Report for

## Polk County Water Providers

# Regional Water Needs Assessment
# Final Report

June 2004

June 7, 2004

Mr. Gene Clemens, Director
Polk County Community Development
850 Main Street
Dalles, OR 97338

**RE: Polk County Water Providers Regional Water Needs Assessment**

Dear Gene:

Enclosed please find twenty (20) copies Economic and Engineering Services, Inc.'s (EES's) final report on the regional water needs assessment study recently completed for the Polk County water providers Technical Advisory Committee.

We certainly appreciate the assistance you and the participant's have provided in the execution of this work. This report represents the conclusion to our initial phase of work and should provide a useful framework in moving forward in developing a long-range water supply plan for the participating agencies. We look forward to continuing to work with you and the group in this important project.

Very truly yours,

ECONOMIC AND ENGINEERING SERVICES, INC.

Wade E. Hathhorn
President

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# Polk County Water Needs Reference Material

Assessment of the Water Resources of the Grand Ronde Area, Oregon – US Geological Survey
Water-Resources Investigations Report 97-4040

City of Dallas – Regional Water Supply Project, Phase 1 & 2

Data Request – Polk County Water Needs Analysis Project

Geology of the Dallas and Valsetz Quadrangles, Oregon

Groundwater Resources of the Dallas-Monmouth Area, Polk, Benton and Marion counties, Oregon

Polk County Water Needs Analysis

Summary of Findings and Recommendations
Water Resources Planning
Lincoln, Polk, and Yamhill Counties
December 1992

Tanglewood Water Project Feasibility Study

5-Year GRTHA Indian Housing Plan 2003 to 2007

City of Monmouth Water System Master Plan Technical Data & Appendix

October 2001 – September 2002 Oregon Water Resources Department
Annual Water Use, Monthly Quantities Form

Domestic Water Production Table

City of Monmouth Water System Master Plan 2000

# Section 1

# Introduction

## 1.1 Introduction

In year 2000, the census for Polk County totaled 62,380, with more than 70% of that total being located in four main population centers – the Cities of Dallas, Monmouth, and Independence and the western portion of the City of Salem. The remaining population is largely dispersed within the unincorporated areas of the County.

Like many areas in Oregon, Polk County is anticipating growth over the next 50 years. A recent consulting study indicates that the three Cities of Dallas, Monmouth, and Independence will add approximately 15,500 persons by year 2020 and another 36,000 persons by year 2050. Paralleling the increase in population is a growth in demand for water. Unfortunately, the area simply does not have enough water at this time to meet the 50-year anticipated demand. In particular, the City of Dallas is expected to experience deficit conditions during peak day demands as early as year 2006, depending on whether or not the local plywood mill (or equivalent) reopens. Even if no large industrial customer were to return, the City would experience potential summertime water supply shortages by year 2017 without adding treatment capacity and treated water storage. Similarly, in the Cities of Independence and Monmouth, peak day demands may exceed supplies by as early as year 2013 and 2026, respectively.

Accordingly, the County is in need of water. Residents of the County are presently served by both surface and ground water supplies, the latter representing the larger of the two sources in terms of the number of agencies who rely on that source for their water. In fact, only four of the water systems within the County rely on surface water. Ground water, however, is not readily abundant throughout the County. The principal aquifers are those located near the Willamette River which are relatively shallow and potentially impacted by land based activities such as agriculture, domestic septic systems and other sources of contamination. Away from the river, the availability of groundwater diminishes, forcing service to rely on cooperative water agreements among various supply companies and agencies.

In response, the County has formed a Technical Advisory Committee (TAC) comprised of representatives from thirteen (13) water providers in the area, including:

City of Dallas
City of Monmouth
City of Independence
City of Adair Village
City of Willamina
City of Falls City
Perrydale Water Association
Grand Ronde Community Water Association
Rickreall Community Water Association
Tanglewood Water Cooperative
Luckiamute Domestic Water Cooperative
Rock Creek Water District
Buell Red Prairie Water District

A summary of the basic descriptions for each of the study participants is provided in Appendix A.

The TAC has, in turn, been charged with the task of identifying the future needs for water within the County and studying various options for developing a long-range source of domestic and municipal supply.

One of the more interesting potential sources is that associated with City of Adair Village. Dating back to a time when Adair Village was a vibrant military installation, the City acquired substantial water rights (82 cfs) on the Willamette River. The City has since radically diminished in population yet holds several important municipal water right permits on the Willamette River. In addition, the County has identified several other potential sources of water including:

- Surface water storage along Mill Creek
- Surface water storage along Sunshine and Rock Creeks
- Surface water storage along Rickreall Creek
- Surface water storage in the Valsetz area
- Expansion of ground water withdrawals from the Setniker wellfield
- Broadened resource sharing among study participants

## 1.2 Study Objectives

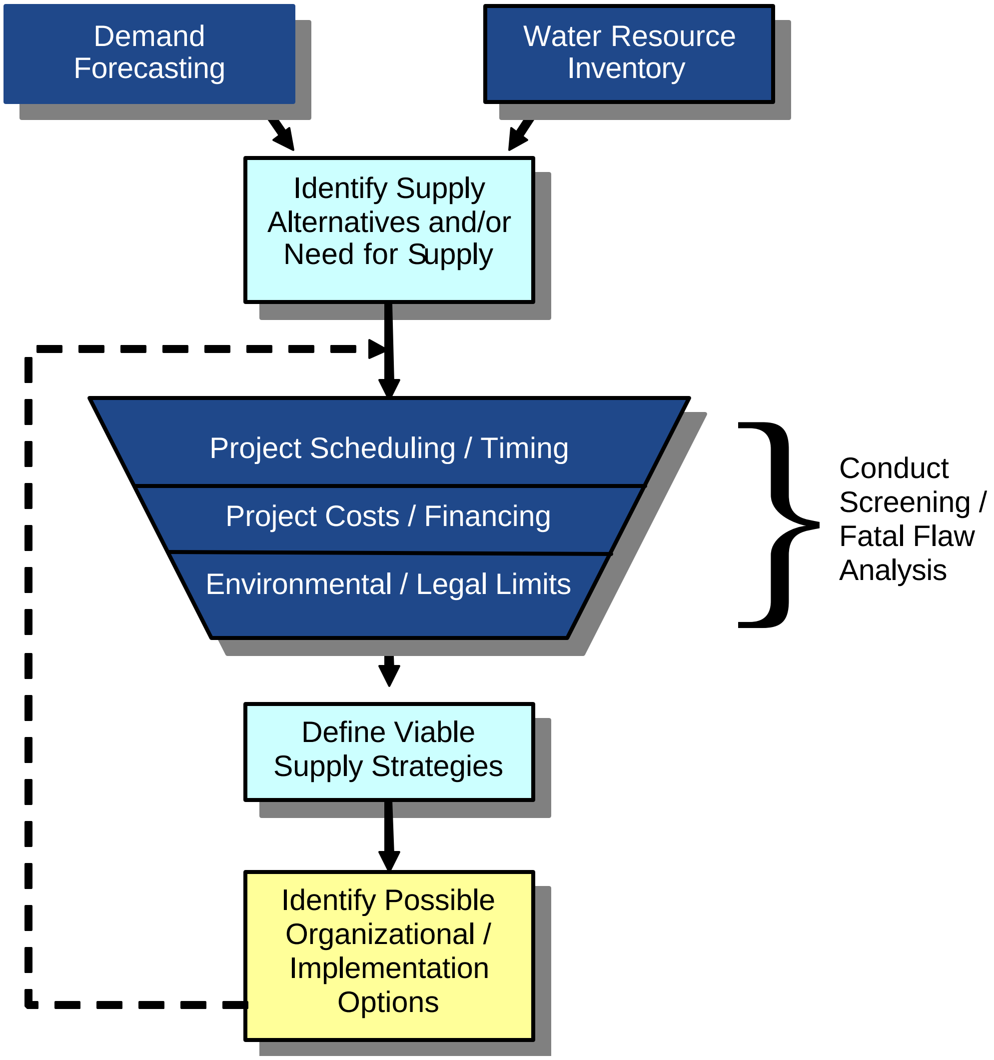
The objectives of this work are to examine the County's need for water and identify a safe and reliable long-term source of water for the study participants. This work is intended to conduct a "fatal flaws" analysis of the various potential sources in recommending possibly two or three options that merit further investigation. These analyses will examine the potential costs, environmental impacts, permitting limitations, capacities, reliability, water quality, risks from natural or manmade hazards, and location (i.e. proximity to location of need) in developing a set of recommended supply alternatives.

