areas of the County. Paralleling the increase in population is a growth in demand for reliable water supply. The objective of this study is to identify water supply options that can meet the increasing demands through year 2050.

Recent planning efforts by the individual communities and by the County indicate that several of the communities will need additional source of water within the next ten years. In addition, several communities including, Carlton, Amity, Newberg and Lafayette have had to implement at least one curtailment event in the past year. In response, Yamhill County is being proactive in search of a more abundant and reliable supply for municipal water, and formed a Water Task Force comprised of members from all of the communities. The communities have also met regularly over nearly two years to discuss and track water supply issues. The Water Task Force is comprised of representatives from the ten water providers in the County:

- City of Amity
- City of Carlton
- City of Dayton
- City of Dundee
- City of Lafayette
- City of McMinnville (McMinnville Water and Light)
- City of Newberg
- City of Sheridan
- City of Yamhill
- City of Willamina (portions within Yamhill County)

The issues related to development of significant new water supply for the County are complex:

- Major rivers and tributaries are fully appropriated during the low flow periods.
- Population centers in the County are dispersed making potential transmission needs a challenge.
- Storage options may be limited to locations along streams with existing surface water rights because of potential limits in issuance of new water rights.
- Some existing groundwater systems have experienced problems in declining yields, so opportunities for new groundwater supplies may be limited.
- The equitable distribution of financial burden is a key issue, especially for several small communities in the County.

Numerous studies have been conducted to aid this current study. Regional water supply planning has been undertaken since the early 1990's. Two of the more significant regional studies include: (i) the Bureau of Reclamation study (1996) evaluating large reservoir/storage options, and (ii) the Yamhill County intertie study (EES, 1998). Sources of supply considered by each community have also been identified in water master plans.

Within Yamhill County some of the potential sources of water include regional use of stored water in MacGuire Reservoir; developing water rights on the Willamette River; developing the proposed Sheridan/Willamina Reservoir; ground water (especially along the Willamette River); and aquifer storage and recovery (ASR). Furthermore, in Yamhill County a significant portion of growth and development may occur in the urban-rural transition zones where agricultural lands currently exist. Opportunities for transferring water rights used for irrigation can be considered for municipal use. Water conservation and reuse also are important options to offset part of the demand increase.

1.2 Study Objectives

The objective of this study is to provide an analysis of future municipal water supply needs in Yamhill County and to develop recommended supply alternatives and a strategy to meet those needs to a 2050 planning horizon. Elements of this study include:

- Estimate the county’s future needs for water (municipal)
- Identify the most viable long-term drinking water source(s)
- Evaluate supply options and recommend a strategy and alternatives for further development
- Discuss potential administrative options required for financing, governing and operation

This report documents the findings from the analysis associated with the elements listed above. This first phase outlines recommended strategies based on the source options that will meet the County’s water supply needs over the next 40 years. This analysis examines the potential costs, environmental impacts, permitting limitations, capacities, reliability, water quality, risks, and location (i.e., proximity to location of need) in developing recommended supply alternatives and strategy.

The findings and recommendations in this “Phase 1” study will be further developed in “Phase 2” once funding is obtained by Yamhill County. The recommended strategy and supply alternatives will be further developed and refined with respect to the technical feasibility and the implementation considerations.

1.3 General Approach

The tasks for this project include:

- Task 1—Water Needs Analysis:

The objective of the first task is to estimate the future water demands of the study participants in Yamhill County using existing information. The intent is to provide a “realistic” projection of demands consistent with existing planning efforts and appropriate for the planning level needs of this water supply study.

- Task 2—Review Existing Water Resources:

Task 2 identifies the existing and planned water supply sources available to the study participants (referred to as “water providers”).

- Task 3—Future Needs Analysis:

The third task defines the future water supply needs of the County relative to available water rights and existing water supply infrastructure for the County as a whole, as well as the individual participating water providers. HDR will present the findings of this draft memo to the TAP at their February 28, 2007 meeting as part of the 25% Progress Report.

- Task 4—Source of Supply Options and Alternatives:

Task 4 summarizes the source of supply deficiencies for the primary municipal water providers in Yamhill County (based on findings from Task 3); identifies potential source of supply options to meet the project demands (including local and regional options); identifies the evaluation criteria to select preferred alternatives; and develops sources alternatives (including transmission) based on the source options.

- Task 5—Review of Governance and Administrative Options:

Task 5 reviews in general terms the governance and administrative options available to the participants with respect to a sub-regional or regional entity to administer the supply strategy(s) identified in the assessment. The review will allow the participants to consider how to move forward with the recommended alternatives.

Figure 1-1 illustrates the tasks and review/meeting periods for the project. Throughout this process, the consulting team coordinated with the Water Task Force and members of the Technical Advisory Committee (a subgroup of the Task Force).

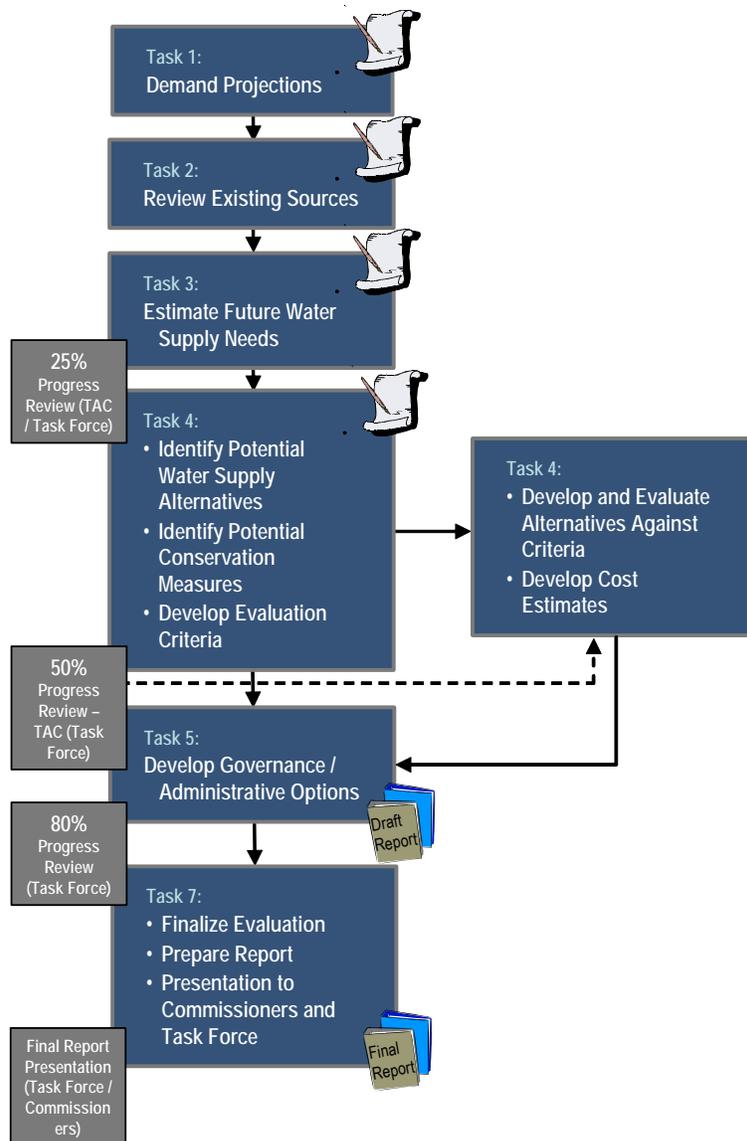


Figure 1-1. Illustration of Study Approach

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2.0 WATER DEMAND ANALYSIS

The first step in this study is to develop a water demand forecast based on population estimates and per capita water consumption rates provided by the individual water providers. The demand forecast is developed for average day demand (ADD) and maximum (peak) day demands (MDD) through the year 2050. As requested by the TAP, a range of outcomes (high, medium and low estimates) is presented to account for the uncertainty inherent in long-range forecasting of this kind.

The study participants for which population and water demand forecast data are developed include the members of the Water Task Force. Water demands outside of the study participants are not considered, because they are assumed to be served by individual domestic/irrigation sources or private industrial/commercial sources. It is assumed that any unincorporated areas/population eventually served by the study participants is included in the population growth estimates for each community.

The approach to forecast water demands is based on two primary elements: (i) population and (ii) per capita water use. The two elements are multiplied to produce the forecast of water demand. Several assumptions are needed within this approach, however, as described in Section 2.2.

2.1 Methodology

Whenever available, specific water master plan data was used as the primary source of population, water demand data, and per capita water consumption. When recent master plan information is not available, other sources are used as the basis for population estimates and per capita water use. The following communities had recent (within 10 years) water master plans available for use in this analysis:

- Dundee (2003)
- McMinnville Water and Light (1996)
- Newberg (2004)
- Sheridan (2000/2002)
- Yamhill (1996/1998)

In addition, information from the county's Transportation Plan were reviewed to augment or compare information in the master plans. Finally, population data from the U.S. Census and Portland State University Population Research Center were reviewed and used as basis for population projections. A summary of the references, plans and studies used in this analysis is presented in **Table 2-1**.

Reference	Information Provided
U.S. Census (1990, 2000)	Population for each study participant for years 1990 and 2000. This information was used to determine a growth rate applied to the entire planning period for those communities without a recent water master plan.
Portland State University Population Research Center Oregon Population Reports (2005 and 2006)	Population estimates for each study participant for years 2005 and 2006. This information was used to compare population estimates in the water master plans.
Yamhill County Transportation Plan (1994)	Population estimates for each study participant for years 1990, 1994, 2014. This information was used to compare population estimates in the water master plans.
Yamhill County Comprehensive Plan (1996)	Reviewed to identify any basis for growth constraints on population projections.
Yamhill County Intertie Study (1998)	Per capita water use (gallons per capita per day) for each study participant without a recent water master plan. This study used pre-1998 water master plans as the source of per capita water use. These values are considered the most reliable references for per capita water use at this time.
City of Newberg Water Distribution System Master	Information for the following is available over the planning period of each

Reference	Information Provided
Plan (2004)	master plan: <ul style="list-style-type: none"> ▪ Population projection ▪ Average day and maximum day demand projections ▪ Per capita water use This information is extrapolated over the planning period of this study (to 2050).
McMinnville Water and Light Water System Master Plan (1996)	
City of Sheridan Water Source/Supply Facility Plan (2000 [addendum 2002])	
City of Dundee Water System Master Plan (2003)	
City of Yamhill Water Master Plan (1996 [addendum 1998])	
Survey data from study participants in response to Eric Abrams, McMinnville Water and Light (2006)	Survey sheets included information on total number of service connections, peak water use and personnel contact information.

Table 2-2 summarizes the sources of information used to estimate population and water use over the planning period of this study.

Study Participant	Population	Per Capita Use	Peaking Factor	Master Plan Study Period	Notes
Amity	1990-2000 Census ⁽¹⁾	Intertie Study ⁽³⁾	Dundee as surrogate ⁽⁴⁾	NA	
Carlton	1990-2000 Census ⁽¹⁾	Intertie Study ⁽³⁾	Dundee as surrogate ⁽⁴⁾	NA	
Dayton	1990-2000 Census ⁽¹⁾	Intertie Study ⁽³⁾	Dundee as surrogate ⁽⁴⁾	NA	
Dundee	Water Master Plan ⁽²⁾	Water Master Plan ⁽²⁾	Water Master Plan ⁽⁴⁾	2003-2023	Build-out defined
Lafayette	Survey response	Survey response	Dundee as surrogate ⁽⁴⁾	NA	Build-out defined
McMinnville	Water Master Plan ⁽²⁾	Water Master Plan ⁽²⁾	Water Master Plan ⁽²⁾	1996-2025	Build-out defined
Newberg	Water Master Plan ⁽²⁾	Water Master Plan ⁽²⁾	Water Master Plan ⁽²⁾	2004-2025	
Sheridan	Water Master Plan ⁽²⁾	Water Master Plan ⁽²⁾	Water Master Plan ⁽²⁾	2002-2025	Build-out defined
Willamina	1990-2000 Census ⁽¹⁾	Intertie Study ⁽³⁾	Dundee as surrogate ⁽⁴⁾	NA	
Yamhill (City of)	1990-2000 Census ⁽¹⁾	Intertie Study ⁽³⁾	Dundee as surrogate ⁽⁴⁾	NA	Build-out defined

Notes:

- (1) U.S. Census Data for population for years 1990 and 2000 were used to derive a growth rate applied to the entire planning period.
- (2) Water master plan developed for the community is used as the basis for population data, per capita water use and peaking factor to derive average day and maximum day demand (see Table 1).
- (3) Yamhill County Intertie Study (EES, 1998) was used as the basis for the per capita water use for these communities.
- (4) City of Dundee's peaking factor was also applied for these communities because of their similar size in terms of population served by the water system.

Population Estimate. The key feature of the demand forecast is the population estimates for the study area. Whenever available, population projections developed in existing water master plans are used for the individual study participants. In those cases where a recent master plan is not available, the primary source of population data is taken from U.S. Census. Data from Portland State University and Yamhill County Planning Department were also considered, but were determined not to provide any more recent or reliable information.

Population Growth Rate. By definition, the population growth rates are assumed to be annually compounding (geometric). In those cases where the U.S. census data is used for the population forecast, a growth rate is derived using the data from years 1990 and 2000¹. For those communities with master plans, the population was projected using the growth rate from the last period developed in the master plan.

Per Capita Use. The per capita water consumption rate (gallons per capita per day) is based on information in the *Yamhill County Intertie Study* (EES 1998), unless this information is available in a more recent water master plan for the individual study participants. The *Intertie Study* is used as the default source for per capita use because the study has already been reviewed by the County.

Water Demand. The water demand forecast is expressed in terms of ADD and MDD. Whenever available, ADD and MDD from existing water master plans are used and projected to 2050 using the same growth rate from the last period in the master plan. For those cases where ADD is not available in a master plan, it is derived by multiplying the population for a given year by the per capita water use. In turn, MDD is derived by multiplying ADD by a peaking factor (typically on the order of 2.0). Whenever available, the peaking factors derived in the master plans are used for each study participant. If that information is not available, a surrogate is used. In this case, the City of Dundee has a recent water master plan and the peaking factor of ~2.2 is applied to all of the other communities that do not have a recent master plan, and which have similar population. These include Amity, Carlton, Dayton, Willamina and Yamhill.

Table 2-3 summarizes the per capita water use and peaking factor assumed for each study participant. The per capita water use assumed in this study ranges from 135 gallons per capita per day (gpcd) for Newberg to 231 gpcd for McMinnville, with the average being 147 gpcd. These per capita water use factors were not based on the same time period.

The peaking factors ranged from 1.5 for Dayton to 2.5 for McMinnville and Yamhill. This is important for evaluating sources to meet the maximum day demands of the individual communities and the project as a whole.

Study Participant	Per Capita Use (gallons per capita per day)	Peaking Factor (MDD/ADD)
Amity	147	2.2
Carlton	182	2.2
Dayton	150	1.5
Dundee	143	2.2
Lafayette	147	2.2
McMinnville	231	2.5
Newberg	135	2.1
Sheridan	173	2.2
Willamina	145	2.2
Yamhill (City of)	140	2.5

¹ The formula to derive the growth rate is: $r = [(b/a)^{1/n} - 1]$, where:

r = the compound growth rate, expressed as a decimal

b = population at the end of the overall time period (e.g. pop. in year 2000)

a = population at the beginning of the period (e.g. pop. in year 1990)

n = number of sub-periods (e.g. number of years between a and b)

Build-Out. Under Oregon’s land use laws, communities are required to maintain comprehensive plans which define urban growth boundaries (UGB) and include density requirements for development. A community reaches “build-out” when all available lots within the UGB are developed. If this occurs, a building moratorium may be initiated and population growth can be significantly reduced (or halted) from its projected growth rate. Alternatively, a community may decide to pursue expansion of its UGB to allow more development (and population growth) to continue to occur.

If build-out or density requirements are disregarded the projections will continue to grow unbounded. Considering the constraints of land use planning, this is not necessarily a “realistic” result. For this study, basic assumptions are used to reflect the likely “tapering” of growth over the long-term. The “low range” estimate assumes that UGB will limit the population growth, while the “high range” estimate assumes that the UGB will be expanded to allow continued growth. It is difficult to justify if and when the UGB will constrain growth and whether each community will allow expansion of the UGB. Nevertheless, representing this situation is important to capture the potential range in water demands.

At the time of this analysis, specific build-out information was not available for all communities, with the exception of Dundee, Sheridan, Lafayette, McMinnville and Yamhill. For Dundee and Sheridan, build-out was not anticipated to be reached until after 2020. In Lafayette, build-out was expected to be reached by ~2010. Although the water system plan for Yamhill indicated build-out would not be reached before 2020, input from Yamhill staff for this study indicated that the City of Yamhill was close to build-out (*personal communication, Richard Howard*). McMinnville indicated that the UGB would likely be expanded upon reaching its limits at approximately 2012.

Taking this information into account, three different scenarios for the population projection are considered:

- *Scenario 1 – No build-out constraints:* assumes growth rates derived from the census data and water master plans continue unimpeded through the entire planning period, unless information from master plans indicate explicitly that build-out is achieved within the planning period (i.e. for the cases of Dundee, Lafayette, Sheridan and Yamhill).
- *Scenario 2 - UGB expansion not allowed:* generally assumes that UGB constraints reduce the growth rates to *half* of the rate derived from the census data between 2015 and 2025, and further by half between 2025 and 2050 for communities without explicit build-out information from the master plans. This applies to Amity, Carlton, Dayton, McMinnville, Newberg and Willamina. In this case, the UGB is not expanded within the planning period. Exceptions to this description are shown in **Table 2-4**.
- *Scenario 3 – UGB expansion allowed:* generally assumes that UGB constraints reduce the growth rates to half of the rate derived from the census data between 2015 and 2025. By 2025 it is assumed that a UGB expansion occurs and that growth rates continue at the pre-2015 growth rates derived from the census data and master plans. This applies to Amity, Carlton, Dayton, McMinnville, Newberg and Willamina. Exceptions to this description are shown in **Table 2-4**.

Table 2-4 summarizes the growth rates for each of the three scenarios over the planning period (through 2050). Predicting when UGB expansion might occur is highly uncertain; therefore, the assumptions for their timing were based partly to make the analysis more convenient.

Uncertainty. In addition to the uncertainty associated with reaching build-out, water demand forecasting has inherent uncertainty due to the potential for varying growth rates, changes in land use (e.g. impacts of Measure 37), changes in water use efficiency and other factors. To account for this uncertainty, the baseline projections are adjusted to develop a “low” and “high” estimate of water demand. The demands based on Build-out Scenario 1 is adjusted higher by 10%, while the demands based on the Build-out Scenario 3 is adjusted lower by 10%. This provides a “demand projection band” for comparative purposes.

Table 2-4. Growth Rates for Build-Out Scenarios for Population Projections			
Study Participant	Scenario 1: No Build-out Constraints	Scenario 2: UGB Expansion not Allowed	Scenario 3: UGB Expansion Allowed
Amity	2.3% (to 2050)	2.3% (to 2014) 1.2% (2015-2025) 0.6% (2026-2050)	2.3% (to 2014) 1.2% (2015-2025) 2.3% (2026-2050)
Carlton	1.6% (to 2050)	1.6% (to 2014) 0.8% (2015-2025) 0.4% (2026-2050)	1.6% (to 2014) 0.8% (2015-2025) 1.6% (2026-2050)
Dayton	3.3% (to 2050)	3.3% (to 2014) 1.7% (2015-2025) 0.83% (2026-2050)	3.3% (to 2014) 1.7% (2015-2025) 3.3% (2026-2050)
Dundee	4.0% (to 2015) 3.3% (2016 to 2023) 0% (2024-2050)	Same as Scenario 1	4.0% (to 2015) 3.3% (2016 to 2050)
Lafayette	6.7% (to 2010) 1.5% (2011 to 2015) 0% (2015 to 2050)	Same as Scenario 1	6.7% (to 2010) 1.5% (2011 to 2050)
McMinnville	3.1% (to 2050)	3.1% (to 2014) 1.5% (2015-2025) 0.78% (2026-2050)	3.1% (to 2014) 1.5% (2015-2025) 3.1% (2026-2050)
Newberg	2.0% (to 2020) 1.7% (2021 to 2050)	2.0% (to 2020) 1.7% (2021 to 2025) 0.85% (2026 to 2050)	2.0% (to 2020) 1.7% (2021 to 2025) 2.0% (2026 to 2050)
Sheridan	3.0% (to 2030) 0% (2031 to 2050)	Same as Scenario 1	3.0% (to 2030) 1.5% (2031 to 2050) 3.0% (2026-205)
Willamina	0.5% (to 2050)	0.5% (to 2014) 0.25% (2015-2025) 0.12% (2026-2050)	0.5% (to 2014) 0.25% (2015-2025) 0.5% (2026-2050)
Yamhill (City of)	1.7% (to 2020) 0% (2021 to 2050)	1.7% (to 2015) 0.85% (2016-2025) 0.42% (2026-2050)	1.7% (to 2015) 0.85% (2016-2025) 1.7% (2026-2050)

Other Assumptions. Several other assumptions used in the development of the population and water demand projections are worth noting:

- Per capita water use assumes production demands (i.e. the values include unaccounted-for-water).
- Per capita water use does not generally change for each study participant during the planning period (unless specifically developed in the water master plan). The effect of water conservation and efficiency measures would be to reduce the per capita water use over time, and as such act as “additional” source of supply. This is considered in the source of supply analysis.
- Demands are primarily driven by residential use. Industrial/commercial use is not explicitly projected. The individual water providers did not identify any large or significant projected non-residential use.

2.2 Demand Forecast Results

Appendix A includes a detailed spreadsheet table of the population and water demand forecasting analysis based on the methods described above. This section includes summary tables of the results. **Table 2-5** summarizes the population projection data over the entire planning period for each of the water providers and unincorporated areas for each of the three build-out scenarios. As **Table 2-5** shows, McMinnville and Newberg are by far the largest populations served, followed by Sheridan, Lafayette, Dundee and Dayton. The smaller communities include Amity, Carlton, Willamina and Yamhill. It should be noted that Willamina is not entirely inside Yamhill County, but its full service area is considered in this study.

Table 2-5. Summary Population Projections with Build-Out Scenarios				
	2010	2015	2025	2050
Amity				
Scenario 1-No Buildout Constraint	1,859	2,085	2,623	4,654
Scenario 2-UGB Expansion not Allowed	1,859	2,085	2,340	2,704
Scenario 3-UGB Expansion Allowed	1,859	2,085	2,340	4,153
Carlton				
Scenario 1-No Buildout Constraint	1,778	1,927	2,264	3,384
Scenario 2-UGB Expansion not Allowed	1,778	1,927	2,089	2,312
Scenario 3-UGB Expansion Allowed	1,778	1,927	2,089	3,124
Dayton				
Scenario 1-No Buildout Constraint	2,942	3,467	4,815	10,940
Scenario 2-UGB Expansion not Allowed	2,942	3,467	4,091	5,036
Scenario 3-UGB Expansion Allowed	2,942	3,467	4,091	9,296
Dundee				
Scenario 1-No Buildout Constraint	3,865	4,713	6,540	6,540
Scenario 2-UGB Expansion not Allowed	3,865	4,713	6,540	6,540
Scenario 3-UGB Expansion Allowed	3,865	4,713	6,540	14,832
Lafayette				
Scenario 1-No Buildout Constraint	4,946	5,328	5,328	5,328
Scenario 2-UGB Expansion not Allowed	4,946	5,328	5,328	5,328
Scenario 3-UGB Expansion Allowed	4,946	5,328	6,184	8,972
McMinnville				
Scenario 1-No Buildout Constraint	34,218	39,861	54,092	116,036
Scenario 2-UGB Expansion not Allowed	34,218	39,861	46,489	56,385
Scenario 3-UGB Expansion Allowed	34,218	39,861	46,489	99,725
Newberg				
Scenario 1-No Buildout Constraint	22,953	25,406	30,545	46,186
Scenario 2-UGB Expansion not Allowed	22,953	25,406	30,545	37,592
Scenario 3-UGB Expansion Allowed	22,953	25,406	30,545	50,747
Sheridan				
Scenario 1-No Buildout Constraint	7,600	8,810	11,839	13,725
Scenario 2-UGB Expansion not Allowed	7,600	8,810	11,839	13,725
Scenario 3-UGB Expansion Allowed	7,600	8,810	11,839	18,484
Willamina				
Scenario 1-No Buildout Constraint	1,945	1,998	2,108	2,409
Scenario 2-UGB Expansion not Allowed	1,945	1,998	2,052	2,122
Scenario 3-UGB Expansion Allowed	1,945	1,998	2,052	2,346

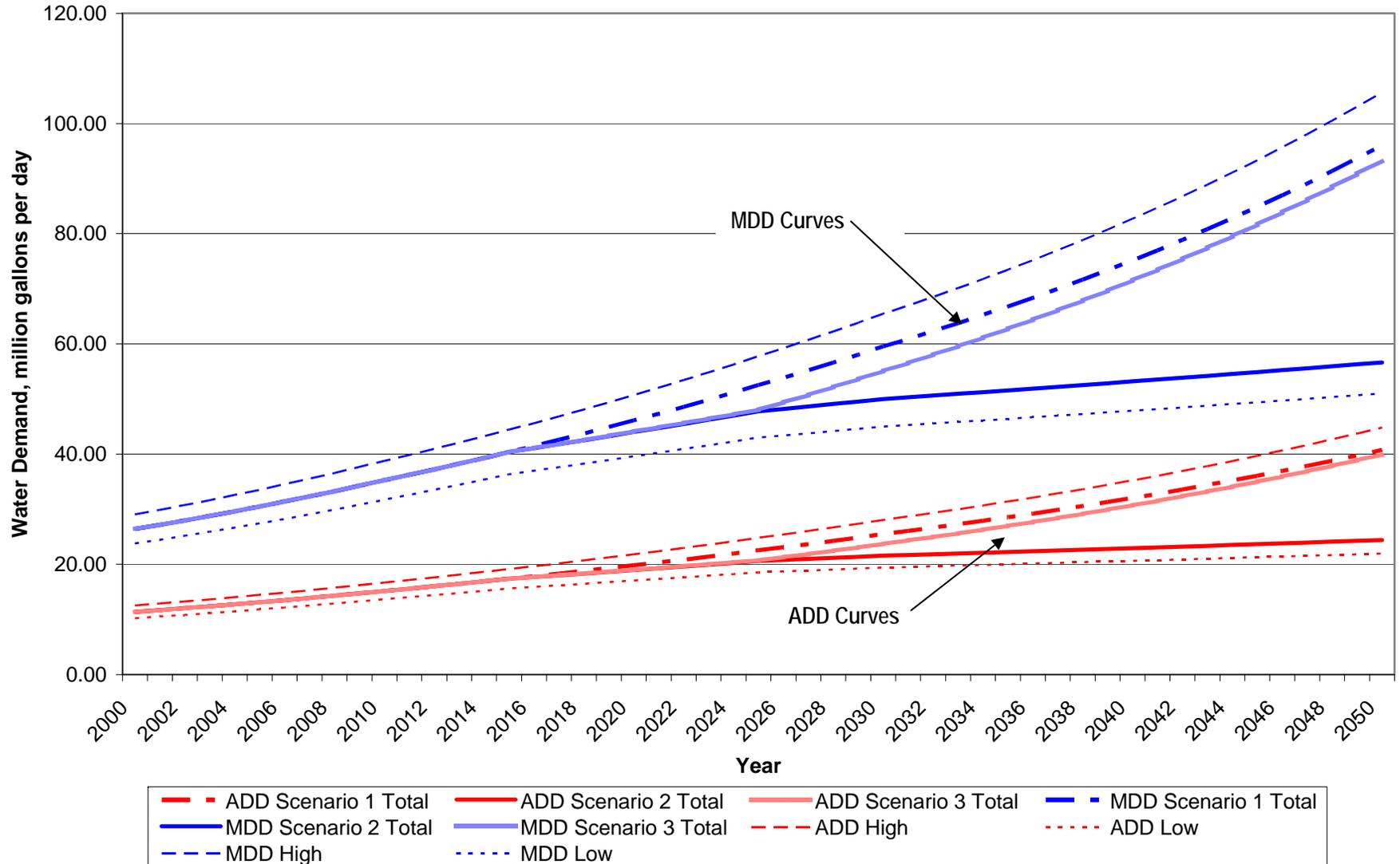
Table 2-5. Summary Population Projections with Build-Out Scenarios				
	2010	2015	2025	2050
Yamhill				
Scenario 1-No Buildout Constraint	1,984	2,158	2,348	2,348
Scenario 2-UGB Expansion not Allowed	1,984	2,158	2,348	2,348
Scenario 3-UGB Expansion Allowed	1,984	2,158	2,349	3,577
Water Provider Total				
Scenario 1-No Buildout Constraint	84,091	95,755	122,502	211,550
Scenario 2-UGB Expansion not Allowed	84,091	95,755	113,663	134,093
Scenario 3-UGB Expansion Allowed	84,091	95,755	114,519	215,256
Incorporated Yamhill County	28,131	30,056	34,311	47,774

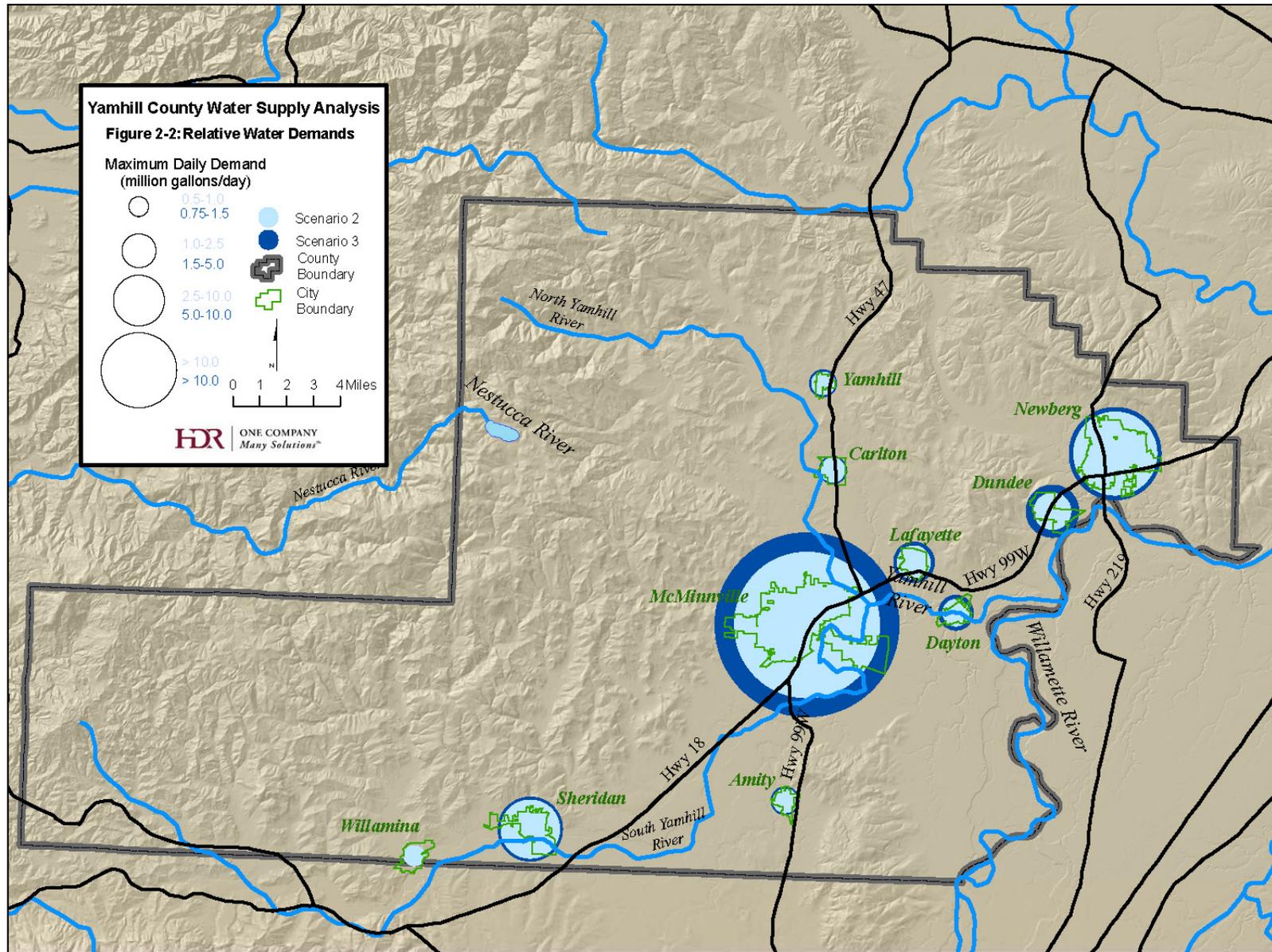
Table 2-6 includes a summary of the average daily demand projections for each of the study participants based on the population and per capita water use presented in **Tables 4 and 5**. **Figure 2-1** shows the water demand projection for totals for ADD and MDD for all of the study participants, along with the low and high ranges.

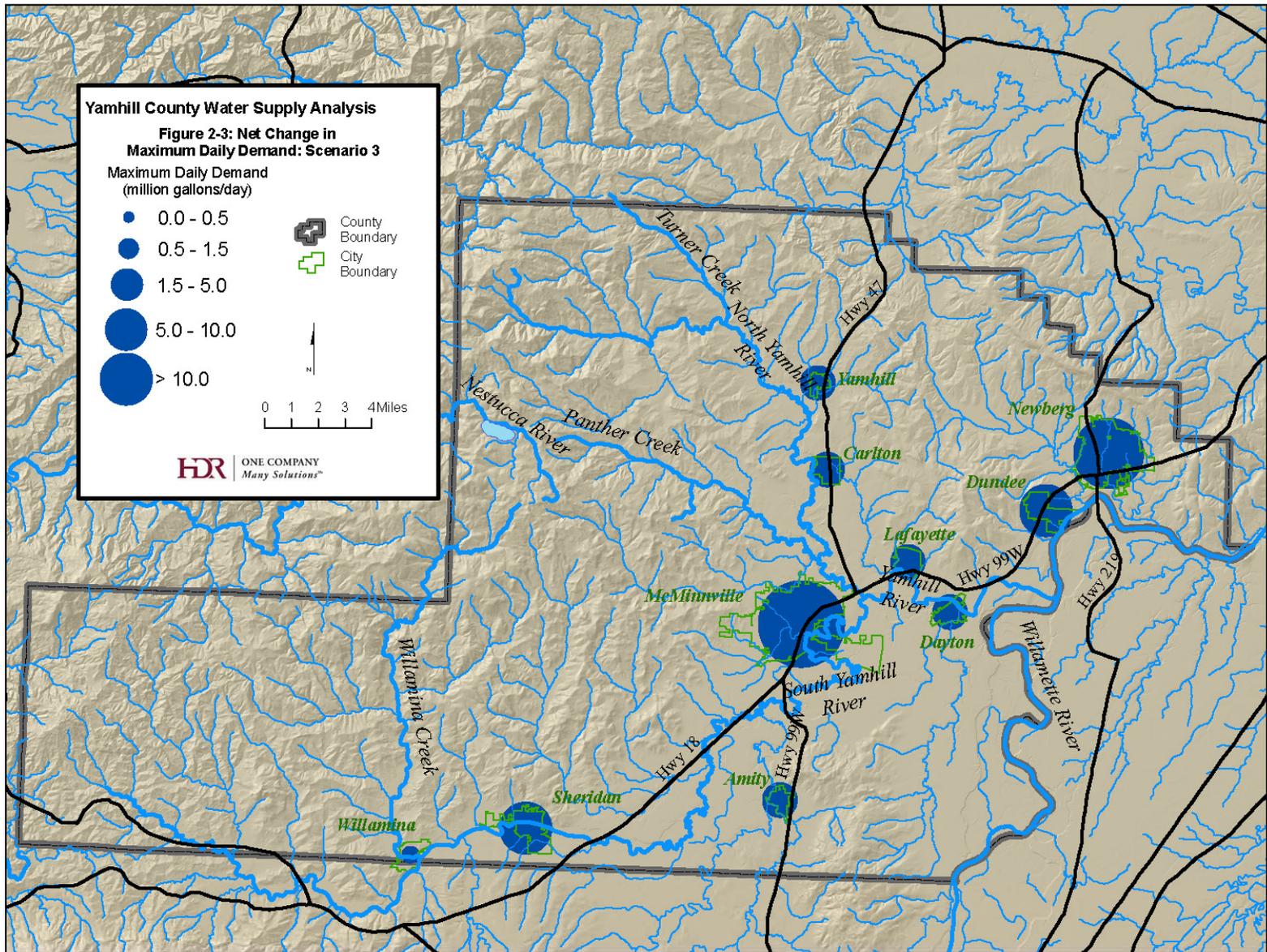
As **Table 2-6** shows, McMinnville presents the largest current demands and the largest increase in demands to be met over the planning period. Under the three build-out scenarios, the total project demand at 2050 is estimated to range from 24.4 to 40.7 mgd for ADD and 56.7 to 96.0 mgd for MDD. The net increase (from 2010 to 2050) for the project as a whole could range from 9.2 to 25.6 mgd for ADD and from 21.4 to 60.7 mgd for MDD. **Figure 2-2** shows the relative demands of each study participant spatially within the county for Scenarios 2 and 3. **Figure 2-3** shows the overall increase in demand for each study participant, and illustrates where the greatest increase in demand is occurring spatially for Scenario 3. Both of these figures are useful for visualizing potential sharing or water supply or development of regional supply for Yamhill County to serve the study participants.

Table 2-6. Summary of Water Demand Projections (in million gallons per day)										
	2010		2015		2025		2050		Net Increase (2010-2050)	
	ADD	MDD	ADD	MDD	ADD	MDD	ADD	MDD	ADD	MDD
Amity										
Scenario 1	0.27	0.60	0.31	0.67	0.39	0.85	0.68	1.51	0.41	0.90
Scenario 2	0.27	0.60	0.31	0.67	0.34	0.76	0.40	0.87	0.12	0.27
Scenario 3	0.27	0.60	0.31	0.67	0.34	0.76	0.61	1.34	0.34	0.74
Carlton										
Scenario 1	0.32	0.71	0.35	0.77	0.41	0.91	0.62	1.36	0.29	0.64
Scenario 2	0.32	0.71	0.35	0.77	0.38	0.84	0.42	0.93	0.10	0.21
Scenario 3	0.32	0.71	0.35	0.77	0.38	0.84	0.57	1.25	0.24	0.54
Dayton										
Scenario 1	0.44	0.66	0.52	0.78	0.72	1.08	1.64	2.46	1.20	1.80
Scenario 2	0.44	0.66	0.52	0.78	0.61	0.92	0.76	1.13	0.31	0.47
Scenario 3	0.44	0.66	0.52	0.78	0.61	0.92	1.39	2.09	0.95	1.43
Dundee										
Scenario 1	0.55	1.22	0.67	1.48	0.94	2.06	0.94	2.06	0.38	0.84
Scenario 2	0.55	1.22	0.67	1.48	0.94	2.06	0.94	2.06	0.38	0.84
Scenario 3	0.55	1.22	0.67	1.48	0.94	2.06	2.12	4.67	1.57	3.45
Lafayette										
Scenario 1	0.73	1.60	0.78	1.72	0.78	1.72	0.78	1.72	0.06	0.12
Scenario 2	0.73	1.60	0.78	1.72	0.78	1.72	0.78	1.72	0.06	0.12
Scenario 3	0.73	1.60	0.78	1.72	0.91	2.00	1.32	2.90	0.59	1.30
McMinnville										
Scenario 1	7.90	19.76	9.21	23.02	12.50	31.24	26.80	67.01	18.90	47.25
Scenario 2	7.90	19.76	9.21	23.02	10.74	26.85	13.03	32.56	5.12	12.80
Scenario 3	7.90	19.76	9.21	23.02	10.74	26.85	23.04	57.59	15.13	37.83
Newberg										
Scenario 1	3.10	6.51	3.43	7.20	4.12	8.66	6.24	13.09	3.14	6.59
Scenario 2	3.10	6.51	3.43	7.20	4.12	8.66	5.07	10.66	1.98	4.15
Scenario 3	3.10	6.51	3.43	7.20	4.12	8.66	6.85	14.39	3.75	7.88
Sheridan										
Scenario 1	1.31	2.89	1.52	3.35	1.77	3.89	2.37	5.22	1.06	2.33
Scenario 2	1.31	2.89	1.52	3.35	1.77	3.89	2.37	5.22	1.06	2.33
Scenario 3	1.31	2.89	1.52	3.35	1.90	4.19	3.20	7.04	1.88	4.14
Willamina										
Scenario 1	0.28	0.62	0.29	0.64	0.31	0.67	0.35	0.77	0.07	0.15
Scenario 2	0.28	0.62	0.29	0.64	0.30	0.65	0.31	0.68	0.03	0.06
Scenario 3	0.28	0.62	0.29	0.64	0.30	0.65	0.34	0.75	0.06	0.13
Yamhill										
Scenario 1	0.28	0.69	0.30	0.76	0.33	0.82	0.33	0.82	0.05	0.13
Scenario 2	0.28	0.69	0.30	0.76	0.33	0.82	0.33	0.82	0.05	0.13
Scenario 3	0.28	0.69	0.30	0.76	0.33	0.82	0.50	1.25	0.22	0.56
Total										
Scenario 1	15.2	35.3	17.4	40.4	22.3	51.9	40.7	96.0	25.6	60.7
Scenario 2	15.2	35.3	17.4	40.4	20.3	47.2	24.4	56.7	9.2	21.4
Scenario 3	15.2	35.3	17.4	40.4	20.6	47.7	39.9	93.3	24.7	58.0

Figure 2-1. Projected Water Demands Using Three Build-Out Scenarios







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3.0 EXISTING WATER SUPPLY

3.1 Description of Water Supplies

The ten water providers participating in this study utilize surface water, springs and groundwater to meet the water demands of their service area. The surface water sources used include South Yamhill River, Willamina Creek, Panther Creek, Fall Creek, Turner Creek, Yamhill River, and the Nestucca River. Although none of the water providers currently utilize the Willamette River, Dundee currently holds water rights on the Willamette River. Groundwater wells are screened in three different aquifer formations in the basin including the alluvial, Troutdale formation, and basalt unit. **Figure 3-1** shows the general locations of the existing source of supplies and related infrastructure including groundwater wells, points of diversion, treatment plants and raw water reservoirs.