## 1.3 General Approach

The basic study approach is fashioned after commonly used tools to "screen" various supply alternatives and prioritize options for meeting a predicted long-term demand. The approach begins with a review of the technical details of each source, such a capacity, water quality, reliability, water right availability (or seniority), risk from natural or manmade hazards, environmental impact and public acceptance. At the same time, a demand forecast for the TAC members are created that identifies average and peak day demand, as well as seasonal changes.

This information is then brought together to develop a range of possible supply options that will satisfy the predicted demand. These alternatives are then tested against defined criteria in an "organized screening" against such factors as cost, reliability, feasibility, environmental and social impact, and availability both in terms of capacity and timing. The outcome is a limited set of viable alternatives for which further assessment may be prioritized.

The search concludes with a review of possible implications with regards to intergovernmental sharing of resources and the administrative structure(s) that would allow for the effective implementation of the prioritized strategies. Recommendations are then made as to which alternatives are most viable from a technical, economic, and political viewpoint. The overall process of investigation is outlined in the flowchart below:



**Approach to Develop Long-Range Water Supply Alternatives for Polk County**

# Section 2

# Regional Demand for Water

## 2.1 Introduction

The first step in the study process is to document the approved population (growth) estimates for each of the study participants, then produce a future water demand forecast based on historical per capita water consumption rates. The resulting demand forecast is intended to produce estimates for both average day (ADD) and peak day (MDD) demands through year 2040. In addition, a range of outcomes is developed to reflect the uncertainty embedded in long-range forecasting of this kind, resulting in estimates highlighted in terms of high, medium and low forecasted outcomes. This section is intended to document the methods and results of that forecast and examine potential implications on regional demands.

## 2.2 Regional Population Projections

The desired estimate of demand is founded in two main elements – a projection of area population and an estimate of per capita use. The two elements are then multiplied together in producing a forecast of water demand.

The central feature of the demand forecast, however, resides in the population estimates for the area. The principal study area is that of the entire County, with the inclusion of the City of Adair Village. Here, population projections were provided from the Polk County Planning Department staff based on numbers taken from:

1. The "Regional Water Supply Project, Phase 1 and 2, Summary Report (dated February 6, 2003)" for the cities of Dallas, Monmouth, and Independence;

2. Various master planning documents for the study participants; and

3. An assumed growth rate for the unincorporated portion of the County.

A summary of those findings is outlined in Table 2-1.

**Table 2-1**
**Polk County**
**Population Forecast**

| | 2000 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|---|
| City/Water Association/Water District/Water Authority | | | | | | |
| Dallas[1] | 12,278 | 19,207 | 21,414 | 23,876 | 26,621 | 29,681 |
| Monmouth[1] | 8,146 | 12,837 | 14,360 | 16,089 | 18,026 | 20,197 |
| Independence[1] | 6,035 | 9,480 | 10,570 | 11,785 | 13,140 | 14,650 |
| Falls City[2] | 990 | 1,316 | 1,422 | 1,536 | 1,659 | 1,793 |
| Willimina[2] | 602 | 894 | 987 | 1,090 | 1,204 | 1,329 |
| Unincorporated Area Purveyors | | | | | | |
| Buell Red Prairie[7] | *530* | *609* | *622* | *634* | *647* | *660* |
| Rock Creek[6] | *370* | *450* | *450* | *450* | *450* | *450* |
| Luckiamute Water Co-op[3] | *2,310* | *2,656* | *2,709* | *2,764* | *2,820* | *2,877* |
| Grande Ronde Community Water Assoc. (minus Willimina)[9] | *2,000* | *2,299* | *2,381* | *2,466* | *2,553* | *2,644* |
| Rickreall Water Association[8] | *1,190* | *1,368* | *1,396* | *1,424* | *1,453* | *1,482* |
| Perrydale Water Association[10] | *1,625* | *4,170* | *4,170* | *4,170* | *4,170* | *4,170* |
| Tanglewood Area[11] | *180* | *220* | *231* | *243* | *255* | *268* |
| Others | *7,773* | *6,598* | *6,781* | *6,968* | *7,157* | *7,347* |
| Total Unincorporated Population | 15,978 | 18,370 | 18,740 | 19,118 | 19,504 | 19,897 |
| **Total (minus West Salem)** | **44,029** | **62,104** | **67,493** | **73,494** | **80,154** | **87,547** |
| West Salem (UGB for all)[4] | 16,340 | 34,250 | 37,852 | 41,465 | 45,423 | 49,753 |
| **Total Polk County Population (MWVCOG)** | **60,369** | **96,354** | **105,345** | **114,959** | **125,577** | **137,300** |
| **Comparative Polk County Population Projections** | | | | | | |
| *Polk County OEA Forecast* | *62,700* | *81,752* | *87,153* | *92,529* | *97,803* | *103,120* |
| *Polk County PSU Study Forecast (High)* | *62,380* | *84,901* | *90,766* | *96,453* | *101,994* | *107,385* |
| *Polk County PSU Study Forecast (Medium)* | *62,380* | *80,649* | *85,266* | *89,695* | *93,969* | *98,091* |
| *Polk County PSU Study Forecast (Low)* | *62,380* | *76,611* | *80,100* | *83,411* | *86,576* | *89,601* |
| Population Projection Summary - (Study Participants Only) | | | | | | |
| Study Participants Outside Polk County (Adair Village) | 825 | 1,235 | 1,503 | 1,828 | 2,224 | 2,706 |
| Polk County Study Participants | 44,029 | 62,104 | 67,493 | 73,494 | 80,154 | 87,547 |
| **Total (Study Participants)** | **44,854** | **63,339** | **68,996** | **75,322** | **82,378** | **90,253** |

Notes:

1. From CH2MHill Regional Water Supply Project, Phase 1 & 2, Summary Report, Feb 6, 2003
2. Falls City forecast based on a 1.6% growth rate. Willimina forecast based on a 1.1% growth rate.
3. 2000 Population taken from 1994 water master plan. 0.7% Growth Rate 2000-2020. 0.4% Growth Rate 2020-2040.
4. 2000 and 2025 population from the SKATS RTSP 2002.
5. Adair Village 2000 population extrapolated from 2005 projection in water master plan. 2020 population as reported in water master plan. Population growth after 2020 assumed to be 1.04%.
6. Rock Creek projection from an additional 20 service connections. From an existing population of 370 and 94 connections there are approximately 4 people per connection, for a build-out population of 450.
7. 0.7% Growth Rate 2000-2020. 0.4% Growth Rate 2020-2040. The District had a service population of 530 in 1997. This number was used as the base year.
8. Base year was estimated from a 2002 estimate of 1,200 from the 2002 Water Master Plan. 0.7% Growth Rate 2000-2020. 0.4 % Growth Rate 2020-2040.
9. Assumes approximately 800 connections in year 2000 and a population/connection of 2.5 (800 x 2.5 = 2000). Growth rate is 0.7%
10. Perrydale's population estimated from 1992 addendum to Water Conservation Plan. The association reported a service area of 517 residences with a projected growth of 12 to 17 residences per year to a build-out of 150 additional connections to be reached by 2020.
11. Tangelwood service area assumes a total of 72 connections from Tanglewood Water Project Feasibility study. Population estimate calculated from an estimate of 2.5 persons per connection. Growth was assumed to be 1%.

In addition, a summary of the projected population growth for the entire Polk County area and Adair Village is shown in Exhibit 2-1 (at the end of this section). The results indicate the Cities of Dallas, Independence, and Monmouth serve approximately 70% of the total population, with the other participating rural water providers serving about 20% of the total. The remaining 10% is comprised of the Cities of Falls City, Willamina, and Adair Village - as well as any remaining population not served by one of the identified water providers (the latter listed as "others" in Table 2-1).

These growth projections are also adjusted to account for projected changes in land use and uncertainty in long-range estimates of growth. To accommodate this uncertainty, a range of +/- 10% is established around the projected medium population forecast, representing a potential high and low in the projected outcomes, respectively. The range of +/- 10% is often used by analyst to predict the uncertainty of this kind over a forecast period of 20 to 40 years. It is expected that the county's population growth will lie somewhere within this window as shown in Exhibit 2-2.

## 2.3 Summary of Present Water Use

The second major element of the demand forecast is that of estimated per capita consumption. Here, water consumption for the county was analyzed through two principal approaches. First, for the major incorporated areas such as the Cities of Dallas, Monmouth and Independence, each has recently completed a formal water master plan. Here, no analysis was required – the appropriate numbers for present and future water use were simply taken directly from those plans. Also within Polk County is the area known as West Salem – whose water is provided by the City of Salem. Accordingly, West Salem is not included in this study since they currently receive and plan to continue to receive service from the City of Salem

To develop a water demand forecast for the other incorporated portions of the county, a review of water use reporting for the Oregon Water Resources Department (OWRD) and master plans was conducted to develop reasonable water usage per capita estimates for the Cities of Falls City, Willamina, and Adair Village. Water usage for the City of Willamina was reviewed from a Regional Water Resources Study of the Willamina/Grand Ronde area (Balfour 1999). There was a lack of data documenting Falls City's historical and present water usage. Here, it was assumed that water usage in Falls City was similar to that in Willamina and the two were assigned the same water use factors based on the records available for Willamina. This assumption is presumed generally valid due to the similar size, proximity, and projected growth rate for the two cities.

Although not in Polk County, this report also includes the City of Adair Village. Adair Village's inclusion in this study is largely a result of their extensive amount of permitted water at a Willamette River point of diversion. Per capita water use estimates for the cities of Adair Village, Willamina, and Falls City are shown in Table 2-2.

## Table 2-2
## Polk County
## Water Use Factors for Adair Village, Falls City, and Willamina

| Water Provider | Average Day (gpcd) | Maximum Month (gpcd) | Peak Day (gpcd) |
|---|---|---|---|
| Adair Village[1] | 371 | 575 | 1,195 |
| Falls City[2] | 170 | 194 | 350 |
| Willamina[3] | 170 | 194 | 350 |

1. Adair Village per capita use estimates and peaking factors taken from 2001 Water Master Plan.
2. Falls City per capita use estimates assumed to be the same as the City of Willamina.
3. Willamina per capita use estimates taken from a Grand Ronde/Willamina Regional Water Resource Study prepared for the Mid-Willamette Valley Council of Governments, 1998.

For the unincorporated areas, data was again collected from OWRD water use reports and master plans (as available). From these numbers and an estimate of the total population served by each supplier, an average water use factor per capita was calculated for average day and maximum monthly demands. Also, an estimate of peak day use was estimated either from reported data in master plans or by using a common regional average of about 2 to 3 times average daily use. Table 2-3 provides a summary of these factors used for the county's unincorporated areas (reported in gallons per capita day or gpcd).

## Table 2-3
## Polk County
## Water Use Factors for Unincorporated Portions of Polk County

| Water Provider | Average Day (gpcd) | Maximum Month (gpcd) | Peak Day (gpcd) |
|---|---|---|---|
| Tanglewood | 150 | 225 | 480 |
| Perrydale[1] | 66 | 115 | 212 |
| Buell Red Prairie[2] | 128 | 166 | 319 |
| Rickreall[3] | 125 | 163 | 325 |
| Grand Ronde[4] | 147 | 206 | 412 |
| Luckiamute[5] | 125 | 188 | 281 |
| Rock Creek[6] | 141 | 212 | 296 |
| **Average** | **126** | **181** | **332** |

1. Perrydale use factor assumes a population of 1,625 and incorporates an annual water usage of 0.11 mgd (Year 2000)
2. Buell Red Prairie assumes a population of 530 and incorporates an annual water usage of 0.067 mgd (Year 2000). 1997 WMCP shows a peak day factor of 2.5.
3. Rickreall water use factor of 108 gpcd taken from draft water master plan, 2002.
4. Grand Ronde water use factor of 147gpcd was taken from a Grand Ronde/Willamina Regional Water Resource Study prepared for the Mid-Willamette Valley Council of Governments, 1998.
5. Luckiamute water use factors taken from 1994 water master plan.
6. Rock Creek water use factors taken from 2003 WMCP.

## 2.4 Water Demand Projections

The Cities of Dallas, Monmouth, and Independence recently completed water demand projections for their communities in a combined report titled, “Regional Water Supply Project” conducted by CH2M-Hill in 2003. Data regarding present and future water use for those cities were taken directly from this report without modification.

For the other principal cities, Falls City, Willamina, and Adair Village, demand estimates were produced from the product of population projection and per capita use factors, with a similar approach being taken to fill out the estimates for the unincorporated portions of the County. These water demand projections were then combined to generate a total water demand for all study participants. Table 2-4 provides a summary of average daily demands in millions of gallons per day (mgd) for each water provider.