Table 3-1 lists the water rights (totals) available for each water provider. **Attachment B (Table B-1)** lists the detailed water rights. The total certificated and permitted ground water and surface water rights available among all of the water providers is 71.3 mgd of instantaneous rights. The water rights are based on information included in the master plans or information provided by responses to the survey conducted by McMinnville Water and Light in June 2006. The water rights information was then verified with Oregon Water Resources Department (OWRD) online database. When necessary, staff from the water providers were contacted to confirm or request specific information not available in the master plans or survey responses.

Water Provider	Total Certificated (cfs)	Total Permitted (cfs)	Total Application (cfs)	Total Claim (cfs)	Total Storage (ac-ft)
Amity	SW – 1.11 GW – 0.56	SW – 1.0 GW – 0.16	NA	GW – 0.13	N/A
Carlton	SW – 0.5	SW – 5.01	NA	NA	75
Dayton	SW – 0.25 GW – 1.39	GW – 0.67	NA	NA	N/A
Dundee	SW – 0.807 GW – 0.48	SW – 4.0 GW – 3.33	NA	NA	N/A
Lafayette	SW – 1.49 GW – 0.60	GW – 1.41	SW – 0.4	GW – 0.4456	N/A
McMinnville	SW – 4.5	SW – 27.8	NA	NA	22,082
Newberg	SW – 8.00 GW – 10.7	GW – 20	NA	SW – 0.5 GW – 2.228	N/A
Sheridan	SW – 0.67	SW – 10.0 GW – 0.612	NA	NA	552
Willamina	SW – 1.4	SW – 2.6	NA	NA	20
Yamhill	SW – 1.28	NA	NA	NA	60
Combined Total	SW – 20.01 GW – 13.73	SW – 50.41 GW – 26.18	SW – 0.4	SW – 0.50 GW – 2.80	22,789

Notes:

SW – surface water; GW – groundwater; cfs – cubic feet per second; ac-ft – acre feet; NA – not applicable

Descriptions of existing sources and water supply infrastructure are summarized below for each water provider. The information is used to assign reliable source capacities for the water needs analysis (supply minus demand).

City of Amity. Amity has both surface and groundwater sources. Amity has four (4) wells with a total production capacity of 0.45 million gallons per day (mgd) (0.69 cubic feet per second [cfs]). This

capacity does not include one of the unused well (permit number G12189). The surface water sources include South Yamhill River and springs. The total production capacity from the surface sources is 1.27 mgd (1.98 cfs), and does not include one of the unused spring sources. The treatment plant has a treatment capacity of 0.576 mgd. Amity did not indicate a source limitation due to groundwater yield or spring flows.

City of Carlton. Carlton has a surface water source on Panther Creek and Fall Creek with a total production capacity of 3.6 mgd (5.6 cfs). The treatment plant is direct filtration-pressure sand filter type with a capacity of 1.11 mgd. The treatment plant was recently constructed in 2004 and Carlton has no plans for expansion in the near future. Carlton noted that not all of their water rights are developable because of streamflow limitations.

City of Dayton. Dayton has a groundwater source using a wellfield of five (5) wells with a total production capacity of 0.95 mgd (1.47 cfs). One of the sources (certificate number 49959) is not used without treatment. The treatment plant uses multimedia filters and has a capacity of 2.1 mgd. Dayton has observed declining water levels and reduced production capacity over the past few years.

City of Dundee. Dundee has existing groundwater sources, and has unused water rights on the Willamette River. Dundee has nine (9) wells with a total current production capacity of 1.14 mgd (1.77 cfs). However, Dundee has observed decreased production of its active wells over the past few years. The City provides chlorination and no other treatment. Besides the groundwater wells, Dundee historically used spring sources, but for unspecified reasons they have not been used for decades. The majority of the wells have recorded declining production yields.

City of Lafayette. Lafayette has several groundwater and spring sources. Lafayette currently has four (4) wells in operation with a total production capacity of 0.35 mgd (0.55 cfs). The wells are screened in three different aquifer formations (basalt, alluvial, and Troutdale formation). Lafayette also uses water from springs with total production capacity of 0.05 mgd (0.08 cfs). Lafayette has some inactive groundwater and spring sources. Water produced from all of the wells are treated with chlorine prior to entering the distribution system. In addition, the well in the Dayton/Lafayette wellfield is also treated for manganese removal and the “watershed” wells are treated with soda ash and chlorine. During winter months in normal rainfall years, the springs produce more water than Lafayette can store. Lafayette usually tries to rely on spring water from November through June to allow the wells to recover. However, in the past, the wells have operated through the winter because of lack of rainfall.

City of McMinnville (McMinnville Water and Light). MWL has surface water sources which are impounded in reservoirs and then diverted to the Haskins Creek Water Treatment Plant. Raw water is supplied from the Yamhill River and Nestucca River basins. MWL has rights to instream flow of 12.61 mgd (19.5 cfs) from Haskins Creek, 4.16 mgd (6.40 cfs) from Nestucca River, and 6.20 mgd (9.6 cfs) from Walker Creek for a total of 22.97 mgd. Water from the Yamhill River is impounded in Haskins Reservoir which is on Haskins Creek behind the Walter Link Dam. Water from Nestucca River is impounded in McGuire Reservoir. When needed, water from McGuire Reservoir is then diverted to the Haskins Reservoir through Idlewild Creek. In the summer months, peak water demands are met by diverting water from storage. The total water that can be diverted from storage is 250 million gallons (MG) from Haskins Reservoir and 3,248 MG in McGuire Reservoir. When or if built, Walker Creek Reservoir would have available storage right of 1,466 MG under the existing permit. Haskins Creek water treatment plant (WTP) is located downstream of the Haskins Reservoir and has a capacity of 13.3 mgd. MWL did not note a source limitation due to available streamflow or storage.

City of Newberg. The City of Newberg currently has several spring and groundwater sources. Newberg holds a total of 22.6 mgd of groundwater rights for wells and 5.5 mgd of water rights from the springs; however, the achievable wellfield capacity is less than the groundwater rights due to well interference. There are six (6) wells in operation with a total production capacity of approximately 6.0 mgd (9.28 cfs). The sum of the wells’ pumping capacity rates is greater than 6.0 mgd, but a lowered aquifer level during

the summer months reduces the wells' combined capacities. The wells are screened in three different aquifer formations: basalt, alluvial, and Troutdale formations. All water from the wells is delivered directly to an oxidation/filtration water treatment plant that has a 5.6 mgd capacity. The WTP has recently been expanded to capacity of 9.5 mgd. Newberg also uses water from springs. The production of the springs has been on the decline with the most recent production rate being on the order of 0.17 mgd. Although the reason behind the spring production decline is unknown, possible explanations include decreased rainfall or overpumping of wells located above the springs.

City of Sheridan. The City of Sheridan presently supplies water from two sources: the Stoney Mountain springs and the South Yamhill River. Water from the springs is the Sheridan's primary water supply source, while the South Yamhill River is used as a secondary source during high demand periods. The combined production capacity of surface water from both sources is 1.78 mgd. A well is also located at the Stoney Mountain springs that has a production capacity of 0.07 mgd. Sheridan's surface water source is treated through a conventional filter treatment plant with a capacity of 1.3 mgd. The springs provide a high quality year-round water source although the yield can be variable depending on the season. Sheridan did not note a source limitation due to available streamflow or spring flow.

City of Willamina. The City of Willamina supplies only surface water from Willamina Creek. In 2005, Willamina had a total production capacity of 0.53 mgd (1.28 cfs). Willamina also has a water right for Lady Creek but is not currently using the source. The treatment plant has a capacity of 1.0 mgd (1.55 cfs). Willamina did not note a source limitation due to available streamflow.

City of Yamhill. City of Yamhill's only source of water is surface water from Turner Creek. Yamhill has two water right certificates from that source, totaling 0.83 mgd (1.28 cfs). In addition, Yamhill has the right to store 30 acre-feet of water in the Turner Creek Reservoir and distribute it at whatever rate is needed. Water is stored in the Turner Creek Reservoir behind the Turner Creek Dam during the summer only. Yamhill's treatment plant has a capacity of 0.648 mgd. Yamhill did not note a source limitation due to available streamflow in Turner Creek.

3.2 Reliable Source Capacity

The amount of water actually available in terms of reliable, high quality water is typically less than the permitted rights listed in **Table 3-1**. Factors that affect the actual capacities include natural limits of the source, raw water quality, installed infrastructure and interference from multiple points of withdrawal. To quantify the need for additional or new water supply, an estimate of "true" water availability is required. Estimates can be derived from interviews with operational staff or through reviews of documented capacities in planning or engineering reports.

The source of supply available to the water providers may be limited in terms of reliability of access to the source water. For example, a "live" stream flow water right may allow diversions up to 1 cfs; however, the stream may have an 80% exceedance flow of less than 0.3 cfs – thus allowing the water provider to access their full right less than 40% of the time. For this study, the assumption is that infrastructure and water right limits are the primary basis for source capacity, unless the water provider explicitly noted a source limitation due to available streamflow, spring flow or groundwater yield.

Table 3-2 summarizes the reliable capacity with respect to diversion (pump) capacity, treatment capacity, water rights capacity or source limitation. In addition, **Table 3-2** indicates which of these factors limits the existing source capacity for each water provider. In general, the source of water does not limit the reliable capacity in that there is available water to meet the current treatment capacity or production capacity. Six of the ten providers had treatment capacity as the limiting factor. The remaining four water providers were limited by the production capacity (well or diversion). In all cases, the water providers' have some excess water rights to develop beyond their current infrastructure, although this does not imply that the existing water rights are adequate to meet future demands or that there is available source of

water to expand production or treatment capacity further. Of course the reliable capacities can change over time (e.g. as infrastructure improvements occur), but for the purposes of this study, the current reliable capacities based on treatment or production capacity are used to evaluate future water supply needs. This evaluation is presented in Section 4.

Table 3-2. Source of Supply Limiting Capacity

City	Source Type and Capacity	Treatment Capacity	Source Limitations (Streamflow and Groundwater Yield)	Available Water Rights	Limiting Capacity
Amity	SW – 1.275 mgd (1.975 cfs) GW – 0.36 mgd (0.56 cfs)	0.576 mgd	Not limited by source; 1 abandoned well (G12189) and 1 abandoned spring (S5481)	SW – 1.360 mgd (2.105 cfs) GW – 0.55 mgd (0.85 cfs)	Treatment plant capacity
Carlton	SW – 3.6 mgd	1.11 mgd	Streamflow limited below water right; source available to meet treatment capacity	SW – 3.55 mgd (5.51 cfs) Storage – 75 ac-ft	Treatment plant capacity
Dayton	GW – 0.95 mgd (660 gpm)	2.1 mgd	Declining water levels in wells have reduced the amount of available water; source available to meet current well capacity	SW – 0.16 mgd (0.25 cfs) GW – 1.33 mgd (2.06 cfs)	Production well capacity
Dundee	GW – 1.14 mgd (1.77 cfs)	No treatment	Declining water levels in wells have reduced the amount of available water; source available to meet current well capacity.	SW – 3.1 mgd (4.81 cfs) GW – 2.46 mgd (3.81 cfs)	Production well capacity
Lafayette	SW – 0.05 mgd (0.08 cfs) GW – 0.35 mgd (0.55 cfs)	N/A	Groundwater requires “recovery”; source available to meet current well capacity.	SW – 1.24 mgd (1.92 cfs) GW – 1.58 mgd (2.45 cfs)	Production well and diversion capacity
McMinnville	SW – 20.84 mgd (32.3 cfs)	13.3 mgd (2.06 cfs)	Not limited by source	SW – 22.97 mgd (35.54 cfs) Storage – 18,887 ac-ft	Treatment plant capacity
Newberg	GW – 6.0 mgd (9.3 cfs) SW – 0.17 mgd (0.26 cfs)	5.6 mgd (8.7 cfs)	Well interference limits available ground water production; declining spring production rate; source available to meet current treatment capacity.	GW – 22.7 mgd (35.1 cfs) SW – 5.5 mgd (8.5 cfs)	Treatment plant capacity
Sheridan	SW – 1.78 mgd (2.86 cfs) GW – 0.07 mgd (0.11 cfs)	1.3 mgd	Low summer flows for springs; source available to meet current treatment capacity.	SW – 6.88 mgd (10.7 cfs) GW – 0.39 mgd (0.61 cfs) Storage – 276 ac-ft	Treatment plant capacity
Willamina	SW – 0.53 mgd (0.82 cfs)	1.0 mgd	Not limited by source	SW – 2.58 mgd (4.00 cfs) Storage – 20 ac-ft	Diversion capacity
Yamhill	SW – 0.83 mgd (1.28 cfs)	0.648 mgd (1.0 cfs)	Not limited by source	SW – 0.83 mgd (1.28 cfs) Storage – 60 ac-ft	Treatment plant capacity

Notes:

SW – surface water; GW – groundwater; cfs – cubic feet per second; mgd – million gallons per day; ac-ft – acre feet; N/A – not applicable

3.3 Planned Water Supply Infrastructure Improvements

This section summarizes planned water supply and infrastructure improvements or expansions that have been documented in existing capital improvement plans or that have been identified through communication with staff for this project. In most cases, the planned improvements have a timeline identified. The paragraphs below provide additional descriptions for those water providers with known planned improvements. This review has not identified specific planned water supply improvements for Carlton and Willamina. **Table 3-3** summarizes the planned improvements. These improvements are considered in the source alternatives and supply strategy evaluation in Section 5.

Table 3-3 Summary of Planned Water Supply or Infrastructure Improvements	
City	Improvement
Amity	<ul style="list-style-type: none"> • Treatment plant expansion in 5 to 7 years.
Carlton	<ul style="list-style-type: none"> • No planned improvements identified at this time.
Dayton	<ul style="list-style-type: none"> • Treatment plant expansion within next 20 years.
Dundee	<ul style="list-style-type: none"> • Planning to construct a new reservoir of approximately 1.5 million gallons • No plans to build a treatment plant (in the near-term)
Lafayette	<ul style="list-style-type: none"> • Additional wells in Dayton/Lafayette wellfields.
McMinnville	<ul style="list-style-type: none"> • CIP recommends: <ul style="list-style-type: none"> ○ piping improvements, increased storage, and land acquisition by the City • MWL is deciding whether to upgrade the current treatment plant. • MWL is looking for another pressure zone to provide additional water.
Newberg	<ul style="list-style-type: none"> • CIP recommends <ul style="list-style-type: none"> ○ addition of two new pump stations ○ replacing aging pipes ○ addition of a new 1.5 million gallon reservoir to serve new development. • The treatment plant has been expanded to 9.5 mgd.
Sheridan	<ul style="list-style-type: none"> • CIP recommends: <ul style="list-style-type: none"> ○ upgrading the Stoney Mountain Transmission line and exploring the Stoney Mountain Springs ○ expanding the current Stoney Mountain sources ○ developing the Willamina Creek source.
Willamina	<ul style="list-style-type: none"> • No information available.
Yamhill	<ul style="list-style-type: none"> • City CIP recommends: <ul style="list-style-type: none"> ○ upsizing pipes to provide adequate fire flows ○ replacing undersized and aged pipes that are leaking ○ adding 1.0 mgd of capacity at the treatment plant ○ adding 1.0 million gallons of treated water storage capacity

City of Amity. Amity has plans to expand the treatment plant in the next 5 to 7 years (information was not available regarding the size of expansion).

City of Dayton. Dayton has plans to expand the treatment plant within the next 20 years (information was not available regarding the size of expansion).

City of Dundee. The City of Dundee is currently looking to expand their storage capacity by constructing a new finished water reservoir of approximately 1.5 MG. There is not a firm date set for the design and construction of the reservoir. The construction of a new reservoir as well as exploratory well drilling and distribution system improvements are noted in the City’s Capital Improvement Plan (CIP). There are no plans to build a treatment plant at this time.

City of Lafayette. Lafayette is planning to construct two new wells in its Dayton Wellfield for potentially an additional 0.36 to 0.43 mgd (0.56 to 0.67 cfs).

City of McMinnville (McMinnville Water and Light). MWL's CIP recommends distribution piping improvements, increased storage, and land acquisition. MWL is currently in the process of deciding whether to upgrade or improve the current treatment plant to provide additional treatment for dissolved metals in the water, and a decision should be reached by March 2007. MWL is also looking for another pressure zone that can provide an additional source of water.

City of Newberg. The City of Newberg has a Capital Improvement Plan included in the Newberg's Water System Master Plan. The CIP recommends the addition of two new pump stations to serve new development, replacement of aging pipes, and the addition of a new 1.5 MG reservoir to serve new development. In addition, Newberg's treatment plant was recently expanded to 9.5 mgd with a new membrane filtration unit. The CIP was developed for the period 2010 to 2024.

City of Sheridan. The City of Sheridan has a Capital Improvement Plan included in the City's Water System Master Plan. The CIP is recommended in a three phase process: The first phase is to upgrade the Stoney Mountain Transmission line and explore the Stoney Mountain Springs (listed to be completed in 2000). This phase involves upsizing transmission pipes and exploring the Stoney Mountain area for more spring supplies. The second phase is to expand the current Stoney Mountain sources (listed to be completed in 2005). This would be accomplished after the completion of phase one and involves drilling new wells, diverting water from the East and West Baltimore Creeks, and constructing new storage facilities. The water treatment plant would also require upgrading to accommodate the new sources. As of this study, the first two phases have not yet been completed. The third phase is to develop the Willamina Creek source (listed to be completed in 2020). This involves constructing an impoundment on Willamina Creek to supply water through build-out of Sheridan's urban growth boundary.

City of Yamhill. The City of Yamhill has a Capital Improvement Plan that includes upsizing pipes to provide adequate fire flows, replacing undersized and aged pipes that are leaking, adding a new water treatment unit at the existing plant with a capacity of 1.0 mgd, and adding 1.0 MG of treated water storage capacity to provide water for peak demand periods. No timeline was specified in the CIP.

3.4 Water Quality Issues

Water quality is an important consideration when reviewing water supply sources because of the potential for mixing sources among the water providers. Not all of the water providers provide treatment nor use the same type of treatment processes. In addition, certain water uses requires that the water quality be known, e.g. certain types of industrial uses. McMinnville and Newberg have source supply water quality issues, as described below. Specific water quality issues for Amity, Carlton, Dayton, Dundee, Lafayette, and Willamina were not identified.

McMinnville Water and Light. MWL treats its water at the Haskins Creek Water Treatment Plant. The treatment plant components include chemical feed, coagulation in a 570,000 gallon contact basin, mixed-media filtration in 4 filter beds with a total surface area of 1,728 square feet, disinfection with chlorine, and the addition of fluoride. The treatment plant currently does not treat lead and manganese contained in the water, however MWL is looking at options to upgrade or expand the treatment plant to treat these dissolved metals.

City of Newberg. The City of Newberg has tested its water for lead, copper, and coliform bacteria, and has found low concentrations of each in its water. All water used by Newberg is delivered directly to an oxidation/filtration water treatment plant that has a 5.6 mgd capacity. The WTP is currently under expansion with an expanded capacity of 9.5 mgd. Newberg currently treats its water for low concentrations of dissolved iron and manganese.

4.0 FUTURE NEEDS ANALYSIS

This section compares the future demand for water with the available supplies (and water rights) for each provider. The resulting unmet water needs (or water supply deficits) are defined as the difference between the provider's available water and projected water demand. A detailed description of the methods and assumptions used is provided in this section.

4.1 Water Rights Needs

Water rights needs were determined for each water provider by comparing the demand projections from Section 1 and existing permitted and certificated water rights (see **Table 3-1** and **Attachment B**). This comparison assumes the available water rights are fully developed or available. The water rights are compared against maximum day demand (MDD) projections through 2050. MDD is used as the primary basis for evaluating future needs because it is the limiting factor during the low flow/high demand periods (late summer/early fall) critical to evaluating adequacy of water supply. This comparison is conservative in nature because it does not account for finished water storage to meet peak demands. The MDD comparison assumes that peak demands will be met through instantaneous production.

Average day demands (ADD) are also compared to the available water rights owned by each community. A deficit under comparison with ADD indicates a more critical water supply shortage. **Table C-1** in **Appendix C** shows water rights surplus and deficits compared against ADD for each provider through the planning period.

Table 4-1 summarizes water rights surplus and deficits (values in parentheses) based on the MDD for each provider. **Figure 4-1** shows graphically the surplus/deficit in 2050 with respect to water rights using Scenario 3 demands. County-wide, the ten water providers have total water rights of 78.21 mgd. Under Scenario 1, demand is projected to come within ~10 mgd of total rights. Scenario 2 is the most conservative with ~37 mgd in surplus, and Scenario 3 at ~22 mgd. This general pattern follows for individual providers as well. Surplus under the three scenarios are consistent for each water provider until about 2015, then begin to diverge. In 2015, Scenarios 2 and 3 assume a reduction in growth rate by half, while Scenario 1 continues at the same growth rate to 2050. In 2025, Scenario 2 assumes a further reduction in growth by half again while scenario three assumes a UGB expansion and growth rates occur at the same rate as 2015 levels.

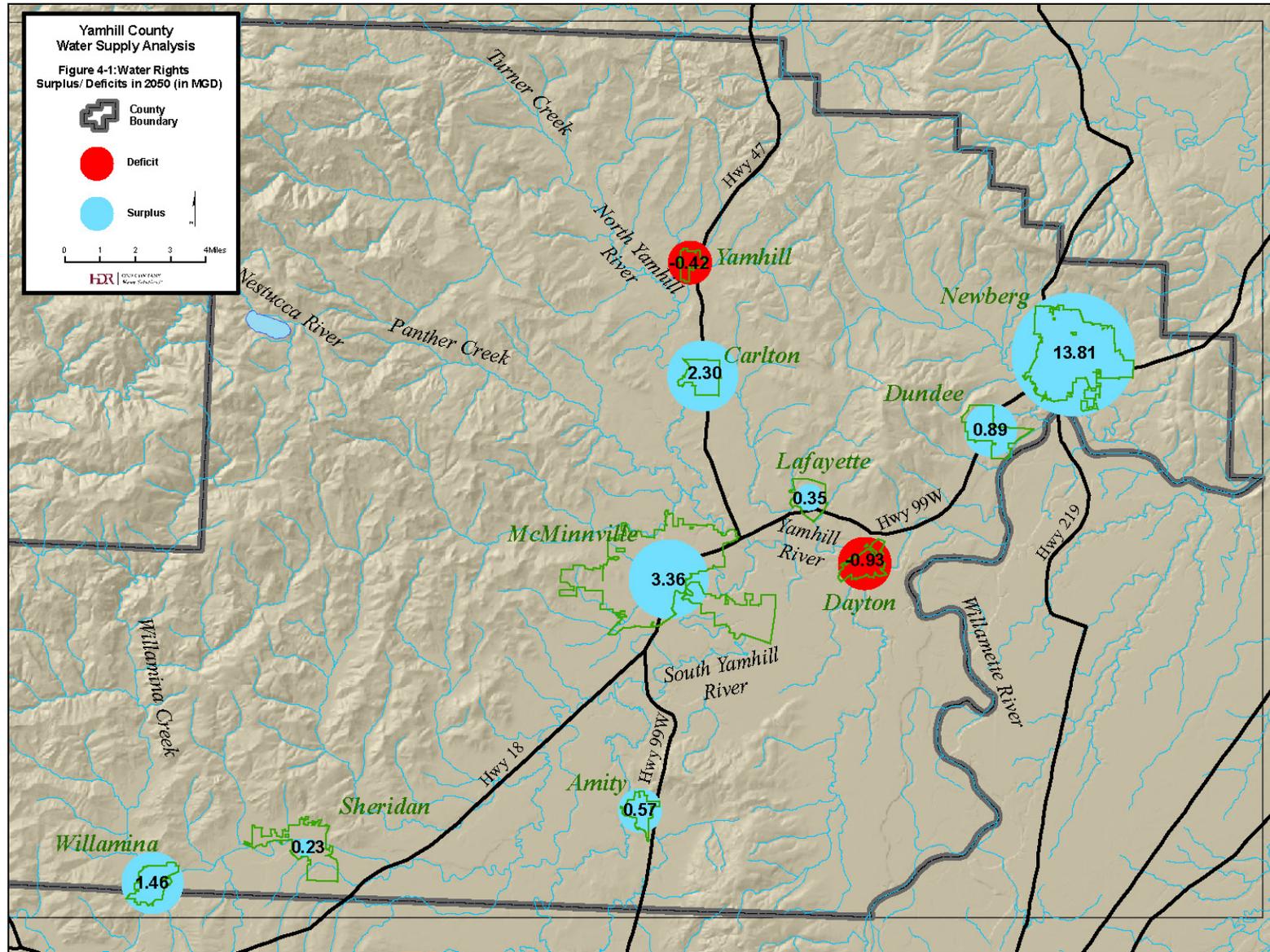
Most of the providers in the study group currently have enough water rights to meet their projected demands through the planning period (2050). The exceptions are Dayton, Lafayette, McMinnville and Yamhill:

- MWL only has water rights deficiencies under Scenario 1, which is the most aggressive growth projection for these communities. Projections for MWL indicate a surplus until 2031, which grows to over 12 mgd in 2050 under Scenario 1 (no build-out constraints) conditions. MWL will maintain a surplus of 6.9 mgd under Scenario 2 (UGB expansion not allowed) and a surplus of 3.4 mgd under Scenario 3 (UGB expansion allowed). Thus, MWL has available water rights (under the less aggressive demand scenarios) to potentially share regionally. The need for MWL to pursue water rights depends significantly on how much growth is allowed within their service area and whether MWL pursues a regional role in providing water.
- Lafayette only has water rights deficiencies under Scenario 1, which is the most aggressive growth projection for these communities.
- Dayton has water rights deficiencies under the two more aggressive growth scenarios (Scenario 1 – no build-out constraints and Scenario 3 – UGB expansion allowed). Under Scenario 1, Dayton is projected to exceed its current water rights in 2035, growing to a deficit of ~1.5 mgd in 2050. Under

Scenario 3 (UGB expansion allowed), Dayton's demands are projected to exceed available rights in 2040 and growing to a deficit of almost 1.0 mgd in 2050.

- Lafayette is projected to see a deficit by 2050 of 0.07 mgd under Scenario 1. Under Scenarios 2 and 3, Lafayette will maintain a surplus through the planning period.
- Dayton and Lafayette have the potential to share water rights (as they currently do with one of their groundwater rights). However, by ~2040 under Scenario 1 and ~2047 under Scenario 3 the total demands between the two would exceed their combined water rights. At that point, the two water providers would have to consider adding new water rights or accessing water from other providers or sources.
- Yamhill is projected to exceed its current water rights in 2021, growing to a deficit of ~0.5 mgd in 2050 under Scenario 1. Under Scenario 3, Yamhill's demands are projected to exceed available rights in 2026, growing to a deficit of 0.42 mgd in 2050. Carlton, the closest provider to Yamhill, has surplus water rights adequate to offset the deficits of Yamhill under all of the scenarios considered. However, water availability limitations may preclude further developing those water rights.

Table 4-1. Summary of Water Rights Surplus/ Deficits for Maximum Day Demand (million gallons per day)					
	Total Water Rights	2010	2015	2025	2050
Amity					
Scenario 1	1.91	1.31	1.24	1.06	0.40
Scenario 2	1.91	1.31	1.24	1.15	1.04
Scenario 3	1.91	1.31	1.24	1.15	0.57
Carlton					
Scenario 1	3.55	2.84	2.78	2.64	2.19
Scenario 2	3.55	2.84	2.78	2.71	2.62
Scenario 3	3.55	2.84	2.78	2.71	2.30
Dayton					
Scenario 1	2.14	1.17	1.00	0.55	(1.47)
Scenario 2	2.14	1.17	1.00	0.79	0.48
Scenario 3	2.14	1.17	1.00	0.79	(0.93)
Dundee					
Scenario 1	5.56	4.34	4.08	3.50	3.50
Scenario 2	5.56	4.34	4.08	3.50	3.50
Scenario 3	5.56	4.34	4.08	3.50	0.89
Lafayette					
Scenario 1	3.2	2.13	1.97	1.57	(0.07)
Scenario 2	3.2	2.13	1.97	1.78	1.19
Scenario 3	3.2	2.13	1.97	1.78	0.35
McMinnville					
Scenario 1	22.97	8.21	6.51	2.51	(12.28)
Scenario 2	22.97	8.20	6.85	6.85	6.85
Scenario 3	22.97	8.20	6.50	3.36	3.36
Newberg					
Scenario 1	28.2	21.69	21.00	19.54	15.11
Scenario 2	28.2	21.69	21.00	19.54	17.54
Scenario 3	28.2	21.69	21.00	19.54	13.81
Sheridan					
Scenario 1	7.27	4.38	3.92	2.76	2.05
Scenario 2	7.27	4.38	3.92	2.76	2.05
Scenario 3	7.27	4.38	3.92	2.76	0.23
Willamina					
Scenario 1	2.58	1.86	1.79	1.61	1.00
Scenario 2	2.58	1.86	1.79	1.79	1.79
Scenario 3	2.58	1.86	1.79	1.71	1.46
Yamhill					
Scenario 1	0.83	0.14	0.07	(0.06)	(0.53)
Scenario 2	0.83	0.14	0.07	0.01	0.01
Scenario 3	0.83	0.14	0.07	0.01	(0.42)
Water Providers Total					
Scenario 1-MDD	78.21	48.07	44.34	35.70	9.90
Scenario 2-MDD	78.21	48.05	44.68	40.90	37.07
Scenario 3-MDD	78.21	48.05	44.33	37.32	21.64



4.2 Water Supply Needs Based on Reliable Source Capacity

Water supply needs are assessed for both the individual water providers and the sum total of all the water providers by comparing the reliable source capacity (see **Section 3.2** and **Table 3-2**) to MDD. As with the water rights comparison, the needs resulting from a comparison with reliable source capacity are compared against the three demand scenarios discussed previously.

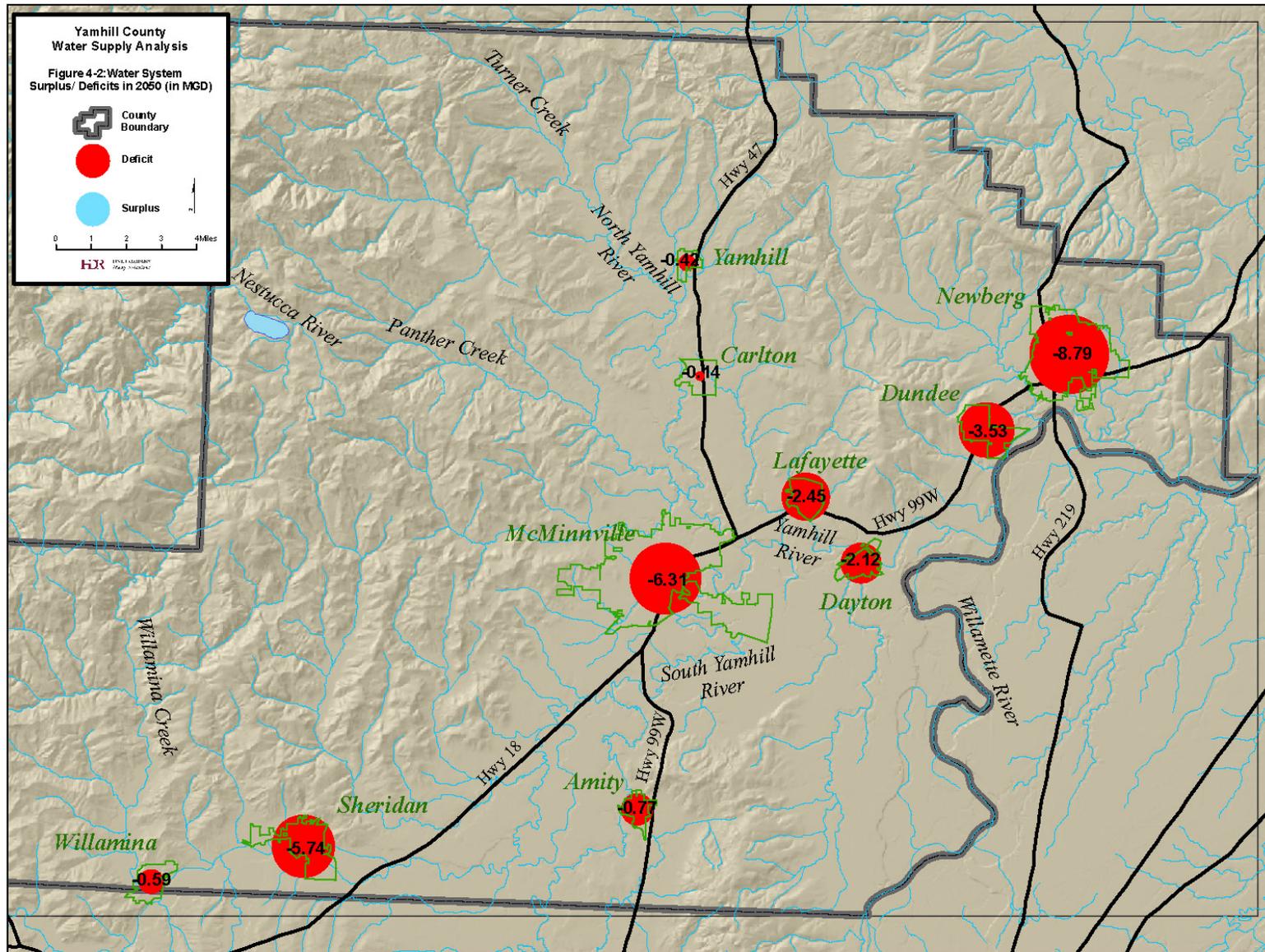
Table 3-2 summarizes the reliable source capacity used for the comparison source pumping capacities and treatment capacities for each water provider. Treatment plant capacities are the limiting factor for Amity, Carlton, McMinnville, Newberg, and Sheridan. Carlton and McMinnville have no treatment plant improvements/expansions planned; Dayton, Dundee, Lafayette, Willamina and Yamhill are limited by their source pumping capacity. Dundee and Lafayette have source improvements planned, whereas Dayton, Willamina and Yamhill have no source improvements planned.

Unlike water rights, reliable source capacity is projected to present more of a problem to meeting long-term MDD. For all water providers except Carlton and Yamhill, treatment capacity or source production capacity is a limiting factor for meeting MDD in the near-term (2010), as summarized in **Table 4-2**. **Figure 4-2** shows graphically the surplus/deficit in 2050 with respect to reliable source capacity using Scenario 3 demands. For all water providers combined, deficits are projected to occur in 2010 and stay in a deficit through 2050 under all scenarios.

To be clear, these deficits are based on MDD, which assumes that peak demands need to be met through instantaneous production. The water provider may need to implement curtailment actions to reduce demands during peak demand periods, but under non-peak demand conditions may have adequate source capacity. A deficit under comparison with ADD indicates a more critical water production shortage. A deficit under MDD conditions does not necessarily mean that average day demands cannot be met. **Table C-2** in **Appendix C** detail water system surplus and deficits for ADD for each provider through the planning period.

Treatment plant limitations would prevent Amity, Newberg, MWL, Sheridan and Yamhill to meet maximum day demands. With the exception of McMinnville and Sheridan, these water providers have capacity improvements planned over the next 20 years. McMinnville is determining whether to upgrade the treatment plant, and while Sheridan has planned transmission and source improvements, there are no plans to improve their treatment system. Dayton, Dundee, Lafayette, and Willamina are limited by their source production or diversion capacity. Of these, Dundee and Lafayette have plans to improve production capacities. The surplus water rights for some of the water providers indicates that there are opportunities for infrastructure improvements and expansions to reduce or eliminate the source capacity deficiencies identified; however in many instances, water availability limitations preclude developing these water rights further.

Table 4-2. Summary of Reliable Source Capacity Surplus/ Deficits for Maximum Day Demand (million gallons per day)					
	Total Reliable Capacity	2010	2015	2025	2050
Amity					
Scenario 1	0.576	(0.03)	(0.10)	(0.27)	(0.93)
Scenario 2	0.576	(0.03)	(0.10)	(0.18)	(0.30)
Scenario 3	0.576	(0.03)	(0.10)	(0.18)	(0.77)
Carlton					
Scenario 1	1.11	0.40	0.34	0.20	(0.25)
Scenario 2	1.11	0.40	0.34	0.27	0.18
Scenario 3	1.11	0.40	0.34	0.27	(0.14)
Dayton					
Scenario 1	0.95	(0.02)	(0.19)	(0.64)	(2.66)
Scenario 2	0.95	(0.02)	(0.19)	(0.40)	(0.71)
Scenario 3	0.95	(0.02)	(0.19)	(0.40)	(2.12)
Dundee					
Scenario 1	1.14	(0.08)	(0.34)	(0.92)	(0.92)
Scenario 2	1.14	(0.08)	(0.34)	(0.92)	(0.92)
Scenario 3	1.14	(0.08)	(0.34)	(0.92)	(3.53)
Lafayette					
Scenario 1	0.4	(0.67)	(0.83)	(1.23)	(2.87)
Scenario 2	0.4	(0.67)	(0.83)	(1.02)	(1.61)
Scenario 3	0.4	(0.67)	(0.83)	(1.02)	(2.45)
McMinnville					
Scenario 1	13.3	(1.46)	(3.16)	(7.16)	(21.95)
Scenario 2	13.3	(1.47)	(2.82)	(2.82)	(2.82)
Scenario 3	13.3	(1.47)	(3.17)	(6.31)	(6.31)
Newberg					
Scenario 1	5.6	(0.91)	(1.60)	(3.06)	(7.49)
Scenario 2	5.6	(0.91)	(1.60)	(3.06)	(5.06)
Scenario 3	5.6	(0.91)	(1.60)	(3.06)	(8.79)
Sheridan					
Scenario 1	1.3	(1.59)	(2.05)	(3.21)	(3.92)
Scenario 2	1.3	(1.59)	(2.05)	(3.21)	(3.92)
Scenario 3	1.3	(1.59)	(2.05)	(3.21)	(5.74)
Willamina					
Scenario 1	0.53	(0.19)	(0.26)	(0.44)	(1.05)
Scenario 2	0.53	(0.19)	(0.26)	(0.26)	(0.26)
Scenario 3	0.53	(0.19)	(0.26)	(0.34)	(0.59)
Yamhill					
Scenario 1	0.83	0.14	0.07	(0.06)	(0.53)
Scenario 2	0.83	0.14	0.07	0.01	0.01
Scenario 3	0.83	0.14	0.07	0.01	(0.42)
Water Providers Total					
Scenario 1-MDD	25.74	(4.41)	(8.13)	(16.78)	(42.57)
Scenario 2-MDD	25.74	(4.42)	(7.79)	(11.58)	(15.41)
Scenario 3-MDD	25.74	(4.42)	(8.14)	(15.15)	(30.84)



4.3 Summary of Needs Analysis

Figure 4-3 provides a graphical summary of demand projections, water rights and reliable source capacity at the county level. MDD projections are not expected to exceed total water rights within the planning period, however MDD is expected to exceed reliable source capacities in 2010 or sooner. Note that these results are for the combined total needs of all the participating water providers. Individually, most of the communities have some deficit in reliable source capacity even early in the planning period.

Based on the geographic distribution of the water rights and reliable source capacity, consideration should be given to how surpluses can be distributed to those areas with supply deficits. For illustration purposes, Scenario 3 demands are used to describe possible water rights and source production management approaches for the participating water providers to meet their deficiencies in 2050 taking into consideration the planned improvements by each water provider. The summary is presented in **Table 4-3**. For example, Lafayette-Dayton and Carlton-Yamhill may be able to share water rights to address their projected water rights deficiencies. The cost of transmission and pumping versus localized development of water supply for individual water providers is assessed in **Section 5**.

Figure 4-3. Comparison of Projected Water Demands to Reliable Source Capacity and Water Rights

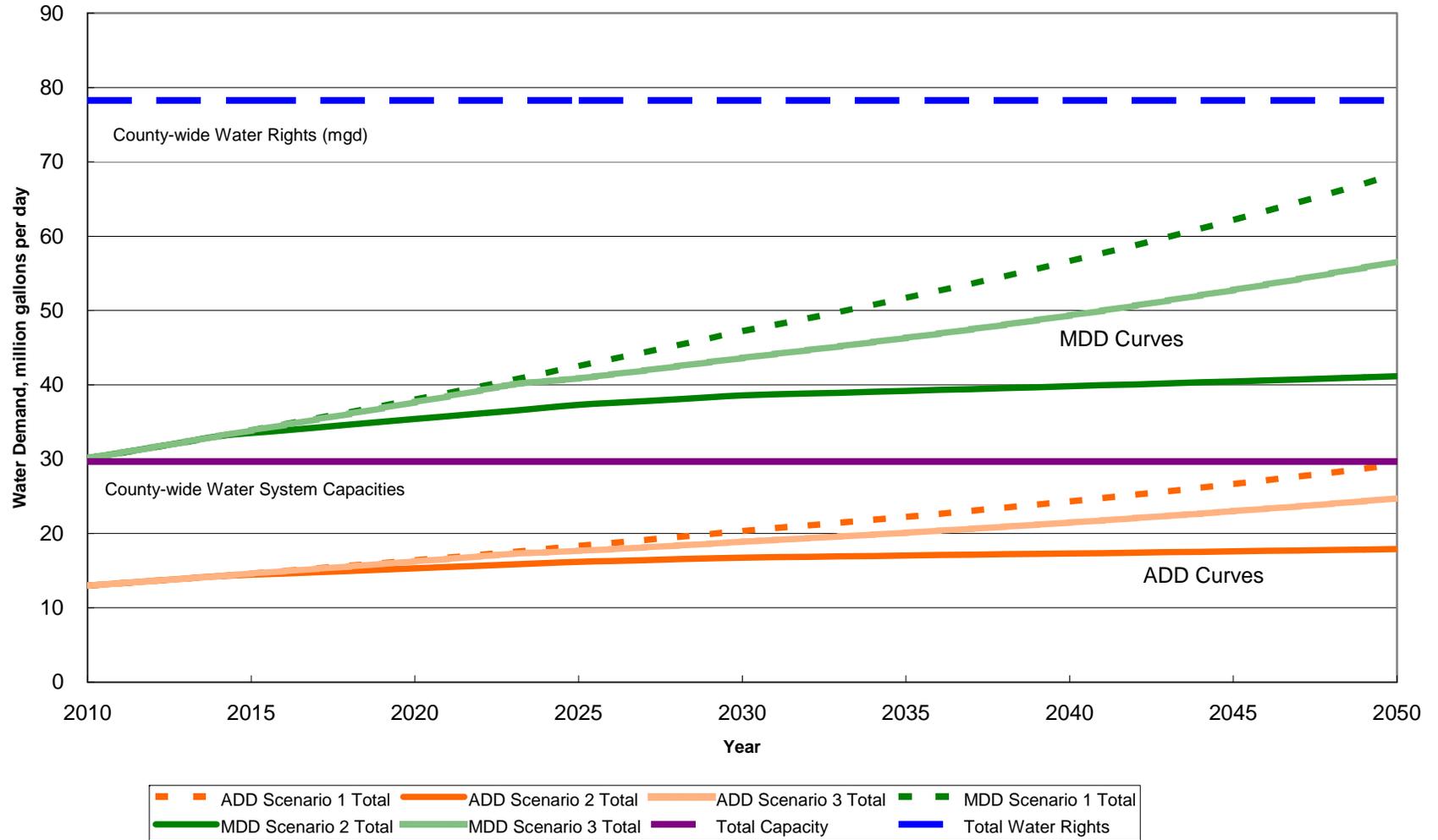


Table 4-3. Summary of Surplus/Deficiencies* to Meet Projected Demands			
Water Provider	2050 Water Rights Surplus (mgd)	2050 Source Production Surplus (mgd)	Current Developable Water Rights
Amity	0.57	-0.77 (treatment limited)	SW – 0.085 mgd GW – 0.19 mgd
Carlton	2.30	-0.14 (treatment limited)	SW – None GW – None
Dayton	-0.93 (deficit)	-2.12 (source capacity limited)	SW – 0.16 mgd GW – 1.03 mgd
Dundee	0.89	-3.53 (source capacity limited)	SW – 3.1 mgd GW – 1.32 mgd
Lafayette	0.35	-2.45 (source capacity limited)	SW – 0.91 mgd GW – 1.89 mgd
McMinnville	3.36	-6.31 (treatment limited)	SW – 2.13 mgd GW – NA
Newberg	13.81	-8.79 (treatment limited)	SW – 16.7 mgd GW – 5.33 mgd
Sheridan	0.23	-5.74 (treatment limited)	SW – 5.1 mgd GW – 0.32 mgd
Willamina	1.46	-0.59 (source capacity limited)	SW – 2.05 mgd GW – NA
Yamhill	-0.42	-0.42 (source capacity limited)	SW – None GW – NA

Notes:

**The surplus and deficiencies presented in this table are based on Scenario 3 demands for illustration purposes.*

SW – surface water

GW – groundwater

Mgd – million gallons per day

5.0 SOURCE OF SUPPLY OPTIONS

This section discusses source of supply options available to the water providers in Yamhill County. Source options considered include those that could be developed by the individual water providers (“local options”), as well as those that are regional in nature (“regional options”). In developing the potential supply options, primary consideration was given to the many existing studies that have been conducted for the area.

The approach used in this assessment is to consider which water supply deficits can be addressed through management of existing supplies (conservation, reuse, water rights transfers and interties) and where new sources are needed because of the scale of the deficit. While water conservation, reuse, and water transfers can offset or delay the need to develop new sources, in many cases new sources of supply are needed. New sources are generally linked to either expansion of surface water diversions or ground water withdrawals or creation of additional storage of off-peak season water.

5.1 Availability of Water Resources

One of the keys to the feasibility of a new source is the availability of water. Protecting threatened and endangered species, particularly those of anadromous fish, and restoring impaired or contaminated sections of stream or ground water reserves are in direct competition with the need for water supply – and water availability. State and federal designation for streams for aesthetic and other instream beneficial uses also affect the availability of water.

5.1.1 Surface Water Availability

The Yamhill County study area includes the Yamhill River basin where the North Yamhill and South Yamhill Rivers converge into the Yamhill River east of McMinnville and eventually drains into the Willamette River. Some of the primary tributaries in the basin that are used currently for source of supply include Turner Creek, Fall Creek, Panther Creek and Haskins Creek on the North Yamhill branch, and Willamina Creek and Mill Creek on the South Yamhill branch.

With the exception of MWL’s source of supply (transferred from adjacent basin), major surface water storage is not present in the Yamhill River basin. Therefore, out-of-stream diversions are supplied by unregulated natural flow, and the Oregon Water Resources Department (OWRD) issues water rights based on the availability of natural flow.

Table 5-1 summarizes the water availability information provided by OWRD’s Water Availability Reporting System (WARS) for the key tributaries in the County. The WARS database essentially provides a determination on a particular point in the stream whether water is available (on a monthly basis) for issuing new water rights based on estimates of natural streamflow, consumptive uses, and instream flow requirements². **Table 5-1** indicates that most of the tributaries in the study area do not have year-round water available for new water rights permits (appropriations) for run-of-river diversions. Water is generally not available during the late summer and early fall months. For the most part, water is available for storage rights purposes.

² *Instream rights help maintain streamflows for fish production by restricting the issuance of new water rights that are “junior” (later priority date) to the instream flow right. Oregon water law does not require that the flows be maintained below the site prescribed, and the instream rights actually exceed the amount of water available in the stream.*

Waterbody	50% Exceedence		80% Exceedence	
	Year-round Availability	Months Not available	Year-round Availability	Months Not available
Turner Cr.	No	May-November	No	April-November
Panther Cr.	Yes	None	No	July-September, November
Willamina Cr.	No	August-October	No	June-November
Haskins Cr.	No	May-November	No	January, April-December
S. Yamhill R.	No	July-October	No	June-October
N. Yamhill R.	No	July-September	No	June-November
Fall Cr.	Yes	None	No	April
Yamhill R.	No	August-September	No	July-September

Note: 50% exceedence means monthly streamflows that on average are exceeded 50% of the time. Thus, 80% exceedence flow is a lower flow rate than a 50% exceedence flow.

5.1.2 Ground Water Availability

One of the principal aquifers in the area is hosted by the Grande Ronde Basalt unit of the Columbia River Basalt Group (CRBG). The majority of ground water flow within the CRBG is found within a series of interflow zones. CRBG interflow zones can be a highly productive source of ground water with wells commonly yielding several hundred gallons per minute. However, as described later, CRBG aquifers have been prone to over-pumping, which has caused water level declines and reduced well yields in many areas.

Ground water is also found in marine sediments, basin fill sediments (such as the French Prairie near Dayton), and within younger alluvial deposits along the Willamette River and other streams in the basin. The yield from sediment-hosted aquifers can vary greatly depending on the amount of coarse-grained sediments present. In general, the yield from marine sediments is low and not adequate for municipal supplies. The yield from wells completed within the basin-fill and younger alluvial deposits adjacent to rivers and streams can be relatively high (on the order of several hundred gpm); however these locations are generally within the flood plain or on land zoned for exclusive farm use (EFU).

OWRD has defined several ground water limited areas within or near the Yamhill County study area that restrict the availability of ground water rights. Ground water limited areas have been established in a number of areas underlain by CRBG aquifers. The areas in Yamhill County include the Amity Hills/Walnut Hills area and Eola Hills area. Heavy pumping from CRBG aquifers have caused significant water level declines in these areas. Under State basin programs, new ground water rights in these areas are restricted to a few designated uses. Another factor limiting the potential to develop new ground water rights is Division 9 of OAR-690-009, which are OWRD rules governing well interference within surface water. These rules restrict ground water development within 1 mile of streams and tributaries that are not open to further appropriation. For example, new ground water permits would not allow pumping during certain times of the year for wells located within one mile of the streams or tributaries to the streams listed in **Table 5-1**, if those aquifers are hydraulically connected to the streams (which most are) and if the proposed well production rate exceeds certain criteria.

The Bureau of Reclamation (BOR) has concluded that ground water in Yamhill County has been so intensely developed that the potential for future development is limited to only a few areas (BOR, 1996). In some areas, increased pumping is causing water quality problems, as well as declining aquifer levels, especially in the CRBG aquifers. According to BOR (1996), “there is essentially no potential for additional ground water development except in the Newberg area.” Despite these limitations in ground

water availability, several communities in the county continue to rely on ground water as their primary source of supply, and look to ground water to meet their future water demands.

5.2 Managing Existing Supplies

5.2.1 Water Conservation

In most cases, water conservation will not likely save enough water to eliminate the need for additional water completely, but can delay or offset the need for new sources. Therefore, water conservation is assumed to be a “source option” to be implemented by each of the water providers to some degree, including meeting the minimum requirements. Oregon State law (OAR 690-086) requires all water providers with service populations greater than 1,000 submit a Water Management and Conservation Plan (WMCP) when they apply for new water rights or for an extension of their existing right. Most of the cities in Yamhill County have outdated WMCPs that are in need of revision. In some cases, such as Lafayette, cities are operating on extensions to their WMCP in order to secure additional water rights. Other cities need revisions to their plans in order to make conservation an effective tool in water management.

Conservation measures vary depending on the specific needs of the water provider, but Division 86 (OAR 690-086-0150) requires certain components of water conservation, which include:

- Full metering of systems
- Meter testing and maintenance program
- Annual water audit
- Leak detection program if audit indicates loss >10%
- Leak repair program if audit indicates loss >15%
- Rate structure based on quantity of water metered
- Public education program
- Progress report on previous WMCP
- Documentation of water use measurement and reporting
- List of measures already implemented or required under contract

Conservation programs can also lower revenue coming into the cities; therefore, there is an implied disincentive to water conservation. However, in addition to being required by law, conservation can eliminate nuisance shortages that typically occur in the dry summer months. None of the cities conducts analysis on the effectiveness of their conservation programs, yet it is generally accepted that a well-implemented conservation program could reduce water consumption by approximately 5% to 10%. Greater reduction in water use would be contingent on the customer base (i.e. percentage of commercial/industrial and residential accounts), the level of effort put forth on previous conservation measures and other considerations that vary widely between different water systems.

Additional input from the water providers is needed to identify specific conservation activities and to estimate the possible water savings. Several cities have active conservation programs in effect. The following are some of the activities being implemented by the water providers based on input received to date:

- Newberg conducts public outreach programs and offers low flow fixture distribution to its customers.
- Sheridan applies several conservation measures including a water use measurement and recording program, variable rate structures, and retrofitting/ replacement of existing inefficient fixtures. In addition, the Sheridan performs routine field inspections of the water system and incorporates a program for the regular replacement of old pipes.

- The City of Yamhill eliminated the need for additional water rights by conducting institutional irrigation audits on local schools and churches, thereby extending their current capacity past 2020.

5.2.2 Water Reuse and Non-potable Source

Besides conservation, reuse of wastewater or industrial water and non-potable use of source water provides another option to offsetting the need for new sources of supply. As with water conservation, reuse is not likely to save enough water to eliminate the need for additional water completely. However, reuse is also assumed to be a “source option” to be implemented by each of the water providers to some level. Larger communities with more commercial or industrial users may have more opportunities, but small communities may also be able to develop some limited reuse practices.

Recycled municipal wastewater or commercial process is the most widely discussed reuse option. Use in wide-spread municipal application is often proven to be too costly in terms of other alternatives, largely because of health restrictions associated with requirements to separate “grey water sources.” In terms of costs and feasibility, a reuse program lends itself to urban environments where large volumes of water usage and sales provide an economy of scale not typically available in more rural settings.

Similar to reuse, non-potable source targets the use of non-treated (raw) water for commercial or industrial application, such as irrigation or process operations in which high-quality source water is not needed. As with reuse, this option would be most economical in an environment with large water users and a relatively large percentage of commercial/industrial customers. Again, additional input from the water providers is needed to identify specific non-potable source opportunities.

5.3 Local Source Options Review

This section summarizes the “local” source of supply options available to each of the water providers. Local options in this case, refer to those options that can be developed individually by each provider to attempt to meet the water demands for their own service area. **Section 5.3** discusses the regional and sub-regional options available to the water providers.

Table 5-2 summarizes the *existing* sources of supply in terms of water rights and reliable source capacity and notes when each provider would need new water rights or source infrastructure to meet their projected demands. In terms of the reliable source capacity, an attempt was made to obtain information from each provider regarding whether water availability (resource limit) is limiting the ability to fully utilize the water right. If the resource is limiting full use of the water right, then this is an indication that increasing production from that existing source is not likely feasible.

Local source options available for each water provider were identified under the following six categories:

- *Surface water source* – includes increasing diversion rate (capacity) from existing points of diversion under existing water rights or developing a new water right under the same source (stream/spring). These options only consider streams/springs that are currently used as sources of supply. It is assumed that available flows from other tributaries not already being used as a source are too low to be a practical municipal source of supply.
- *Ground water source* – includes construction of additional wells under existing water rights or developing a new water right within the same aquifer source. In general, it is assumed that only those water providers that are currently using ground water as a municipal source would pursue additional ground water supply. In general, ground water levels have been declining in some areas and there appears to be an aquifer yield limitation that could limit addition of significantly more production from wells, especially in other areas within the ground water limited areas in the County.
- *Storage/reservoir* – includes on-stream and off-stream storage options for those water providers who already have a storage right or have noted plans for storage or conducted feasibility studies. Analysis to identify other storage sites was not included in this scope.

- *Water conservation* – water conservation is considered an option for each of the water providers. Specific activities have not been identified, except to note those providers who have indicated that water management and conservation plans are being developed. The rate of water savings is not estimated, but it is generally assumed at this point that water conservation alone will not fully address source deficiencies.
- *Water Reuse* – reuse is considered an option available for each of the water providers but specific opportunities have not been identified, unless specifically provided. It is generally assumed at this point that, like conservation, water reuse alone will not fully address source deficiencies.
- *Intertie* – identifies opportunities to connect water systems among one or more providers to share sources of supply. Interties in this case refers to sharing existing sources, and are distinguished from “transmission” associated with transporting regional water from diverse sources regionally.

Table 5-2. Summary of Source of Supply Needs by Community					
Community	Permitted/ Certificated Water Rights ⁽¹⁾	Reliable Source Capacity ⁽²⁾	Likelihood of expanding water rights (new application)	Year when MDD > available water rights or reliable capacity	Comments
Amity	GW = 0.465 mgd SW = 1.360 mgd	GW = 0.45 mgd (pumping) SW = 1.27 mgd (pumping) SW treatment = 0.576 mgd	<ul style="list-style-type: none"> Not likely able to develop significant production from S. Yamhill River 	<ul style="list-style-type: none"> No water rights deficit 	<ul style="list-style-type: none"> Assumes that GW and SW sources are not limiting the water right due to resource limitation. One well and one spring source are not currently being used.
Carlton	SW = 3.557 mgd Storage = 75 ac-ft	SW = 3.6 mgd (pumping) SW Treatment = 1.11 mgd	<ul style="list-style-type: none"> Not likely able to develop <i>additional significant production</i> from Panther Creek. 	<ul style="list-style-type: none"> No water rights deficit 	<ul style="list-style-type: none"> WTP may need to be expanded >2025 to meet demands. Panther Creek Flows are limiting available water during late summer. Fall Creek source is being developed in 2007 (up to ~1.3 mgd)
Dayton	GW = 1.977 mgd SW = 0.161 mgd	GW = 0.87 mgd (pumping) SW = .08 mgd (spring) GW treatment = 2.1 mgd	<ul style="list-style-type: none"> Not likely able to develop <i>significant new</i> ground water production from existing wells. 	<ul style="list-style-type: none"> Water rights deficit beyond 2030 GW pumping capacity deficit by 2010 	<ul style="list-style-type: none"> Recently constructed two new wells with Lafayette (shared). New water rights will need to be secured over the long-term. Declining water levels observed in active wells have reduced amount of usable capacity. Existing spring supply cannot be expanded.
Dundee	GW = 2.463 mgd SW = 3.105 mgd (2.58 mgd from Willamette R.)	GW = 1.14 mgd (pumping) SW = not used	<ul style="list-style-type: none"> Not likely able to develop <i>significant new</i> ground water production. 	<ul style="list-style-type: none"> No water rights deficit GW pumping capacity deficit by 2010 	<ul style="list-style-type: none"> Decreasing production in active wells; spring sources are not used New wells are not planned due to aquifer yield concerns. Opportunity to develop rights on Willamette River.

Table 5-2. Summary of Source of Supply Needs by Community					
Community	Permitted/ Certificated Water Rights ⁽¹⁾	Reliable Source Capacity ⁽²⁾	Likelihood of expanding water rights (new application)	Year when MDD > available water rights or reliable capacity	Comments
Lafayette	GW = 1.944 mgd SW = 0.963 mgd	GW = 0.35 mgd (pumping) SW = 0.05 mgd (spring)	<ul style="list-style-type: none"> Not likely able to develop <i>significant new</i> ground water production from existing wells. 	<ul style="list-style-type: none"> No water rights deficit GW pumping capacity deficit by 2010 	<ul style="list-style-type: none"> Recently constructed two new wells with Dayton (shared). Two additional wells planned for summer 2007. Production of springs and some wells drops significantly during late summer. Springs used in the winter months to allow well recovery. Not possible to expand spring. Looking at possibility of ASR. Additional supply needed after new wells are online. New water rights will need to be secured over the long-term.
McMinnville	SW = 12.61 mgd (Haskins) SW = 4.134 mgd (Nestucca) SW = 6.20 mgd (Walker) Storage = 765 ac-ft (Haskins) Storage = 3,760 + 6,040 ac-ft (McGuire) Storage = 4,500 ac-ft (Walker)	SW Treatment plant = 13.3 mgd	<ul style="list-style-type: none"> McGuire Res. recently expanded Unlikely to expand reservoirs again within the planning period. 	<ul style="list-style-type: none"> WR deficit beyond 2030 (for instream rights); however, storage rights can address peak demands; WTP capacity deficit by 2010 	<ul style="list-style-type: none"> Assumes use of storage rights can be maximized. Treatment plant needs to be expanded to meet demands through 2050 Opportunities to use available storage to serve region. Currently only rely on stored water during peak season; fill reliability is high

Table 5-2. Summary of Source of Supply Needs by Community					
Community	Permitted/ Certificated Water Rights ⁽¹⁾	Reliable Source Capacity ⁽²⁾	Likelihood of expanding water rights (new application)	Year when MDD > available water rights or reliable capacity	Comments
Newberg	GW = 19.832 mgd SW = 5.171 mgd	GW = 6.0 mgd (pumping) SW = 0.17 mgd (springs) GW treatment = 9.6 mgd	<ul style="list-style-type: none"> ▪ Ground water yield expected to provide adequate production in the near term (for most recent new wells). ▪ Not likely able to develop <i>significant new</i> ground water production from existing wells. ▪ Springs production has been on the decline and is not expected to be a reliable future source. 	<ul style="list-style-type: none"> ▪ No water rights deficit ▪ GW pumping capacity deficit by 2010 ▪ WTP capacity deficit by 2030 	<ul style="list-style-type: none"> ▪ Adequate water rights ▪ Anticipated that new wells (under existing water rights) will produce 1,000 gpm each (5 wells). ▪ Well interference limits actual pumping capacity during summer. ▪ Spring sources will no longer be available to City after 2007. ▪ System expansions planned: water treatment plant expansions (2020 and 2030); two wells added in 2010 and 2012
Sheridan	GW = 0.395 mgd SW = 6.890 mgd Storage = 276 ac-ft	GW = 0.07 mgd (pumping) SW = 1.78 mgd (pumping) SW treatment = 1.3 mgd	<ul style="list-style-type: none"> ▪ Not likely able to develop significant production from Willamina Creek and other tributaries, except in conjunction with storage. 	<ul style="list-style-type: none"> ▪ No water rights deficit ▪ SW/GW pumping capacity deficit by 2010 ▪ WTP capacity deficit by 2010 	<ul style="list-style-type: none"> ▪ Springs provide year-round source; several tributary sources have low flows and limit water rights availability. ▪ Planning a 60 MG off-line reservoir; WTP being developed for up to 2 mgd (will only utilize 1 mgd) ▪ Pumping facilities and treatment plant needs to be expanded to meet demands through 2050. ▪ No water is currently diverted from Willamina Cr and a reservoir study has recently been completed; reservoir could be used for regional purposes also.
Willamina	SW = 2.584 mgd Storage = 20 ac-ft (fish)	SW = 0.53 mgd (pumping) SW treatment = 1.0 mgd	<ul style="list-style-type: none"> ▪ Not likely able to develop significant production from Willamina Creek 	<ul style="list-style-type: none"> ▪ No water rights deficit ▪ SW pumping capacity deficit by 2010; ▪ WTP capacity deficit by 2025 	<ul style="list-style-type: none"> ▪ Assumes that streamflows are not limiting existing water right due to resource limitation. ▪ Not using Lady Creek source

Table 5-2. Summary of Source of Supply Needs by Community					
Community	Permitted/ Certificated Water Rights ⁽¹⁾	Reliable Source Capacity ⁽²⁾	Likelihood of expanding water rights (new application)	Year when MDD > available water rights or reliable capacity	Comments
Yamhill	SW = 0.827 mgd Storage = 30 ac-ft	SW = 0.827 mgd (pumping) SW treatment = 1.0 mgd	<ul style="list-style-type: none"> Not likely able to develop significant production from Turner Creek, except in conjunction with storage. 	<ul style="list-style-type: none"> Water rights deficit by 2020 SW pumping capacity deficit beyond 2020 WTP capacity beyond 2030 	<ul style="list-style-type: none"> Turner Creek is not currently limiting use of existing water rights. Water is available according to WARS. Potential to increase raw water storage (60 ac-ft)

Notes:

(1) Only permitted and certificated water rights are included; claims are not included in the total water rights listed.

(2) Reliable capacity is based on information provided by water providers and considers current production (pumping) capacity from the point of diversion or withdrawal, historical resource limitations (i.e. available streamflow or aquifer yield), or information from water use reports.

GW – ground water; SW – surface water; mgd – million gallons per day, ac-ft – acre feet; WTP – water treatment plant

The following paragraphs discuss the local source options for each of the water providers. **Table 5-3** summarizes the local source options for each water provider.

Amity. The reliable production capacities from both the ground water and surface water sources are near the permitted/certificated water rights that Amity owns. The South Yamhill River does not appear to have water available for new surface water rights, based on a WARS analysis. Amity may be able to develop local ground water wells in the future if not affected by the ground water limited areas or Division 9 surface water interference concerns. However, Amity has no deficiency in water rights through the planning period based on the range of demand scenarios considered. At this time, it appears that the treatment plant for the surface water source is the long-term limiting factor for source of supply. Expanding the treatment plant in the near-term will address Amity's source deficiencies. An intertie or regional source can provide source reliability over the long-term.

Carlton. The reliable production capacity from Carlton's surface water source at Panther and Fall Creeks is near their permitted water rights. Water availability appears to be very limited for any new water rights on these tributaries based on WARS analysis. However, Carlton has no deficiency in water rights through the planning period based on the range of demand scenarios considered. Carlton has observed recently that the available water in Panther Creek in the summer limits their ability to divert sufficient water to meet peak demands. For this reason, the diversion at Fall Creek is being improved to increase the diversion rate. At this time, it appears that expansion of the water treatment plant will allow Carlton to meet their long-term water demands, assuming that the surface water sources do not limit the available water for diversion. For long-term planning, improvements to their storage capacity becomes an important option, because of recent flow limitations. In addition, Carlton should consider options for interties with their closest water providers including Yamhill, McMinnville and even source water provided through the Joint Water Commission (Yamhill does not have long-term source surplus).

Dayton. Production capacity from Dayton's wells has diminished and additional source capacity will be needed. Dayton is currently working with Lafayette to develop additional shared wells in the Dayton-Lafayette wellfield over the next several years. Dayton has attempted to rehabilitate existing wells with limited success. Further development of spring sources will not be possible without additional treatment. Additional water rights will need to be secured in the long-term (beyond 2030) to meet the demands over the full planning period considered in this study. However, with declining well yields (specifically during summer peak demand season) the ability to develop significant long-term ground water sources may be limited. Dayton should consider options for obtaining water supply beyond developing ground water sources with Lafayette.

Dundee. Dundee does not appear to need additional water rights through the planning period based on the range of demand scenarios considered in this study. However, production capacity from Dundee's wells needs to be increased or new wells drilled to meet near-term peak demands. Dundee could attempt to further develop ground water sources to increase production within their existing water rights; however, declining water levels in the basalt aquifer and increasing competition from new developments for limited ground water sources limits their ability to significantly increase production over the long-term. Dundee does have a Willamette River water right and unused spring sources that can be developed. The need to construct a treatment plant is the primary constraint on this option. Dundee could also look to develop an intertie with Newberg or share use of their treatment plant.

Lafayette. Lafayette does not appear to need additional water rights through the planning period based on the range of demand scenarios considered in this study. Production capacity from Lafayette's wells has diminished and additional source capacity will be needed. Lafayette is currently working with Dayton to develop two additional shared wells in the Dayton-Lafayette well field during the summer of 2007. Further development of spring sources or installation of new wells in the watershed will not be possible. Additional water rights will need to be secured in the long-term to meet demands over the full planning period considered in this study. However, with declining well yields (specifically during

summer peak demand season) the ability to develop significant long-term ground water sources may be limited. Lafayette should consider options for obtaining water supply beyond developing ground water sources with Dayton. Lafayette is investigating options for developing an ASR program, but is only in the evaluation stage.

McMinnville. MWL's water rights are sufficient to meet the projected demands through the planning period based on the range of demand scenarios considered in this study. MWL has adequate run-of-river production capacity until the summer period when it relies on their stored water to meet the peak demands. The limiting component of their system is the treatment plant capacity, and plans are in place to expand the plant by 2010 to 22 mgd. Based on their existing stored water rights, MWL has the ability to meet their local demands through the planning period.

Of the participating water providers, MWL may have the best ability to provide any significant quantities of water for regional use based on their size and available sources and water rights. Although MWL has water rights to develop Walker Reservoir, the designation of Walker Creek as a Wild and Scenic river adds to the difficulties and challenges to constructing a new reservoir for regional use. In the end, the ability of MWL to provide regional or sub-regional source of water will depend on the needs of the other water providers (overall quantity) and the types of agreements (administration, length of terms) open to interested parties.

Newberg. Newberg's water rights are sufficient to meet the projected demands through the planning period based on the range of demand scenarios considered in this study. In addition, Newberg recently completed an expansion to their water treatment plant. However, production capacity from Newberg's wells needs to be increased to meet near-term peak demands. To address this need, Newberg has plans to develop two new wells in the near-term (2010 and 2012), as well as expand its treatment plant to treat the iron that comes from these wells in the longer-term (2020 and 2030). Although Newberg has the ground water rights to continue to develop additional wells, it is not known how many additional wells can be installed and additional iron treatment will be needed. In addition, Newberg's spring sources will no longer be available to the majority of the City after 2007. Therefore, Newberg should consider options for developing other sources such as Willamette River source with Dundee.

Sheridan. Sheridan completed a comprehensive source/supply study in year 2000 and identified several preferred options to meet their projected water demands. Sheridan has sufficient water rights through the planning period to meet the range of demand scenarios considered in this study. New water rights from streams in and around Sheridan are generally not available during summer months. Ground water appears to be limited in the area, but Sheridan can emphasize developing its surface water/storage rights to meet future demands. The limiting component for Sheridan is its treatment plant capacity, and development of the surface water/storage options would require construction of a new treatment plant. If the surface water/storage and treatment plant options can be developed, Sheridan should have adequate supply to meet demands through the planning period. These facilities could also serve sub-regional demands for neighboring water providers.

Willamina. Willamina does not appear to need additional water rights through the planning period based on the range of demand scenarios considered in this study. However, production capacity from Willamina's diversion needs to be increased to meet near-term peak demands. This assumes that Willamina Creek has water available during peak demand periods. Over the longer-term, Willamina would also need to expand its treatment plant. Therefore, any source development from surface water could need a storage component, if water is not available during peak demand periods in the summer. There is no additional water available on Willamina Creek based on WARS analysis; however, Willamina has a water right on Lady Creek of 1 cfs that is not being used. Willamina is also in close proximity to Sheridan and can potentially share a source of supply.

Yamhill. The production capacity from the surface water source is equal to the permitted/certificated water rights that Yamhill owns. Yamhill is expected to need additional water rights and diversion capacity some time after year 2020 based on the range of demand scenarios considered in this study. However, Turner Creek does not appear to have water available for new surface water rights, based on a WARS analysis. Yamhill is also expected to need additional treatment plant capacity some time after year 2030. Yamhill does own storage rights (30 ac-ft) that can be expanded to at least 60 ac-ft which could help meet peak demands. The supply deficiency for Yamhill is not significant (< 1 mgd through the planning period), so conservation and other reuse measures could have substantial benefits. As discussed above, Carlton does not have source surplus that Yamhill can use. Because of the limited options for local source development, Yamhill should consider options for a sub-regional or regional source or look for other source options besides Turner Creek.

Table 5-3. Local Options for Source of Supply Development						
Entity	Surface Water	Ground Water	Stored Water/ Reservoir	Water Conservation	Reuse	Intertie
Amity	<ul style="list-style-type: none"> ▪ New surface water rights not likely available on S. Yamhill River ▪ Treatment plant expansion 	<ul style="list-style-type: none"> ▪ Potential local ground water well development (no indications of declining water levels) 	<ul style="list-style-type: none"> ▪ No specific storage/reservoir site identified 	<ul style="list-style-type: none"> ▪ No specific conservation activities identified 	<ul style="list-style-type: none"> ▪ No specific reuse options identified 	<ul style="list-style-type: none"> ▪ Amity-McMinnville ▪ Amity-Sheridan
Carlton	<ul style="list-style-type: none"> ▪ New surface water rights not likely available year-round on Panther Creek and Fall Creek ▪ Improvements to increase diversion at Fall Creek ▪ Treatment plant expansion 	<ul style="list-style-type: none"> ▪ No existing ground water sources/rights 	<ul style="list-style-type: none"> ▪ Expand existing reservoir and storage right (currently 75 ac-ft). ▪ Dredge existing reservoir to improve storage capacity. 	<ul style="list-style-type: none"> ▪ No specific conservation activities identified ▪ WMCP-outdated, unspecified update 	<ul style="list-style-type: none"> ▪ No specific reuse options identified 	<ul style="list-style-type: none"> ▪ Carlton-Lafayette ▪ Carlton-Yamhill ▪ Carlton-McMinnville
Dayton	<ul style="list-style-type: none"> ▪ Further development of existing spring sources not likely ▪ Planned treatment plant expansion ▪ New surface water rights not likely available 	<ul style="list-style-type: none"> ▪ Currently developing two additional wells with Lafayette in the Dayton-Lafayette wellfield ▪ Potential for rehabilitating existing wells not likely. ▪ New large wells or new wellfields are unlikely in the future due to land use constraints (surrounded by EFU land) ▪ New ground water rights not likely 	<ul style="list-style-type: none"> ▪ No specific storage/reservoir site identified 	<ul style="list-style-type: none"> ▪ Leak repair program ▪ No other specific conservation activities identified ▪ WMCP-outdated, unspecified update 	<ul style="list-style-type: none"> ▪ No specific reuse options identified 	<ul style="list-style-type: none"> ▪ Dayton-Lafayette: Currently shared wellfield with Lafayette (including treatment plant for wellfield) ▪ Dayton-McMinnville
Dundee	<ul style="list-style-type: none"> ▪ Develop Willamette River water right; requires treatment plant ▪ Develop water rights for springs (production unknown); requires treatment plant ▪ New surface water rights not likely available. 	<ul style="list-style-type: none"> ▪ Potential for rehabilitating existing wells. ▪ New large wells or new wellfields are unlikely in the future. 	<ul style="list-style-type: none"> ▪ No specific storage/reservoir site identified ▪ Potentially investigate ASR or aquifer recharge 	<ul style="list-style-type: none"> ▪ No specific conservation activities identified ▪ WMCP-draft, pending 2007 	<ul style="list-style-type: none"> ▪ No specific reuse options identified 	<ul style="list-style-type: none"> ▪ Dundee-Newberg (including potential to share treatment plant with Newberg)

Table 5-3. Local Options for Source of Supply Development						
Entity	Surface Water	Ground Water	Stored Water/ Reservoir	Water Conservation	Reuse	Intertie
Lafayette	<ul style="list-style-type: none"> ▪ Further development of existing spring sources not likely ▪ New surface water rights not likely available. 	<ul style="list-style-type: none"> ▪ Currently developing two additional wells in the Dayton-Lafayette wellfield ▪ Potential for rehabilitating existing wells not likely ▪ New large wells or new wellfields are unlikely in the future ▪ New ground water rights not likely 	<ul style="list-style-type: none"> ▪ Investigating ASR for storage ▪ No specific storage/reservoir site identified 	<ul style="list-style-type: none"> ▪ Variable rate structure ▪ No other specific conservation activities identified ▪ WMCP-draft, pending May 2007 	<ul style="list-style-type: none"> ▪ No specific reuse options identified 	<ul style="list-style-type: none"> ▪ Lafayette-Dayton: Currently shared wellfield with Dayton (including treatment plant for wellfield)
McMinnville	<ul style="list-style-type: none"> ▪ New surface water rights not likely available (for direct diversion) ▪ Treatment plant expansion 	<ul style="list-style-type: none"> ▪ No existing ground water sources/rights 	<ul style="list-style-type: none"> ▪ Develop Walker Creek Reservoir ▪ Recently expanded McGuire Reservoir (not likely to expand again within planning period) 	<ul style="list-style-type: none"> ▪ No specific conservation activities identified ▪ WMCP-draft, pending May 2007 	<ul style="list-style-type: none"> ▪ No specific reuse options identified 	<ul style="list-style-type: none"> ▪ Potential source for other water providers through interties (Carlton, Amity, Dayton, Lafayette, Sheridan) ▪ Unlikely that other water providers will supply water to MWL
Newberg	<ul style="list-style-type: none"> ▪ Further development of existing spring sources not likely ▪ Treatment plant expansions planned (2020 and 2030) up to 15 mgd ▪ New surface water rights not likely available 	<ul style="list-style-type: none"> ▪ Plans to add two new wells to wellfield (2010 and 2012) ▪ Additional large wells or new wellfields may be limited in the future (well interference occurs) 	<ul style="list-style-type: none"> ▪ No specific storage/reservoir site identified ▪ Potentially investigate ASR or aquifer recharge 	<ul style="list-style-type: none"> ▪ System metering, public education ▪ No other specific conservation activities identified ▪ WMCP-2002, update pending May 2007 	<ul style="list-style-type: none"> ▪ Wastewater Reuse Facility with 1 mgd capacity in 2008, expandable to 2mgd with no current implementation date established. 	<ul style="list-style-type: none"> ▪ Newberg-Dundee: may also utilize Dundee’s Willamette River right; including potential to share their treatment plant with Dundee

Table 5-3. Local Options for Source of Supply Development						
Entity	Surface Water	Ground Water	Stored Water/ Reservoir	Water Conservation	Reuse	Intertie
Sheridan	<ul style="list-style-type: none"> Further develop existing spring sources and other small tributaries (within Stoney Mtn. watershed; to be developed in conjunction with storage) New treatment plant needed as part of source/storage development (plans for 2 mgd capacity by 2010) 	<ul style="list-style-type: none"> Limited existing ground water sources/ rights Limited ground water availability to expand or obtain new water rights. 	<ul style="list-style-type: none"> Preferred site identified is Upper Willamina Creek Reservoir and Upper La Toutena Mary Impoundment Other storage/ reservoir sites considered include: East Baltimore Creek and Lower La Toutena Mary 	<ul style="list-style-type: none"> System metering, water audit, leak detection, variable rate structure, water use reporting No other specific conservation activities identified WMCP-draft, pending 2008 	<ul style="list-style-type: none"> No specific reuse options identified 	<ul style="list-style-type: none"> Potential source for other water providers through interties (Willamina, Grande Ronde Tribe, Amity) Sheridan-McMinnville: Unlikely that other water providers will supply water to Sheridan, with exception of MWL
Willamina	<ul style="list-style-type: none"> Develop additional pumping capacity at diversion from Willamina Creek Develop diversion at Lady Creek Treatment plant expansion New surface water rights not likely available 	<ul style="list-style-type: none"> No existing ground water sources/rights Limited water availability to expand or obtain new water rights (based on Sheridan findings) 	<ul style="list-style-type: none"> No specific storage/reservoir site identified Potentially expand storage at existing site (available storage of 20-ac-ft – used for fish purposes) 	<ul style="list-style-type: none"> No specific conservation activities identified WMCP-outdated, unspecified update 	<ul style="list-style-type: none"> No specific reuse options identified 	<ul style="list-style-type: none"> Willamina-Sheridan (including potential to share treatment plant with Sheridan)
Yamhill	<ul style="list-style-type: none"> No additional water rights available on Turner Creek Treatment plant expansion 	<ul style="list-style-type: none"> No existing ground water sources/rights 	<ul style="list-style-type: none"> Potentially expand storage at existing site (available storage of 30-ac-ft) 	<ul style="list-style-type: none"> Irrigation audits No other specific conservation activities identified WMCP-outdated, unspecified update 	<ul style="list-style-type: none"> No specific reuse options identified 	<ul style="list-style-type: none"> Yamhill-Carlton Yamhill-Joint Water Commission(?)

Notes:

Ac-ft – acre feet; ASR – aquifer storage and recovery; Mgd – million gallons per day; WMCP – water management and conservation plan

5.4 Regional and Sub-regional Source of Supply Options

Regional source options include sources that have the potential to provide significant quantities of water to meet the projected demands for the County. With the exception of the Willamette River, the streams and tributaries in Yamhill County generally do not have year-round water availability. The other streams and tributaries do have stream flows available during the winter season, which can be diverted for storage and used during peak demand periods. Although ground water continues to be used throughout the County and some water providers are developing additional wells, observed declines in aquifer levels, designation of ground water limited areas in portions of the County, land use compatibility concerns with Exclusive Farm Use (EFU) zoned land, and interference concerns with surface water (Division 9) puts into question the extent to which *regional* ground water supplies can be developed. Based on these constraints, the main regional options available to Yamhill County include use of the Willamette River and developing storage reservoirs (in-stream or off-stream).

The *Polk County Water Needs Assessment* (EES, 2004) identified other regional sources. With the exception of the Gorge Dam Reservoir, these alternatives were reviewed, but not considered further in this study because of their distance from the Yamhill County water providers.

5.4.1 Willamette River

Possible methods for securing Willamette River water supply involves application for a new water right and associated point of diversion (POD), using Dundee's water right and POD, and purchasing uncontracted water from the U.S. Army Corps of Engineers (COE). These options involve treatment and transmission of the finished water to areas with supply deficiencies. The location of the additional infrastructure should be similar under all of the Willamette scenarios. **Table 5-4** summarizes the features of the Willamette River options.

One of the key issues with using Willamette River water is the water quality issues and level of treatment required. Similar to the concerns raised in the City of Wilsonville's use of the Willamette River, an expanded level of treatment may be necessary to address social and political interests related to a diversion downstream of industrial and agricultural discharges along the Willamette River. In addition, the Willamette River is on the Oregon Department of Environmental Quality 303(d) list for temperature. Appropriation of water from the Willamette may be limited in accordance with the Willamette River's recently published Total Maximum Daily Load (TMDL).

New water right on Willamette River. This option involves the use of Willamette River under a point of diversion near Dayton, Dundee or Newberg, and involves construction of an intake, treatment plant, transmission main and pumping. Treatment can occur near the point of diversion in which case the treatment plant at Dayton or Newberg would have to be modified and upgraded, while a new treatment plant would need to be constructed at Dundee. Alternatively, the raw water can be delivered to a more central location for treatment such as McMinnville. Any expansions and modifications to a treatment plant can be done under staged improvements.

Dundee currently has undeveloped rights of 4 cfs from the Willamette, and a new water right could be used in conjunction with Dundee's rights. In this case, the POD can remain at Dundee's original POD and the new right can be located at the same location. Alternatively, Dundee's POD can be transferred to the location of the new water right POD. Depending on how the new water right and Dundee's water right are administered, a formal transfer of ownership may also be needed. The transfer would require a formal public comment and administrative review.

In addition, COE has storage rights on the Willamette, which may also be used in conjunction with a new water right, as discussed below.

Uncontracted Storage from U.S. Corps of Engineers. This option is similar to the new water right option, but instead of diverting natural flows from the Willamette River, the source of water is to purchase *uncontracted* storage from the COE. Entering into an agreement with the COE to purchase a portion of that storage would greatly increase the reliability of supply without acquisition of new water rights. This agreement may also be considered a more reliable source of supply than a newly acquired right with a junior priority date, since storage releases are not considered as part of live, natural streamflow. The COE reservoirs in the Willamette River basin contain about 1.6 million acre-feet of uncontracted storage. As with the other Willamette River option, this option involves the creation of a treatment plant, transmission main and pumping. It should be noted that stored water in federal reservoir projects is presently not available for municipal and industrial uses and OWRD must approve such a change in type of use. There is a group of water providers discussing the possibility of gaining access to this stored water; however, it is not known when the stored water would be available to release and a long approval process is likely needed.

5.4.2 Surface Water Storage

Previous studies were reviewed to compile a representative list of storage options that could meet the regional source of supply needs of the County. The three reservoir options identified include: Gorge Reservoir on Mill Creek, Upper Willamina Creek Reservoir, and MWL's Walker Reservoir. Another reservoir option includes the Buck Hollow Reservoir on lower Willamina Creek. However, for the purposes of this study, the issues and evaluation of this reservoir are similar to the Upper Willamina Creek Reservoir. **Table 5-4** summarizes the features of the storage options.