**Table 2-4**
**Polk County**
**Average Daily Demand Projections (mgd)**

| | Year | | | | | |
|---|---|---|---|---|---|---|
| **Water Provider** | **2000** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Dallas, City of | 2.61 | 4.03 | 4.32 | 4.61 | 4.88 | 5.15 |
| Independence, City of | 0.78 | 1.12 | 1.22 | 1.32 | 1.42 | 1.52 |
| Monmouth, City of | 0.92 | 1.67 | 1.91 | 2.19 | 2.51 | 2.88 |
| Falls City | 0.17 | 0.22 | 0.24 | 0.26 | 0.28 | 0.30 |
| Willamina | 0.10 | 0.15 | 0.17 | 0.19 | 0.20 | 0.23 |
| Buell Red Prairie | 0.07 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Rickreall | 0.15 | 0.17 | 0.17 | 0.18 | 0.18 | 0.19 |
| Grande Ronde | 0.29 | 0.34 | 0.35 | 0.36 | 0.38 | 0.39 |
| Luckiamute | 0.29 | 0.33 | 0.34 | 0.35 | 0.35 | 0.36 |
| Perrydale | 0.11 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 |
| Rock Creek | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| Tanglewood | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Others | 1.05 | 0.89 | 0.92 | 0.94 | 0.97 | 0.99 |
| Adair Village | 0.31 | 0.46 | 0.56 | 0.68 | 0.83 | 1.00 |
| **Totals** | **6.92** | **9.82** | **10.64** | **11.52** | **12.45** | **13.46** |

The largest water provider is the City of Dallas with a 2040 projected average daily demand (ADD) of 5.15 mgd. The total average daily demand (ADD) for all study participants is about 13.3 mgd in year 2040.

Estimates were also produced for maximum month demands (MMD) and peak day demands (PDD) using the factors shown in Tables 2-2 and 2-3, as well as the master plans noted for the major cities. A summary of the total future demands for the County, including the City of Adair Village, is shown in Table 2-5.

**Table 2-5**
**Polk County**
**Regional Water Demand Projections (mgd)**

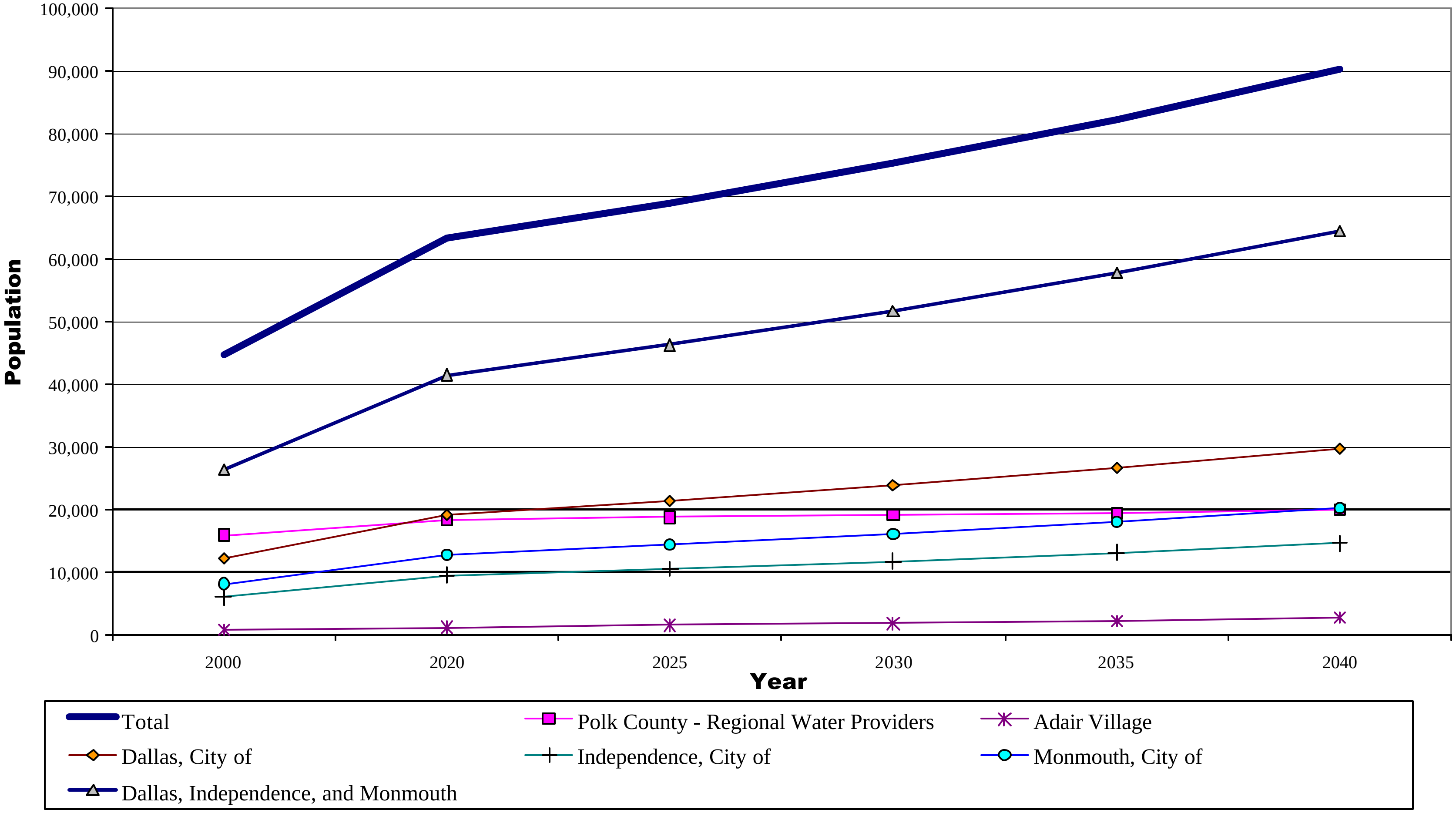
| Year | ADD | MMD | PDD |
|---|---|---|---|
| 2000 | 6.92 | 10.17 | 16.41 |
| 2020 | 9.82 | 14.20 | 25.93 |
| 2025 | 10.65 | 15.35 | 28.08 |
| 2030 | 11.52 | 16.56 | 30.38 |
| 2035 | 12.45 | 17.87 | 32.89 |
| 2040 | 13.46 | 19.30 | 35.62 |

To account for varying growth rates, changes in land use, and changes in water use efficiency the demand projections were adjusted to develop a low, moderate, and high estimate of increased need for water. The low and high estimates were calculated by adjusting the population growth assumptions 10% either upwards or downwards throughout the entire county. Exhibit 2-3 visually shows this “window” of projected water demand out to 2040 for peak day demand.

## 2.5 Distribution of Regional Demand

When evaluating viable options for meeting future water needs, the distribution of the demand across the region will have a large impact on selection of a water supply option. As a result, the demand of each of the entities was mapped to provide a visual representation of how this demand varies across the county. Exhibit 2-4 shows that over 75% of the region’s demand centers around the Cities of Dallas, Monmouth, and Independence. This fact will play an important role in the decision as to the location of any future supply development and the cost associated with the delivery of water for the study participants. Certainly, this element is not the only factor that important in the final decision to develop a particular source, however, given the distance between the various participants and the potential source locations, the spatial distribution of demand will be a key element in the costs associated with any such decision.