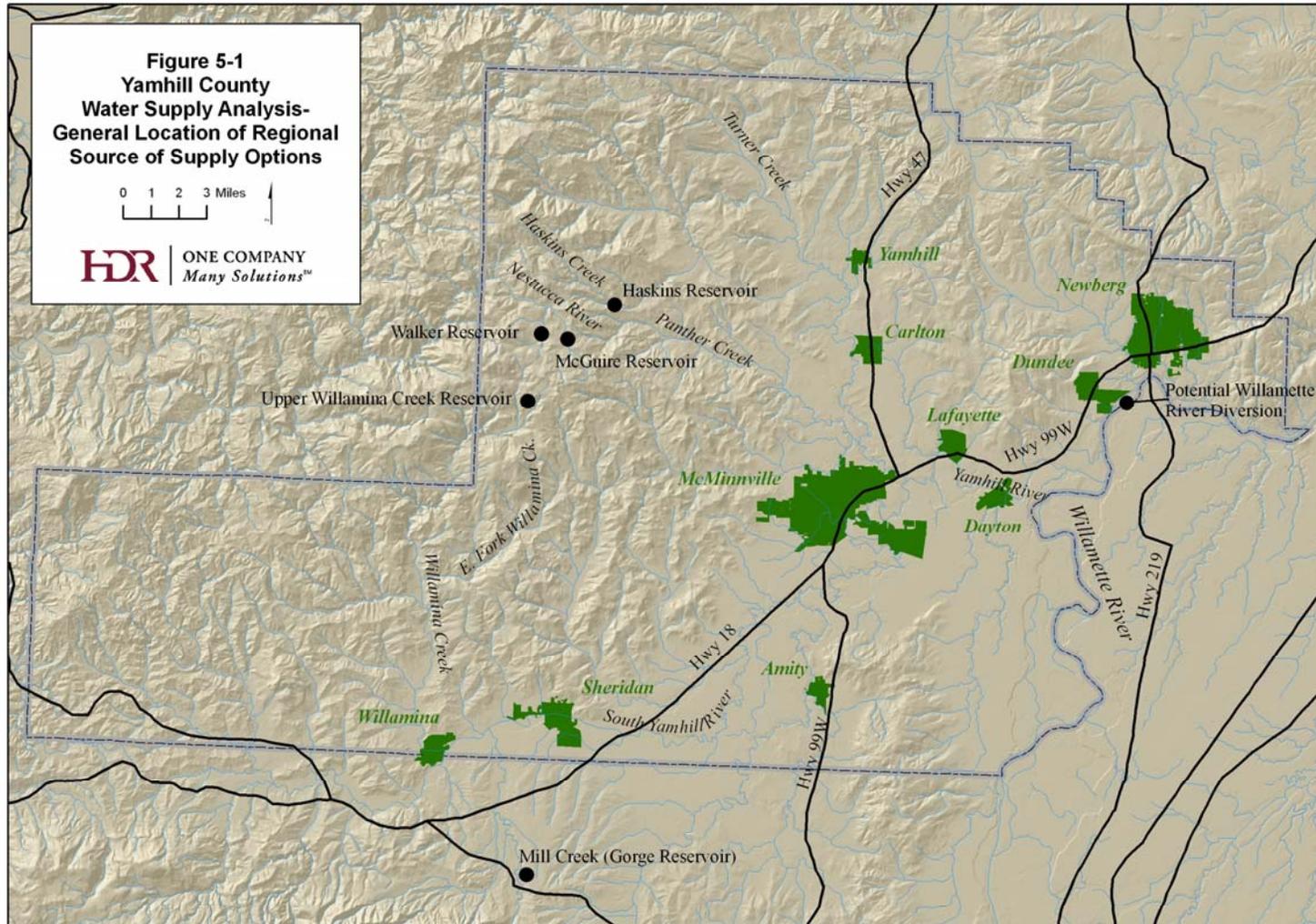
With the exception of Walker Reservoir, the released water could eventually be routed through South Yamhill River in conjunction with transmission mains to reach the various communities in the County. Potential barriers to developing additional storage include environmental concerns, securing additional storage rights, securing the necessary funding, and developing interagency agreements.

Gorge Reservoir on Mill Creek. The Gorge site is located on Mill Creek directly south of Highway 22. It is the most distant storage option for Yamhill County. The BOR (1992) study evaluated a range of storage capacity for the Gorge Reservoir from 2,200 ac-ft to 21,900 ac-ft. This storage option may be most applicable to serve the central and southern area communities (Willamina, Sheridan, Amity, McMinnville). Transmission may be an issue for serving the other communities located to the north of McMinnville.

Upper Willamina Creek Reservoir. The Upper Willamina Creek Reservoir is located in the headwaters of Willamina Creek. The Reservoir could provide a total of 700 to 10,000 ac-ft based on the study conducted by Sheridan. This storage option may be most applicable to serve communities along the South Yamhill River area.

Walker Creek Reservoir. MWL has a water right of 4,500 ac-ft for a reservoir on Walker Creek. Walker Creek is a tributary of Nestucca River and the dam site is located on Bureau of Land Management land. Since released water would be routed through MWL's system, this storage option is the most centrally located for regional distribution.

Figure 5-1 shows the general location of these surface water sources.



5.4.3 Ground Water

As discussed in Section 4, ground water availability in the basin is generally limited, and as a result it is expected that large regional wellfields are not likely feasible. Additional localized ground water wells may be possible as identified in **Section 5.3** (including the Dayton-Lafayette and Newberg wellfields). However, large production wells applicable for use in a regional setting is not considered further.

The Polk County Regional Water Needs Assessment (EES, 2004) and regional ground water study performed for the Rickreal Community Water Association (GSI, 2004) identified one major ground water supply alternative centered around Setnicker Well Field located in the alluvial deposits near the Willamette River. This area is located in the vicinity of Salem, OR, which is significantly distant from the Yamhill County water providers. Consideration could be given to conducting a study to look for similar setting in Yamhill County.

5.4.4 Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) involves the development of wells for injecting high quality treated water into a suitable aquifer during high flow periods (typically winter months) and for then pumping the same wells and delivering the stored water to the water system during peak demand periods (e.g. summer months). Raw water would be diverted from an intake at one of the area's streams, treated, and pumped to ASR wells during the winter season. ASR functions similarly to surface water storage to meet peak demands. The key is to find the proper hydrogeologic conditions that allow storage of meaningful volumes of water without loss to springs or streams, and recovery of the water at meaningful rates. In addition, access to treated surface water is necessary. ASR is being applied with success at a number of locations in Oregon. The feasibility of ASR in Yamhill County is not known at this time; however, it is inferred that ASR might be feasible in locations where wells have good production (e.g. greater than 200 gpm) and where the aquifer is large enough to hold enough water to meet peak supply needs (e.g. 300 gpm for 3 months = 39 million gallons). ASR may be possible at locations in the Columbia River Basalt where ground water depletion has already been observed (e.g. the ground water limited areas). At this time, only Lafayette has plans to investigate ASR as a source option.

Table 5-4. Summary of Potential Regional Water Source Options		
Source Option	Description	Comments
Willamette River		
New Willamette River water right and Point of Diversion	<ul style="list-style-type: none"> ▪ Application for new water right on Willamette R. with diversion and intake near Dayton, Dundee or Newberg. ▪ New water treatment plant (if located in Newberg, may expand existing WTP). ▪ Booster stations and transmission line. ▪ May use in conjunction with Dundee's Willamette R. right to transfer to same POD as intake. 	<ul style="list-style-type: none"> ▪ Water right will have junior priority date ▪ Potential social/political issues with Willamette R. source. ▪ Reduced flows in Willamette River which would impact water quality issues (e.g. TMDLs). ▪ Dundee's water rights is 4 cfs.
Use of U.S. Corps of Engineers uncontracted storage	<ul style="list-style-type: none"> ▪ Purchase uncontracted storage from USACE ▪ New water treatment plant (if located in Newberg, may expand existing WTP). ▪ Booster stations and transmission line. ▪ May use in conjunction with Dundee's Willamette R. right to transfer to same POD as new intake. 	<ul style="list-style-type: none"> ▪ Several dams are operated with uncontracted storage of 1.6 million acre-feet; Detroit Lake may be most appropriate option. ▪ May be more reliable than new water right for natural stream flow. ▪ Habitat impacts due to increased drawdown at COE reservoir(s) ▪ Use of stored water for M&I use presently not allowed. Long approval process likely.
Surface Storage		
Gorge Reservoir on Mill Creek	<ul style="list-style-type: none"> ▪ On-line reservoir located on Mill Creek in Polk County ▪ Storage releases conveyed through Mill Creek and S. Yamhill River. ▪ New point(s) of diversion and treatment plant can be constructed near Sheridan, McMinnville or Lafayette. ▪ Booster stations and transmission line. 	<ul style="list-style-type: none"> ▪ Can provide 4,600 ac-ft to 19,500 ac-ft depending on storage objectives. ▪ Water rights have not been secured. ▪ Habitat and wildlife impacts from construction of new reservoir.
Upper Willamina Creek Reservoir (similar to Buck Hollow except located higher in the drainage basin)	<ul style="list-style-type: none"> ▪ On-line reservoir located on Willamina Creek ▪ Storage releases conveyed through Willamina Creek and S. Yamhill River. ▪ New point(s) of diversion and treatment plant can be constructed near Sheridan, McMinnville or Lafayette. ▪ Booster stations and transmission line. 	<ul style="list-style-type: none"> ▪ Can provide 700 ac-ft to 10,000 ac-ft depending on storage objectives. ▪ Water rights have not been secured. ▪ Habitat and wildlife impacts from construction of new reservoir. ▪ No fatal flaws were identified by the City of Sheridan study (2004).
Walker Reservoir	<ul style="list-style-type: none"> ▪ On-line reservoir located on Walker Creek ▪ Storage releases conveyed through Willamina Creek and S. Yamhill River. ▪ New point(s) of diversion and treatment plant can be constructed near Sheridan, McMinnville or Lafayette. ▪ Booster stations and transmission line. 	<ul style="list-style-type: none"> ▪ Water right permit has been secured for 4,500 ac-ft with natural flow diversion of 9.60 cfs (6.20 mgd). ▪ Need to transfer place of use for existing water rights beyond McMinnville.

6.0 EVALUATION OF SUPPLY ALTERNATIVES

This section evaluates supply alternatives developed from the source options identified in **Section 5**. This section first defines evaluation criteria, and then applies those criteria to evaluate individual regional source options. Supply alternatives are then developed based on the available source options and geographic distribution of demands. The supply alternatives are developed based on estimates of actual flows and storage volumes available to meet source deficiencies and accounts for potential transmission needs on a planning level. The same criteria are used to evaluate the supply alternatives.

6.1 Evaluation Criteria

The source of supply alternatives are evaluated using a set of criteria approved by the TAC. Generally, evaluation criteria are derived from a set of policy objectives formulated by stakeholders, often including the public. The policy objectives and evaluation criteria generally reflect the issues important to the region and should be useful to policymakers in distinguishing among alternative resource futures. In this case, evaluation criteria developed from similar studies conducted by several major water providers in the Portland metropolitan and Polk County areas were for use in the Yamhill County study. The series of publicly-tested evaluation criteria adopted for this study include: water availability, environmental impacts, raw water quality, vulnerability to catastrophic events, ease of implementation, treatment requirements, and capital and operating costs. A summary of these evaluation criteria is listed in **Table 6-1**.

Criterion	Description
Water Availability	Consideration of hydrology, water rights, and storage operation.
Environmental Impacts	Includes impacts to natural and human environments; planning-level subjective analysis of both natural and human environmental factors including: <ul style="list-style-type: none"> ▪ Natural environment: fish, geotechnical and natural hazards, threatened and endangered species, wetlands, wildlife and habitat ▪ Human environment: cultural resources, hazardous materials, land use, recreational resources, scenic resources
Raw Water Quality	Physical, inorganic, organic, and microbiological constituents, DO, and nutrients were reviewed; aesthetic aspects considered; assessment of ability to protect watershed and resulting vulnerability of raw water quality
Vulnerability to Catastrophic Events	Vulnerability to volcanic, fire, slide, and spill events
Ease of Implementation	Implementability with respect to legal or permitting requirements; subjective assessment
Treatment Requirements	Treatment regime was developed based on raw water quality, used multiple barrier approach to exceed drinking water standards; all of the surface sources can readily be treated to meet or surpass safe drinking water standards
Capital and Operating Costs	Costs included intakes, raw water pipelines, treatment plants, pumping stations, finished water pipelines, and terminal reservoirs

6.2 Comparison of Regional Source Options

Based on the source options discussed in Section 5, seven regional source options were selected to compare using the defined evaluation criteria. The seven regional source options include:

- Option 1 – Individual Sources: existing and expanded sources developed and managed by each individual provider, including smaller local sources such as ground water well development and aquifer storage and recovery (no regional action)
- Option 2 – McGuire Reservoir as regional source
- Option 3 – McGuire Reservoir + Walker Reservoir
- Option 4 – Willamette River natural flow

- Option 5 – U.S. Corps of Engineers Stored Water (diverted from Willamette River)
- Option 6 – Upper Willamina Creek Reservoir
- Option 7 – Gorge (Mill Creek Reservoir)

It should be kept in mind that these comparisons are only for the source options themselves. The ratings do not account for transmission issues to move water among the different service areas. These issues are considered in the “alternatives” evaluation in **Section 6.3** (and **Table 6-4**).

The source options evaluation is presented in **Table 6-2**. Each regional source option was rated against the criteria under a simple qualitative assessment as being “favorable”, “neutral”, or “unfavorable” in each category. A given rating was determined by information that was available in existing reports or plans and through subjective comparison among the various supply options.

Several general conclusions can be made for the source options with respect to the evaluation criteria. Cost and ease of implementation are considered the most prohibitive factors for the storage-related options (Options 3-7). However, the ultimate importance of cost and ease of implementation is taken into account under the alternatives evaluation, where transmission is also considered (see **Section 6.3**). Options where development of new storage is required (or purchase of stored water in the case of *Option 5 – U.S. Corps of Engineers Stored Water*) results in much greater complexity in terms of permitting, environmental impacts, and cost.

The following are other key points considered in developing the ratings shown in **Table 6-2**:

- *Option 2 – McGuire Reservoir*: water availability is considered unfavorable *in relative terms* since no new source of water would be developed for the region if this source option were the only one pursued. Vulnerability to catastrophic events is considered unfavorable for the McGuire Reservoir because the development of the other source options would provide some other primary regional source as a redundancy.
- *Option 3 – McGuire Reservoir + Walker Reservoir*: provides favorable water availability, but the obvious obstacle of building the reservoir on the Wild and Scenic-designated Walker Creek presents high environmental impacts and a difficult implementation process.
- *Option 3 – McGuire Reservoir + Walker Reservoir; Option 6 – Upper Willamina Creek Reservoir; and Option 7- Gorge Reservoir*: provides high quality water, but receives unfavorable marks for environmental impacts, cost and ease of implementation criteria.
- *Option 4 – Willamette River natural flow and Option 5 – U.S. Corps of Engineers Stored Water*: presents problems in regards to water quality. The Willamette River has a TMDL for temperature, among other parameters, which may inhibit securing additional water rights. Public perception of the Willamette River as a supply source is generally negative, although more recent developments such as the Wilsonville water treatment plant and Tualatin Valley Water District’s interest in the Willamette River improves the perception. If water rights to the Willamette River can be secured, the public will need to be reassured of its quality through an extensive treatment process, which could add to the overall cost for these options.
- *Option 5 – U.S. Corps of Engineers Stored Water*: Uncontracted water available from the COE reservoirs upstream on the Willamette River would provide good water availability, but negotiations with COE, OWRD, ODFW and other agencies for municipal purposes could be a long process. The cost for the water is highly uncertain, but could be very restrictive also. The uncontracted water purchased could be priced as if a new storage facility holding the same volume of water would be constructed. The same negative public perception of using the Willamette River’s water would still need to be overcome.
- *Option 3 and Option 7*: compare similarly because they are both instream storage projects. Environmental impacts, ease of implementation and cost are rated unfavorably, but are not distinguished at this level of assessment.

Table 6-2. Evaluation of Regional Supply Options							
Option	Description	Water Availability	Environmental Impacts	Raw Water Quality	Vulnerability to Catastrophic Events	Ease of Implementation	Cost
Option 1: Individual Sources	<i>Source:</i> Existing and expanded sources developed and managed by each individual provider. <i>Raw water/treatment:</i> Individual intakes, wells and water treatment plants. <i>Finished water/transmission:</i> No transmission	-	O	O	O	+	O
Option 2: McGuire Reservoir as Regional Source	<i>Source:</i> Stored water from McGuire Reservoir <i>Raw water/treatment:</i> Expand existing diversion at McGuire reservoir and expand MWL WTP into a regional treatment plant. <i>Finished water/transmission:</i> Finished water transmission from MWL regional treatment plant.	-	O	+	-	O	O
Option 3: McGuire Reservoir + Walker Reservoir	<i>Source:</i> Stored water from McGuire and Walker Reservoirs <i>Raw water/treatment:</i> Expand existing diversion at McGuire reservoir and expand MWL WTP into a regional treatment plant. <i>Finished water/transmission:</i> Finished water transmission from MWL regional treatment plant.	+	-	O	O	-	-
Option 4: Willamette River Natural Flow	<i>Source:</i> Willamette River (natural flow only) <i>Raw water/treatment:</i> Point of diversion and intake near Dundee; new regional water treatment plant in the vicinity of Dundee. <i>Finished water/transmission:</i> Finished water transmission from Dundee regional WTP at Dundee.	O	O	-	O	-	-
Option 5: U.S. Corps of Engineers Stored Water	<i>Source:</i> Willamette River (stored water releases) with supplemental natural flow diversion. <i>Raw water/treatment:</i> Point of diversion and intake near Dundee; new regional water treatment plant in the vicinity of Dundee. <i>Finished water/transmission:</i> Finished water transmission from Dundee regional WTP at Dundee.	+	O	-	O	-	-
Option 6: Upper Willamina Creek Reservoir	<i>Source:</i> Stored water releases from proposed Upper Willamina Creek reservoir near Sheridan. <i>Raw water/treatment:</i> Point of diversion at Willamina Creek with regional WTP near Sheridan. <i>Finished water/transmission:</i> Finished water transmission from regional WTP at Sheridan.	O	-	+	O	-	-

Table 6-2. Evaluation of Regional Supply Options							
Option	Description	Water Availability	Environmental Impacts	Raw Water Quality	Vulnerability to Catastrophic Events	Ease of Implementation	Cost
Option 7: Gorge Reservoir on Mill Creek	<p><u>Source:</u> Stored water releases from proposed Gorge Reservoir on Mill Creek reservoir south of Willamina.</p> <p><u>Raw water/treatment:</u> Point of diversion at S. Yamhill River with regional WTP near Sheridan or McMinnville depending on are served.</p> <p><u>Finished water/transmission:</u> Finished water transmission from a regional WTP at Sheridan or McMinnville.</p>	O	-	+	O	-	-

Notes:

Ratings are assigned under a simple qualitative assessment as being “favorable”, “neutral”, or “unfavorable” in each category. A given rating was determined by information that was available in existing reports or plans and through subjective comparison among the various supply options.

+ : favorable

o : neutral

- : unfavorable

6.3 Evaluation of Supply Alternatives and Transmission

Based on the geographic proximity of the communities in the County, several sub-regions become apparent when assessing the different supply options. Implementation of the various supply options identified in **Section 6.2** may be better suited to these subregions rather than to all study participants as one large region. The sub-regions are defined as follows:

- City of McMinnville (MWL service area)
- Dayton-Lafayette
- Dundee-Newberg
- Yamhill-Carlton
- Sheridan-Willamina
- Amity

Based on the demand projections and needs analysis presented in **Sections 2 and 4**, respectively, the capacity needs for each sub-region can be derived. The need for additional source is to address the maximum day demands (MDD) during the high demand period – typically the summer months. Over the course of the year, the existing sources have the capacity to provide ~33,000 ac-ft of water. **Table 6-3** summarizes the additional source capacity needed by each sub-region based on meeting the MDD in the year 2050. The needs are calculated by subtracting the existing demands for each subregion from the source capacity currently available for that subregion. There is a fairly wide range of source needs because of the range of assumptions used to derive the demand projections (see **Section 2**).

Subregion	Needed Additional Source Capacity Based on MDD (cfs)	Needed Additional Volume to meet peak demands (MDD over 90 days) (ac-ft)	Annual Volume (2050 ADD over a year) (ac-ft)	Additional Volume to meet ADD (ac-ft)
McMinnville	4.4 - 34.0	800 – 6,100	7,400 – 16,200	None (surplus)
Dayton-Lafayette	3.6 – 8.6	700 – 1,500	1,600 – 2,900	Up to 750
Dundee-Newberg	3.1 – 12.9	600 – 2,300	6,700 – 10,100	None (surplus)
Yamhill-Carlton	0 – 1.2	0 - 200	800 – 1,300	Up to 1,500
Sheridan-Willamina	6.5 – 9.8	1,200 – 1,800	3,100 – 4,200	None (surplus)
Amity	0.5 – 1.4	100 - 300	400 - 800	None (surplus)
Total	17.7 – 59.7	3,200 – 10,700	20,000 – 32,600	None (surplus)

6.3.1 Development of Supply Alternatives

With the source options described and evaluated in **Table 6-2**, several source alternatives were defined based on meeting the demands of the region as a whole or in the subregions shown in **Table 6-3**. Four “categories” of source alternatives were developed, as shown in **Table 6-4**:

- McMinnville Water and Light Reservoir Alternatives (MWL): Source alternatives associated with the McMinnville Water and Light reservoirs including McGuire Reservoir and the potential for constructing Walker Reservoir.
 - MWL-1 – Use of McGuire and Walker Reservoirs to serve the entire region.
 - MWL-2 – Use of McGuire Reservoir to serve McMinnville, Yamhill-Carlton.
 - MWL-3 – Use of McGuire Reservoir to serve McMinnville, Yamhill-Carlton, and Dayton-Lafayette.

- Willamette River Alternatives (WIL): source alternatives associated with using a combination of Willamette River natural flows and stored water from existing COE reservoirs. The COE reservoir water is used to the extent that the permitted natural flows would not be able to meet the demands.
 - WIL-1 – Use of Willamette River natural flows and COE stored water to serve the entire region
 - WIL-2 – Use of Willamette River natural flows and COE stored water to serve Dundee-Newberg.
 - WIL-3 – Use of Willamette River natural flows and COE stored water to serve Dundee-Newberg and Dayton-Lafayette.
- Upper Willamina Creek Reservoir Alternatives (UWC): source alternatives associate with constructing the Upper Willamina Creek Reservoir as documented in the feasibility study.
 - UWC-1 – Use of Upper Willamina Creek Reservoir to serve the entire region.
 - UWC-2 – Use of Upper Willamina Creek Reservoir to serve Sheridan-Willamina-Amity.
- Gorge Creek Reservoir Alternatives (GRC): source alternatives associate with constructing the Gorge Creek Reservoir as documented in the feasibility study.
 - GRC-1 – Use of Gorge Creek Reservoir to serve the entire region.
 - GRC-2 – Use of Gorge Creek Reservoir to serve Sheridan-Willamina-Amity.

Table 6-4 includes a conceptual description of the components of the alternatives including the intake/diversion and transmission needed to deliver the raw water to the water treatment plant, as well as the treatment plant capacity and transmission needed to deliver the finished water to the service areas. The transmission alignments are based on those developed in the Yamhill County Intertie Study (EES, 1998). **Appendix D** includes a figure from the Intertie Study that shows the alignments. The ratings against the evaluation criteria are based on similar considerations from those used in the source options ratings; however, the transmission issues are included in these ratings for environmental impacts, vulnerability to catastrophic events, ease of implementation, and cost. Note, that the summary of cost estimates used as the basis for the cost rating is presented in **Section 6.3.2** and **Table 6-5**. Again it should be kept in mind that these ratings are given on a relative basis considering all of the alternatives.

Furthermore, another criteria has been added to evaluate the source alternatives: Addresses Regional Needs. This criteria accounts for the ability of the alternatives to meet the needs of the region as a whole. Essentially, this balances the impacts of the larger projects/alternatives against the benefits gained, or alternatively the impacts resulting from having to implement several of the smaller projects/alternatives to meet the total needs of the region.

General conclusions from the evaluation screening include:

- Generally, the alternatives that serve the entire region (MWL-1, UWC-1 and GRC-1) rate lower than the sub-regional alternatives primarily because of the cost and ease of implementation factors. The regional alternatives were rated lower than the other alternatives for these two factors because of the challenges of having to build new reservoirs as well as the significant amount of transmission needed.
- Although the smaller sub-regional alternatives (MWL-2, WIL-2, UWC-2 and GRC-2) had more favorable ratings for most of the criteria, they are not able to completely address the entire needs of the region individually. If these sub-regional alternatives are developed individually in order to meet the total demands of the region, the combined impacts to the environment and the total costs could ultimately be the same as if one of the larger regional alternatives were developed.

- The WIL-3 alternative where the Willamette River diversion and treatment plant would be used to serve Dundee, Newberg, Dayton, and Lafayette has the advantage of addressing the needs of four of the major service areas in the region. If the WIL-3 alternative is pursued, a smaller storage reservoir for Upper Willamina Creek Reservoir or Gorge Reservoir could be developed. In addition, the Yamhill-Carlton area would also need to consider developing some intertie over the long-term to meet their needs.
- As noted previously, the Upper Willamina Creek Reservoir and Gorge Reservoir compare similarly as source options. The advantage of Gorge Reservoir is the ability to use S. Yamhill River to transmit water centrally to the other demand areas (McMinnville). If the service areas are limited to Sheridan, Willamina and Amity, the Gorge Reservoir does not appear to have a distinct advantage over Willamina Creek. A more detailed feasibility study is needed to compare the environmental and other feasibility issues to identify a preferred alternative between the two.
- Although the regional source options can meet the long-term (2050) demands projected for Yamhill County, significant implementation and cost constraints make their development challenging. The smaller, sub-regional source alternatives appear to provide more favorable opportunities to meet the needs of the area. However, over the long-term additional (local) sources for other sub-regions not addressed by the smaller project(s) would need to be developed.
- The cost and reliability of the Willamette River option is directly dependent on how much uncontracted stored water can be released and the price per acre-foot that can be negotiated.

Table 6-4. Evaluation of Supply Alternatives										
Alternative	Additional Peak Rate ⁽¹⁾ / Volume Needed ⁽²⁾	Raw Water Diversion and Transmission Components	Treatment and Finished Water Transmission Components	Water Availability	Environmental Impacts	Raw Water Quality	Vulnerability to Catastrophic Events	Ease of Implementation	Cost	Addresses Regional Needs
McMinnville Water and Light Reservoir Alternatives										
MWL-1: Regional	<ul style="list-style-type: none"> 12-39 mgd (18-60 cfs) 3,200-10,700 ac-ft 	<i>Dam/Reservoir:</i> 4,500 ac-ft (new for Walker Res.); includes McGuire raise <i>Diversion Intake:</i> New for Walker Reservoir; may need to upgrade capacity of Idlewood Diversion <i>Raw water pipeline to WTP:</i> Add 48-inch pipeline for additional 40 mgd capacity (1,000 ft)	<i>WTP:</i> Expand existing WTP to 53 mgd (increase of 40 mgd from existing) <i>Transmission Lines:</i> <ul style="list-style-type: none"> WTP to McMinnville: Add 9.8 miles @ 48-inch (40 mgd) To Sheridan-Willamina To Amity To Yamhill-Carlton To Dayton-Lafayette To Dundee-Newberg 	+	-	o	o	--	-	+
MWL-2: McMinnville-Yamhill-Carlton (Walker Creek Reservoir not constructed)	<ul style="list-style-type: none"> 5-28 mgd (8-43 cfs) 1,500-6,700 ac-ft 	<i>Dam/Reservoir:</i> McGuire Res. only <i>Diversion Intake:</i> Existing only – may need to upgrade capacity <i>Raw water pipeline to WTP:</i> Add 42-inch pipeline for additional 28 mgd capacity (1,000 ft)	<i>WTP:</i> Expand existing WTP to 41 mgd (increase of 28 mgd) <i>Transmission Lines:</i> <ul style="list-style-type: none"> WTP to McMinnville: Add 9.8 miles @ 42-inch (28 mgd) To Yamhill-Carlton 	o	o	o	-	o	o	--
MWL-3: McMinnville-Yamhill-Carlton-Dayton-Lafayette (Walker Creek Reservoir not constructed)	<ul style="list-style-type: none"> 5-28 mgd (8-44 cfs) 1,500-7,800 ac-ft 	<i>Dam/Reservoir:</i> McGuire Res. only <i>Diversion Intake:</i> Existing only – may need to upgrade capacity <i>Raw water pipeline to WTP:</i> Add 42-inch pipeline for additional 28 mgd capacity (1,000 ft)	<i>WTP:</i> Expand existing WTP to 41 mgd (increase of 28 mgd) <i>Transmission Lines:</i> <ul style="list-style-type: none"> WTP to McMinnville: Add 9.8 miles @ 42-inch (28 mgd) To Yamhill-Carlton To Dayton-Lafayette 	o	o	o	-	o	o	-
Willamette River Alternatives										
WIL-1: Regional (includes option to use COE Storage and/or natural stream flows)	<ul style="list-style-type: none"> 12-39 mgd (18-60 cfs) 3,200-10,700 ac-ft 	<i>Pump station/River intake:</i> 40 mgd (build-out) WTP assumed at Dundee; 200-300 feet of lift to WTP <i>Raw water pipeline to WTP:</i> 5,000 ft @ 48- inch (40 mgd)	<i>WTP:</i> 40 mgd (build-out) <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Sheridan-Willamina: 1, 4 To Amity: 6 To Yamhill-Carlton: 8, 10, 12 To Dayton-Lafayette: 7, 9 To Dundee-Newberg: 15, 16, 17, 18 	+	-	-	o	--	--	+
WIL-2: Dundee-Newberg (includes option to use COE Storage and/or natural stream flows)	<ul style="list-style-type: none"> 2-8 mgd (3-13 cfs) 600-2,300 ac-ft 	<i>Pump station/River intake:</i> 8 mgd <i>Raw water pipeline to WTP:</i> 5,000 ft @ 24- inch (8 mgd)	<i>WTP:</i> 8mgd <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Newberg: 18 	+	o	-	o	o	--	--
WIL-3: Dundee-Newberg-Dayton-Lafayette (includes option to use COE Storage and/or natural stream flows)	<ul style="list-style-type: none"> 5-14 mgd (7-22 cfs) 1,300-3,800 ac-ft 	<i>Pump station/River intake:</i> 14 mgd <i>Raw water pipeline to WTP:</i> 5,000 ft @ 30-inch (14 mgd)	<i>WTP:</i> 14 mgd <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Newberg: 18 To Dundee-Lafayette: 15, 16, 17 	+	o	-	o	o	--	-

Notes: Ratings are assigned under a simple qualitative assessment as being favorable (+), neutral (o), or unfavorable (-) in each category. A given rating was determined by information that was available in existing reports or plans and through subjective comparison among the various supply options.

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Table 6-4. Evaluation of Supply Alternatives										
Alternative	Additional Peak Rate ⁽¹⁾ / Volume Needed ⁽²⁾	Raw Water Diversion and Transmission Components	Treatment and Finished Water Transmission Components	Water Availability	Environmental Impacts	Raw Water Quality	Vulnerability to Catastrophic Events	Ease of Implementation	Cost	Addresses Regional Needs
Upper Willamina Creek Reservoir Alternatives										
UWC-1: Regional	<ul style="list-style-type: none"> 12-39 mgd (18-60 cfs) 3,200-10,700 ac-ft 	<i>Dam/Reservoir:</i> 10,000 ac-ft <i>Pump station/Creek intake:</i> 7 mgd <i>Reservoir intake tower (to MWL):</i> 32 mgd <i>Raw water pipeline to WTP:</i> <ul style="list-style-type: none"> To Sheridan WTP: 44,000 ft @ 20-inch (7 mgd) To MWL WTP: 40,000 ft @ 48-inch (32 mgd) 	<i>WTP:</i> <ul style="list-style-type: none"> 7 mgd (at Sheridan) + 32 mgd (expanded at MWL) <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Sheridan-Willamina: 1, 4 To Amity: 6 To Yamhill-Carlton: 8, 10, 12 To Dayton-Lafayette: 7, 9 To Dundee-Newberg: 15, 16, 17, 18 	O	-	+	O	--	-	+
UWC-2: Sheridan-Willamina-Amity	<ul style="list-style-type: none"> 5-7 mgd (7-11 cfs) 1,200-2,100 ac-ft 	<i>Dam/Reservoir:</i> 2,000 ac-ft <i>Pump station/Creek intake:</i> 7 mgd <i>Raw water pipeline to WTP:</i> <ul style="list-style-type: none"> To Sheridan WTP: 44,000 ft @ 20-inch (7 mgd) 	<i>WTP:</i> 7 mgd <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Willamina: 1 To Amity: 5 	O	-	+	O	O	+	--
Mill Creek Gorge Reservoir Alternatives										
GRC-1: Regional	<ul style="list-style-type: none"> 12-39 mgd (18-60 cfs) 3,200-10,700 ac-ft 	<i>Dam/Reservoir:</i> 10,000 ac-ft <i>Pump station/Creek intake:</i> 40 mgd <i>Raw water pipeline to WTP:</i> Add 48-inch pipeline for additional 40 mgd capacity (5,000 ft)	<i>WTP:</i> 40 mgd (build-out) <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Sheridan-Willamina: 1, 4 To Amity: 6 To Yamhill-Carlton: 8, 10, 12 To Dayton-Lafayette: 7, 9 To Dundee-Newberg: 15, 16, 17, 18 	O	-	+	O	--	-	+
GRC-2: Sheridan-Willamina-Amity	<ul style="list-style-type: none"> 5-7 mgd (7-11 cfs) 1,200-2,100 ac-ft 	<i>Dam/Reservoir:</i> 2,000 ac-ft <i>Pump station/Creek intake:</i> 7 mgd <i>Raw water pipeline to WTP:</i> <ul style="list-style-type: none"> To Sheridan WTP: 10,000 ft @ 20-inch (7 mgd) 	<i>WTP:</i> 7 mgd <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Willamina: 1 To Amity: 5 	O	-	+	O	O	+	--

Notes:

Ratings are assigned under a simple qualitative assessment as being favorable (+), neutral (o), or unfavorable (-) in each category. A given rating was determined by information that was available in existing reports or plans and through subjective comparison among the various supply options.

Ac-ft – acre feet

Cfs – cubic feet per second

Mgd – million gallons per day

WTP – water treatment plant

Transmission Details (Modified from Yamhill County Intertie Study, EES, 1998):

- To Sheridan-Willamina: (1) 21,800 ft @ 10-inch; (4) 60,200 ft @ 24-inch
- To Amity: (6) 27,400 ft @ 10-inch
- To Yamhill-Carlton: (8) 3,000 ft @ 24-inch; (10) 20,500 ft @ 8-inch; (12) 15,300 ft @ 8-inch
- To Dayton-Lafayette: (7) 14,200 ft @ 24-inch; (9) 12,800 ft @ 24-inch
- To Dundee-Newberg: (15) 13,800 ft @ 24-inch; (16) 9,800 ft @ 24-inch; (17) 22,400 ft @ 24-inch; (18) 8,800 ft @ 24-in

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6.3.2 Summary of Cost Estimates

Among the evaluation criteria, cost represents a key factor in the selection of the recommended alternative. Preliminary cost estimates were generated for each supply alternative documenting the estimated capital costs for required diversion or raw water storage, treatment, raw and finished water transmission and pumping. Mitigation and permitting costs and general contingency costs were also estimated based on an assumed percentage of the capital costs. The cost estimates are summarized in **Table 6-5** with details for each alternative provided in **Appendix E**. For the purposes of this study, the capital costs were used as the basis for the cost ratings given in **Table 6-4**.

A more convenient basis for comparing costs is to use averaged annual unit costs. **Table 6-6** summarizes the annualized cost for each alternative. The total capital costs (including permitting, mitigation and contingency) is converted to annualized cost (assuming 40 year life and 5.5% interest). This annualized cost is then divided by the average water used per year. Operation and maintenance costs are also an important consideration, but are considered secondary to the initial capital costs. Typically, O&M costs are on the order of 10 to 15 percent of annualized average unit costs (in dollars per acre-feet or hundred cubic feet). The average unit costs per acre-foot ranges from approximately \$1,100 to \$2,000 (or \$2.50 to \$4.70 per ccf).

One important consideration for the Willamette River options (WIL-1 , WIL-2 and WIL-3) are the annual purchase costs for the stored water. At this time, it is very difficult to estimate the unit price of water that the Corps of Engineers would assign to the uncontracted waters in the Willamette Basin reservoirs. The Corps is continuing to work with the State of Oregon to establish M&I water supply in the Willamette but there is still significant work remaining. A general review of pricing for stored water in other Pacific Northwest region reservoirs indicates wide variability. Values ranged anywhere from \$14/ac-ft to over \$1,000/ac-ft. For the purposes of this study, pricing for waters in the Willamette Basin is assumed to be on the order of \$1,800 ac-ft or higher.

The O&M costs for the Willamette River options would be considerably greater than the other alternatives because of the stored water purchase costs. For example, assuming \$1,800/ac-ft for the WIL-1 option, the annual purchase cost would be on the order of \$19 million. If the annual costs of purchasing Willamette River water is included the average annual unit cost almost doubles for the Willamette River options. The costs for these options increased dramatically to approximately \$3,800 per acre-feet (~\$8.80/ccf). Of course, these costs would be lower as more natural streamflow from the Willamette River is used.

Table 6-5. Summary of Planning Level Cost Estimates for Supply Alternatives (in \$million)							
Supply Alternative	Source Development	Treatment	Finished Water Transmission	Capital Cost Subtotal	Mitigation/ Permitting	Contingency	Total
MWL Reservoir Alternatives							
WL-1 Regional	\$20.9	\$87.5	\$27.4	\$135.7	\$61.8	\$33.9	\$230.7
MWL-2 McMinnville-Yamhill-Carlton	\$0.18	\$61.3	\$10.9	\$72.4	\$32.6	\$18.1	\$123.0
MWL-3 McMinnville-Yamhill-Carlton-Dayton-Lafayette	\$0.18	\$61.3	\$14.2	\$75.6	\$34.0	\$27.4	\$137.1
Willamette River Alternatives							
WIL-1 Regional	\$1.04	\$187.5	\$17.0	\$205.6	\$92.5	\$51.4	\$349.5
WIL-2 Dundee-Newberg	\$1.38	\$37.5	\$0.79	\$39.7	\$17.9	\$9.92	\$67.4
WIL-3 Dundee- Newberg-Dayton-Lafayette	\$2.24	\$65.6	\$4.92	\$72.8	\$32.7	\$18.2	\$123.7
Upper Willamina Creek Reservoir Alternatives							
UWC-1 Regional	\$57.2	\$80.9	\$17.2	\$155.3	\$69.9	\$38.8	\$264.0
UWC-2 Sheridan-Willamina-Amity	\$12.6	\$10.9	\$2.84	\$26.4	\$11.9	\$6.59	\$44.8
Gorge Reservoir (Mill Creek) Alternatives							
GRC-1 Regional	\$46.4	\$62.5	\$17.2	\$126.2	\$56.8	\$31.5	\$214.5
GRC-2 Sheridan-Willamina-Amity	\$9.8	\$10.9	\$2.84	\$23.6	\$10.6	\$5.9	\$40.1

Notes:

Costs are presented in 2007 dollars

Section 6 – Evaluation of Regional Supply Alternatives

Table 6-6. Summary of Annual Average Unit Cost for Supply Alternatives							
Alternative	Average Annual Capital Cost (Total)	Stored Water Cost (COE Reservoirs)	Acre-feet per year (at build-out)	Hundred Cubic Feet (ccf)	Annual Cost per Acre-Foot	Annual Cost per CCF	Annual cost per Ac-Ft with Stored Water
MWL-1	\$14.8 M	N/A	10,700	4.66 M	\$1,344	\$3.09	\$1,344
MWL-2	\$7.7 M	N/A	6,700	2.92 M	\$1,144	\$2.63	\$1,144
MWL-3	\$ 8.5 M	N/A	7,800	3.40 M	\$1,095	\$2.51	\$1,095
WIL-1	\$21.8 M	\$19.3 M	10,700	4.66 M	\$,2035	\$4.67	\$3,835
WIL-2	\$ 4.2 M	\$ 4.1 M	2,300	1.00 M	\$1,827	\$4.19	\$3,627
WIL-3	\$ 7.7 M	\$ 6.8 M	3,800	1.65 M	\$,2029	\$4.66	\$3,829
UWC-1	\$ 16.5 M	N/A	10,700	4.66 M	\$1,538	\$3.53	\$1,538
UWC-2	\$2.8 M	N/A	2,100	0.91 M	\$1,330	\$3.05	\$1,330
GRC-1	\$13.4M	N/A	10,700	4.66 M	\$1,249	\$2.87	\$1,249
GRC-2	\$2.5 M	N/A	2,100	0.91 M	\$1,192	\$2.73	\$1,191

Notes:

Costs are presented in 2007 dollars

M – Million

CCF – hundred cubic feet

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7.0 RECOMMENDED SUPPLY STRATEGY

The assessment of water needs and supply options in Sections 2 through 6 demonstrate the need for additional water supply in the County. The study assessment considered both local options and regional/sub-regional supply options. This section integrates the findings to develop a recommended water supply strategy for the region for further consideration in Phase II of this study, where the alternatives can be further developed for technical feasibility for implementing the strategy.