## Exhibit 2-1
## Polk County (with Adair Village)
## Regional Population Forecasts

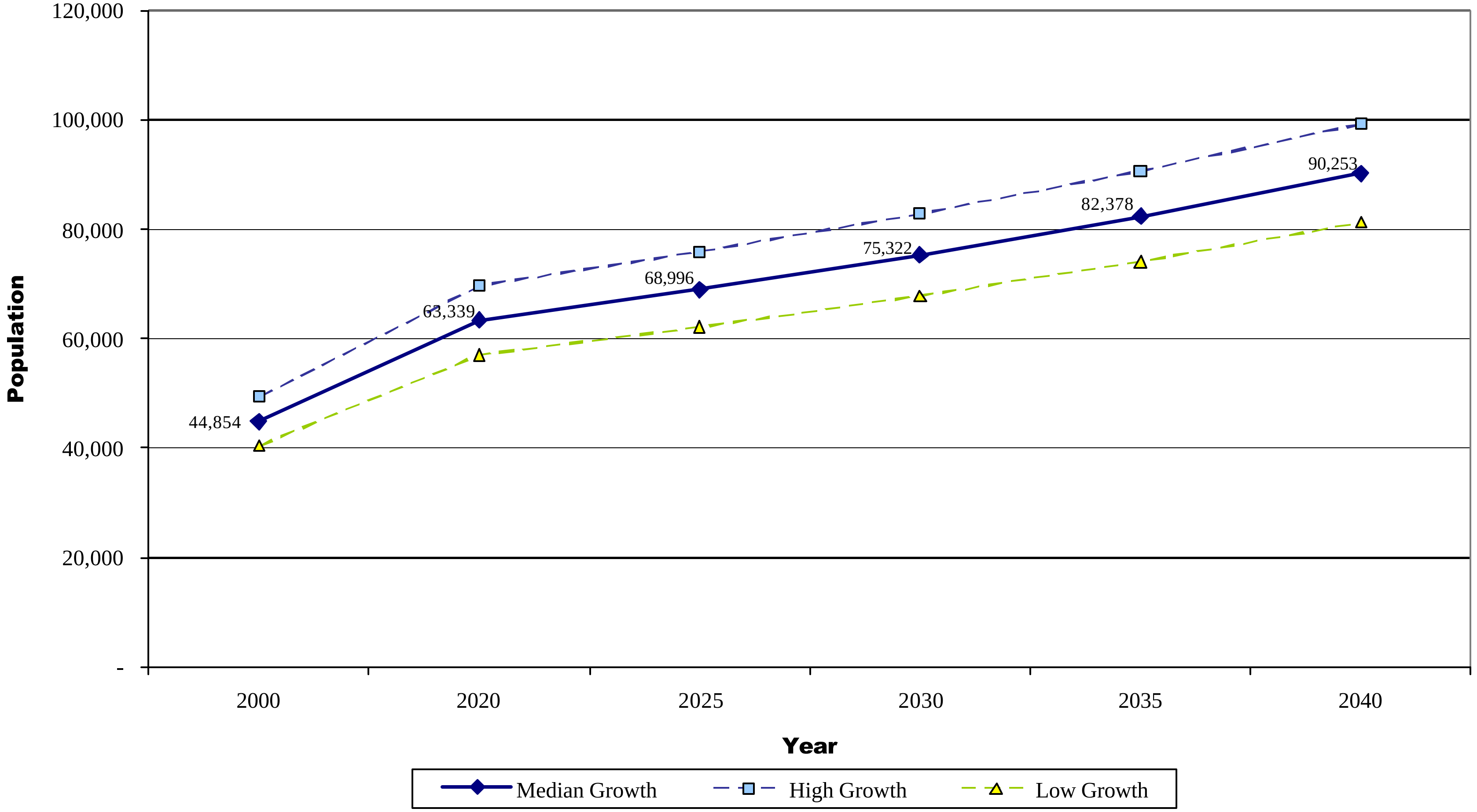


* Includes the following water providers: Buell Red Prairie, Rickreall, Grand Ronde, Luckiamute, Perrydale, Rock Creek, and Tanglewood

## Exhibit 2-2

## Polk County (with Adair Village)

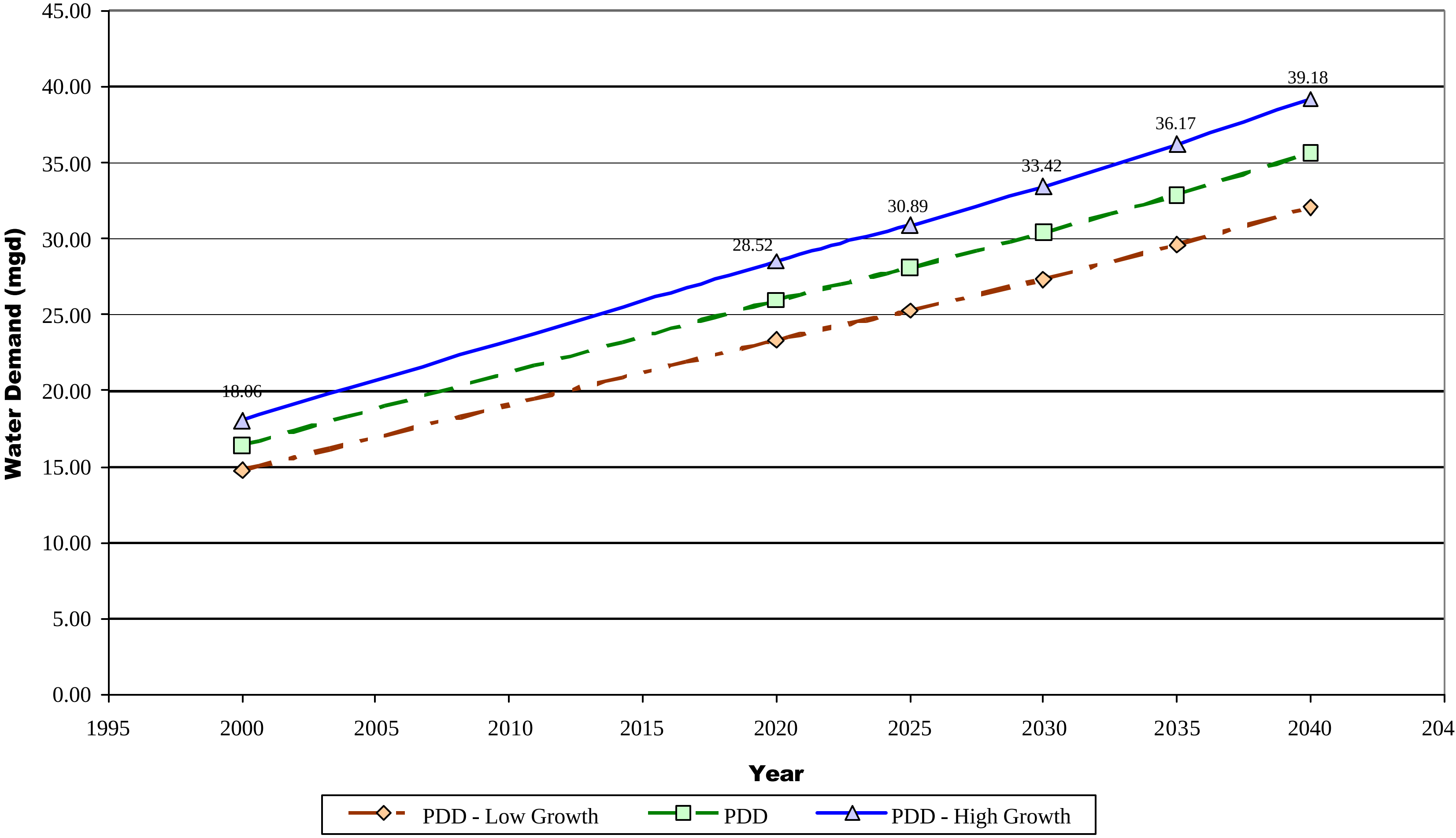
## Population Projections - High, Median, and Low Growth Assumptions

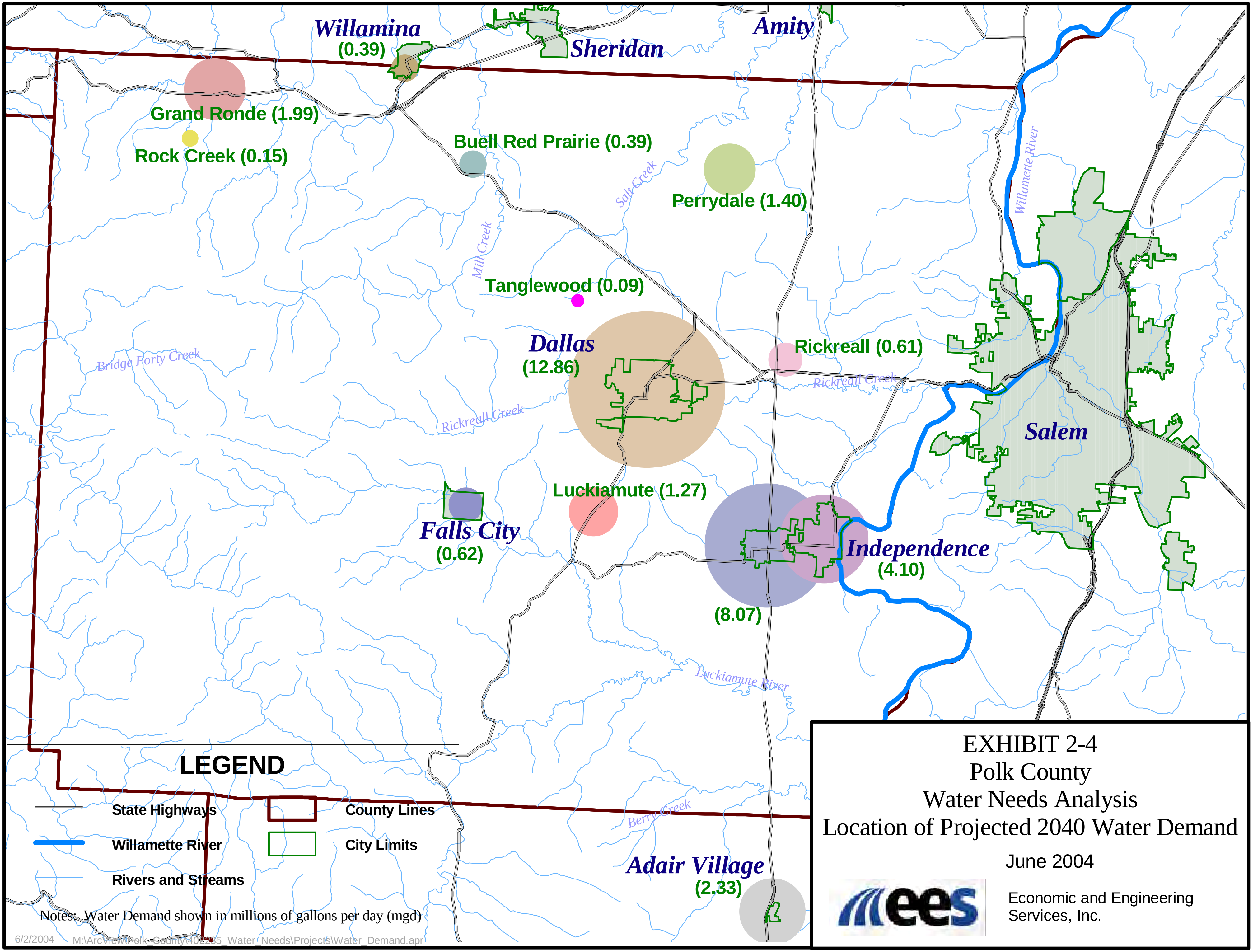


## Exhibit 2-3

## Polk County

## Peak Day Demand (Low, Medium, and High Growth Scenarios)





Notes: Water Demand shown in millions of gallons per day (mgd)

EXHIBIT 2-4
Polk County
Water Needs Analysis
Location of Projected 2040 Water Demand

June 2004

Economic and Engineering Services, Inc.

# Section 3

# Future Needs Analysis

## 3.1 Introduction

The next step in the analysis is to compare the future demand for water with that of available supplies for each water provider, noting future supply needs. 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 in developing these estimates is provided in the remainder of this section.

## 3.2 Summary of Existing Water Rights

### 3.2.1 General Access to Supplies

The water providers involved in this study hold varying amounts of ground and surface water rights, some of which have been fully developed and certificated. Over 40% of the county's population relies on surface water as a source of drinking water. Groundwater supplies another 30% of the population, with the remaining portion being served from a combination of ground and surface water sources. Table 3-1 provides a summary of the total amount of water available to each water provider under existing rights.

**Table 3-1**
**Polk County Water Providers (with Adair Village)**
**Total Permitted Diversion Rate**

| Water Provider | Permitted Rate – cfs (mgd) |
|---|---|
| Perrydale Domestic Water Association | 5.34 (3.45) |
| Monmouth, City of | 11.88 (7.68) |
| Dallas, City of | 15.33 (9.91) |
| Buell Red Prairie Water District | 0.84 (0.54) |
| Independence, City of | 7.68 (4.96) |
| Falls City | 5.26 (3.40) |
| Rickreall Community Water Association | 4.37 (2.82) |
| Grand Ronde Community Water Association | 0.74 (0.48) |
| Luckiamute Domestic Water Cooperative | 6.05 (3.91) |
| Rock Creek Water District | 0.14 (0.10) |
| Willamina, City of | 3.80 (2.46) |
| Adair Village | 85.00 (55.0) |
| Total (with Adair Village) | 146.4 (94.6) |
| **Total (without Adair Village)** | **61.4 (39.7)** |

These numbers were generated from querying the Oregon Water Resources Department's (OWRDs) water rights database and cross referencing those results with documentation and water master plans provided by the individual providers. Exhibit 3-1 provides a summary of points of diversion and their associated water rights for each provider and details how the total permitted capacity shown in Table 3-1 was calculated. In addition, a map was created (Exhibit 3-2) to display the location of that information. It is important to note, the permitted rate of diversion does not take into account seasonal limitations and is nothing more than a summary of the total maximum rate of diversion authorized under the noted water rights.