7.1 Local versus Regional Options

Many factors need to be considered when evaluating whether a regional/sub-regional source or local source option should be pursued by a water provider. The following factors are taken into account to recommend whether a water provider should consider regional options:

- *Geography and proximity to other communities* – a particular community’s location is important to determining the feasibility of sharing water sources among communities. Water providers that are geographically isolated from other communities are recommended to develop or expand local water sources to the extent possible, and cities close to each other are recommended to develop and share regional sources.
- *Magnitude of source deficiency size within the planning period* – water availability from local sources may not be sufficient to address the deficiencies within the planning period; thus requiring shared resources.
- *Extent of current usage of existing sources* – encourage expansion of current sources when those sources are not fully utilized.
- *Limits of existing sources* – sources with limited or diminishing output, such as declining ground water levels or stream flows, are considered when recommending supply alternatives. Diminishing supply output creates a greater need for the development of new sources.

Using the factors above, each community was examined for the local and regional source options available. It is assumed that each community will continue pursue its local source options. **Table 7-1** notes whether the water provider should also develop a regional water supply option based on their current water supply situation, as discussed in previous sections.

City	Regional Option	Description
Amity	Optional for reliability (long-term)	<ul style="list-style-type: none"> ▪ <i>Local source of supply development/expansion recommended – Expand WTP</i> ▪ Based on available information, groundwater and surface water sources are not considered limitations to use of water rights. ▪ WTP expansion will satisfy local water demands. ▪ Intertie or regional options may be pursued in the long-term for reliability.
Carlton	Optional for reliability (long-term)	<ul style="list-style-type: none"> ▪ <i>Local source of supply development/expansion recommended – Expand WTP (see also Yamhill for potentially sharing supply)</i> ▪ Based on available information, existing water rights and production capacity are adequate to meet future local water demands. ▪ WTP expansion will satisfy local water demands through planning period. ▪ Intertie or regional options may be pursued in the long-term for reliability. ▪ <i>Note: If SW sources are not limitations to use of water rights, Carlton can provide some excess source of supply to Yamhill (~2 mgd in 2050).</i>

Table 7-1. Recommendations for Regional Supply Development		
City	Regional Option	Description
Dayton	Recommended (near-term)	<ul style="list-style-type: none"> ▪ <i>Regional/shared source of supply recommended based on need – develop additional wells to the extent possible; option to use source from McMinnville or Lafayette.</i> ▪ Expansion with additional wells needs to be developed but may not be sufficient to meet near-term demands due to limitations on ability to expand existing well field. ▪ Additional water rights need to be secured ▪ Surface water rights may not be sufficient to meet long-term needs.
Dundee	Recommended as source (mid-term)	<ul style="list-style-type: none"> ▪ <i>Regional/shared source of supply recommended based on available sources- expand additional wells to the extent possible and develop Willamette R. right (primarily to share with Newberg).</i> ▪ Expansion with additional wells need to be developed but may not be sufficient to meet near-term demands due to declining ground water levels. ▪ Surface water rights (Willamette R.) can be developed and potentially shared with mutual benefit with Newberg (and others).
Lafayette	Recommended (near-term)	<ul style="list-style-type: none"> ▪ <i>Regional/shared source of supply recommended based on available sources – expand additional wells to the extent possible (primarily share with Dayton); option to use source from McMinnville.</i> ▪ Expansion with additional wells needs to be developed but may not be sufficient to meet near-term demands due to limitations on ability to expand existing well field. ▪ Additional water rights need to be secured.
McMinnville	Recommended as source (long-term)	<ul style="list-style-type: none"> ▪ <i>Regional/shared source of supply recommended based on need and available sources – Expand WTP (primarily with Lafayette, Dayton; also potentially for region as a whole).</i> ▪ WTP expansion will satisfy local water demands (assuming use of storage rights can be maximized). ▪ Development of Walker Creek Res. can serve as a regional source.
Newberg	Recommended (mid-term)	<ul style="list-style-type: none"> ▪ <i>Regional/shared source of supply recommended based on need – expand additional wells to the extent possible (Option to use source from Dundee).</i> ▪ Expansion with additional wells needs to be developed. ▪ WTP expansion needed over long-term. Option may be to expand WTP at Newberg and transfer water right POD from Dundee to Newberg location.
Sheridan	Recommended as source (long-term)	<ul style="list-style-type: none"> ▪ <i>Regional source of supply development/expansion recommended based on available source - expand SW source and WTP to the extent possible. (see Willamina also)</i> ▪ If SW sources (Willamina Cr) are not limitations to use of water rights, pumping capacity and WTP expansion will satisfy local water demands. ▪ <i>Note: if existing springs limit water rights availability for further development, proposed Upper Willamina Cr. Reservoir (700 to 10000 AF) may provide a regional source of supply for Sheridan, Willamina, and potentially more of the region.</i>
Willamina	Optional for reliability (mid-term)	<ul style="list-style-type: none"> ▪ <i>Local source of supply development/expansion recommended - expand SW source and WTP to the extent possible. (see Sheridan also)</i> ▪ If SW sources (Willamina Cr) are not limitations to use of water rights, pumping capacity and WTP expansion will satisfy local water demands.
Yamhill	Recommended (mid-term)	<ul style="list-style-type: none"> ▪ <i>Regional/shared source of supply recommended based on need - expand SW source and WTP to the extent possible. (Option to use source from Carlton).</i> ▪ Expansion with SW pumping capacity needs to be developed but depends whether Turner Creek flows limit available water. ▪ Additional water rights need to be secured (after 2020) ▪ WTP expansion needed over long-term. ▪ <i>Note: Option may be to expand develop both Turner Creek (Yamhill) and Panther Creek (Carlton) water rights to meet the combined needs of the two communities.</i>

7.2 Recommendation for Water Supply Strategy

Yamhill County is taking a long-term, strategic approach to meet the increasing demands for water as a result of significant growth occurring in the county. To that end, the County Board of Commissioners formed a Water Task Force comprised of representatives from the ten cities in the county to study the water supply issues and the need to secure more reliable supply for municipal use. The mission statement of the Water Task Force is as follows:

Mission Statement: *The mission of the Yamhill County Water Task Force is to work as a facilitating group to ensure adequate future water supply for its communities³.*

At the outset of the Water Task Force’s efforts, they identified possible strategies to accomplish the mission to include:

- Raise awareness of the need for and support acquisition of additional water source(s) and treatment for the Yamhill-Chehalem basin.
- Support the development of a county wide transmission system throughout the basin.
- Ensure a locally driven and environmentally sound process.
- Foster cooperation among members on current and future water needs.
- Engage the state and federal governments in the process of reaching our goals.
- Identify funding mechanisms for short, intermediate and long-term aspirations.

This report documents Phase 1 of a water supply study to identify water supply alternatives to meet these needs. The recommended strategy and supply alternatives from this report will be advanced in Phase 2 of the study, where more detailed technical feasibility and an implementation plan will be developed.

It is prudent to continue to implement smaller, local source options to address immediate source of supply needs while pursuing the long-term security of a larger, more reliable source, which takes considerable time and funding to develop. Therefore, the recommended supply strategy includes elements of both local and regional source of supply development.

Each of the regional supply alternatives evaluated has significant uncertainties. None of the alternatives has a clear advantage over the others. The storage alternatives provide positive benefits for reliability, but pose significant environmental impacts. The Willamette River alternatives, while also providing positive benefits for reliability, could require significant cost for the uncontracted stored water to meet the streamflow and supply needs. The regional use of MacGuire Reservoir limits the environmental impacts, but does not provide the same level of long-term reliability of supply because of McMinnville’s own long-term needs to meet their growth.

Underlying these factors is the significant costs associated with developing a single, large regional source of supply and the network of transmission lines. The cost of building Upper Willamina Creek Reservoir or Gorge Reservoir to a size capable of serving the entire region could be cost-prohibitive. Cost advantages could exist over the Willamette River alternatives, if MacGuire Reservoir is used as a regional source in conjunction with Walker Reservoir or smaller design for Upper Willamina Creek Reservoir or Gorge Reservoir.

For the Willamette River source, the timeline for gaining access to the uncontracted water is highly uncertain, but in the end the feasibility of using the Willamette River as a source comes down to what the price of stored water is determined to be, and how much natural streamflow will be made available. In

³ *Note: It is not the intent of the Yamhill County Water Task Force to set up regional government for the basin or constitute a give-a-way program for or from any member. The intent is to facilitate efforts to determine how to best accomplish “synergy” - benefit from the strength of us all working to support each other to mutual benefit*

addition, it could also be cost prohibitive to rely solely on the Willamette River as the source for the region because of the potential enhanced treatment needed.

Based on these issues, the following recommendations are made regarding regional supply development:

- Develop the Upper Willamina Creek Reservoir or Gorge Reservoir to serve the Sheridan-Willamina-Amity sub-region. Developing a smaller project may be more feasible at this time and can be utilized by the sub-region furthest from the other communities. This also limits the extent of the environmental impact and is less cost-prohibitive to develop.
- Develop short-term leasing options with MWL to meet immediate or short-term needs where possible. A short-term leasing agreement will buy time while the larger regional alternatives are pursued. Carlton, Yamhill, Dayton and Lafayette would continue to develop their local sources and use the MWL supply for peaking or emergency purposes in the short-term, while a long-term regional supply is further considered.
 - As part of the leasing option, interties need to be constructed between McMinnville-Carlton-Yamhill and McMinnville-Dayton-Lafayette to increase supply reliability. These interties can also serve as the longer-term transmission infrastructure for a future regional source.
 - Interties and leasing options could be extended to Dundee and Newberg, as well.
- Develop the Willamette River to a smaller degree to serve primarily the Dundee-Newberg and perhaps the Dayton-Lafayette area. Depending on the feasibility of ASR, the Willamette River might also be used for this purpose to maximize use of the natural streamflow available. Over the longer-term the Willamette River source can be expanded as needed once the initial infrastructure and governing issues are developed and functional.
- Continue the development and management of local sources, including the appropriate levels of water conservation, as these sub-regional alternatives are advanced.

The recommended water supply strategy is presented in terms of their near-term, mid-term, and long-term implementation as follows:

- *Near-term (less than 5 years)* – relatively easy to implement and relatively low cost; planning effort or action that would be implemented by the provider in any case, such as improving efficiency/production of existing infrastructure or implementing water conservation.
- *Mid-term (within 5-15 years)* – may require more extensive planning/studies or where new water rights applications are needed; or those projects that have gone through studies but require significant funding or time to construct.
- *Long-term (beyond 15 years)* – more complex options that are larger/regional-scale projects to meet the demands further in the future.

Using this time-scale, each community was examined for the local and regional source options available. **Table 7-2** summarizes the timeline of the strategy conceptually for each water provider. In all cases, it is recommended that each community should continue to pursue its local source options and implement the appropriate water conservation program to maximize use of existing supplies. While the strategy is not based on the least cost option (based on the planning level capital costs), it provides a tiered supply development process that in the end provides source redundancy and prevents catastrophic vulnerability.

Table 7-2. Summary of Recommended Water Supply Strategy for Yamhill County											
Time Frame	Supply Strategy	Amity	Carlton	Dayton	Dundee	Lafayette	McMinnville	Newberg	Sheridan	Willamina	Yamhill
Within 5 yrs.	Continue local source development/ rehabilitation (including ASR feasibility)	●	●	●		●	●	●	●	●	●
	Develop/ enhance water conservation program (to extent practicable)	●	●	●	●	●	●	●	●	●	●
	Plan and design interties/transmission with MWL		●	●		●	●				●
	Develop short-term leasing option with MWL (use of MacGuire Reservoir)		●	●	●	●	●	●			●
	Complete feasibility study for Willamette River diversion and WTP				●			●			
	Complete Feasibility Study for Upper Willamina Cr./ Gorge Reservoir	●							●	●	
5-15 yrs.	Construct interties/transmission with MWL (use of MacGuire Reservoir)		●	●		●	●				●
	Planning and design for Willamette River diversion and WTP ⁽¹⁾		○	○	●	○	○	●			●
	Planning and design for Upper Willamina Cr./Gorge Reservoir	●							●	●	
Beyond 15 yrs.	Construct Willamette River diversion and WTP ⁽¹⁾		○	○	●	○	○	●			●
	Construct Upper Willamina Cr./Gorge Reservoir	●							●	●	

Notes:

(1) Dundee and Newberg recommended to implement the Willamette River supply option; other water providers may participate in the regional use of the Willamette River source as their short-term leases with MWL end.

● – City/provider recommended to implement the supply strategy component

○ – Besides Dundee and Newberg this is optional for city/provider to implement the supply strategy component at this time – see Note (1)

ASR – aquifer storage and recovery

MWL – McMinnville Water and Light

WTP – water treatment plant; possible location is near Dundee

General costs to complete the proposed studies and strategy components are shown in **Table 7-3** on the following page. The range of costs shown should be considered “ball park” figures and is dependent on the specific supply alternatives pursued. Furthermore, detailed costs to implement this strategy for each entity/provider are not developed for this Phase 1 study because additional work on administrative and governance options would be needed to determine cost-sharing options.

Time Frame	Supply Strategy	Approximate Cost Range
<5 yrs.	Continue local source development/ rehabilitation (including ASR feasibility)	Specific to Entity ⁽¹⁾
	Develop/ enhance water conservation program	Specific to Entity ⁽¹⁾
	Plan and design interties/transmission with MWL	\$1M - \$3M ⁽²⁾
	Develop short-term leasing option with MWL (use of MacGuire Reservoir)	\$50K-\$150K
	Complete feasibility study for Willamette River diversion and WTP	\$1.5M - \$3M ⁽³⁾
	Complete Feasibility Study for Upper Willamina Cr./ Gorge Reservoir	\$1M - \$2M ⁽³⁾
5-15 yrs.	Construct interties/transmission with MWL (use of MacGuire Reservoir)	\$11 - \$27M ⁽⁴⁾
	Planning and design for Willamette River diversion and WTP ⁽¹⁾	\$1.5M - \$15M ⁽²⁾
	Planning and design for Upper Willamina Cr./Gorge Reservoir and WTP	\$2M - \$13M ⁽²⁾
> 15 yrs.	Construct Willamette River diversion and WTP ⁽¹⁾	\$40M - \$200M ⁽⁴⁾
	Construct Upper Willamina Cr./Gorge Reservoir	\$10M - \$90M ⁽⁴⁾

Notes:

Costs are presented in 2007 dollars

M – million; K - thousand

- (1) Costs for local source development and water conservation programs were developed for this study. The costs are dependent on specific projects defined by each provider.
- (2) Engineering and design based on 10% of capital costs estimates from this study.
- (3) Feasibility study and Environmental Impact Study based on recent experience with preparing FS/EIS documents.
- (4) Construction costs based on capital cost estimates from this study.

Based on the issues and considerations discussed above, **Table 7-4** presents specific steps for near-term, mid-term, and long-term implementation for each water provider.

Entity	Near-term (by 2012)	Mid-term (by 2022)	Long-term (beyond 2022)
Amity	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ Expand WTP to meet demands (to minimum of 0.65 mgd) 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Expand WTP to meet demands (to minimum of 0.80 mgd) 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Expand WTP to meet demands (to minimum of 1.5 mgd) ▪ May need to increase production capacity by 0.25 mgd
Carlton	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ Improve diversion structure at Fall Creek ▪ <i>Investigate ASR, storage, intertie, and regional source options (for reliability)</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Develop storage reservoir to maximize existing storage right (75 ac-ft) 	<ul style="list-style-type: none"> ▪ Expand WTP to meet demands (to minimum of 1.5 mgd; unless coordinating with Yamhill) ▪ Aggressive conservation (~20%) may eliminate the need for expansion
Dayton	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ Develop additional wells in existing wellfield (Dayton-Lafayette) ▪ Rehabilitate existing production wells to the extent possible ▪ <i>Investigate ASR, storage, intertie, and regional source options</i> ▪ <i>Develop short-term leasing agreement with MWL.</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ <i>Develop ASR, storage, or regional source options</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Implement ASR, storage, or regional source options ▪ Secure additional water rights (up to additional 1.5 mgd by 2050) ▪ Expand WTP to meet demands (to minimum of 3.6 mgd)

Table 7-4. Recommended Supply Strategy for Local and Regional Source Options (Note: regional source actions italicized)			
Entity	Near-term (by 2012)	Mid-term (by 2022)	Long-term (beyond 2022)
Dundee	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ Rehabilitate existing production wells ▪ Planning for Willamette River source ▪ <i>Investigate ASR, storage, intertie, and sub-regional source options with Newberg.</i> ▪ <i>Develop short-term leasing agreement with MWL.</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Continue well rehabilitation ▪ <i>Develop ASR, storage, or regional source options: Work with Newberg to develop Willamette River right to the extent possible; construct WTP for full water right (or modify/expand Newberg's existing WTP)</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ <i>Implement ASR, storage, or regional source options; expand WTP, if used as a sub-regional source with Newberg</i>
Lafayette	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ Develop additional wells in existing wellfield (Dayton-Lafayette) ▪ Rehabilitate existing production wells, to the extent possible ▪ <i>Investigate ASR, storage, intertie, and sub-regional source options with Dayton.</i> ▪ <i>Develop short-term leasing agreement with MWL.</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Continue well rehabilitation ▪ <i>Develop ASR, storage, or sub-regional source options with Dayton</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ <i>Implement ASR, storage, or sub-regional source options with Dayton</i>
McMinnville	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ Complete WTP expansion (to 22 mgd) ▪ <i>Investigate lead as regional supplier role or providing short-term leasing options with nearby water providers.</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Investigate Walker Creek Reservoir ▪ <i>Implement regional supplier role, if feasible</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Expand WTP to meet demands (to minimum of 35 mgd; greater if regional)
Newberg	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ Implement water reuse program ▪ Develop additional wells in existing wellfield (Dayton-Lafayette) ▪ Rehabilitate existing production wells to the extent possible ▪ <i>Investigate ASR, storage, intertie, and sub-regional source options with Dundee</i> ▪ <i>Develop short-term leasing agreement with MWL.</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Continue well rehabilitation ▪ <i>Develop ASR, storage, or regional source options: work with Dundee to develop Willamette River right to the extent possible; construct WTP for full water right (or modify/expand existing WTP)</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ <i>Implement ASR, storage, or sub-regional source options with Dundee</i> ▪ Expand WTP to meet demands (to minimum of 15 mgd; greater if regional)

Table 7-4. Recommended Supply Strategy for Local and Regional Source Options (Note: regional source actions italicized)			
Entity	Near-term (by 2012)	Mid-term (by 2022)	Long-term (beyond 2022)
Sheridan	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ Expand WTP to meet demands (to minimum of 3.2 mgd) ▪ Complete storage reservoir (60 MG) ▪ <i>Investigate ASR, storage, intertie, and sub-regional source options with Willamina and Amity</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Expand WTP to meet demands (to minimum of 4.2 mgd) ▪ <i>Develop Upper Willamina Cr. Reservoir for sub-regional use</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ <i>Implement ASR, storage, or regional source option</i> ▪ Expand WTP to meet demands (to minimum of 6 mgd; greater if regional)
Willamina	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ Increase diversion capacity ▪ <i>Coordinate with Sheridan to develop storage, treatment and intertie</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ <i>Work with Sheridan to develop Upper Willamina Cr. Reservoir for regional use (for reliability)</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Expand WTP to meet demands (to minimum of 1.5 unless coordinating with Sheridan)
Yamhill	<ul style="list-style-type: none"> ▪ Implement water conservation measures ▪ <i>Investigate ASR, storage, intertie, and regional source options (for reliability)</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ <i>Develop intertie with Carlton</i> 	<ul style="list-style-type: none"> ▪ Continue conservation measures ▪ Secure additional water rights (up to additional 1.5 mgd by 2050) ▪ Expand WTP to meet demands (to minimum of 1.5 unless coordinating with Carlton)

8.0 ADMINISTRATIVE AND GOVERNANCE OPTIONS

8.1 Introduction

Beyond the technical elements of the various water supply options, there are a variety of political and economic issues that also weigh heavily into the water supply strategy development. Whether a regional or combination of local and sub-regional supply approach is taken, the sharing of resources among the participants will likely drive the need for the formation of a new agency to organize and administer the operations and financing of a regional⁴ supply entity. As such, the form of governance, financing and rate setting policies selected for that agency will have direct impacts on the range of functions and ability to establish a secure financial framework. In bringing together the various supply entities, it is important to recognize their current form of governance. In the case of Yamhill County, all of the participants in this study are members of the Water Task Force with a legal status as “city” with the exception of McMinnville Water and Light. The only other major entity in the County not involved in the study to-date is the Grande Ronde Tribe.

Presented in this section is a review of the various options that could be used in the operation of the regional entity. The options are reviewed by component in order to allow the participants to develop a business model that meets their needs and objectives. The reader in reviewing the various options should keep in mind that there is no right or wrong business model. Rather the model chosen needs to be developed to meet the needs of the participants. Given the number and diversity of the various participants, the final business model will most likely be developed through a consensus process that attempts to best meet the majority of each participant’s needs and objectives.

This section is organized by components that would make up the general framework in the development of a business model. These are: (i) ownership options and rights, (ii) rate setting, (iii) financing options and (iv) organization options. Each one of these major components is further broken down by subcomponent as required. A review and discussion of the each option is provided including the advantages and disadvantages of each option to allow the reader to assess which option would best meet the needs and objectives of the participants based on their policy perspectives.

In the development of the business model the reader should be aware that some options are mutually exclusive. An example is a decision with respect to financing. The financing method chosen may preclude certain options with respect to rate setting or may make certain organizational options non viable from a risk management standpoint. An attempt is made to identify these exclusions where possible, but the magnitude of the matrix would make the review overwhelming and is best finalized in the consensus and implementation stage when the number of options being reviewed is more limited.

8.2 Ownership Options

The component piece of the business model dealing with ownership options has two subcomponents. These components include: (i) the demands of the participants that the regional entity serve; and (ii) how ownership in the entity is defined and allowed. The options for serving demand are for the regional entity to serve all the demand needs of the participants or only new demands and current deficiencies. With respect to ownership participation, two options are available. The first option is that each participant owns a defined amount of capacity rights in the regional entity. The second option is that the regional entity is charged with meeting the demand needs of the participants without regard to ownership rights. It should be noted that the two subcomponents are not mutually exclusive to themselves, but the option chosen could impact rates, financing and organizational options.

⁴ Note: in this discussion the term “regional entity” refers to either smaller sub-regional entities that would administer shared resources among two or more water providers or a larger entity that would administer a shared resource for all of the providers.

8.2.1 Demand Serving Options

Presented in this section is a discussion of the options for serving the demands of the participants.

Regional Entity Serves all Demands – This option would require the regional entity to be responsible to meet all the demand needs of the participants. From a planning and operational standpoint, the regional entity would have the responsibility to meet the demand needs of the participants, not from an individual basis, but from the perspective of the participants as a whole. The system would be operated and developed in order to minimize overall system costs to the participants.

- **Advantages** – The advantage to this option is that it allows the regional entity to operate and develop the system in a manner that minimizes the overall costs to the region and not just individual participants. From a regional economic standpoint, this results in the most efficient utilization of resources, since any current excess capacity would be utilized before the construction of new capacity and new capacity could be developed in a least cost manner. With respect to operations, the system could be run in a manner that minimizes operating costs, since least cost resources would be utilized first to serve demand and the highest cost resources used last.
- **Disadvantages** – The disadvantage to this option is that it would require the sale or development of a compensation plan to the participants who contribute their existing assets to the regional entity. This may not be financially advantageous to participants who have developed low cost sources of supply. This option may also require the transfer of water rights that could impact the priority date of those water rights.
- **Impact on other Options** – This option could impact the decision on ownership participation. While either option on ownership participation discussed below could be implemented, the decision to have set capacity ownership would require mechanisms for compensation to participants with excess capacity. This option could also impact decisions on rates and financing.

Regional Entity Serves New Demand and Current Deficiencies – This option would set a business model wherein the regional entity is charged with the development of new sources to meet the future and current deficiencies of the participants. From a planning standpoint, the regional entity would be responsible for the development of new sources only. This could be from the regional needs of the participants or from the individual needs of the participants. Operationally, the regional entity would only be charged with the operation and maintenance of new facilities developed by the regional entity. This option could also allow for the use of excess capacity in the short run through leasing or sale agreements to meet the current deficiencies of participants until such time as a regional source could be developed.

- **Advantages** – The advantage to this option is that it only deals with the development of new capacity and each participant is allowed to use their existing capacity to serve the needs of their system. This eliminates any potential issues with respect to the compensation for existing assets and transfer of water rights. It also allows new resources to be operated and developed in the most economically efficient manner.
- **Disadvantages** – The disadvantage to this option is that it may not produce the most economically efficient utilization of resources within the region. To the extent that participants currently have excess capacity, new capacity could be constructed before all existing capacity is fully utilized. This could also be true from an operation standpoint; since the system would most likely not be operated in a manner which minimizes the overall cost of operation to the region. This disadvantage could be minimized through the use of leasing agreements or short term surplus sales until such time as a regional source is developed.

- **Impact on other Options** – This option could impact the decision on ownership participation. While either option on ownership participation discussed below could be implemented, the decision to have set capacity ownership could require mechanisms for compensation to participants with excess capacity.

8.2.2 Ownership Participation Options

Presented in this section are the options for ownership participation in a new regional entity.

Specific Ownership Percentages – This option would require each participant to own specific capacity amounts and rights in the regional entity. This option could be used for either of the demand serving options, but would be much easier if used for the new demand and current deficiency option.

- **Advantages** – The advantage to this option is that the responsibility for planning is at the participant level. The regional entity provides the platform for the development and operation of new facilities that takes advantage of economies of scale. This results in the development of resources that serve the region and individual at the lowest cost, but still maintains individual autonomy for planning.
- **Disadvantages** – The disadvantage to this approach is that it can result in the development of excess capacity due to the requirements of one or more participants. Most agreements under this option allow one or more participants to require expansion even though there may still be capacity in the plant. Often times buy-back provisions are put into the agreements which allow participants who did not initially invest in the expansion to buy-back to their ownership percentage within a specified time period. This results in an unstable planning horizon for the parties that trigger the expansion. These issues can be worked around, but require considerable consensus and compromise by the participants.
- **Impact on other Options** – This option can have an impact on the rate setting and financing options available to the participants.

No Defined Ownership – This option would eliminate any capacity ownership rights in the regional entity and require the regional entity to serve the demands of the participants. This would result in planning being done on a regional basis to serve the needs of the participants. This option would work under both the demand serving options. This option would most likely be a necessity for the all demand serving option.

- **Advantages** – The advantage to this option is that it puts the planning function responsibility with the regional entity. This could result in the greatest economic efficiency in the development of resources, since the development of new resources would be done to maximize the benefit to the region and not just meet the needs of individual participants.
- **Disadvantages** – The disadvantage to this option is that it eliminates local control and relies on the regional entity to meet the needs of the individual participants on a least cost basis. It also would most likely transfer the rate setting and financing aspects of the business model to the regional entity and potentially minimize (depending on the voting requirements and the organizational option) local control over those decisions.
- **Impact on other Options** – This option could have an impact on the rate setting, financing and organizational options available to the participants.

8.3 Rate Setting Options

This component of the business model has a multitude of subcomponents and is the most politically sensitive issue after the determination of the organizational structure. Furthermore, while the organizational options need to be decided at the conception of the business model, the rate setting options continue through the life of the organization and therefore need to be thoroughly thought out and considered prior to implementation to assure that any future disagreements are minimized. The subcomponents of the rate setting options that need to be considered are the items that are included in the rates, the basis for assessing rates to individual participants and the collection and assessment of system development charges.

8.3.1 Components in Rates

This subcomponent of the rate setting options portion of the business model deals with which parts of the costs of operating a regional supply system are included in the rate charged to the participants and which part of the rate is the sole responsibility of the participant. The rate items that need to be considered are operation and maintenance expense, debt service, renewals and replacements and possibly future capacity costs. Some of the items will be driven by the option taken with respect to financing. If it is the decision of the group to issue debt through the regional entity, then the bond market will dictate that the regional entity collect rates equal to operation and maintenance expense, debt service, renewal and replacements and be required to show financial sufficiency to finance future capital needs through rates, system development charges and/or new debt.

As evidenced by the above discussion, the type of financing options chosen will have a direct impact on the components that are included in the rates. In fact, the bond market will dictate to the regional entity the components that must be included in rates. To the extent that the regional entity does not issue debt, then the components included in rates is more of a policy issue. The options range from the minimum to the maximum. On the minimum spectrum is the collection of only operation and maintenance expense.

Requirements for capital, for both renewal and replacement and future capacity expansion, would be the responsibility of the individual participants based on the percentage of capacity owned or some other formula. On the other end of the spectrum is the concept of the regional entity acting as an independent organization with its own financial requirements and setting rates to meet those requirements. An analogy to this option is that the participants would be very much like their current retail customers wherein a commodity is provided for at a price. The option of a position in the middle is also available wherein rates include operation and maintenance expense and an allowance for renewals and replacements.

As can be seen, this issue tends to be very policy driven and is also highly dependent on all the other options in the business model. For ease in discussion at this preliminary level, the advantages and disadvantages will focus on the two extremes that are only operation and maintenance expense or all costs required to operate the regional entity as a standalone business.

- **Advantages** – The advantage of only having a minimum charge of operation and maintenance expenses is that it provides the minimum rate to the participants and allows each participant to determine for itself how to finance the other aspects of the rate components including debt service, renewals and replacements and new capacity expansion requirements. This allows for more local control of financial planning options. The advantage of having the maximum charge is that it assures that adequate funding is available to assure continued operation of the regional entity and if proper financial planning is undertaken by the regional entity, assure the participants a predictable cash flow requirement under which they can plan for their local requirements.
- **Disadvantages** – The disadvantage to the minimum charge approach is that there is no assurance that the participants can provide the needed cash flow as it is required based on their own local

conditions. This can result in decisions being made not based on the short and long term needs of the regional entity, but on the local cash flow circumstances of the participants. The disadvantage to the maximum charge approach is that the decision process is no longer a local decision, but rather a regional decision. These expenses become an operation and maintenance expense to the participant that must be paid before their own debt service and internal capital improvements.

- **Impact on other Options** – As was discussed previously, the impact of rates on the other options in the business model is not so much that the rates drive the other options, but more that the other options will drive the rate setting process and what is included in rates. The decisions made in the Ownership Options, Financing Options and Organization Options will have a direct bearing on the items that not only should, but also maybe required to be included in rates.

8.3.2 Rate Setting Methods

This subcomponent of the rate setting options portion of the business model deals with the method used to set rates for each individual participant. There are basically two options: (1) uniform rates for all participants with the possibility of adjustments for transmission and pumping costs or (2) cost of service rates based on the costs required to service each participant and individual usage characteristics. Either option is viable and is really a policy decision.

While other aspects of the business model may impact the cost, their influence is minor. An example is the option to only include operation and maintenance expense in the rate. The general practice is to charge a uniform rate to all participants on a \$/ccf basis, this can be modified as agreed to by the participants.

- **Advantages** – The advantage to a single rate-setting concept is simplicity and ease of understanding. This is even true after adjustments for transmission and pumping costs. Since rates tend to be a very controversial issue, simplicity in the formula to set rates tends to minimize future disagreements. The advantage to cost of service-based rates is that they send the proper price signal to each participant as to the cost of water. This allows the individual participants to make better- informed decisions as to the benefits of investments within their local system. An example is the decision to build additional storage or invest in conservations measures to minimize peaking charges. A cost of service-based rate would allow the participant to determine if the construction of additional storage or conservation measures is the most economical option(s) vs. paying peaking charges. These price signals help to maximize the efficient use of resources.
- **Disadvantages** – The disadvantage to the use of a single rate-setting concept is the lack of price signals sent to individual participants as to the true economic cost of their usage patterns. This could result in choices that are not the most economical long run decisions. The disadvantage to the use of cost of service-based rates is not one of economics, but one of policy and perception issue. It is often hard for people to understand why they are paying different rates for the same commodity (water) due to the way in which they use the system. Given this tendency, costs of service-based rates tend to be considerably more controversial and require a far great expenditure of time and money to implement. This controversy and expense can be minimized by a very detailed agreement on methodology in the initial agreement.
- **Impact on other Options** – The impact on this subcomponent to the overall all business models are minimal or non-existent.

8.3.3 System Development Charges

This subcomponent of the rate setting process deals with the assessment of system development charges. The two options are to have the individual participants assess system development charges for the

regional supply system or have the regional supply system assess a system development charge. The option chosen is highly dependent on the ownership options, rate components and financing option.

- **Advantages** – The advantages and disadvantages of this option are highly correlated to the option on ownership participation and financing. To the extent that specific ownership percentages and financing by the individual participant's are the chosen options, then it is imperative that the individual participants collect the SDC. To the extent that a regional approach to ownership and financing is the given approach, then the regional entity must be the party that set and collects the SDC. The advantage to individual collection under certain options is that it will allow the participants to operate their financial plans in a manner that reflects their cash flow needs. The advantage to the collection as a regional entity, under certain organizational options, is that the regional entity can collect SDC based on growth and cash flow requirements.
- **Disadvantages** – The disadvantage of trying to do something that is contrary to the ownership and financing options is that a disconnect will be created between the ownership and financing options and the collection of the SDC. The financing option may well drive the basis for the collection and the assessment of the SDC. The disadvantage to individual collection under certain options is that it will not allow the regional entity to operate its financial plan in a manner that reflects its cash flow needs. The disadvantage to the collection as a regional entity under certain options is that all local control is lost in the determination of the amount to be charged, regardless of what can be charged, based on local policy.
- **Impact on other Options** – The impact on this subcomponent to the overall all business models is not a driving factor, but the option is more influenced by the business model chosen.

8.4 Financing Options

This component of the business model is rather simple compared to the other components of the business model. The options are for the individual participants to provide funds for the financing of capital improvements or for the regional entity to serve as the source of funding for capital improvements. The sources of funds for the regional entity would be rates, system development charges and debt. These same options would be available to the individual participants, but the combination of sources would be a policy decision of the local participant and not driven by decision of the regional entity.

As can be seen, the options for financing will directly impact the decisions or be driven by the decisions on rate options, ownership options and risk management from an organizational option standpoint. The risk management and legal issues need to be thoroughly considered in determining which financing option to undertake.

- **Advantages** – The advantage of individual financing under various business model options are that the local participant's can control the method used to finance capital improvements based on their particular circumstances in order to maximize the benefit to their customers. The advantage to using the regional entity as the financing vehicle under various business model options is that the regional entity can minimize rates to all the participants by developing a long term financial plan that best meets the overall objectives of all the participants.
- **Disadvantages** – The disadvantage of individual financing is the ability of the individual participants to obtain financing at the best possible rates. A financing backed by the collective financial capability of all the participants, as part of a regional entity, would most likely result in more favorable financing rates. The disadvantage to this approach is the loss of local control in financing and the resulting costs becoming an operations and maintenance expense to the local participants. This could have the result, under various organization options, of subordinating the debt of the local participants to the debt of the regional entity, resulting in increased borrowing costs to the local participant.

- **Impact on other Options** – The impact on this component to the overall all business models can drastically effect the decisions made from the standpoint of rates, SDCs, ownership participation and organizational options. This component has the ability to be the driving factor in the other business model components or can be the result of the decisions made in the other business model components.

8.5 Organizational Options

This component of the business model deals with the organizational options available to the participants in the formation of a regional entity. A discussion of the various items and policy issues to consider in choosing an organizational structure for formation of a regional entity is provided. Next, a discussion of each of the regional entities is provided. Finally, a matrix of the various issues and rights associated with each of the options for formation of a legal entity is presented. The advantages and disadvantages of each entity, with respect to the various issues to consider, is provided as part of the discussion of the legal entities. The options available to the participants for formation of a regional entity are as follows:

- A water authority formed under ORS 450
- A water district formed under ORS 264
- A county service district formed under ORS 451
- A peoples utility district formed under ORS 261
- A intergovernmental agency formed under ORS 190

In addition to these current legal entities, which can be used to meet the needs of the participants under Oregon law, the participants should not preclude changes in legislation and formation of a new type of entity or modification of the provisions under one the above entities in order to meet the policy needs and objectives of the participants. While this option would take longer due to the need for legislative changes, the potential should not be ruled out at this stage.

The other option that the participants may wish to consider is the formation of a legal entity with one of the options set forth in this section with only a portion of the members. The other nonparticipating members could then enter into a long-term contract with the regional entity for the provision of potable water. This option may allow of the formation of the regional entity under current Oregon law and allow all the participants to meet their goals and objectives.

8.5.1 Issues to Consider in Organizational Options

In the determination of the best organizational option for the participants in the formation of a regional entity, a number of key items and policy decisions need to be considered. As with the majority of the options available in the formation of a business model for the regional entity, there is no right or wrong answer with respect to the option chosen, but it is a policy decision in the development of an organizational option which will meet the needs of the participants. The issues to consider include representation, voting rights of the members, financing available and financial liability to the individual participants and formational requirements.

The issue of representation has to do with the representatives of the regional entity and how those representatives are chosen. Each of the various organizational options has different requirements for election or appointment of representatives to the regional entity and the method under which those representatives are selected. The policy issue becomes one of local control by the individual participants in the regional entity versus non-local control by representatives who are either appointed by issue of law or elected from the general area served by the regional entity.

The issue of voting rights has to do with the basis under which the regional entity conducts business setting rates, rules and regulations for the regional entity. Under some of the organizational options the

method for voting is driven by the requirements under state law. This issue has to do with local control of the regional entity. Under a number of the organizational options, voting is accomplished by a majority of the members and hence no recognition for size or investment is provided in the voting structure. Under other options, the participants can resolve this issue such that voting can be by majority, by a super majority or by another mechanism such as percentage ownership in the entity.

The issue with respect to financing and liability to the participants has to do with the methods available for financing of infrastructure through the various organizational options and the subsequent liability to the individual participants. All of the organizational options allow the entity to issue revenue bonds as a financing vehicle for capital improvements. However, only certain of the organizational options allow the issuance of general obligation debt, which carries a much lower interest rate, by vote of the people within the organization. The issue of liability and risk has to do with the responsibility of the participants in the event of a default on any debt issuance by the regional entity. Some of the organizational options allow the liability and risk to be minimized and only as specified in the terms and conditions of the contracts between the regional entity and the participants. Other organizational options provide for joint and severable liability of the participants to any financing undertaken by the regional entity.

This could result in a large financial risk being passed on to participants given a default by the regional entity and subsequent default by other participants. Additionally, this joint and severable liability can cause problems with respect to the ability of the individual participants to issue debt due to the fact that the financial markets may view the debt issued by the individual participants as subordinated to the debt issued by the regional entity and hence the debt of the individual participants could be harder to find, come with more restrictive conveyance and/or carry a higher interest rates.

The issue with formation requirements has to do with the methods and requirements for formation of the various types of organizational options. The ability to form the regional entity may be extremely difficult if a vote of the people is required for the formation. Other options can be accomplished by ordinance of the various governmental entities to the regional entity or by a vote of the County Board of Commissioners.

It appears that Oregon law allows these types of organizations to be party to the various organizational options as set forth in this discussion. The issue of taxation over the Tribe would have to be worked out as part of the agreement in formation and would be a contractual in- lieu payment as opposed to payment of taxes. It is also recommended that the participants have the regional entities authority validated by the court prior to final finalization.

8.5.2 Water Authority formed under ORS 450

A water authority is a legal organization under Oregon law. The main purpose of water authorities has to do with combinations of districts and cities that preclude the cities from taking over the assets and customers of the districts upon annexation. The statutes allow for the formation of a wholesale water authority that would not impact the annexation issues at a retail level. However, it appears that the annexation statutes within the ORS 450 would require a city annexing into a districts service territory to continue to buy wholesale water from the ORS 450 authority to serve those customers.

The representation for an ORS 450 is five (5) to seven (7) members elected within the boundaries of the ORS 450. These can be elected at large or by zones based on population. Voting is by majority. The relationship between the participants and the water authority would be by contract for the sale of water.

The approval for an ORS 450 is by the County Commission. The statute requires certain tests and documentation to be filed showing that the ORS 450 is in the best interest of the various entities. Additionally, the statutes allows for protests by effected parties which include other water purveyors, mainly cities which are not part of the water authority but have service areas continuous to a member of the regional entity.

Oregon law also provides that a city or district may transfer their water right to the water authority with no impact on the priority date. The authority may also change the point of diversion of the water right with no impact on the priority date. Given the water supply options available to the regional entity, this may be a very beneficial advantage to the formation of a water authority.

8.5.3 Water District formed under ORS 264

This business model option would provide for the formation of a water district under ORS 264. The intent of the water district would be to hold and manage the assets of the regional entity and provide wholesale service to the various participants. This organizational option is very similar to the options under ORS 450, however the annexation issues do not come into play. That is, if a city annexes the service area of one of the participants, not only would the distribution system be taken over by the city, the city would be under no obligation to purchase water at a wholesale level to serve the customers of the annexed area. The provisions under ORS 264 do not provide for the transference of water rights to the entity and the ability to move the point of diversions of those water rights.

The election of representatives for an ORS 264 is five (5) members at large for four (4) year terms. The relationship of the participants to the district would be via contract. The formation of a water district is approval by the County Commissioners or can be formed by a petition requiring a vote of the people for formation. Furthermore, the statutes allow for the decision of the County Commissioners to be put to a vote of the people provided signature requirements are met per Oregon law. With respect to financing aspects under ORS 264, the entity has the ability to provide for independent financing either through revenue bonds or a vote of the people for issuance of general obligation bonds. From a liability and risk issue, the various participants would not be at risk for the debts of the district except to the extent that their contracts require them to pay all costs of the district. The basic business relationship between the participants and the regional entity would be one of a pure contractual matter.

8.5.4 County Service District formed under ORS 451

A county service district is an entity that can provide potable water service to the areas within the county service district. It appears that the service territory could include cities, districts, cooperatives, associations and the Tribe.

The representatives of a county service district are the County Commissioners. Therefore, since all members of the county have the ability to elect these officials, all members of the county service district would provide for election of representation. Voting is by majority rule of the County Commission.