The numbers indicated the majority of the groundwater rights in the County are located in the low-lying areas adjacent to the Willamette River, while the majority of the surface water sources are in the Rickreall Creek and Luckiamute River drainage areas. Willamina, Grand Ronde Community Water Association, and Rock Creek Water District also have surface water rights in the Yamhill River drainage basin in the northern portions of Polk County. Of the surface water points of diversion, the only water utilities that rely on "live" stream flow (i.e. non-storage related diversions) are the Grand Ronde Community Water Association and the Cities of Falls City and Adair Village.

By contrast, the Cities of Dallas and Willamina, along with the Buell Red Prairie Water District and the Rock Creek Water District, all rely to some degree on surface water releases from reservoirs. The largest being the City of Dallas who holds 1,550 acre-feet of stored water rights in the Mercer Reservoir, located along Rickreall Creek to the west of the City. Others include the Buell Red Prairie Water District who holds 61 acre-feet of stored water rights on a lake fed by Gooseneck Creek and the Rock Creek Water District who holds 0.15 acre-feet of stored water rights on Rock Creek Hideout Reservoir, located directly south of the community of Grand Ronde. The City of Willamina also holds 20 acre-feet of stored water rights on a reservoir along Willamina Creek - a tributary of the Yamhill River.

### 3.2.2 City of Adair Village Water Rights

Certainly of those rights potentially available, the approximate 85 cfs (55 mgd) available in the City of Adair Village's water rights is an important feature. Because of the mere size of potentially available water under these rights, the TAC and its study participants have a keen interest in the potential for utilizing these rights as a potential source of water for the county. It is important to note, however, several important features associated with these rights. First, the permitted volume of water is outlined under two separate rights. Moreover, each of these rights has special provisions attached that affect their use. The first of these rights is a 1941 certificate for 3 cfs (1.94 mgd) that was originally granted to the U.S. Air Force and later assigned to the City of Adiar Village, while the second is a 1971 permit for 82 cfs originally granted to the City of Albany and assigned to the City of Adair Village. Although both the certificate and permit do not accurately identify a place of use that includes the area encompassed by the study participants, the law provides for exemption of this element provided the use of water under these rights remains for municipal purpose.

The more relevant question surrounds interest in potentially moving the point of diversion for each of these rights to support a new intake and treatment plant located downstream of the City of Albany. To do that, the first of these rights (i.e. 3 cfs certificate) would have to undergo a transfer request. The transfer process, although preserving priority date, is subject not only to an injury test (by potentially affected parties) but also public comment and review, thus opening such a request to intervention by environmental and other public interest groups. By contrast, the second right of 82 cfs is only a permit and cannot be formally transferred. Rather, a change in its point of diversion may be accomplished through an amended permit application, which is again subject to traditional injury tests among other water users, as well as potential intervention by public interest and review.

Thus, the issue raised is one of the value of the City of Adair Village's water rights in comparison to potential public interest garnered in any attempt to modify their use. One of the more contentious issues has been that of the exempt nature of municipal water right holders to the traditional timelines for construction and actual diversion of a permitted right (usually five years). Those opposing the municipal exemption cite the state's over appropriation of waters, especially to municipalities who have potentially more water rights permitted on paper than is required to serve reasonable demand. In making that argument, the opposition commonly cites the existing City of Adair Village water right of 82 cfs – a quantity much larger than potentially needed by the City itself. As a result, this right is at the forefront of environmental group interests and any attempt to modify it will likely result in public intervention.

The alternative is to apply for a new water right on the Willamette River that specifies multiple points of diversion and place of use sufficient to encompass the service area of all study participants. By the state's account, there is sufficient water available for diversion from the Willamette River for new domestic and municipal use. The advantage of such an application is that it will not be subject to the on-going scrutiny of the existing rights held by the City of Adair Village, however, it would be granted a much more junior priority date (i.e. the date of the actual application). The seniority of that right, however, may not be a major issue since the state does report the availability of sufficient supplies in the Willamette River at this time and there is no current minimum instream flow standards set on the river. In fact, as of October 1, 2003, the Oregon Water Resources Department (OWRD) reported that 1,000 cfs of water was available from the Willamette River above Mill Creek. The one outstanding issue of interest is that associated with Portland General Electric (PGE). PGE has, however, submitted a pre-1900 claim for a substantial portion of the river at its hydroelectric operations at Willamette Falls. If approved, that claim could require limits on access to essentially all users of the Willamette River, including those defined under the existing City of Adair Village water rights or any new permit application approved by OWRD. Determination of the validity of PGE's claim, however, can only be made through formal adjudication which is not foreseeable at this time.

## 3.3 Available Water Supplies

Although the water providers listed above have a large amount of permitted water, the actual amount of water available in terms of reliable, high quality sources is usually less. The difference is often related to the natural limits of a well or the limited capacity of installed infrastructure. As a result, to quantify the actual need for water, an estimate of "true" water availability is required. This is the amount of water actually available to a specific provider at any given time. Estimates are often achieved through interviews with operational staff or through reviews of documented capacities in master plans or other planning reports. Factors to be considered include the natural limits of the source, installed infrastructure, operational redundancy, ability to withdraw from various diversions, or reserves for future supply development.

Here, consideration must be given to the reliability and access to water under existing permits. For example, a “live” stream flow right may allow diversions of up to 1 cfs; however, the stream may have an 80% exceedance flow of less than 0.3 cfs – thus, allowing the City to access their full right less than 40% of the time. Similarly, a groundwater well permit may allow for a maximum withdrawal rate of 1,500 gpm, but due limited aquifer productivity the well may only produce 750 gpm. For these two examples, the total water available under existing permits is far less than that permitted on paper. However, for the ground water right, the permit may also allow for a second point of diversion in the same aquifer and access to the full permitted right. By contrast, the stream flow right holder may have less options because of seniority and may be limited to the smaller rate of withdrawal due to a lack of reliability of flow at that point in the drainage basin. Thus, natural limits to a given source represent important differences to actual permitted rights and those truly accessible by the permit holder.

Moreover, access to a given source may be limited by the capacity of the infrastructure installed used to divert, treat or distribute the water. For a particular source, the “installed capacity” represents the actual amount of water that can beneficially apply from that source. Exhibit 3-3 provides a map of major points of infrastructure within the study area and graphically depicts the amount of water each provider may produce and distribute through its service area.

In addition, unlike the traditional landowners, municipal and quasi-municipal permit holders may reserve the unused portion of a right for future use. The amount of undeveloped water and plans for its use are a very important component of net available water. This future development may occur under existing permits or, possibly, under newly acquired rights. As a result, some assumptions need to be made with respect to when and how much additional water development will be anticipated under both existing and potential new water rights.