The formation of a county service district is by approval by the County Commissioners. The relationship between the participants and the county service district would be by contract. With respect to financing, a county service district has the ability to issue revenue bonds as well as general obligation bonds as approved by a vote of the people. The debts of the county service districts are not liabilities of the various participants except to the extent that their contracts between the county service district and the participants require payment of all costs and expenses associated with the county service district.

8.5.5 Peoples Utility District formed under ORS 261

A Peoples Utility District is a legal entity that can provide potable water service to participants within the service area. It is unclear whether or not this can be solely a retail entity or can serve as a wholesale entity to the participants. The representation of a Peoples Utility District is five (5) members elected by zone within the boundaries of the Peoples Utility District. The zones are formed by population area with the intent of equal population within each zone. Voting is by majority.

The formation requirements for a Peoples Utility District are by vote of the people. The statutes require that a majority of the people voting approve the formation of the Peoples Utility District. A Peoples Utility District has the ability to issue revenue bonds and general obligation bonds by a vote of the people.

The debt liabilities of the Peoples Utility District would not be debt liabilities of the participants. Rather, the liability would be through contract requirements between the participants and the Peoples Utility District.

8.5.6 Intergovernmental Agency formed under ORS 190

An ORS 190 organization is an intergovernmental agency organization created by an intergovernmental agreement between the various participants. This option provides the maximum flexibility in the formation of the business model. However, the risk factors associated with financing are the greatest under all of the organizational options. The voting requirements and membership to an intergovernmental agency are determined by the parties to the intergovernmental agreement and would be part of the agreement forming the intergovernmental agency. Examples for voting requirements that are used other entities in the State of Oregon, include a majority, a majority of the members provided that an affirmative vote is received from each one of the members and based on participation in the entity. The formation of an intergovernmental agency is done by the development of the agreement that sets forth the basis under which the entity will operate and is approved by ordinance by the various entities that are participants to entity.

The statutes allow for issuance of revenue bonds through the ORS 190. However, the ORS 190 has no taxing authority and cannot issue general obligation bonds. From a risk standpoint, the debts and liabilities of the ORS 190 are debts and liabilities of the entities. The statute requires that debt is a joint and severable liability of the parties unless otherwise specified in the formation of the organization. While different types of liability responsibilities could be provided in the agreement, anything other than joint and severable liability may cause difficulty in the financial markets. This is a concern to the extent that this could cause some problems with the debt issuance by the individual participants. This is due to the fact that debt from the intergovernmental agency could be considered an operation and maintenance expense to the various participants and is hence be viewed as senior debt to the entities own debt. This could result in higher interest rates, more stringent covenanted for issuance of debt by the individual participants and changes in the revenue stream pledge for the individual participants.

8.5.7 Summary of the Options

Presented in **Table 8-1** is a summary of the various issues and the provisions under each one of the organizational options as presented in this subsection.

8.6 Next Steps

The discussion presented here was intended to serve as an informational resource in contrasting and comparing the various governance strategies available in potentially creating a new regional (or sub-regional) supply agency. The essential elements included components for ownership participation, rate setting practices, financing options and organizational options. This discussion was presented in a manner to allow the various participants to determine the impact of the various options on their operations.

The next step in this process would be to narrow down the options and develop the framework of the business model. This is best done through a consensus process of the various participants. Once the basic business model framework and principals have been developed, then the next phase of the process is the actual drafting of the agreements. It is best to first provide for a conceptual framework in the business model in order to help provide guidance in the detailed implementation phase, while assuring that an actual agreement can be developed which meets the needs and objectives of all the participants.

Table 8-1. Yamhill County Organization Options							
Organization	Representation	Voting	Water Rights Transfer Required	Formation Requirements	Financing		
					Revenue Bonds	General Obligation Bonds	Risk
Water Authority Under ORS 450	5 or 7 members at large or by population zone	Majority vote	No	By vote of County Commissioners	Yes	Yes by Vote	Limited to Contracts
Water District Under ORS 264	5 members at large	Majority vote	Yes	By vote of County Commissioners	Yes	Yes by Vote	Limited to Contracts
County Service District Under ORS 451	County Commissioners	Majority vote	Yes	By majority vote of the people or by the County Commissioners	Yes	Yes by Vote	Limited to Contracts
People's Utility District Under ORS 261	5 members by population zone	Majority vote	Yes	By a vote of the people	Yes	Yes by Vote	Limited to Contracts
Intergovernmental Agency Under ORS 190	Open	Open	Yes	By ordinance of members	Yes	No	Joint and severable ⁽¹⁾

(1) For cities this could extend to the General Fund

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9.0 REFERENCES

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Appendix A

Population and Demand Forecast Data

**Appendix A
Population and Demand Worksheet
Yamhill County Water Supply Analysis
November 12, 2007**

	Notes	Notes	1990-2000 Census Growth Rate	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016			
AMITY	Amity-Census growth rate projections	Population data extrapolated from 1990-2000 census	linear growth rate	0.02579	1175	1205	1236	1266	1296	1327	1357	1387	1417	1448	1478	1508	1539	1569	1599	1630	1660	1690	1720	1751	1781	1811	1842	1872	1902	1933	1963		
			compound growth rate	0.023207363	1175	1202.268652	1230.170137	1258.719142	1287.930694	1317.82017	1348.403301	1379.696186	1411.715297	1444.477486	1478	1512.300483	1547.396989	1583.307993	1620.052397	1657.649541	1696.1192	1735.481671	1775.757624	1816.968276	1859.135319	1902.280948	1946.427873	1991.599331	2037.8191	2085.111508	2133.501448		
	ADD-calc from census	ADD calcs derived from GPCD from Intertie study and census population estimates			0.172725	0.176733492	0.18083501	0.185031714	0.189325812	0.193719565	0.198215285	0.202815339	0.207522149	0.21233819	0.217266	0.222308171	0.227467357	0.232746275	0.238147702	0.243674483	0.2493295	0.255115806	0.261036371	0.267094337	0.273292892	0.279635299	0.286124897	0.292765102	0.299559408	0.306511392	0.313624713		
	MDD-calc from census	ADD/MDD Ratio taken from the City of Dundee	2.219512195		0.383365244	0.39226214	0.40136551	0.410680145	0.420210949	0.429962937	0.439941243	0.450151119	0.46059794	0.471287203	0.482224537	0.493415697	0.504866574	0.516583196	0.52857173	0.540838486	0.5533899	0.566232642	0.579373408	0.592819137	0.606576906	0.620653957	0.635057699	0.649795713	0.664875759	0.680305772	0.696093875		
	ADD'-from WMP data	Not Available																															
	MDD-from WMP data	Not Available																															
	GPCD-Calculated				147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	
GPCD-From City Master Plan																																	
GPCD-From Intertie Study	147																																
CARLTON	Carlton	Population data extrapolated from 1990-2000 census	linear growth rate	0.02	1289	1312	1334	1357	1379	1402	1424	1447	1469	1492	1514	1537	1559	1582	1604	1627	1649	1672	1694	1717	1739	1762	1784	1807	1829	1852	1874		
			compound growth rate	0.016218965	1289	1309.906246	1331.151571	1352.741472	1374.681539	1396.977452	1419.634981	1442.659991	1466.058444	1489.836395	1514	1538.555514	1563.509292	1588.867796	1614.637587	1640.825339	1667.4378	1694.481945	1721.964689	1749.893175	1778.274631	1807.116406	1836.425965	1866.210894	1896.478904	1927.23783	1958.495634		
	ADD-calc from census	ADD calcs derived from GPCD from Intertie study and census population estimates			0.234598	0.238402937	0.242269586	0.246198948	0.25019204	0.254249896	0.258373566	0.262564118	0.266822637	0.271150224	0.275548	0.280017103	0.284558691	0.289173939	0.293864041	0.298630212	0.3034737	0.308395714	0.313397573	0.318480558	0.323645983	0.328895186	0.334229526	0.339650383	0.345159161	0.350757285	0.356446205		
	MDD-calc from census	ADD/MDD Ratio taken from the City of Dundee	2.219512195		0.520693122	0.529138226	0.5377203	0.546441567	0.555304284	0.564310745	0.573463282	0.582764263	0.592216096	0.601821229	0.611582146	0.621501376	0.631581485	0.641825084	0.652234823	0.662813397	0.6735635	0.684488048	0.695589736	0.706871482	0.718336206	0.729986876	0.741826508	0.753858167	0.766084966	0.778510072	0.7911367		
	ADD'-from WMP data	Not Available																															
	MDD-from WMP data	Not Available																															
	GPCD-Calculated				182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	
GPCD-From City Master Plan																																	
GPCD-From Intertie Study	182																																
DAYTON	Dayton	Population data extrapolated from 1990-2000 census	linear growth rate	0.04	1526	1585	1645	1704	1763	1823	1882	1941	2000	2060	2119	2178	2238	2297	2356	2416	2475	2534	2593	2653	2712	2771	2831	2890	2949	3009	3068		
			compound growth rate	0.033374266	1526	1576.92913	1629.557983	1683.943285	1740.143657	1798.219675	1858.233938	1920.251132	1984.338105	2050.563933	2119	2189.72007	2262.800371	2338.319674	2416.359377	2497.003599	2580.3393	2666.456192	2755.447211	2847.40824	2942.438401	3040.640124	3142.119257	3246.985182	3355.350931	3467.333306	3583.053012		
	ADD-calc from census	ADD calcs derived from GPCD from Intertie study and census population estimates			0.2289	0.23653937	0.244433697	0.252591493	0.261021549	0.269732951	0.278735091	0.28803767	0.297650716	0.30758459	0.31785	0.328458011	0.339420056	0.350747951	0.362453907	0.37455054	0.3870509	0.399968429	0.413317082	0.427111236	0.44136578	0.456096019	0.471317889	0.487047777	0.50330264	0.520099996	0.537457952		
	MDD-calc from census	ADD/MDD Ratio taken from the City of Dundee	2.219512195		0.508046341	0.525002015	0.542523572	0.560629899	0.57934051	0.598675575	0.618655933	0.639303121	0.660639393	0.682687748	0.705471951	0.72901656	0.753346953	0.778489355	0.804470866	0.831319491	0.8590642	0.887734805	0.917362303	0.947978597	0.979616687	1.012310675	1.046095802	1.081008481	1.117086346	1.154368284	1.192894478		
	ADD'-from WMP data	Not Available																															
	MDD-from WMP data	Not Available																															
	GPCD-Calculated				150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	
GPCD-From City Master Plan																																	
GPCD-From Intertie Study	150																																
DUNDEE	Dundee	Population data extrapolated from 1990-2000 census	linear growth rate	0.06	1663	1757	1850	1944	2037	2131	2224	2318	2411	2505	2598	2692	2785	2879	2972	3066	3159	3253	3346	3440	3533	3627	3720	3814	3907	4001	4094		
			compound growth rate	0.045621946	1663	1738.869296	1818.199897	1901.149714	1987.883863	2078.574993	2173.403628	2272.558531	2376.237073	2484.645632	2598	2716.525815	2840.459009	2970.046275	3105.545566	3247.226597	3395.3714	3550.274842	3712.245289	3881.605142	4058.691521	4243.856926	4437.469936	4639.915949	4851.597943	5072.937281	5304.374551		
	Plan population values	These Data provided in City's plan	Build out at 6350		1663									2478	2598	2670	2770	2882	#REF!	#REF!	#REF!	#REF!	3515	#REF!	#REF!	#REF!	#REF!	4286	#REF!	#REF!	#REF!		
	ADD-calc from census	ADD calcs derived from GPCD from Intertie study and census population estimates. These ADD calcs are used for reference only			0.304329																												
	MDD-calc from census	ADD/MDD Ratio taken from the City of Dundee	2.219512195																														
	ADD'-from WMP data	0.042857143	ADD/MDD ratio:		0.241135										0.41	0.43	0.38	0.38	0.42	0.441857143	0.463714286	0.4855714	0.507428571	0.51	0.531857143	0.553714286	0.575571429	0.597428571	0.62	0.641857143	0.663714286	0.68571429	
	MDD-from WMP data	0.043478261	2.219512195												0.91	0.95	0.69	0.81	0.92	0.96895652	1.017391304	1.066087	1.114782609	1.12	1.168695652	1.219512195	1.266086957	1.314782609	1.37	1.418695652	1.467391304	1.516086957	
GPCD-Calculated														165	166	142	137	146	#REF!	#REF!	#REF!	#REF!	143	#REF!	#REF!	#REF!	145	#REF!	#REF!	#REF!	#REF!		
GPCD-From City Master Plan																																	
GPCD-From Intertie Study	145																																
LAFAYETTE	Lafayette	Population data extrapolated from 1990-2000 census	linear growth rate	0.10	1292	1421	1551	1680	1810	1939	2068	2198	2327	2457	2586	2715	2845	2974	3104	3233	3362	3492	3621	3751	3880	4009	4139	4268	4398	4527	4656		
			compound growth rate	0.071856388	1292	1384.838454	1484.347943	1591.007825	1705.331901	1827.870893	1959.215093	2099.997214	2250.895429	2412.636645	2586	2771.82062	2970.993639	3184.478511	3413.303635	3658.571307													

**Appendix A
Population and Demand Worksheet
Yamhill County Water Supply Analysis
November 12, 2007**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050			
Amity-Census growth rate projections	1993	2023	2054	2084	2114	2145	2175	2205	2236	2266	2296	2326	2357	2387	2417	2448	2478	2508	2539	2569	2599	2629	2660	2690	2720	2751	2781	2811	2842	2872	2902	2932	2963	2993			
	2183.014391	2233.676399	2285.514138	2338.554895	2392.826588	2448.357784	2505.177712	2563.3163	2622.804093	2683.67246	2745.9534	2809.6798	2874.885018	2941.6035	3009.8704	3079.7215	3151.1938	3224.3246	3299.1527	3375.7174	3454.0589	3534.2185	3616.2383	3700.1617	3786.0327	3873.8965	3963.7995	4055.7888	4149.913	4246.2215	4344.7651	4445.5956	4548.7662	4654.331061			
ADD-calc from census	0.320903115	0.328350431	0.335970578	0.34376757	0.351745508	0.359908594	0.368261124	0.3768075	0.385522202	0.394499852	0.4036552	0.4130229	0.422608098	0.4324157	0.4424509	0.4527191	0.4632255	0.4739757	0.4849755	0.4962305	0.5077467	0.5195301	0.531587	0.5439238	0.5565468	0.5694628	0.5826785	0.596201	0.6100372	0.6241946	0.6386805	0.6535026	0.6686686	0.684186666			
MDD-calc from census	0.712248378	0.728777785	0.745690796	0.762996313	0.780703446	0.798821514	0.817360055	0.8363288	0.855737813	0.875597232	0.8959175	0.9167094	0.937983827	0.959752	0.9820253	1.0048155	1.0281346	1.0519949	1.0764089	1.1013895	1.1269499	1.1531034	1.1798639	1.2072454	1.2352624	1.2639296	1.2932621	1.3232753	1.353985	1.3854074	1.4175591	1.4504569	1.4841182	1.518560649			
ADD-from WMP data																																					
MDD-from WMP data																																					
GPCD-Calculated	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147		
GPCD-From City Master Plan																																					
GPCD-From Intertie Study																																					
Carlton	1897	1919	1942	1964	1987	2009	2032	2054	2077	2099	2122	2144	2167	2189	2212	2234	2257	2279	2302	2324	2347	2369	2392	2414	2437	2459	2482	2504	2527	2549	2572	2594	2617	2639			
	1990.260407	2022.540371	2055.343884	2088.679435	2122.555655	2156.981312	2191.965317	2227.5167	2263.644744	2300.358719	2337.6682	2375.5827	2414.112211	2453.2666	2493.0561	2533.4909	2574.5815	2616.3385	2658.7728	2701.8953	2745.7173	2790.25	2835.505	2881.4939	2928.2288	2975.7216	3023.9847	3073.0306	3122.872	3173.5218	3224.993	3277.2991	3330.4535	3384.469964			
ADD-calc from census	0.362227394	0.368102348	0.374072587	0.380139657	0.386305129	0.392570599	0.398937688	0.405408	0.411983343	0.418665287	0.4254556	0.4323561	0.439368422	0.4464945	0.4537362	0.4610953	0.4685738	0.4761736	0.4838966	0.491745	0.4997205	0.5078255	0.5160619	0.5244319	0.5329376	0.5415813	0.5503652	0.5592916	0.5683627	0.577581	0.5869487	0.5964684	0.6061425	0.615973533			
MDD-calc from census	0.803968118	0.81700765	0.830258668	0.843724605	0.857408945	0.871315231	0.885447063	0.8998081	0.914402055	0.92923271	0.9443039	0.9596195	0.975183572	0.991	1.007073	1.0234067	1.0400053	1.0568731	1.0740145	1.0914339	1.1091358	1.1271249	1.1454057	1.163983	1.1828616	1.2020464	1.2215423	1.2413545	1.261488	1.281948	1.3027399	1.3238689	1.3453407	1.367160789			
ADD-from WMP data																																					
MDD-from WMP data																																					
GPCD-Calculated	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182		
GPCD-From City Master Plan																																					
GPCD-From Intertie Study																																					
Dayton	3127	3186	3246	3305	3364	3424	3483	3542	3602	3661	3720	3779	3839	3898	3957	4017	4076	4135	4195	4254	4313	4372	4432	4491	4550	4610	4669	4728	4788	4847	4906	4965	5025	5084			
	3702.634777	3826.207497	3953.904365	4085.863022	4222.225703	4363.139388	4508.755964	4659.2324	4814.730849	4975.418959	5141.4699	5313.0627	5490.382273	5673.6198	5862.9727	6058.6451	6260.8479	6469.7991	6685.7239	6908.855	7139.433	7377.7063	7623.9319	7878.375	8141.31	8413.0202	8693.7986	8983.9478	9283.7804	9593.6198	9913.7998	10244.666	10586.574	10939.89295			
ADD-calc from census	0.555395217	0.573931124	0.593085655	0.612879453	0.633333855	0.654470908	0.676313395	0.6988849	0.722209627	0.746312844	0.7712205	0.7969594	0.823557341	0.851043	0.8794459	0.9087968	0.9391272	0.9704699	1.0028586	1.0363283	1.0709149	1.106656	1.1435898	1.1817563	1.2211965	1.261953	1.3040698	1.3475922	1.3925671	1.439043	1.48707	1.5366998	1.5879861	1.640983942			
MDD-calc from census	1.232706456	1.27384713	1.316360843	1.360293421	1.405992216	1.452606162	1.501085827	1.5511835	1.602953075	1.656450458	1.7117333	1.7688611	1.827895562	1.8889002	1.9519409	2.0170855	2.0844042	2.1539697	2.2258569	2.3001432	2.3769088	2.4562364	2.5382115	2.6229224	2.7104605	2.8009202	2.8943988	2.9909972	3.0908196	3.1939734	3.3005699	3.410724	3.5245545	3.642183871			
ADD-from WMP data																																					
MDD-from WMP data																																					
GPCD-Calculated	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	
GPCD-From City Master Plan																																					
GPCD-From Intertie Study																																					
Dundee	4188	4281	4375	4468	4562	4655	4749	4842	4936	5029	5123	5216	5310	5403	5497	5590	5684	5777	5871	5964	6058	6151	6245	6338	6432	6525	6619	6712	6806	6899	6993	7086	7180	7273			
	5546.370439	5799.406651	6063.966866	6340.637747	6630	6930	7230	7530	7830	8130	8430	8730	9030	9330	9630	9930	10230	10530	10830	11130	11430	11730	12030	12330	12630	12930	13230	13530	13830	14130	14430	14730	15030	15330	15630		
Plan population values	#REF!	5228	#REF!	5750	#REF!	#REF!	#REF!	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350	
ADD-calc from census																																					
MDD-calc from census																																					
ADD-from WMP data	0.707428571	0.76	0.781857143	0.803714286	0.825571429	0.847428571	0.869285714	0.891142857	0.913000000	0.934857143	0.956714286	0.978571429	1.000428571	1.022285714	1.044142857	1.066000000	1.087857143	1.109714286	1.131571429	1.153428571	1.175285714	1.197142857	1.219000000	1.240857143	1.262714286	1.284571429	1.306428571	1.328285714	1.350142857	1.372000000	1.393857143	1.415714286	1.437571429	1.459428571	1.481285714		
MDD-from WMP data	1.564782609	1.67	1.718695652	1.767391304	1.816086957	1.864782609	1.913478261	1.962173913	2.010869565	2.059565217	2.108260970	2.156956522	2.205652174	2.254347826	2.303043478	2.351739130	2.400434781	2.449130435	2.497826087	2.546521739	2.595217391	2.643913043	2.692608695														

**Appendix A
Population and Demand Worksheet
Yamhill County Water Supply Analysis
November 12, 2007**

	Notes	Notes	1990-2000 Census Growth Rate	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
NE	MDD-from WMP data	2% MDD growth rate	0.021319797						5.29	5.23	5.42	5.21	4.97	5.56	4.15	5.21	5.89	6.25	6.61	6.86	7.12	7.37	7.63	7.80	8.041646428	8.206608791	8.374955111	8.546754804	8.72	8.897302594		
	ADD/MDD ratio													2.146718147					2.098412698					2.101333333					2.101204819			
	GPCD-Calculated																		136						136					135		
	GPCD-From City Master Plan-from ADD	136																														
SHERIDAN	Sheridan		Population data extrapolated from 1990-2000 census	0.04	3979	4137	4295	4454	4612	4770	4928	5086	5245	5403	5561	5719	5877	6036	6194	6352	6510	6668	6827	6985	7143	7301	7459	7618	7776	7934	8092	
				0.034041325	3979	4114.450433	4254.511779	4399.340998	4549.100396	4703.957802	4864.086759	5029.666719	5200.883239	5377.928197	5561	5750.30381	5946.051772	6148.463254	6357.765092	6574.191841	6797.986	7029.398498	7268.688538	7516.124329	7771.983162	8036.551768	8310.126641	8593.014365	8885.531961	9188.007245	9500.779188	
	Plan population values		Build out at 13688						4615	4615	4800	4930	5330	5260	5655	5824.526515	5999.135123	6178.978176	6364.212594	6555	6751.6426	6954.184288	7162.801982	7377.677972	7599	7827.090175	8062.026662	8304.014959	8553.266732	8810	9074.263644	
	Growth Rates													0.029978163					0.029998873						0.030015815					0.029995873		
	ADD-calc from census	These ADD calcs are used for reference only																														
	MDD-calc from census																															
	ADD-from WMP data	0.028290766								0.769	0.838	0.875	0.874	0.844	1.018	1.05	1.08	1.11	1.15	1.162	1.20	1.23	1.27	1.31	1.329	1.37	1.41	1.45	1.50	1.523	1.57	
	MDD-from WMP data	0.031828758								1.303	1.511	1.378	1.5	1.352	2.149	2.21	2.28	2.35	2.42	2.491	2.56	2.64	2.72	2.80	2.889	2.98	3.07	3.16	3.25	3.348	3.45	
	GPCD-Census Projection-from ADD									1.634408322	1.803102625	1.574857143	1.71624714	1.601895735	2.111001965					2.143717728					2.173989993					2.198292843		
	GPCD-From City Master Plan									161	161	178	164	160	180																	
GPCD-From Interlie Study	180								167	175	178	164	160	180					177						175					173		
WILLAMINA	Willamina		Population data extrapolated from 1990-2000 census	0.01	1748	1758	1767	1777	1786	1796	1806	1815	1825	1834	1844	1854	1863	1873	1882	1892	1902	1911	1921	1930	1940	1950	1959	1969	1978	1988	1998	
				0.005360803	1748	1757.370683	1766.791601	1776.263022	1785.785218	1795.35846	1804.983023	1814.659181	1824.38721	1834.16739	1844	1853.88532	1863.823634	1873.815225	1883.860378	1893.959382	1904.1125	1914.320097	1924.582389	1934.899696	1945.272311	1955.700532	1966.184657	1976.724985	1987.321818	1997.975458	2008.686211	
	Plan population values																															
	Growth Rates																															
	ADD-calc from census																															
	MDD-calc from census																															
	ADD-from WMP data		ADD is calculated based on City of Dundee consumption data		0.25346	0.254818749	0.256184782	0.257558138	0.258938857	0.260326977	0.261722538	0.263125581	0.264536146	0.265954272	0.26738	0.268813371	0.270254427	0.271703208	0.273159755	0.27462411	0.2760963	0.277576414	0.279064446	0.280560456	0.282064485	0.283576577	0.285096775	0.286625123	0.288161664	0.289706441	0.291259501	
	MDD-from WMP data		MDD is based on the ratio of ADD/MDD for the City of Dundee		0.562557561	0.565573321	0.568605248	0.571653429	0.57471795	0.5777989	0.580896365	0.584010436	0.587141201	0.590288749	0.593453171	0.596634556	0.599832996	0.603048583	0.606281407	0.609531562	0.6127991	0.616084236	0.619386942	0.622707353	0.626045565	0.629401671	0.63277577	0.636167956	0.639578327	0.64300698	0.646454013	
	GPCD-Calculated																			145	145	145	145	145	145	145	145	145	145	145	145	
	GPCD-From City Master Plan	145	This GPCD is taken from Dundee WMP																													
GPCD-From Interlie Study	125																															
YAMHILL CITY	Yamhill City		Population data extrapolated from 1990-2000 census	-0.01	867	860	852	845	838	831	823	816	809	801	794	787	779	772	765	758	750	743	736	728	721	714	706	699	692	685	677	
				-0.008756984	867	859.407695	851.8818757	844.4219599	837.0273704	829.6975353	822.4318873	815.2298646	808.0909098	801.0144708	794	787.0469548	780.1547974	773.3229944	766.5510174	759.8383425	753.18445	746.5888264	740.0509601	733.5703458	727.1464821	720.7788721	714.4670232	708.210447	702.0086596	695.8611811	689.7675359	
	Plan population values	these populations values are for population served, including those outside city limits								1570	1585	1595	1622.065718	1649.590717	1677.582791	1706.049865	1735	1764.948121	1795.413181	1826.404103	1857.93	1890	1922.838846	1956.248269	1990.238183	2024.818672	2060	2096.670959	2133.994715	2171.982886	2210.647302	
	Growth Rates											0.016989102					0.017261165					0.017375051					0.017801437					
	ADD-calc from census		MDD is based on the ratio of ADD/MDD for the City of Dundee																													
	MDD-calc from census		2.219512195																													
	ADD-from WMP data																0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.27	0.28	0.28	0.29	0.29	0.30	0.30	0.31	
	MDD-from WMP data																0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.69	0.70	0.71	0.72	0.73	0.75	0.76	0.77	
	GPCD-Calculated																															
	GPCD-From City Master Plan																															
GPCD-From Interlie Study	156																															
YAMHILL	Yamhill County (excludes cities)		Yamhill population projections taken from PSU Population Research Center	0.01	21586	21874	22165	22461	22760	23063	23371	23682	23998	24318	24642	24970	25303	25641	25982	26329	26680	27035	27395	27761	28131	28506	28886	29271	29661	30056	30457	
	Growth Rates			0.013328781																												

**Appendix A
Population and Demand Worksheet
Yamhill County Water Supply Analysis
November 12, 2007**

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050		
MDD-from WMP data	9.078210258	9.262796293	9.451135492	9.64	9.80075987	9.964200625	10.13036697	10.299304	10.48	10.65476799	10.83245	11.013096	11.19675413	11.383475	11.57331	11.76631	11.962529	12.16202	12.364838	12.571038	12.780677	12.993812	13.210501	13.430804	13.65478	13.882492	14.114001	14.349371	14.588666	14.831951	15.079294	15.330761	15.586422	15.84634658		
ADD-MDD-ratio				2.100217865					2.100200401																										136	
GPCD-Calculated				136					136																											
GPCD-From City Master Plan-from ADD																																				
GPCD-From Interlie Study																																				
Sheridan	8250	8409	8567	8725	8883	9041	9200	9358	9516	9674	9832	9991	10149	10307	10465	10623	10782	10940	11098	11256	11414	11573	11731	11889	12047	12205	12364	12522	12680	12838	12996	13155	13313	13471		
	9824.198302	10158.62703	10504.44016	10862.02522	11231.78296	11614.12773	12009.48803	12418.307	12841.04255	13278.16865	13730.175	14197.568	14680.87251	15180.629	15697.398	16231.758	16784.308	17355.668	17946.478	18557.4	19189.119	19842.342	20517.801	21216.255	21938.484	22685.299	23457.537	24256.062	25081.771	25935.588	26818.469	27731.406	28675.419	29651.56872		
Plan population values	9346.454106	9626.80916	9915.573707	10213	10519.27163	10834.72786	11159.64412	11494.304	11839	12194.03278	12559.712	12936.358	13324.29905	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688	13688		
Growth Rates				0.02998841																																
ADD-calc from census																																				
MDD-calc from census																																				
ADD-from WMP data	1.62	1.67	1.72	1.747	1.80	1.85	1.91	1.97	2.007	2.07	2.14	2.20	2.27	2.31	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	
MDD-from WMP data	3.55	3.66	3.77	3.881	4.00	4.12	4.24	4.37	4.499	4.65	4.79	4.93	5.08	5.20	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	5.18	
GPCD-Census Projection-from ADD				2.22152261					2.24165421					2.2524903																					2.252490256	
GPCD-From City Master Plan																																				
GPCD-From Interlie Study				171					170					168																					168	
Willamina	2007	2017	2026	2036	2046	2055	2065	2074	2084	2094	2103	2113	2122	2132	2142	2151	2161	2170	2180	2190	2199	2209	2218	2228	2238	2247	2257	2266	2276	2286	2295	2305	2314	2324		
	2019.454381	2030.280278	2041.16421	2052.106488	2063.107427	2074.167339	2085.286541	2096.4654	2107.704088	2119.003073	2130.3626	2141.7831	2153.264761	2164.808	2176.4131	2188.0804	2199.8103	2211.603	2223.459	2235.3785	2247.362	2259.4096	2271.5219	2283.699	2295.9415	2308.2496	2320.6237	2333.0641	2345.5712	2358.1453	2370.7869	2383.4962	2396.2736	2409.119588		
Plan population values																																				
Growth Rates																																				
ADD-calc from census																																				
MDD-calc from census																																				
ADD-from WMP data	0.292820885	0.29439064	0.29596881	0.297555441	0.299150577	0.300754264	0.302366548	0.3039875	0.305617093	0.307255446	0.3089026	0.3105585	0.31222339	0.3138972	0.3155799	0.3172717	0.3189725	0.3206824	0.3224016	0.3241299	0.3258675	0.3276144	0.3293707	0.3311364	0.3329115	0.3346962	0.3364904	0.3382943	0.3401078	0.3419311	0.3437641	0.3456069	0.3474597	0.34932234		
MDD-from WMP data	0.649919526	0.653403616	0.656906384	0.66042793	0.663968354	0.667527757	0.671106242	0.6747039	0.678320864	0.681957209	0.685613	0.6892885	0.692983623	0.6966986	0.7004334	0.7041883	0.7079633	0.7117586	0.7155742	0.7194102	0.7232669	0.7271441	0.7310422	0.7349612	0.7389012	0.7428623	0.7468446	0.7508483	0.7548735	0.7589202	0.7629886	0.7670788	0.771191	0.775325194		
GPCD-Calculated	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	
GPCD-From City Master Plan																																				
GPCD-From Interlie Study																																				
Yamhill City	670	663	655	648	641	633	626	619	612	604	597	590	582	575	568	560	553	546	539	531	524	517	509	502	495	487	480	473	466	458	451	444	436	429		
	683.7272528	677.7398643	671.8049072	665.9219225	660.090455	654.3100535	648.580271	642.90066	637.2707933	631.6902232	626.15852	620.67526	615.2400188	609.85237	604.5119	599.2182	593.97086	588.76947	583.61362	578.50293	573.43699	568.41541	563.4378	558.50379	553.61298	548.765	543.95947	539.19603	534.4743	529.79391	525.15452	520.55575	515.99725	511.47867		
Plan population values	2250	2288.180504	2327.008898	2366.496175	2406.653516	2447.492291	2489.024064	2531.2606	2574.213842	2617.895968	2662.3193	2707.4965	2753.440353	2800.1638	2847.6801	2896.0027	2945.1453	2995.1218	3045.9464	3097.6334	3150.1975	3203.6535	3258.0167	3313.3023	3369.5261	3426.704	3484.8521	3543.987	3604.1253	3665.2841	3727.4807	3790.7328	3855.0581	3920.475044		
Growth Rates	0.016969113																																			
ADD-calc from census																																				
MDD-calc from census																																				
ADD-from WMP data	0.32	0.32	0.33	0.33	0.34	0.34	0.35	0.35	0.36	0.37	0.37	0.38	0.38	0.39	0.40	0.40	0.41	0.42	0.43	0.43	0.44	0.45	0.46	0.46	0.47	0.48	0.49	0.50	0.50	0.51	0.52	0.53	0.54	0.55		
MDD-from WMP data	0.79	0.80	0.81	0.83	0.84	0.86	0.87	0.89	0.90	0.92	0.93	0.95	0.96	0.98	1.00	1.01	1.03	1.05	1.07	1.08	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.24	1.26	1.28	1.30	1.33	1.35	1.37		
GPCD-Calculated	140			140					140																										140	
GPCD-From City Master Plan																																				
GPCD-From Interlie Study																																				
Yamhill County (excludes cities)	30863	31274	31691	32113	32541	32975	33414	33860	34311	34768	35232	35702	36177	36660	37148	37643	38145	38653	39169	39691	40220	40756	41299	41850	42407	42973	43545	44126	44714	45310	45914	46526	47146	47774		
Growth Rates																																				

Appendix B

Water Rights Data

Attachment A – Water Rights List for Water Providers

Table A-1. Summary of Permitted Water Capacity							
City-Permit/Certificate Number	Type (Permit (P), Certificate (C), Application (A), Claim (CL))	Priority Date	Source				Operational Use (notes)
				Rate (cfs)	Rate (gpm)	Storage (af)	
Amity							
GR431	CL	4/30/1931	GW	0.13	60		
82452/	C	3/6/1959	GW	0.45	202	Transfer 5674	
61988/	C	1/24/1939	SW-South Yamhill River	0.475	213	Transfer T2832	
42279	C	4/24/1970	GW	0.11	49		
G12189	P	2/3/1993	GW	0.16	72	Abandoned Well	
2341	C	8/7/1917	Spring	0.5	224		
3920	C	5/26/1922	Spring	0.13	58	Abandoned Spring	
S39599	P	5/16/1973	SW-South Yamhill River	1	449		
Total Certified				1.67			
Total Permit				1.16			
Total Claim				0.13			
Total Storage				0			
Carlton							
R5527	P	10/22/1969	Panther Creek		66		
R10900	P	11/30/1987	Panther Creek		9		
1868	C	8/12/1911	Panther Creek	0.5	224		
S32488	P	10/27/1967	Fall Creek	2	898		
S32489	P	10/27/1967	Panther Creek	2.5	1122		
S34661	P	10/22/1969	Panther Creek	0.5	224		
S50218	P	11/30/1987	Panther Creek	0.007	3	.07 cfs reported in client survey	
Total Certified				0.5			
Total Permit				5.007			

Table A-1. Summary of Permitted Water Capacity							
City-Permit/Certificate Number	Type (Permit (P), Certificate (C), Application (A), Claim (CL))	Priority Date	Source	Rate (cfs)	Rate (gpm)	Storage (af)	Operational Use (notes)
Total Claim				0			
Total Storage						75	
Dayton							
49856	C	2/16/1904	Spring	0.11	49		
35695	C	8/9/1960	GW	0.5	224		.67 cfs reported in client survey
35696	C	8/9/1960	GW	0.5	224		
47233	C	3/13/1972	GW	0.17	76		Comment in Survey-is this WR G5486? G5466 is from OWRD
61750	C	4/14/1978	GW	0.2228	100		
G13838	P	9/27/1996	GW	0.668	300		9/8/2000-Limited to 300 gpm per well
49959	C	8/9/1960	Spring	0.14	63		included in 49586 source-unusable without different treatment
Total Certified				1.643			
Total Permit				0.668			
Total Claim				0			
Total Storage						0	
Dundee							
29157	C	11/28/1958	GW	0.18	81		Well slowed down
G6017	P	4/22/1974	GW	0.222	100		Well slowed down
61759	C	3/24/1983	GW	0.3	135		
G11058	P	10/31/1988	GW	0.33	148		Well slowed down
G12685	P	6/7/1991	GW	1.78	799		Well slowed down
G12736	P	5/19/1995	GW	0.5	224		not in use
G13035	P	5/19/1995	GW	0.5	224		not in use
8781	C	6/20/1923	Spring	0.5	224		not in use
8817	C	3/25/1929	Spring	0.05	22		not in use

Table A-1. Summary of Permitted Water Capacity							
City-Permit/Certificate Number	Type (Permit (P), Certificate (C), Application (A), Claim (CL))	Priority Date	Source	Rate (cfs)	Rate (gpm)	Storage (af)	Operational Use (notes)
14654	C	6/8/1939	Spring	0.0067	3		not in use
17145	C	11/7/1946	SW-unnamed stream	0.25	112		not in use
S44462	P	7/24/1979	SW-Willamette	4	1795		not in use
Total Certified				1.287			
Total Permit				7.332			
Total Claim				0			
Total Storage						0	
Lafayette							
GR1492	CL	12/31/1915	GW	0.4456	200		
39554	C	10/13/1967	GW	0.28	126		Transfer T8178
39561	C	12/16/1968	GW	0.32	144		Transfer T8178
G10399	P	4/10/1984	GW	0.25	112		Abandoned in 1995-contamination/pumping sand/ ground subsided
G10400	P	4/10/1984	GW	0.49	220		contamination/pumping sand
G13839	P	9/27/1996	GW	0.668	300		
6135	C	3/14/1924	SW-Henry Creek	0.75	337		
16623	C	1/13/1937	Spring	0.66	296		
35699	C	4/23/1958	Spring	0.08	36		
LL 1019	A	10/4/2006	SW-South Yamhill River	0.43	193		
Total Certified				2.09			
Total Permit				1.408			
Total Claim				0.446			
Total Storage						0	
McMinnville Water & Light							

Table A-1. Summary of Permitted Water Capacity							
City-Permit/Certificate Number	Type (Permit (P), Certificate (C), Application (A), Claim (CL))	Priority Date	Source	Rate (cfs)	Rate (gpm)	Storage (af)	Operational Use (notes)
3367	C	7/8/1916	SW-Haskins Creek	4.5	2020		
R612	P	2/19/1927	SW-Haskins Reservoir			410	Certification in Process
S8881	P	5/18/1927	Haskins Creek Reservoir			410	Certification in Process
S14837	P	1/10/1941	SW-Haskins Creek	15	6732		
63659	C	11/23/1981	Haskins Reservoir			355	
63660	C	12/15/1981	Haskins Creek			355	
S27520	P	11/19/1958	Nestucca River/McGuire Reservoir	6.4	2873		Survey indicates 9.6 cfs permit capacity
R2652	P	12/24/1958	Nestucca River/McGuire Reservoir			3,550	
R5561	P	12/2/1969	Nestucca River/McGuire Reservoir			210	
S34803	P	12/2/1969	Nestucca River			210	
R13942	P	12/7/1988	Walker Creek/McGuire Reservoir			6040	
S54038	P	12/7/1988	McGuire Reservoir			6040	
R2653	P	12/24/1958	Walker Creek/McMinnville 4b			4,500	
S27520	P	11/19/1958	Nestucca River/Reservoir 4C	6.4	2873		
R13934	P	12/8/2003	Runoff			1.85	
Total Certified				4.5			
Total Permit				27.8			

Table A-1. Summary of Permitted Water Capacity							
City-Permit/Certificate Number	Type (Permit (P), Certificate (C), Application (A), Claim (CL))	Priority Date	Source	Rate (cfs)	Rate (gpm)	Storage (af)	Operational Use (notes)
Total Claim				0			
Total Storage						22,082	
Newberg							
2389	C	8/23/1911	Gardner Spring	4	1795		Primary
2390	C	8/23/1911	Otis Spring				Alternate to Gardner Spring-total use from both limited to 4.0 cfs
5456	C	6/24/1919	Skeleton Spring	2	898		Primary
5456	C	7/10/1923	Atkinson Spring	2	898		Primary
6829	C	12/31/1894	Oliver Spring	0.005	2		Primary
SW641	CL	11/30/1905	Snider Spring	0.5	224		Primary
GR63	CL	9/30/1951	GW	2.228	1000		Primary
GR-54		5/31/1948	Well #2	2.2	987		This claim does not belong to the City of Newberg. OWRD Database indicates and irrigation right in Warren, OR.
48100	C	7/20/1970	GW	2.68	1203		Primary
82595	C	3/28/1980	GW	1.01	453		Primary
68620	C	8/6/1970	GW	3	1346		Primary
82600	C	6/23/1980	GW	4.01	1800		Primary
G13876	P	5/3/1991	GW	20	8977		Primary
Total Certified				18.705			
Total Permit				20			
Total Claim				2.728			
Total Storage						0	
Sheridan							
49612	C	9/11/1908	Springs	0.4	180		

Table A-1. Summary of Permitted Water Capacity							
City-Permit/Certificate Number	Type (Permit (P), Certificate (C), Application (A), Claim (CL))	Priority Date	Source	Rate (cfs)	Rate (gpm)	Storage (af)	Operational Use (notes)
G10739	P	11/24/1986	GW	0.5	224		
G13620	P	5/12/1998	GW	0.112	50		
R13686	P	10/8/2002	Springs			276	Facility under Construction
47036	C	6/26/1930	SW-Baltimore Creek	0.2	90		unable to obtain full permitted amount due to low flows
S13862	P	4/13/1939	SW-Willamina Creek	6	2693		No water diverted from Willamina Creek
34093	C	9/10/1962	SW-unnamed Stream	0.07	31		
S47044	P	5/29/1967	SW-East Fork Baltimore Creek	1.2	539		0 usable capacity-Surface Water, no treatment available
S46730	P	3/18/1976	SW-unnamed Stream	0.4	180		low summer flows, no storage
S44595	P	1/30/1976	SW-East Fork Willamina Creek	2	898		low summer flows, no storage
S44944	P	8/10/1976	Springs	0.22	99		.08 cfs usable, no storage
S46744	P	2/24/1982	SW-unnamed Stream	0.18	81		Low summer flows
S53949	P	10/8/2002	SW-Stony Mountain Reservoir			276	Being constructed under permit # R13686
Total Certified				0.67			
Total Permit				10.612			
Total Claim				0			
Total Storage						552	
Willamina							
S14420/	P	6/10/1940	Willamina Creek	0.45	202		Domestic
S15022	P	6/13/1941	Willamina Creek	0.7	314		Municipal
41796	C	6/13/1941	Willamina Creek			20	Yes, fish storage

Table A-1. Summary of Permitted Water Capacity							
City-Permit/Certificate Number	Type (Permit (P), Certificate (C), Application (A), Claim (CL))	Priority Date	Source	Rate (cfs)	Rate (gpm)	Storage (af)	Operational Use (notes)
67793	C	6/13/1941	Willamina Creek	0.2	90		Fish Pond fill
1018	C	9/22/1909	Lady Creek	1	449		Municipal
11706	C	2/15/1932	Willamina Creek	0.2	90		Municipal
S23560	P	7/6/1955	Willamina Creek	1.45	651		
Total Certified				1.4			
Total Permit				2.6			
Total Claim				0			
Total Storage						20	
Yamhill							
R7245	P	1/30/1978	SW-Turner Creek			30	This is a permit to construct a 30 AF in-channel storage reservoir
10846	C	2/12/1919	SW-Turner Creek	0.65	292		
15427	C	3/27/1940	SW-Turner Creek	0.63	283		
S43032	P	1/30/1978	Turner Creek Reservoir			30	
Total Certified				1.28			
Total Permit				0			
Total Claim				0			
Total Storage						60	
County Totals				114.636		22,789	

Appendix C

Demand Forecast Summary Tables

Appendix C
Table C-1
Average Day Demand
Yamhill County Water Supply Analysis

Table C-1. Summary of Average Day Demand Projections with Build-Out Scenarios (in million gallons per day)																									
	ADD per capita (gpd)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Amity																									
Scenario 1	147	0.22	0.22	0.23	0.23	0.24	0.24	0.25	0.26	0.26	0.27	0.27	0.28	0.29	0.29	0.30	0.31	0.31	0.32	0.33	0.34	0.34	0.35	0.36	0.37
Scenario 2	147	0.22	0.22	0.23	0.23	0.24	0.24	0.25	0.26	0.26	0.27	0.27	0.28	0.29	0.29	0.30	0.31	0.31	0.31	0.32	0.32	0.32	0.33	0.33	0.34
Scenario 3	147	0.22	0.22	0.23	0.23	0.24	0.24	0.25	0.26	0.26	0.27	0.27	0.28	0.29	0.29	0.30	0.31	0.31	0.31	0.32	0.32	0.32	0.33	0.33	0.34
Carlton																									
Scenario 1	182	0.28	0.28	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.34	0.35	0.35	0.36	0.36	0.37	0.37	0.38	0.39	0.39	0.40
Scenario 2	182	0.28	0.28	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.34	0.35	0.35	0.35	0.36	0.36	0.36	0.37	0.37	0.37	0.37
Scenario 3	182	0.28	0.28	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.34	0.35	0.35	0.35	0.36	0.36	0.36	0.37	0.37	0.37	0.37
Dayton																									
Scenario 1	150	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41	0.43	0.44	0.46	0.47	0.49	0.50	0.52	0.54	0.56	0.57	0.59	0.61	0.63	0.65	0.68
Scenario 2	150	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41	0.43	0.44	0.46	0.47	0.49	0.50	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58	0.59
Scenario 3	150	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41	0.43	0.44	0.46	0.47	0.49	0.50	0.52	0.53	0.54	0.55	0.56	0.56	0.57	0.58	0.59
Dundee																									
Scenario 1	143	0.37	0.39	0.40	0.42	0.44	0.45	0.47	0.49	0.51	0.53	0.55	0.58	0.60	0.62	0.65	0.67	0.70	0.72	0.74	0.77	0.79	0.82	0.85	0.88
Scenario 2	143	0.37	0.39	0.40	0.42	0.44	0.45	0.47	0.49	0.51	0.53	0.55	0.58	0.60	0.62	0.65	0.67	0.70	0.72	0.74	0.77	0.79	0.82	0.85	0.88
Scenario 3	143	0.37	0.39	0.40	0.42	0.44	0.45	0.47	0.49	0.51	0.53	0.55	0.58	0.60	0.62	0.65	0.67	0.70	0.72	0.74	0.77	0.79	0.82	0.85	0.88
Lafayette																									
Scenario 1	147	0.38	0.41	0.43	0.46	0.49	0.53	0.56	0.60	0.64	0.68	0.73	0.74	0.75	0.76	0.77	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Scenario 2	147	0.38	0.41	0.43	0.46	0.49	0.53	0.56	0.60	0.64	0.68	0.73	0.74	0.75	0.76	0.77	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Scenario 3	147	0.38	0.41	0.43	0.46	0.49	0.53	0.56	0.60	0.64	0.68	0.73	0.74	0.75	0.76	0.77	0.78	0.80	0.81	0.82	0.83	0.84	0.86	0.87	0.88
McMinnville																									
Scenario 1	231	5.82	6.01	6.19	6.38	6.58	6.79	7.00	7.21	7.44	7.67	7.90	8.15	8.40	8.66	8.93	9.21	9.49	9.79	10.09	10.40	10.73	11.06	11.40	11.76
Scenario 2	231	5.82	6.01	6.19	6.38	6.58	6.79	7.00	7.21	7.44	7.67	7.90	8.15	8.40	8.66	8.93	9.21	9.35	9.50	9.64	9.79	9.94	10.10	10.25	10.41
Scenario 3	231	5.82	6.01	6.19	6.38	6.58	6.79	7.00	7.21	7.44	7.67	7.90	8.15	8.40	8.66	8.93	9.21	9.35	9.50	9.64	9.79	9.94	10.10	10.25	10.41
Newberg																									
Scenario 1	135	2.53	2.58	2.63	2.69	2.74	2.80	2.86	2.92	2.98	3.04	3.10	3.16	3.23	3.29	3.36	3.43	3.50	3.57	3.65	3.72	3.80	3.86	3.92	3.99
Scenario 2	135	2.53	2.58	2.63	2.69	2.74	2.80	2.86	2.92	2.98	3.04	3.10	3.16	3.23	3.29	3.36	3.43	3.50	3.57	3.65	3.72	3.80	3.86	3.92	3.99
Scenario 3	135	2.53	2.58	2.63	2.69	2.74	2.80	2.86	2.92	2.98	3.04	3.10	3.16	3.23	3.29	3.36	3.43	3.50	3.57	3.65	3.72	3.80	3.86	3.92	3.99
Sheridan																									
Scenario 1	173	0.98	1.01	1.04	1.07	1.10	1.13	1.17	1.20	1.24	1.28	1.31	1.35	1.39	1.44	1.48	1.52	1.57	1.62	1.67	1.72	1.77	1.82	1.87	1.93
Scenario 2	173	0.98	1.01	1.04	1.07	1.10	1.13	1.17	1.20	1.24	1.28	1.31	1.35	1.39	1.44	1.48	1.52	1.57	1.62	1.67	1.72	1.77	1.82	1.87	1.93
Scenario 3	173	0.98	1.01	1.04	1.07	1.10	1.13	1.17	1.20	1.24	1.28	1.31	1.35	1.39	1.44	1.48	1.52	1.57	1.62	1.67	1.72	1.77	1.82	1.87	1.93
Willamina																									
Scenario 1	145	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.30	0.30
Scenario 2	145	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.30	0.30
Scenario 3	145	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.30	0.30
Yamhill																									
Scenario 1	140	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.33	0.33
Scenario 2	140	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.33	0.33
Scenario 3	140	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.29	0.30	0.30	0.30	0.31	0.31	0.31	0.32	0.32	0.32	0.32
ADD Scenario 1 Total		11.40	11.72	12.06	12.41	12.77	13.14	13.53	13.93	14.34	14.76	15.20	15.61	16.04	16.47	16.92	17.39	17.85	18.32	18.81	19.31	19.83	20.34	20.87	21.41
ADD Scenario 2 Total		11.40	11.72	12.06	12.41	12.77	13.14	13.53	13.93	14.34	14.76	15.20	15.61	16.04	16.47	16.92	17.39	17.69	18.00	18.31	18.63	18.96	19.28	19.60	19.92
ADD Scenario 3 Total		11.40	11.72	12.06	12.41	12.77	13.14	13.53	13.93	14.34	14.76	15.20	15.61	16.04	16.47	16.92	17.39	17.70	18.02	18.34	18.67	19.01	19.34	19.67	20.02

Appendix C
Table C-1
Average Day Demand
Yamhill County Water Supply Analysis

2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
0.38	0.39	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.50	0.51	0.52	0.53	0.54	0.56	0.57	0.58	0.60	0.61	0.62	0.64	0.65	0.67	0.68
0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.36	0.36	0.37	0.37	0.37	0.37	0.38	0.38	0.38	0.38	0.39	0.39	0.39	0.39	0.40	0.40	0.40
0.34	0.34	0.35	0.36	0.37	0.38	0.39	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.49	0.50	0.51	0.52	0.53	0.54	0.56	0.57	0.58	0.60	0.61
0.41	0.41	0.42	0.43	0.43	0.44	0.45	0.45	0.46	0.47	0.48	0.48	0.49	0.50	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
0.38	0.38	0.38	0.38	0.38	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42
0.38	0.38	0.39	0.39	0.40	0.41	0.41	0.42	0.43	0.43	0.44	0.45	0.45	0.46	0.47	0.48	0.48	0.49	0.50	0.51	0.52	0.52	0.53	0.54	0.55	0.56	0.57
0.70	0.72	0.75	0.77	0.80	0.82	0.85	0.88	0.91	0.94	0.97	1.00	1.04	1.07	1.11	1.14	1.18	1.22	1.26	1.30	1.35	1.39	1.44	1.49	1.54	1.59	1.64
0.60	0.61	0.62	0.62	0.63	0.63	0.64	0.65	0.65	0.66	0.66	0.67	0.67	0.68	0.68	0.69	0.70	0.70	0.71	0.71	0.72	0.72	0.73	0.74	0.74	0.75	0.76
0.60	0.61	0.63	0.66	0.68	0.70	0.72	0.75	0.77	0.80	0.82	0.85	0.88	0.91	0.94	0.97	1.00	1.04	1.07	1.11	1.15	1.18	1.22	1.26	1.31	1.35	1.39
0.91	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
0.91	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
0.91	0.94	0.97	1.00	1.03	1.07	1.10	1.14	1.18	1.22	1.26	1.30	1.34	1.39	1.43	1.48	1.53	1.58	1.63	1.69	1.74	1.80	1.86	1.92	1.99	2.05	2.12
0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
0.90	0.91	0.92	0.94	0.95	0.96	0.98	0.99	1.01	1.02	1.04	1.05	1.07	1.09	1.10	1.12	1.14	1.15	1.17	1.19	1.21	1.22	1.24	1.26	1.28	1.30	1.32
12.12	12.50	12.88	13.28	13.69	14.12	14.56	15.01	15.47	15.95	16.45	16.96	17.48	18.02	18.58	19.16	19.75	20.36	21.00	21.65	22.32	23.01	23.72	24.46	25.22	26.00	26.80
10.58	10.74	10.82	10.91	10.99	11.08	11.16	11.25	11.34	11.42	11.51	11.60	11.69	11.78	11.87	11.96	12.06	12.15	12.24	12.34	12.44	12.53	12.63	12.73	12.83	12.92	13.03
10.58	10.74	11.07	11.42	11.77	12.13	12.51	12.90	13.30	13.71	14.13	14.57	15.02	15.49	15.97	16.47	16.98	17.50	18.04	18.60	19.18	19.78	20.39	21.02	21.67	22.34	23.04
4.06	4.12	4.19	4.26	4.33	4.41	4.48	4.55	4.63	4.71	4.79	4.87	4.95	5.03	5.11	5.20	5.28	5.37	5.46	5.55	5.65	5.74	5.84	5.93	6.03	6.13	6.24
4.06	4.12	4.16	4.19	4.23	4.26	4.30	4.33	4.37	4.41	4.44	4.48	4.52	4.56	4.59	4.63	4.67	4.71	4.75	4.79	4.83	4.87	4.91	4.95	4.99	5.03	5.07
4.06	4.12	4.21	4.29	4.38	4.47	4.56	4.66	4.75	4.85	4.95	5.05	5.16	5.26	5.37	5.48	5.59	5.71	5.82	5.94	6.07	6.19	6.32	6.45	6.58	6.71	6.85
1.99	2.05	2.11	2.17	2.24	2.31	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
1.99	2.05	2.11	2.17	2.24	2.31	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
1.99	2.05	2.11	2.17	2.24	2.31	2.37	2.41	2.45	2.48	2.52	2.56	2.60	2.64	2.67	2.71	2.76	2.80	2.84	2.88	2.92	2.97	3.01	3.06	3.10	3.15	3.20
0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.35
0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.31
0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34
0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
0.33	0.33	0.33	0.34	0.35	0.35	0.36	0.36	0.37	0.38	0.38	0.39	0.40	0.40	0.41	0.42	0.42	0.43	0.44	0.45	0.45	0.46	0.47	0.48	0.48	0.49	0.50
21.97	22.54	23.10	23.67	24.27	24.87	25.50	26.07	26.66	27.27	27.89	28.54	29.20	29.88	30.58	31.30	32.04	32.80	33.59	34.40	35.23	36.08	36.96	37.87	38.80	39.76	40.75
20.25	20.59	20.78	20.97	21.17	21.36	21.56	21.69	21.83	21.96	22.10	22.23	22.37	22.51	22.65	22.79	22.93	23.07	23.21	23.36	23.50	23.65	23.80	23.95	24.10	24.25	24.40
20.36	20.72	21.28	21.87	22.46	23.08	23.71	24.33	24.96	25.61	26.28	26.97	27.68	28.40	29.15	29.92	30.71	31.52	32.35	33.21	34.09	35.00	35.93	36.89	37.88	38.90	39.94

Appendix C
Table C-2
Maximum Day Demand
Yamhill County Water Supply Analysis

Table C-2. Summary of Maximum Day Demand Projections with Build-Out Scenarios (in million gallons per day)																									
	MDD per capita (gpd)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Amity																									
Scenario 1	323	0.48	0.49	0.50	0.51	0.52	0.54	0.55	0.56	0.57	0.59	0.60	0.62	0.63	0.64	0.66	0.67	0.69	0.71	0.72	0.74	0.76	0.77	0.79	0.81
Scenario 2	323	0.48	0.49	0.50	0.51	0.52	0.54	0.55	0.56	0.57	0.59	0.60	0.62	0.63	0.64	0.66	0.67	0.68	0.69	0.70	0.71	0.71	0.72	0.73	0.74
Scenario 3	323	0.48	0.49	0.50	0.51	0.52	0.54	0.55	0.56	0.57	0.59	0.60	0.62	0.63	0.64	0.66	0.67	0.68	0.69	0.70	0.71	0.71	0.72	0.73	0.74
Carlton																									
Scenario 1	400	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.70	0.71	0.72	0.74	0.75	0.76	0.77	0.78	0.80	0.81	0.82	0.84	0.85	0.86	0.88
Scenario 2	400	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.70	0.71	0.72	0.74	0.75	0.76	0.77	0.78	0.78	0.79	0.80	0.80	0.81	0.82	0.82
Scenario 3	400	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.70	0.71	0.72	0.74	0.75	0.76	0.77	0.78	0.78	0.79	0.80	0.80	0.81	0.82	0.82
Dayton																									
Scenario 1	225	0.48	0.49	0.51	0.53	0.54	0.56	0.58	0.60	0.62	0.64	0.66	0.68	0.71	0.73	0.75	0.78	0.81	0.83	0.86	0.89	0.92	0.95	0.98	1.01
Scenario 2	225	0.48	0.49	0.51	0.53	0.54	0.56	0.58	0.60	0.62	0.64	0.66	0.68	0.71	0.73	0.75	0.78	0.79	0.81	0.82	0.83	0.85	0.86	0.88	0.89
Scenario 3	225	0.48	0.49	0.51	0.53	0.54	0.56	0.58	0.60	0.62	0.64	0.66	0.68	0.71	0.73	0.75	0.78	0.79	0.81	0.82	0.83	0.85	0.86	0.88	0.89
Dundee																									
Scenario 1	315	0.82	0.85	0.88	0.92	0.96	1.00	1.04	1.08	1.12	1.17	1.22	1.27	1.32	1.37	1.43	1.48	1.53	1.58	1.64	1.69	1.75	1.80	1.86	1.93
Scenario 2	315	0.82	0.85	0.88	0.92	0.96	1.00	1.04	1.08	1.12	1.17	1.22	1.27	1.32	1.37	1.43	1.48	1.53	1.58	1.64	1.69	1.75	1.80	1.86	1.93
Scenario 3	315	0.82	0.85	0.88	0.92	0.96	1.00	1.04	1.08	1.12	1.17	1.22	1.27	1.32	1.37	1.43	1.48	1.53	1.58	1.64	1.69	1.75	1.80	1.86	1.93
Lafayette																									
Scenario 1	323	0.84	0.89	0.95	1.02	1.08	1.16	1.23	1.32	1.41	1.50	1.60	1.62	1.65	1.67	1.70	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72
Scenario 2	323	0.84	0.89	0.95	1.02	1.08	1.16	1.23	1.32	1.41	1.50	1.60	1.62	1.65	1.67	1.70	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72
Scenario 3	323	0.84	0.89	0.95	1.02	1.08	1.16	1.23	1.32	1.41	1.50	1.60	1.62	1.65	1.67	1.70	1.72	1.75	1.78	1.80	1.83	1.86	1.88	1.91	1.94
McMinnville																									
Scenario 1	578	14.56	15.01	15.48	15.96	16.45	16.96	17.49	18.03	18.59	19.17	19.76	20.37	21.01	21.66	22.33	23.02	23.73	24.47	25.23	26.01	26.82	27.65	28.50	29.39
Scenario 2	578	14.56	15.01	15.48	15.96	16.45	16.96	17.49	18.03	18.59	19.17	19.76	20.37	21.01	21.66	22.33	23.02	23.38	23.74	24.11	24.48	24.86	25.25	25.64	26.03
Scenario 3	578	14.56	15.01	15.48	15.96	16.45	16.96	17.49	18.03	18.59	19.17	19.76	20.37	21.01	21.66	22.33	23.02	23.38	23.74	24.11	24.48	24.86	25.25	25.64	26.03
Newberg																									
Scenario 1	284	5.31	5.42	5.53	5.64	5.76	5.88	6.00	6.12	6.25	6.38	6.51	6.64	6.78	6.92	7.06	7.20	7.35	7.50	7.65	7.81	7.97	8.11	8.24	8.38
Scenario 2	284	5.31	5.42	5.53	5.64	5.76	5.88	6.00	6.12	6.25	6.38	6.51	6.64	6.78	6.92	7.06	7.20	7.35	7.50	7.65	7.81	7.97	8.11	8.24	8.38
Scenario 3	284	5.31	5.42	5.53	5.64	5.76	5.88	6.00	6.12	6.25	6.38	6.51	6.64	6.78	6.92	7.06	7.20	7.35	7.50	7.65	7.81	7.97	8.11	8.24	8.38
Sheridan																									
Scenario 1	381	2.15	2.22	2.28	2.35	2.42	2.50	2.57	2.65	2.73	2.81	2.89	2.98	3.07	3.16	3.26	3.35	3.45	3.56	3.66	3.77	3.89	4.00	4.12	4.25
Scenario 2	381	2.15	2.22	2.28	2.35	2.42	2.50	2.57	2.65	2.73	2.81	2.89	2.98	3.07	3.16	3.26	3.35	3.45	3.56	3.66	3.77	3.89	4.00	4.12	4.25
Scenario 3	381	2.15	2.22	2.28	2.35	2.42	2.50	2.57	2.65	2.73	2.81	2.89	2.98	3.07	3.16	3.26	3.35	3.45	3.56	3.66	3.77	3.89	4.00	4.12	4.25
Willamina																									
Scenario 1	319	0.59	0.59	0.59	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.65	0.65	0.66	0.67
Scenario 2	319	0.59	0.59	0.59	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.65	0.65	0.65	0.65
Scenario 3	319	0.59	0.59	0.59	0.60	0.60	0.60	0.61	0.61	0.61	0.62	0.62	0.62	0.63	0.63	0.63	0.64	0.64	0.64	0.64	0.64	0.65	0.65	0.65	0.65
Yamhill																									
Scenario 1	350	0.59	0.60	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.71	0.72	0.73	0.74	0.76	0.77	0.78	0.79	0.81	0.82	0.82	0.82	0.82
Scenario 2	350	0.59	0.60	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.71	0.72	0.73	0.74	0.76	0.77	0.78	0.79	0.81	0.82	0.82	0.82	0.82
Scenario 3	350	0.59	0.60	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.71	0.72	0.73	0.74	0.76	0.76	0.77	0.77	0.78	0.79	0.80	0.81	0.81
MDD Scenario 1 Total		26.42	27.18	27.97	28.78	29.62	30.49	31.38	32.31	33.26	34.25	35.27	36.24	37.23	38.26	39.31	40.40	41.48	42.60	43.74	44.92	46.13	47.34	48.58	49.85
MDD Scenario 2 Total		26.42	27.18	27.97	28.78	29.62	30.49	31.38	32.31	33.26	34.25	35.27	36.24	37.23	38.26	39.31	40.40	41.10	41.81	42.53	43.27	44.02	44.75	45.48	46.24
MDD Scenario 3 Total		26.42	27.18	27.97	28.78	29.62	30.49	31.38	32.31	33.26	34.25	35.27	36.24	37.23	38.26	39.31	40.40	41.12	41.85	42.59	43.35	44.12	44.88	45.65	46.44

Appendix C
Table C-2
Maximum Day Demand
Yamhill County Water Supply Analysis

2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	
0.83	0.85	0.87	0.89	0.91	0.93	0.95	0.97	1.00	1.02	1.04	1.07	1.09	1.12	1.14	1.17	1.20	1.22	1.25	1.28	1.31	1.34	1.37	1.41	1.44	1.47	1.51	
0.75	0.76	0.76	0.77	0.77	0.77	0.78	0.78	0.79	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.83	0.83	0.84	0.84	0.85	0.85	0.86	0.86	0.87	0.87	
0.75	0.76	0.77	0.79	0.81	0.83	0.85	0.87	0.89	0.91	0.93	0.95	0.97	1.00	1.02	1.04	1.07	1.09	1.12	1.14	1.17	1.20	1.23	1.25	1.28	1.31	1.34	
0.89	0.91	0.92	0.94	0.95	0.97	0.98	1.00	1.01	1.03	1.05	1.06	1.08	1.10	1.12	1.14	1.15	1.17	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.33	1.36	
0.83	0.84	0.84	0.84	0.85	0.85	0.85	0.86	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.89	0.89	0.89	0.90	0.90	0.90	0.90	0.91	0.91	0.91	0.92	0.92	0.93
0.83	0.84	0.85	0.86	0.88	0.89	0.91	0.92	0.94	0.95	0.97	0.98	1.00	1.01	1.03	1.05	1.06	1.08	1.10	1.12	1.14	1.15	1.17	1.19	1.21	1.23	1.25	
1.05	1.08	1.12	1.16	1.20	1.24	1.28	1.32	1.36	1.41	1.46	1.50	1.55	1.61	1.66	1.72	1.77	1.83	1.89	1.96	2.02	2.09	2.16	2.23	2.31	2.38	2.46	
0.91	0.92	0.93	0.94	0.94	0.95	0.96	0.97	0.98	0.98	0.99	1.00	1.01	1.02	1.03	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.10	1.11	1.11	1.12	1.13	
0.91	0.92	0.95	0.98	1.02	1.05	1.08	1.12	1.16	1.20	1.24	1.28	1.32	1.37	1.41	1.46	1.51	1.56	1.61	1.66	1.72	1.78	1.83	1.90	1.96	2.02	2.09	
1.99	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	
1.99	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	
1.99	2.06	2.13	2.20	2.27	2.35	2.42	2.50	2.59	2.67	2.76	2.85	2.95	3.05	3.15	3.25	3.36	3.47	3.59	3.71	3.83	3.96	4.09	4.23	4.37	4.52	4.67	
1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	
1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	
1.97	2.00	2.03	2.06	2.09	2.12	2.15	2.19	2.22	2.25	2.29	2.32	2.36	2.39	2.43	2.46	2.50	2.54	2.58	2.61	2.65	2.69	2.73	2.77	2.82	2.86	2.90	
30.30	31.24	32.21	33.20	34.23	35.30	36.39	37.52	38.68	39.88	41.12	42.39	43.70	45.06	46.46	47.90	49.38	50.91	52.49	54.12	55.79	57.52	59.31	61.15	63.04	65.00	67.01	
26.44	26.85	27.06	27.27	27.48	27.69	27.90	28.12	28.34	28.56	28.78	29.00	29.23	29.45	29.68	29.91	30.14	30.38	30.61	30.85	31.09	31.33	31.57	31.82	32.06	32.31	32.56	
26.44	26.85	27.68	28.54	29.42	30.33	31.27	32.24	33.24	34.27	35.34	36.43	37.56	38.73	39.93	41.16	42.44	43.76	45.11	46.51	47.95	49.44	50.97	52.55	54.18	55.86	57.59	
8.52	8.66	8.80	8.95	9.10	9.25	9.41	9.56	9.72	9.88	10.05	10.22	10.39	10.56	10.74	10.92	11.10	11.28	11.47	11.66	11.86	12.05	12.26	12.46	12.67	12.88	13.09	
8.52	8.66	8.73	8.80	8.88	8.95	9.03	9.10	9.18	9.25	9.33	9.41	9.49	9.57	9.65	9.73	9.81	9.89	9.97	10.06	10.14	10.22	10.31	10.40	10.48	10.57	10.66	
8.52	8.66	8.84	9.02	9.20	9.39	9.58	9.78	9.98	10.19	10.40	10.61	10.83	11.05	11.28	11.51	11.74	11.98	12.23	12.48	12.74	13.00	13.26	13.54	13.81	14.10	14.39	
4.37	4.51	4.64	4.78	4.92	5.07	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	
4.37	4.51	4.64	4.78	4.92	5.07	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	5.22	
4.37	4.51	4.64	4.78	4.92	5.07	5.22	5.30	5.38	5.46	5.54	5.63	5.71	5.80	5.88	5.97	6.06	6.15	6.25	6.34	6.43	6.53	6.63	6.73	6.83	6.93	7.04	
0.67	0.67	0.68	0.68	0.68	0.69	0.69	0.69	0.70	0.70	0.71	0.71	0.71	0.72	0.72	0.72	0.73	0.73	0.74	0.74	0.74	0.75	0.75	0.76	0.76	0.76	0.77	
0.65	0.65	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.68	0.68	0.68	
0.65	0.65	0.66	0.66	0.67	0.67	0.67	0.68	0.68	0.68	0.69	0.69	0.69	0.70	0.70	0.71	0.71	0.71	0.72	0.72	0.72	0.73	0.73	0.74	0.74	0.74	0.75	
0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	
0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	
0.82	0.82	0.84	0.85	0.86	0.88	0.89	0.91	0.92	0.94	0.96	0.97	0.99	1.01	1.02	1.04	1.06	1.08	1.09	1.11	1.13	1.15	1.17	1.19	1.21	1.23	1.25	
51.17	52.52	53.84	55.20	56.60	58.04	59.52	60.89	62.30	63.75	65.24	66.78	68.36	69.99	71.66	73.38	75.16	76.98	78.86	80.79	82.79	84.83	86.94	89.12	91.35	93.65	96.02	
47.00	47.78	48.22	48.65	49.10	49.55	50.01	50.32	50.63	50.94	51.26	51.57	51.89	52.22	52.54	52.87	53.20	53.54	53.87	54.21	54.55	54.90	55.24	55.59	55.94	56.30	56.66	
47.24	48.06	49.38	50.74	52.14	53.59	55.07	56.51	58.00	59.53	61.10	62.72	64.38	66.09	67.85	69.66	71.51	73.43	75.39	77.41	79.49	81.63	83.83	86.09	88.41	90.81	93.27	

Appendix C
Table C-3
Population Forecast
Yamhill County Water Supply Analysis

Table C-3. Summary Population Projections with Build-Out Scenarios																											
	2000-2010	2011-2015	2016-2020	2021-2025	2026-2050	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Amity																											
Scenario 1	2.32%	2.32%	2.32%	2.32%	2.32%	1,478	1,512	1,547	1,583	1,620	1,658	1,696	1,735	1,776	1,817	1,859	1,902	1,946	1,992	2,038	2,085	2,134	2,183	2,234	2,286	2,339	2,393
Scenario 2	2.32%	2.32%	1.16%	1.16%	0.58%	1,478	1,512	1,547	1,583	1,620	1,658	1,696	1,735	1,776	1,817	1,859	1,902	1,946	1,992	2,038	2,085	2,109	2,134	2,159	2,184	2,209	2,235
Scenario 3	2.32%	2.32%	1.16%	1.16%	2.32%	1,478	1,512	1,547	1,583	1,620	1,658	1,696	1,735	1,776	1,817	1,859	1,902	1,946	1,992	2,038	2,085	2,109	2,134	2,159	2,184	2,209	2,235
Carlton																											
Scenario 1	1.62%	1.62%	1.62%	1.62%	1.62%	1,514	1,539	1,564	1,589	1,615	1,641	1,667	1,694	1,722	1,750	1,778	1,807	1,836	1,866	1,896	1,927	1,958	1,990	2,023	2,055	2,089	2,123
Scenario 2	1.62%	1.62%	0.81%	0.81%	0.41%	1,514	1,539	1,564	1,589	1,615	1,641	1,667	1,694	1,722	1,750	1,778	1,807	1,836	1,866	1,896	1,927	1,943	1,959	1,975	1,991	2,007	2,023
Scenario 3	1.62%	1.62%	0.81%	0.81%	1.62%	1,514	1,539	1,564	1,589	1,615	1,641	1,667	1,694	1,722	1,750	1,778	1,807	1,836	1,866	1,896	1,927	1,943	1,959	1,975	1,991	2,007	2,023
Dayton																											
Scenario 1	3.34%	3.34%	3.34%	3.34%	3.34%	2,119	2,190	2,263	2,338	2,416	2,497	2,580	2,666	2,755	2,847	2,942	3,041	3,142	3,247	3,355	3,467	3,583	3,703	3,826	3,954	4,086	4,222
Scenario 2	3.34%	3.34%	1.67%	1.67%	0.83%	2,119	2,190	2,263	2,338	2,416	2,497	2,580	2,666	2,755	2,847	2,942	3,041	3,142	3,247	3,355	3,467	3,525	3,584	3,644	3,705	3,766	3,829
Scenario 3	3.34%	3.34%	1.67%	1.67%	3.34%	2,119	2,190	2,263	2,338	2,416	2,497	2,580	2,666	2,755	2,847	2,942	3,041	3,142	3,247	3,355	3,467	3,525	3,584	3,644	3,705	3,766	3,829
Dundee																											
Scenario 1	4.05%	4.05%	3.33%	3.33%	0.00%	2,598	2,703	2,813	2,927	3,045	3,169	3,297	3,431	3,570	3,714	3,865	4,021	4,184	4,354	4,530	4,713	4,870	5,032	5,200	5,373	5,552	5,737
Scenario 2	4.05%	4.05%	3.33%	3.33%	0.00%	2,598	2,703	2,813	2,927	3,045	3,169	3,297	3,431	3,570	3,714	3,865	4,021	4,184	4,354	4,530	4,713	4,870	5,032	5,200	5,373	5,552	5,737
Scenario 3	4.05%	4.05%	3.33%	3.33%	3.33%	2,598	2,703	2,813	2,927	3,045	3,169	3,297	3,431	3,570	3,714	3,865	4,021	4,184	4,354	4,530	4,713	4,870	5,032	5,200	5,373	5,552	5,737
Lafayette																											
Scenario 1	6.70%	1.50%	0.00%	0.00%	0.00%	2,586	2,759	2,944	3,141	3,352	3,576	3,816	4,072	4,345	4,636	4,946	5,020	5,096	5,172	5,250	5,328	5,328	5,328	5,328	5,328	5,328	5,328
Scenario 2	6.70%	1.50%	0.00%	0.00%	0.00%	2,586	2,759	2,944	3,141	3,352	3,576	3,816	4,072	4,345	4,636	4,946	5,020	5,096	5,172	5,250	5,328	5,328	5,328	5,328	5,328	5,328	5,328
Scenario 3	6.70%	1.50%	1.50%	1.50%	1.50%	2,586	2,759	2,944	3,141	3,352	3,576	3,816	4,072	4,345	4,636	4,946	5,020	5,096	5,172	5,250	5,328	5,408	5,489	5,572	5,655	5,740	5,826
McMinnville																											
Scenario 1	3.10%	3.10%	3.10%	3.10%	3.10%	25,216	25,998	26,804	27,634	28,491	29,374	30,285	31,224	32,192	33,190	34,218	35,279	36,373	37,500	38,663	39,861	41,097	42,371	43,684	45,039	46,435	47,874
Scenario 2	3.10%	3.10%	1.55%	1.55%	0.77%	25,216	25,998	26,804	27,634	28,491	29,374	30,285	31,224	32,192	33,190	34,218	35,279	36,373	37,500	38,663	39,861	40,479	41,106	41,744	42,391	43,048	43,715
Scenario 3	3.10%	3.10%	1.55%	1.55%	3.10%	25,216	25,998	26,804	27,634	28,491	29,374	30,285	31,224	32,192	33,190	34,218	35,279	36,373	37,500	38,663	39,861	40,479	41,106	41,744	42,391	43,048	43,715
Newberg																											
Scenario 1	2.05%	2.05%	2.05%	1.67%	1.67%	18,735	19,119	19,512	19,912	20,320	20,737	21,162	21,597	22,040	22,492	22,953	23,424	23,904	24,395	24,895	25,406	25,927	26,459	27,002	27,556	28,121	28,590
Scenario 2	2.05%	2.05%	2.05%	1.67%	0.83%	18,735	19,119	19,512	19,912	20,320	20,737	21,162	21,597	22,040	22,492	22,953	23,424	23,904	24,395	24,895	25,406	25,927	26,459	27,002	27,556	28,121	28,590
Scenario 3	2.05%	2.05%	2.05%	1.67%	2.05%	18,735	19,119	19,512	19,912	20,320	20,737	21,162	21,597	22,040	22,492	22,953	23,424	23,904	24,395	24,895	25,406	25,927	26,459	27,002	27,556	28,121	28,590
Sheridan																											
Scenario 1	3.00%	3.00%	3.00%	0.00%	0.00%	5,655	5,825	5,999	6,179	6,365	6,556	6,752	6,955	7,163	7,378	7,600	7,827	8,062	8,304	8,553	8,810	9,074	9,346	9,627	9,915	10,213	10,519
Scenario 2	3.00%	3.00%	3.00%	0.00%	0.00%	5,655	5,825	5,999	6,179	6,365	6,556	6,752	6,955	7,163	7,378	7,600	7,827	8,062	8,304	8,553	8,810	9,074	9,346	9,627	9,915	10,213	10,519
Scenario 3	3.00%	3.00%	3.00%	3.00%	1.50%	5,655	5,825	5,999	6,179	6,365	6,556	6,752	6,955	7,163	7,378	7,600	7,827	8,062	8,304	8,553	8,810	9,074	9,346	9,627	9,915	10,213	10,519
Willamina																											
Scenario 1	0.54%	0.54%	0.54%	0.54%	0.54%	1,844	1,854	1,864	1,874	1,884	1,894	1,904	1,914	1,925	1,935	1,945	1,956	1,966	1,977	1,987	1,998	2,009	2,019	2,030	2,041	2,052	2,063
Scenario 2	0.54%	0.54%	0.27%	0.27%	0.13%	1,844	1,854	1,864	1,874	1,884	1,894	1,904	1,914	1,925	1,935	1,945	1,956	1,966	1,977	1,987	1,998	2,003	2,009	2,014	2,019	2,025	2,030
Scenario 3	0.54%	0.54%	0.27%	0.27%	0.54%	1,844	1,854	1,864	1,874	1,884	1,894	1,904	1,914	1,925	1,935	1,945	1,956	1,966	1,977	1,987	1,998	2,003	2,009	2,014	2,019	2,025	2,030
Yamhill																											
Scenario 1	1.70%	1.70%	1.70%	0.00%	0.00%	1,677	1,705	1,734	1,764	1,794	1,824	1,855	1,887	1,919	1,951	1,984	2,018	2,052	2,087	2,122	2,158	2,195	2,232	2,270	2,309	2,348	2,388
Scenario 2	1.70%	1.70%	1.70%	0.00%	0.00%	1,677	1,705	1,734	1,764	1,794	1,824	1,855	1,887	1,919	1,951	1,984	2,018	2,052	2,087	2,122	2,158	2,195	2,232	2,270	2,309	2,348	2,388
Scenario 3	1.70%	1.70%	0.85%	0.85%	1.70%	1,677	1,705	1,734	1,764	1,794	1,824	1,855	1,887	1,919	1,951	1,984	2,018	2,052	2,087	2,122	2,158	2,177	2,195	2,214	2,233	2,252	2,271
Water Provider Total																											
Scenario 1						63,422	65,204	67,043	68,942	70,902	72,926	75,016	77,175	79,405	81,710	84,091	86,296	88,563	90,893	93,290	95,755	98,176	100,665	103,224	105,856	108,562	111,197
Scenario 2						63,422	65,204	67,043	68,942	70,902	72,926	75,016	77,175	79,405	81,710	84,091	86,296	88,563	90,893	93,290	95,755	97,455	99,190	100,962	102,770	104,617	106,354
Scenario 3						63,422	65,204	67,043	68,942	70,902	72,926	75,016	77,175	79,405	81,710	84,091	86,296	88,563	90,893	93,290	95,755	97,516	99,314	101,149	103,021	104,932	106,775
Incorporated Yamhill County																											
						24,642	24,970	25,303	25,641	25,982	26,329	26,680	27,035	27,395	27,761	28,131	28,506	28,886	29,271	29,661	30,056	30,457	30,863	31,274	31,691	32,113	32,541

Appendix C
Table C-3
Population Forecast
Yamhill County Water Supply Analysis

2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
2,448	2,505	2,563	2,623	2,684	2,746	2,810	2,875	2,942	3,010	3,080	3,151	3,224	3,299	3,376	3,454	3,534	3,616	3,700	3,786	3,874	3,964	4,056	4,150	4,246	4,345	4,446	4,549	4,654
2,260	2,287	2,313	2,340	2,354	2,367	2,381	2,395	2,409	2,423	2,437	2,451	2,465	2,479	2,494	2,508	2,523	2,538	2,552	2,567	2,582	2,597	2,612	2,627	2,642	2,658	2,673	2,689	2,704
2,260	2,287	2,313	2,340	2,394	2,450	2,507	2,565	2,625	2,685	2,748	2,812	2,877	2,944	3,012	3,082	3,153	3,226	3,301	3,378	3,456	3,537	3,619	3,703	3,789	3,876	3,966	4,058	4,153
2,157	2,192	2,228	2,264	2,300	2,338	2,376	2,414	2,453	2,493	2,533	2,575	2,616	2,659	2,702	2,746	2,790	2,836	2,881	2,928	2,976	3,024	3,073	3,123	3,174	3,225	3,277	3,330	3,384
2,039	2,056	2,073	2,089	2,098	2,106	2,115	2,123	2,132	2,141	2,149	2,158	2,167	2,176	2,184	2,193	2,202	2,211	2,220	2,229	2,238	2,247	2,256	2,265	2,275	2,284	2,293	2,302	2,312
2,039	2,056	2,073	2,089	2,123	2,158	2,193	2,228	2,264	2,301	2,338	2,376	2,415	2,454	2,494	2,534	2,575	2,617	2,660	2,703	2,747	2,791	2,836	2,882	2,929	2,977	3,025	3,074	3,124
4,363	4,509	4,659	4,815	4,975	5,141	5,313	5,490	5,674	5,863	6,059	6,261	6,470	6,686	6,909	7,139	7,378	7,624	7,878	8,141	8,413	8,694	8,984	9,284	9,594	9,914	10,245	10,587	10,940
3,893	3,958	4,024	4,091	4,126	4,160	4,195	4,230	4,265	4,301	4,336	4,373	4,409	4,446	4,483	4,520	4,558	4,596	4,634	4,673	4,712	4,751	4,831	4,871	4,912	4,953	4,994	5,036	
3,893	3,958	4,024	4,091	4,228	4,369	4,515	4,666	4,821	4,982	5,148	5,320	5,498	5,681	5,871	6,067	6,269	6,479	6,695	6,918	7,149	7,388	7,634	7,889	8,152	8,424	8,706	8,996	9,296
5,928	6,125	6,329	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540
5,928	6,125	6,329	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540	6,540
5,928	6,125	6,329	6,540	6,758	6,983	7,215	7,456	7,704	7,960	8,225	8,499	8,782	9,075	9,377	9,689	10,012	10,345	10,689	11,045	11,413	11,793	12,186	12,592	13,011	13,444	13,892	14,354	14,832
5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328
5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328	5,328
5,914	6,002	6,092	6,184	6,276	6,371	6,466	6,563	6,662	6,761	6,863	6,966	7,070	7,176	7,284	7,393	7,504	7,617	7,731	7,847	7,964	8,084	8,205	8,328	8,453	8,580	8,708	8,839	8,972
49,358	50,888	52,466	54,092	55,769	57,498	59,280	61,118	63,012	64,966	66,980	69,056	71,196	73,404	75,679	78,025	80,444	82,937	85,508	88,159	90,892	93,709	96,614	99,609	102,697	105,881	109,163	112,547	116,036
44,392	45,081	45,779	46,489	46,849	47,212	47,578	47,947	48,318	48,693	49,070	49,450	49,834	50,220	50,609	51,001	51,396	51,795	52,196	52,601	53,008	53,419	53,833	54,250	54,671	55,094	55,521	55,952	56,385
44,392	45,081	45,779	46,489	47,930	49,416	50,948	52,527	54,155	55,834	57,565	59,349	61,189	63,086	65,041	67,058	69,136	71,279	73,489	75,767	78,116	80,537	83,034	85,608	88,262	90,998	93,819	96,727	99,725
29,067	29,551	30,044	30,545	31,055	31,572	32,099	32,634	33,178	33,732	34,294	34,866	35,448	36,039	36,640	37,251	37,872	38,504	39,146	39,798	40,462	41,137	41,823	42,520	43,229	43,950	44,683	45,428	46,186
29,067	29,551	30,044	30,545	30,800	31,057	31,316	31,577	31,840	32,106	32,373	32,643	32,915	33,190	33,467	33,746	34,027	34,311	34,597	34,885	35,176	35,469	35,765	36,063	36,364	36,667	36,973	37,281	37,592
29,067	29,551	30,044	30,545	31,172	31,811	32,464	33,130	33,809	34,503	35,211	35,933	36,670	37,422	38,190	38,973	39,773	40,589	41,421	42,271	43,138	44,023	44,926	45,848	46,788	47,748	48,727	49,727	50,747
10,835	11,160	11,494	11,839	12,194	12,560	12,937	13,325	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725
10,835	11,160	11,494	11,839	12,194	12,560	12,937	13,325	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725	13,725
10,835	11,160	11,494	11,839	12,194	12,560	12,937	13,325	13,725	13,930	14,139	14,351	14,567	14,785	15,007	15,232	15,460	15,692	15,928	16,166	16,409	16,655	16,905	17,158	17,416	17,677	17,942	18,211	18,484
2,074	2,085	2,096	2,108	2,119	2,130	2,142	2,153	2,165	2,176	2,188	2,200	2,212	2,223	2,235	2,247	2,259	2,272	2,284	2,296	2,308	2,321	2,333	2,346	2,358	2,371	2,383	2,396	2,409
2,036	2,041	2,047	2,052	2,055	2,058	2,060	2,063	2,066	2,069	2,072	2,074	2,077	2,080	2,083	2,085	2,088	2,091	2,094	2,097	2,102	2,105	2,108	2,111	2,114	2,116	2,119	2,122	
2,036	2,041	2,047	2,052	2,063	2,074	2,085	2,097	2,108	2,119	2,130	2,142	2,153	2,165	2,176	2,188	2,200	2,212	2,224	2,235	2,247	2,259	2,272	2,284	2,296	2,308	2,321	2,333	2,346
2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348
2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348	2,348
2,290	2,309	2,329	2,349	2,389	2,429	2,470	2,512	2,555	2,598	2,642	2,687	2,733	2,779	2,826	2,874	2,923	2,973	3,023	3,074	3,127	3,180	3,234	3,288	3,344	3,401	3,459	3,517	3,577
113,906	116,692	119,556	122,502	125,313	128,202	131,172	134,226	137,365	140,181	143,075	146,049	149,107	152,250	155,482	158,803	162,218	165,729	169,339	173,050	176,866	180,790	184,824	188,973	193,239	197,626	202,138	206,778	211,550
108,127	109,935	111,780	113,663	114,692	115,737	116,798	117,876	118,971	119,672	120,378	121,090	121,808	122,531	123,260	123,995	124,736	125,482	126,235	126,993	127,757	128,527	129,304	130,086	130,875	131,670	132,471	133,279	134,093
108,654	110,571	112,525	114,519	117,528	120,620	123,800	127,068	130,427	133,675	137,010	140,436	143,954	147,567	151,278	155,090	159,006	163,028	167,161	171,405	175,766	180,247	184,850	189,580	194,440	199,433	204,565	209,837	215,256
32,975	33,414	33,860	34,311	34,768	35,232	35,702	36,177	36,660	37,148	37,643	38,145	38,653	39,169	39,691	40,220	40,756	41,299	41,850	42,407	42,973	43,545	44,126	44,714	45,310	45,914	46,526	47,146	47,774

Appendix D

Transmission Line Alignment from Yamhill County Intertie Study (EES, 1998)

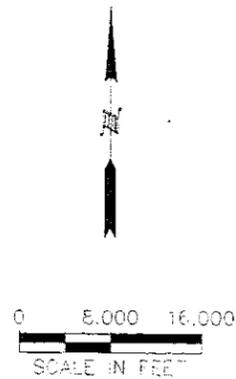
Yamhill County
City Water Rights Compared With Water Requirements*

City	Water Rights**	Estimated Current demand ADD / PDD	Projected Future demand ADD / PDD (2020*)
McMinnville	23.3 mgd from Haskins creek, Upper Nesucca River and Walker Creek	4.49 / 11.67 mgd	6.94 / 18.04 mgd
Dayton	1.4 mgd well rights that are unable to produce flows	.36 / .92 mgd	.55 / 1.43 mgd
Lafayette	2.3 mgd wells - most abandoned or unable to produce flows required	.40 / 1.03 mgd	.61 / 1.59 mgd
Dundee	1.30 mgd wells, 4 cubic feet second	.51 / 1.32 mgd	.78 / 2.03 mgd
Amity	1.65 mgd	.24 / .63 mgd	.30 / .98 mgd
Newberg	14.63 mgd well rights, some unusable	3.21 / 8.35 mgd	4.96 / 12.91 mgd
Willamina	1.82 mgd	.33 / .87 mgd	.52 / 1.35 mgd
Carlton	3.6 mgd, most not developable	.28 / .73 mgd	.44 / 1.13 mgd
Sheridan	.54 mgd spring +5.1 mgd creek, all junior and most on Willama creek, & not feasible to develop	.98 / 2.53 mgd	1.52 / 3.94 mgd
Yamhill	.42 mgd	.18 / .47 mgd	.28 / .73 mgd

10.98 / 28.54 mgd 16.97 / 44.13 mgd

* Water rights and demand information were obtained from current water master plans for each of the municipalities shown.

** Many water rights are junior and may be unavailable in the future. Some rights are on streams that have been dismissed as not feasible as a water resource. All systems reliant on wells are currently looking for alternative well fields, with either transference of rights or purchase of new rights. Many surface rights available are most likely not executable due to the junior status and low stream flows especially in peak summer demand when water use is restricted.



LEGEND

- PIPE ROUTE
- MUNICIPAL SUPPLY WELL OR SPRING
- ABANDONED MUNICIPAL SUPPLY WELL
- ⊙ MUNICIPAL SURFACE WATER SOURCE

Lafayette: Groundwater / wells
Pressure Zone: 250'
Water Rights: 2.3 mgd, includes non producing wells
Storage: .5/1.3 MG
no plant

McMinnville: Surface Water - Willamette
Pressure Zone: 371.7'
Water Rights: 23.3
Storage: 22.8 / 34.5 MG
Plant current / future cap: 13.3 / 23.02

Sheridan: Wells & South Yamhill River
Pressure Zone: 410'
Water Rights: .54 + 5.1 undevelopable creek rights
Storage: 5.8 / 5.8 MG
Plant current cap: 3.0 mgd

Willamina: Willamina Creek
Pressure Zone: 418', 500'
Water Rights: 1.82
Storage: 1.75 MG
Plant current / future cap: 1.0 / 1.0 mgd

Carlton: Surface / Fall & Panther Creek
Pressure Zone: 390'
Water Rights: 3.6, mgd not all developable
Storage: 1.39/1.39
Plant current cap: .7 mgd

Yamhill: Turner Creek
Pressure Zone: 379.81'
Water Rights: 1.28 mgd
Storage: 5/15 MG
Plant current cap: .65 mgd

Newberg: Wells & Springs
Pressure Zone: 402'
Water Rights: 14.63 mgd
Storage: 74/1.7 MG
Plant current cap: 7.5 mgd

McGuire Reservoir
City of McMinnville

Haskins Reservoir
City of McMinnville

Panther Creek
City of Carlton

Dundee: Groundwater / wells
Pressure Zone: 688.7, 582.3, & 429.0
Water Rights: 1.3+2.59 mgd junior Willamette
Storage: .74/1.0 MG
no plant

Dayton: Groundwater / wellfield
Pressure Zone: 388.5'
Water Rights: 1.4 mgd, includes non-producing wells
Storage: .98 / 1.25 MG
no plant

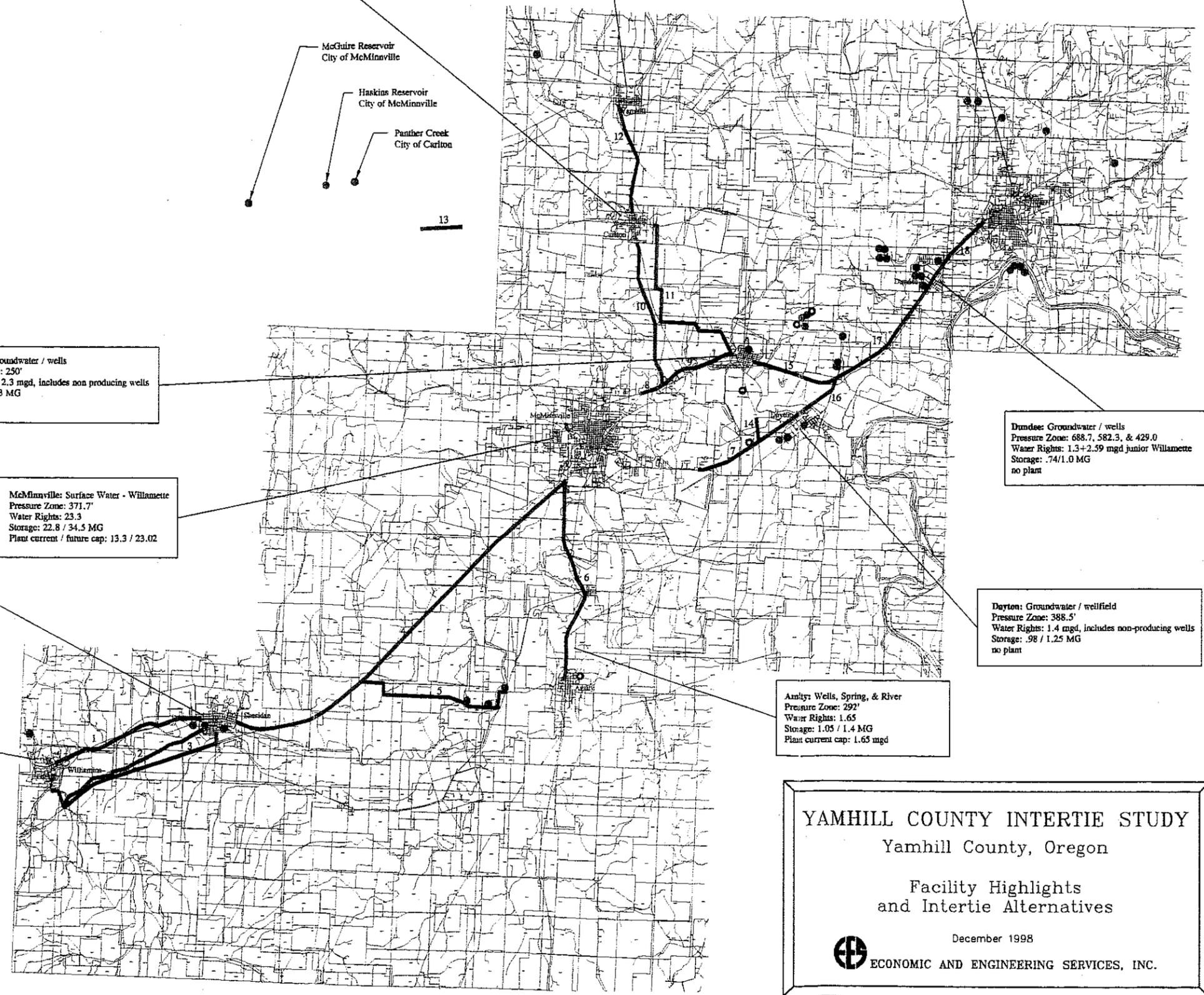
Amity: Wells, Spring, & River
Pressure Zone: 292'
Water Rights: 1.65
Storage: 1.05 / 1.4 MG
Plant current cap: 1.65 mgd

YAMHILL COUNTY INTERTIE STUDY
Yamhill County, Oregon

Facility Highlights
and Intertie Alternatives

December 1998

ECONOMIC AND ENGINEERING SERVICES, INC.



Appendix E

Cost Estimate Sheets and Assumptions

**Appendix E
Cost Estimate**

Alternative	Additional Peak Rate ¹⁾ / Volume Needed ²⁾	Raw Water Diversion and Transmission Components	Treatment and Finished Water Transmission Components
McMinnville Water and Light Reservoir Alternatives			
MWL-1: Regional	<ul style="list-style-type: none"> 12-39 mgd (18-60 cfs) 3,200-10,700 ac-ft 	<i>Dam/Reservoir:</i> 4,500 ac-ft (new for Walker Res.); includes McGuire raise <i>Diversion Intake:</i> New for Walker Reservoir; may need to upgrade capacity of Idlewood Diversion <i>Raw water pipeline to WTP:</i> Add 48-inch pipeline for additional 40 mgd capacity (1,000 ft)	<i>WTP:</i> Expand existing WTP to 53 mgd (increase of 40 mgd from existing) <i>Transmission Lines:</i> <ul style="list-style-type: none"> WTP to McMinnville: Add 9.8 miles @ 48-inch (40 mgd) To Sheridan-Willamina To Amity To Yamhill-Carlton To Dayton-Lafayette To Dundee-Newberg
MWL-2: McMinnville-Yamhill-Carlton (Walker Creek Reservoir not constructed)	<ul style="list-style-type: none"> 5-28 mgd (8-43 cfs) 1,500-6,700 ac-ft 	<i>Dam/Reservoir:</i> McGuire Res. only <i>Diversion Intake:</i> Existing only – may need to upgrade capacity <i>Raw water pipeline to WTP:</i> Add 42-inch pipeline for additional 28 mgd capacity (1,000 ft)	<i>WTP:</i> Expand existing WTP to 41 mgd (increase of 28 mgd) <i>Transmission Lines:</i> <ul style="list-style-type: none"> WTP to McMinnville: Add 9.8 miles @ 48-inch (28 mgd) To Yamhill-Carlton
MWL-3: McMinnville-Yamhill-Carlton-Dayton-Lafayette (Walker Creek Reservoir not constructed)	<ul style="list-style-type: none"> 5-28 mgd (8-44 cfs) 1,500-7,800 ac-ft 	<i>Dam/Reservoir:</i> McGuire Res. only <i>Diversion Intake:</i> Existing only – may need to upgrade capacity <i>Raw water pipeline to WTP:</i> Add 42-inch pipeline for additional 28 mgd capacity (1,000 ft)	<i>WTP:</i> Expand existing WTP to 41 mgd (increase of 28 mgd) <i>Transmission Lines:</i> <ul style="list-style-type: none"> WTP to McMinnville: Add 9.8 miles @ 42-inch (28 mgd) To Yamhill-Carlton To Dayton-Lafayette
Willamette River Alternatives			
WIL-1: Regional (includes option to use COE Storage and/or natural stream flows)	<ul style="list-style-type: none"> 12-39 mgd (18-60 cfs) 3,200-10,700 ac-ft 	<i>Pump station/River intake:</i> 40 mgd (build-out) <i>WTP assumed at Dundee:</i> 200-300 feet of lift to WTP <i>Raw water pipeline to WTP:</i> 5,000 ft @ 48- inch (40 mgd)	<i>WTP:</i> 40 mgd (build-out) <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Sheridan-Willamina: 1, 4 To Amity: 6 To Yamhill-Carlton: 8, 10, 12 To Dayton-Lafayette: 7, 9 To Dundee-Newberg: 15, 16, 17, 18
WIL-2: Dundee-Newberg (includes option to use COE Storage and/or natural stream flows)	<ul style="list-style-type: none"> 2-8 mgd (3-13 cfs) 600-2,300 ac-ft 	<i>Pump station/River intake:</i> 8 mgd <i>Raw water pipeline to WTP:</i> 5,000 ft @ 24- inch (8 mgd)	<i>WTP:</i> 8mgd <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Newberg: 18
WIL-3: Dundee-Newberg-Dayton-Lafayette (includes option to use COE Storage and/or natural stream flows)	<ul style="list-style-type: none"> 5-14 mgd (7-22 cfs) 1,300-3,800 ac-ft 	<i>Pump station/River intake:</i> 14 mgd <i>Raw water pipeline to WTP:</i> 5,000 ft @ 30-inch (14 mgd)	<i>WTP:</i> 14 mgd <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Newberg: 18 To Dundee-Lafayette: 15, 16, 17
Upper Willamina Creek Reservoir Alternatives			
UWC-1: Regional	<ul style="list-style-type: none"> 12-39 mgd (18-60 cfs) 3,200-10,700 ac-ft 	<i>Dam/Reservoir:</i> 10,000 ac-ft <i>Pump station/Creek intake:</i> 7 mgd <i>Reservoir intake tower (to MWL):</i> 32 mgd <i>Raw water pipeline to WTP:</i> <ul style="list-style-type: none"> To Sheridan WTP: 44,000 ft @ 20-inch (7 mgd) To MWL WTP: 40,000 ft @ 48-inch (32 mgd) 	<i>WTP:</i> <ul style="list-style-type: none"> 7 mgd (at Dundee) + 32 mgd (expanded at MWL) <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Sheridan-Willamina: 1, 4 To Amity: 6 To Yamhill-Carlton: 8, 10, 12 To Dayton-Lafayette: 7, 9 To Dundee-Newberg: 15, 16, 17, 18
UWC-2: Sheridan-Willamina-Amity	<ul style="list-style-type: none"> 5-7 mgd (7-11 cfs) 1,200-2,100 ac-ft 	<i>Dam/Reservoir:</i> 2,000 ac-ft <i>Pump station/Creek intake:</i> 7 mgd <i>Raw water pipeline to WTP:</i> <ul style="list-style-type: none"> To Sheridan WTP: 44,000 ft @ 20-inch (7 mgd) 	<i>WTP:</i> 7 mgd <i>Transmission Lines:</i> <ul style="list-style-type: none"> To Willamina: 1 To Amity: 5

Transmission Details (Modified from Yamhill County Interline Study, EES, 1998):

To Sheridan-Willamina: (1) 21,800 ft @ 10-inch; (4) 60,200 ft @ 24-inch

To Amity: (6) 27,400 ft @ 10-inch

To Yamhill-Carlton: (8) 3,000 ft @ 24-inch; (10) 20,500 ft @ 8-inch; (12) 15,300 ft @ 8-inch

To Dayton-Lafayette: (7) 14,200 ft @ 24-inch; (9) 12,800 ft @ 24-inch

To Dundee-Newberg: (15) 13,800 ft @ 24-inch; (16) 9,800 ft @ 24-inch; (17) 22,400 ft @ 24-inch; (18) 8,800 ft @ 24-inch

**Appendix E
Cost Estimate**

MWL-1: Regional Alternative

Project Type	Description	Unit	\$/Unit	Qty.	Total	Total-Rounded	Notes
Source Development Costs							
Dam/ Reservoir Storage Increase	4,500 ac-ft for Walker Creek	Acre Feet	\$ 4,500.00	4500	\$20,250,000	\$20,250,000	Value comes from Upper Willamina Creek Reservoir Study, Table 8-5
Raw Water Pipeline	48-inch pipeline for additional 40 mgd Capacity	LF	\$208.16	1000	\$208,158	\$208,000	
Diversion Intake-existing only-capacity upgrade		MGD	\$ 10,000.00	40	\$400,000	\$400,000	Is capacity upgrade calculated at the same rate as new intake?
Treatment Costs							
Expand WTP to 53 mgd	Increase of 40 mgd to existing capacity	MGD	\$1.75	40,000,000	\$87,500,000.00	\$87,500,000	
Transmission Costs							
WTP to McMinville	51,750 ft @ 42" pipe	LF	\$179.49	51,750	\$9,288,582	\$9,289,000	
Pump Stations (1)		HP	\$1,700.00	500	\$850,000	\$850,000	
To Sheridan-Willamina	21,800 ft. @ 10"	LF	\$43.63	21,800	\$951,045	\$951,000	
	60,200 @ 24"	LF	\$89.74	60,200	\$5,402,634	\$5,403,000	
Pump Station (2)		HP	\$1,700.00	375	\$637,500	\$638,000	
To Amity	27,400 @ 10"	LF	\$43.63	27,400	\$1,195,350	\$1,195,000	
Pump Stations (1)		HP	\$1,700.00	35	\$59,500	\$60,000	
To Yamhill-Carlton	3,000 ft @ 24"	LF	\$89.74	3,000	\$269,234	\$269,000	
	20,500 ft @ 8"	LF	\$34.90	20,500	\$715,465	\$715,000	
	15,300 ft @ 8"	LF	\$34.90	15,300	\$533,981	\$534,000	
Pump Stations (3)		HP	\$1,700.00	75	\$127,500	\$128,000	
To Dayton-Lafayette	14,200 ft @ 24"	LF	\$89.74	14,200	\$1,274,376	\$1,274,000	
	12,800 ft @ 24"	LF	\$89.74	12,800	\$1,148,733	\$1,149,000	
Pump Stations (2)		HP	\$1,700.00	0	\$0	\$0	
To Dundee-Newberg	13,800 ft @ 24"	LF	\$89.74	13,800	\$1,238,478	\$1,238,000	
	9,800 ft @ 24"	LF	\$89.74	9,800	\$879,499	\$879,000	
	22,400 ft @ 24"	LF	\$89.74	22,400	\$2,010,282	\$2,010,000	
	8,800 ft @ 24"	LF	\$89.74	8,800	\$789,754	\$790,000	
Pump Stations (2)		HP	\$1,700.00	0	\$0	\$0	
Summary Costs					Total Costs	Total Costs-Rounded	
Source Development					\$20,858,158	\$20,858,000	
Treatment					\$87,500,000	\$87,500,000	
Transmission					\$27,371,913	\$27,372,000	
Mitigation/ Permitting Costs					\$61,078,532	\$61,079,000	
Contingency					\$33,932,518	\$33,933,000	
Total					\$230,741,121	\$230,741,000	

**Appendix E
Cost Estimate**

**MWL-2: McMinnville-
Yamhill-Carlton**

Project Type	Description	Unit	\$/Unit	Qty.	Total	Total-Rounded	Notes
Source Development Costs							
Raw Water Pipeline	42-inch pipeline for additional 28 mgd Capacity (1,000 ft)	Linear Foot	\$179.49	1000	\$179,490	\$179,000	
Treatment Costs							
Expand WTP to 41 mgd	Increase of 28 mgd from existing capacity	gallon	\$1.75	28000000	\$61,250,000	\$61,250,000	
Transmission Costs							
WTP to McMinnville	51,750 ft @ 42" pipe	Linear Foot	\$179.49	51750	\$9,288,582	\$9,289,000	
To Yamhill-Carlton	3,000 ft @ 24"	Linear Foot	\$89.74	3000	\$269,234	\$269,000	
	20,500 ft @ 8"	Linear Foot	\$34.90	20500	\$715,465	\$715,000	
	15,300 ft @ 8"	Linear Foot	\$34.90	15300	\$533,981	\$534,000	
Pump Stations (3)		HP	\$1,700.00	75	\$127,500	\$128,000	
Summary Costs					Total Costs	Total Costs-Rounded	
Source Development Costs					\$179,490	\$179,000	
Treatment Costs					\$61,250,000	\$61,250,000	
Transmission Costs					\$10,934,763	\$10,935,000	
Mitigation/ Permitting Costs					\$32,563,914	\$32,564,000	
Contingency					\$18,091,063	\$18,091,000	
Total					\$123,019,229	\$123,019,000	

**Appendix E
Cost Estimate**

**MWL-3: McMinnville-Yamhill-
Carlton-Dayton-Lafayette**

Project Type	Description	Unit	\$/Unit	Qty.	Total	Total-Rounded	Notes
Source Development Option							
Raw Water Pipeline	42-inch pipeline for additional 28 mgd Capacity (1,000 ft)	Acre Feet		\$179	1000	\$179,490	\$179,000
Treatment Costs							
			\$/Unit-Expanded				
Expand WTP to 41 mgd	Increase of 28 mgd to existing capacity	gallon		\$1.75	28000000	\$61,250,000.00	\$61,250,000
Transmission Costs							
WTP to McMinnville	51,750 ft @ 42" pipe	Linear Foot		\$179.49	51750	\$9,288,582.07	\$9,289,000
Pump Stations (1)		HP		\$1,700.00	500	\$850,000	\$850,000
To Yamhill-Carlton	3,000 ft @ 24"	Linear Foot		\$89.74	3000	\$269,234.26	\$269,000
	20,500 ft @ 8"	Linear Foot		\$34.90	20500	\$715,465.12	\$715,000
	15,300 ft @ 8"	Linear Foot		\$34.90	15300	\$533,981.29	\$534,000
Pump Stations (3)		HP		\$1,700.00	75	\$127,500	\$128,000
To Dayton-Lafayette	14,200 ft @ 24"	Linear Foot		\$89.74	14200	\$1,274,375.51	\$1,274,000
	12,800 ft @ 24"	Linear Foot		\$89.74	12800	\$1,148,732.85	\$1,149,000
Pump Stations (2)		HP		\$1,700.00	0	\$0	\$0
Summary Costs					Total Costs		Total Costs-Rounded
Source Development Costs					\$179,490		\$179,000
Treatment Costs					\$61,250,000.00		\$61,250,000
Transmission Costs					\$14,207,871.11		\$14,208,000
Mitigation/ Permitting Costs					\$34,036,812.28		\$34,037,000
Contingency					\$27,418,543.22		\$27,419,000
Total					\$137,092,716		\$137,093,000

**Appendix E
Cost Estimate**

WIL-1: Regional

Project Type	Description	Unit	\$/Unit	Qty.	Total	Total-Rounded	Notes
<i>Source Development Costs</i>							
WTP at Dundee-Pump Station/ River Intake: 40 MGD	40 mgd	MGD	\$ 10,000.00	40	\$400,000	\$400,000	
Intake Pump Station	200-300 ft of lift to the WTP (2500 HP)	HP	\$1,700.00	2500	\$4,250,000	\$4,250,000	
Raw water pipeline to WTP	5,000' @ 48"	Linear Foot	208.1579718	5000	\$1,040,790	\$1,041,000	
<i>Treatment</i>							
Expand WTP to 53 mgd	40 mgd from existing capacity	gallon	\$3.75	40000000	\$187,500,000	\$187,500,000	
<i>Transmission Costs</i>							
To Sheridan-Willamina	21,800 ft. @ 10"	Linear Foot	\$43.63	21800	\$951,045	\$951,000	
	60,200 @ 24"	Linear Foot	\$89.74	60200	\$5,402,634	\$5,403,000	
Pump Station (2)		HP	\$1,700.00	250	\$425,000	\$425,000	
To Amity	27,400 @ 10"	Linear Foot	\$43.63	27400	\$1,195,350	\$1,195,000	
Pump Stations (1)		HP	\$1,700.00	35	\$59,500	\$60,000	
To Yamhill-Carlton	3,000 ft @ 24"	Linear Foot	\$89.74	3000	\$269,234	\$269,000	
	20,500 ft @ 8"	Linear Foot	\$34.90	20500	\$715,465	\$715,000	
	15,300 ft @ 8"	Linear Foot	\$34.90	15300	\$533,981	\$534,000	
Pump Stations (3)		HP	\$1,700.00	75	\$127,500	\$128,000	
To Dayton-Lafayette	14,200 ft @ 24"	Linear Foot	\$89.74	14200	\$1,274,376	\$1,274,000	
	12,800 ft @ 24"	Linear Foot	\$89.74	12800	\$1,148,733	\$1,149,000	
Pump Stations (2)		HP	\$1,700.00	0	\$0	\$0	
To Dundee-Newberg	13,800 ft @ 24"	Linear Foot	\$89.74	13800	\$1,238,478	\$1,238,000	
	9,800 ft @ 24"	Linear Foot	\$89.74	9800	\$879,499	\$879,000	
	22,400 ft @ 24"	Linear Foot	\$89.74	22400	\$2,010,282	\$2,010,000	
	8,800 ft @ 24"	Linear Foot	\$89.74	8800	\$789,754	\$790,000	
Pump Stations (4)		HP	\$1,700.00	0	\$0	\$0	
COE Uncontracted Water	Purchase storage	ac-ft	\$ 1,800.00	10700	\$19,260,000	\$19,260,000	
Summary Costs					Total Costs	Total Costs-Rounded	
Source Development Costs					\$1,040,790	\$1,041,000	
Treatment Costs					\$187,500,000	\$187,500,000	
Transmission Costs					\$17,020,831	\$17,021,000	
COE Water					\$19,260,000	\$19,260,000	
Mitigation/ Permitting Costs					\$92,502,729	\$92,503,000	
Contingency					\$51,390,405	\$51,390,000	
Total					\$349,454,756	\$349,455,000	

**Appendix E
Cost Estimate**

WIL-2: Dundee-Newberg

Project Type	Description	Unit	\$/Unit	Qty.	Total		Notes
<i>Source Development Costs</i>							
Pump Station Intake	8 mgd	MGD	\$ 10,000.00	8	\$80,000	\$80,000	
Intake Pump Station	200-300 ft of lift to the WTP; 500 HP	HP	\$1,700.00	500	\$850,000	\$850,000	
Raw water pipeline to WTP	5,000' @ 24"	Linear Foot	89.74475429	5000	\$448,724	\$449,000	
<i>Treatment Costs</i>							
WTP	8 MGD	gallon	\$3.75	8000000	\$37,500,000	\$37,500,000	
<i>Transmission Costs</i>							
To Newberg	8,800 ft @ 24"	Linear Foot	\$89.74	8800	\$789,754	\$790,000	
Pump Stations (1)		HP	\$1,700.00	0	\$0	\$0	
<i>COE Uncontracted Water</i>							
	Purchase storage	ac-ft	\$ 1,800.00	2300	\$4,140,000	\$4,140,000	
Summary Costs					Total Costs	Total Costs- Rounded	
Source Development Costs					\$1,378,724	\$1,379,000	
Treatment Costs					\$37,500,000	\$37,500,000	
Transmission Costs					\$789,754	\$790,000	
COE Water					\$4,140,000	\$4,140,000	
Mitigation/ Permitting Costs					\$17,850,815	\$17,851,000	
Contingency					\$9,917,119	\$9,917,000	
Total					\$67,436,412	\$67,436,000	

**Appendix E
Cost Estimate**

**WIL-3: Dundee-Newberg-
Dayton-Lafayette**

Project Type	Description	Unit	\$/Unit	Qty.	Total	Total-Rounded	Notes
Source Development Costs							
Pump Station/ River Intake: 14 MGD	14 mgd	MGD	\$ 10,000.00	14	\$140,000	\$140,000	
Intake Pump Station	200-300 ft of lift to the WTP; 900 HP	HP	\$1,700.00	900	\$1,530,000	\$1,530,000	
Raw water pipeline to WTP	5,000' @ 30"	Linear Foot	113.4273978	5000	\$567,137	\$567,000	
Treatment Costs							
		Linear Foot	\$/Unit-New				
WTP	14 MGD	gallon	\$3.75	14000000	\$65,625,000	\$65,625,000	
Transmission Costs							
To Newberg	8,800 ft @ 24"		\$89.74	8800	\$789,754	\$790,000	
Pump Stations (1)		Ea.	\$1,700.00	0	\$0	\$0	
To Dundee-Newberg	13,800 ft @ 24"		\$89.74	13800	\$1,238,478	\$1,238,000	
	9,800 ft @ 24"		\$89.74	9800	\$879,499	\$879,000	
	22,400 ft @ 24"		\$89.74	22400	\$2,010,282	\$2,010,000	
Pump Stations (3)		Ea.	\$1,700.00	0	\$0	\$0	
COE Uncontracted Water	Purchase Storage	ac-ft	\$ 1,800.00	3800	\$6,840,000	\$6,840,000	
Summary Costs					Total Costs	Total Costs-Rounded	
Source Development Costs					\$2,237,137	\$2,237,000	
Treatment Costs					\$65,625,000	\$65,625,000	
Transmission Costs					\$4,918,013	\$4,918,000	
COE Water					\$6,840,000	\$6,840,000	
Mitigation/ Permitting Costs					\$32,751,067	\$32,751,000	
Contingency					\$18,195,037	\$18,195,000	
Total					\$123,726,254	\$123,726,000	

**Appendix E
Cost Estimate**

UWC-1: Regional

Project Type	Description	Unit	\$/Unit	Qty.	Total	total-Rounded	Notes
Source Development Costs							
Dam/ Reservoir	10,000 acre feet	af	\$ 4,500.00	10000	\$45,000,000	\$45,000,000	
Pump Station/ Creek Intake	7 MGD; 100 HP	HP	\$1,700.00	100	\$170,000	\$170,000	
Reservoir Intake Tower	32 MGD	MGD	\$ 10,000.00	32	\$320,000	\$320,000	
Raw water pipeline to Sheridan	44,000 ft. @ 20"	Linear Foot	\$ 76.03	44000	\$3,345,485	\$3,345,000	
Raw water pipeline to MWL WTP	40,000 ft @ 48"	Linear Foot	\$ 208.16	40000	\$8,326,319	\$8,326,000	
Treatment Costs							
		Linear Foot					
Sheridan WTP	7 MGD	gallon	\$1.25	7000000	\$10,937,500	\$10,938,000	
Expanded at MWL	32 MGD	gallon	\$1.75	32000000	\$70,000,000	\$70,000,000	
Transmission Costs							
To Sheridan-Willamina	21,800 ft. @ 10"	Linear Foot	\$43.63	21800	\$951,045	\$951,000	
	60,200 @ 24"	Linear Foot	\$89.74	60200	\$5,402,634	\$5,403,000	
Pump Station (2)		HP	\$1,700.00	375	\$637,500	\$638,000	
To Amity	27,400 @ 10"	Linear Foot	\$43.63	27400	\$1,195,350	\$1,195,000	
Pump Stations (1)		HP	\$1,700.00	35	\$59,500	\$60,000	
To Yamhill-Carlton	3,000 ft @ 24"	Linear Foot	\$89.74	3000	\$269,234	\$269,000	
	20,500 ft @ 8"	Linear Foot	\$34.90	20500	\$715,465	\$715,000	
	15,300 ft @ 8"	Linear Foot	\$34.90	15300	\$533,981	\$534,000	
Pump Stations (3)		HP	\$1,700.00	75	\$127,500	\$128,000	
To Dayton-Lafayette	14,200 ft @ 24"	Linear Foot	\$89.74	14200	\$1,274,376	\$1,274,000	
	12,800 ft @ 24"	Linear Foot	\$89.74	12800	\$1,148,733	\$1,149,000	
Pump Stations (2)		HP	\$1,700.00	0	\$0	\$0	
To Dundee-Newberg	13,800 ft @ 24"	Linear Foot	\$89.74	13800	\$1,238,478	\$1,238,000	
	9,800 ft @ 24"	Linear Foot	\$89.74	9800	\$879,499	\$879,000	
	22,400 ft @ 24"	Linear Foot	\$89.74	22400	\$2,010,282	\$2,010,000	
	8,800 ft @ 24"	Linear Foot	\$89.74	8800	\$789,754	\$790,000	
Pump Stations (4)		HP	\$1,700.00	0	\$0	\$0	
Summary Costs					Total Costs	Total Costs-Rounded	
Source Development Costs					\$57,161,804	\$57,162,000	
Treatment Costs					\$80,937,500	\$80,938,000	
Transmission Costs					\$17,233,331	\$17,233,000	
Mitigation/ Permitting Costs					\$69,899,686	\$69,900,000	
Contingency					\$38,833,159	\$38,833,000	
Total					\$264,065,480	\$264,065,000	

**Appendix E
Cost Estimate**

UWC-2: Sheridan-Willamina-Amity

Project Type	Description	Unit	\$/Unit	Qty.	Total	Total-Rounded	Notes
<i>Source Development Costs</i>							
Dam/ Reservoir	2,000 acre feet	af	\$ 4,500.00	2000	\$9,000,000	\$9,000,000	
Creek Intake	7 MGD	MGD	\$ 10,000.00	7	\$70,000	\$70,000	
Pump Station	7 MGD; 100 HP	HP	\$ 1,700.00	100	\$170,000	\$170,000	
Raw water pipeline to Sheridan	44,000 ft. @ 20"	Linear Foot	\$ 76.03	44000	\$3,345,485	\$3,345,000	
<i>Treatment Costs</i>							
Sheridan WTP	7 MGD	gallon	\$1.25	7000000	\$10,937,500	\$10,938,000	
<i>Transmission Costs</i>							
To Willamina	21,800 ft. @ 10"	Linear Foot	\$43.63	21800	\$951,045	\$951,000	
Pump Stations (1)		HP	\$1,700.00	375	\$637,500	\$638,000	
To Amity	27,400 @ 10"	Linear Foot	\$43.63	27400	\$1,195,350	\$1,195,000	
Pump Stations (1)		HP	\$1,700.00	35	\$59,500	\$60,000	
Summary Costs					Total Costs	Total Costs-Rounded	
Source Development Costs					\$12,585,485	\$12,585,000	
Treatment Costs					\$10,937,500	\$10,938,000	
Transmission Costs					\$2,843,395	\$2,843,000	
Mitigation/ Permitting Costs					\$11,864,871	\$11,865,000	
Contingency					\$6,591,595	\$6,592,000	
Total					\$44,822,847	\$44,823,000	

**Appendix E
Cost Estimate**

GRC-1: Regional

Project Type	Description	Unit	\$/Unit	Qty.	Total	total-Rounded	Notes
Source Development Costs							
Dam/ Reservoir	10,000 acre feet	af	\$ 4,500.00	10000	\$45,000,000	\$45,000,000	
Diversion Intake	40 mgd	MGD	\$ 10,000.00	40	\$400,000	\$400,000	
Raw water pipeline to MWL WTP	5000 ft @ 48"	Linear Foot	\$ 208.16	5000	\$1,040,790	\$1,041,000	
Treatment Costs							
		Linear Foot					
MWL WTP	40 MGD	gallon	\$1.25	40000000	\$62,500,000	\$62,500,000	
Transmission Costs							
To Sheridan-Willamina	21,800 ft. @ 10"	Linear Foot	\$43.63	21800	\$951,045	\$951,000	
	60,200 @ 24"	Linear Foot	\$89.74	60200	\$5,402,634	\$5,403,000	
Pump Station (2)		HP	\$1,700.00	375	\$637,500	\$638,000	
To Amity	27,400 @ 10"	Linear Foot	\$43.63	27400	\$1,195,350	\$1,195,000	
Pump Stations (1)		HP	\$1,700.00	35	\$59,500	\$60,000	
To Yamhill-Carlton	3,000 ft @ 24"	Linear Foot	\$89.74	3000	\$269,234	\$269,000	
	20,500 ft @ 8"	Linear Foot	\$34.90	20500	\$715,465	\$715,000	
	15,300 ft @ 8"	Linear Foot	\$34.90	15300	\$533,981	\$534,000	
Pump Stations (3)		HP	\$1,700.00	75	\$127,500	\$128,000	
To Dayton-Lafayette	14,200 ft @ 24"	Linear Foot	\$89.74	14200	\$1,274,376	\$1,274,000	
	12,800 ft @ 24"	Linear Foot	\$89.74	12800	\$1,148,733	\$1,149,000	
Pump Stations (2)		HP	\$1,700.00	0	\$0	\$0	
To Dundee-Newberg	13,800 ft @ 24"	Linear Foot	\$89.74	13800	\$1,238,478	\$1,238,000	
	9,800 ft @ 24"	Linear Foot	\$89.74	9800	\$879,499	\$879,000	
	22,400 ft @ 24"	Linear Foot	\$89.74	22400	\$2,010,282	\$2,010,000	
	8,800 ft @ 24"	Linear Foot	\$89.74	8800	\$789,754	\$790,000	
Pump Stations (4)		HP	\$1,700.00	0	\$0	\$0	
Summary Costs					Total Costs	Total Costs-Rounded	
Source Development Costs					\$46,440,790	\$46,441,000	
Treatment Costs					\$62,500,000	\$62,500,000	
Transmission Costs					\$17,233,331	\$17,233,000	
Mitigation/ Permitting Costs					\$56,778,354	\$56,778,000	
Contingency					\$31,543,530	\$31,544,000	
Total					\$214,496,006	\$214,496,000	

**Appendix E
Cost Estimate**

GRC-2: Sheridan-Willamina-Amity

Project Type	Description	Unit	\$/Unit	Qty.	Total	Total-Rounded	Notes
Source Development Costs							
Dam/ Reservoir	2,000 acre feet	af	\$ 4,500.00	2000	\$9,000,000	\$9,000,000	
Creek Intake	7 MGD	MGD	\$ 10,000.00	7	\$70,000	\$70,000	
Raw water pipeline to Sheridan	10,000 ft. @ 20"	Linear Foot	\$ 76.03	10000	\$760,338	\$760,000	
Treatment Costs							
Sheridan WTP	7 MGD	gallon	\$1.25	7000000	\$10,937,500	\$10,938,000	
Transmission Costs							
To Willamina	21,800 ft. @ 10"	Linear Foot	\$43.63	21800	\$951,045	\$951,000	
Pump Stations (1)		HP	\$1,700.00	375	\$637,500	\$638,000	
To Amity	27,400 @ 10"	Linear Foot	\$43.63	27400	\$1,195,350	\$1,195,000	
Pump Stations (1)		HP	\$1,700.00	35	\$59,500	\$60,000	
Summary Costs					Total Costs	Total Costs-Rounded	
Source Development Costs					\$9,830,338	\$9,830,000	
Treatment Costs					\$10,937,500	\$10,938,000	
Transmission Costs					\$2,843,395	\$2,843,000	
Mitigation/ Permitting Costs					\$10,625,055	\$10,625,000	
Contingency					\$5,902,808	\$5,903,000	
Total					\$40,139,096	\$40,139,000	