From estimates of reliable amounts of water under each permit, as well as the ability to pump and/or treat and distribute that water, a refined estimate of actual water availability can be generated. This estimate can vary through time as plans for source water development and expansion of infrastructure are executed. From these approximations a more realistic need for water can be evaluated. Table 3-2 provides a preliminary version of water availability estimates.

**Table 3-2**
**Polk County Water Providers with Adair Village**
**Available Source Capacity (mgd)**

| | Year | | | | | |
|---|---|---|---|---|---|---|
| **Provider** | **2000** | **2020** | **2025** | **2030** | **2035** | **2040** |
| Buell Red Prairie | 0.54 | 0.54 | 0.54 | 0.54 | 0.54 | 0.54 |
| Dallas, City of | 9.91 | 9.91 | 9.91 | 9.91 | 9.91 | 9.91 |
| Rickreall | 1.98 | 2.82 | 2.82 | 2.82 | 2.82 | 2.82 |
| Grand Ronde | 0.48 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 |
| Luckiamute | 1.00 | 1.58 | 2.00 | 2.00 | 2.00 | 2.00 |
| Perrydale | 0.50 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Rock Creek | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| Monmouth, City of | 3.10 | 3.10 | 3.10 | 3.10 | 3.10 | 3.10 |
| Independence, City of | 2.70 | 2.70 | 2.70 | 2.70 | 2.70 | 2.70 |
| Falls City | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |
| Adair Village | 55.00 | 55.00 | 55.00 | 55.00 | 55.00 | 55.00 |
| Tanglewood | -- | -- | -- | -- | -- | -- |
| Willamina | 1.00 | 1.80 | 1.80 | 1.80 | 1.80 | 1.80 |
| Total (with Adair Village) | 76.62 | 79.44 | 79.86 | 79.86 | 79.86 | 79.86 |
| **Total (without Adair Village)** | **21.62** | **24.44** | **24.86** | **24.86** | **24.86** | **24.86** |

The numbers shown in this table are intended to provide a starting point and are merely estimates developed from other studies, documented rates of withdrawal (groundwater) or diversion (surface water), well yields, installed pump capacities, and/or treatment capacities.

## 3.4 Regional Water Supply Deficiencies

This study is focused on developing an estimate of “regional” deficiency in supply to establish a framework with which each entity could enter into a partnership to meet their unmet needs for water through a centralized approach to future source water development. From the estimates shown in Table 3-2, the projected demand for water was compared to the amount of available water and a projected deficiency in source water supply was identified. In determining this deficiency in supply, a few assumptions were required. A first assumption was that if a water provider had an unmet demand, it would not receive any water from providers with a surplus of supply. It is assumed that providers with a surplus of supply would hold that water until their demands reach that level. Table 3-3 shows each provider and their deficiency in water supplies from the present through year 2040. These supply deficiencies are calculated from subtracting the total available water amount shown in Table 3-2 from the peak day water demand previously calculated.

## Table 3-3
## Polk County Water Providers with Adair Village
## Regional Water Supply Deficits – Median Growth (mgd)

| | Year | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Provider** | **2000** | | **2020** | | **2025** | | **2030** | | **2035** | | **2040** | |
| | Median | High | Median | High | Median | High | Median | High | Median | High | Median | High |
| Dallas, City of | 5.05 | 4.56 | -0.36 | -1.39 | -1.03 | -2.12 | -1.68 | -2.84 | -2.32 | -3.54 | -2.95 | -4.24 |
| Independence, City of | 0.61 | 0.40 | -0.32 | -0.62 | -0.59 | -0.92 | -0.86 | -1.22 | -1.13 | -1.51 | -1.40 | -1.81 |
| Monmouth, City of | 0.44 | 0.17 | -1.56 | -2.03 | -2.25 | -2.79 | -3.04 | -3.65 | -3.94 | -4.64 | -4.97 | -5.78 |
| Falls City | 0.00 | -0.03 | -0.11 | -0.16 | -0.15 | -0.20 | -0.19 | -0.24 | -0.23 | -0.29 | -0.28 | -0.34 |
| Willamina | 0.79 | 0.77 | 1.49 | 1.46 | 1.45 | 1.42 | 1.42 | 1.38 | 1.38 | 1.34 | 1.33 | 1.29 |
| Buell Red Prairie | 0.37 | 0.35 | 0.35 | 0.33 | 0.34 | 0.32 | 0.34 | 0.32 | 0.33 | 0.31 | 0.33 | 0.31 |
| Rickreall | 1.59 | 1.55 | 2.38 | 2.33 | 2.37 | 2.32 | 2.36 | 2.31 | 2.35 | 2.30 | 2.34 | 2.29 |
| Grand Ronde | -0.34 | -0.43 | -0.46 | -0.46 | -0.40 | -0.50 | -0.44 | -0.54 | -0.47 | -0.58 | 0.51 | -0.62 |
| Luckiamute | 0.35 | 0.29 | 0.83 | 0.76 | 1.24 | 1.16 | 1.22 | 1.15 | 1.21 | 1.13 | 1.19 | 1.11 |
| Perrydale | 0.16 | 0.12 | 0.12 | 0.03 | 0.12 | 0.03 | 0.12 | 0.03 | 0.12 | 0.03 | 0.12 | 0.03 |
| Rock Creek | -0.05 | -0.06 | -0.07 | -0.09 | -0.07 | -0.09 | -0.07 | -0.09 | -0.07 | -0.09 | -0.07 | -0.09 |
| Tanglewood | -0.06 | -0.06 | -0.07 | -0.08 | -0.07 | -0.08 | -0.08 | -0.09 | -0.08 | -0.09 | -0.09 | -0.09 |
| Others | -2.72 | -2.99 | -2.31 | -2.54 | -2.37 | -2.61 | -2.44 | -2.68 | -2.50 | -2.76 | -2.57 | -2.83 |
| **Total Water Supply Deficiency** | **-3.2** | **-3.6** | **-5.2** | **-7.4** | **-6.9** | **-9.3** | **-8.8** | **-11.3** | **-10.8** | **-13.5** | **-12.8** | **-15.8** |

Exhibit 3-4 graphically depicts the region's water supply needs from the present through year 2040. The region shows a water supply deficit of 11.7 mgd under the median growth assumption. The water providers requiring the most water are the Cities of Dallas, Grand Ronde Community Water Association, and eventually, due to projected growth, the Cities of Monmouth and Independence. In 2040, the water providers showing no need for water are Perrydale Domestic Water Association, Luckiamute Domestic Water Cooperative, Rickreall Community Water Association, Buell Red Prairie Water District, and the City of Willamina. However, it's important to note that these results will be strongly affected from the estimates for "available" water shown in Table 3-2.

The estimates as calculated using the high growth assumptions for the region show a water supply deficit of over 14.6 mgd by year 2040. The high growth assumption has no impact on when water supply deficits occur with the exception of the City of Monmouth which reaches a supply deficit by year 2025, five years earlier than the median growth assumption. As compared to the median growth assumptions, the total supply deficit increases by close to 3 mgd to 14.6 mgd by year 2040.

Under any of the growth assumptions, the Cities of Dallas, Monmouth, and Independence make up the majority of the region's water supply deficits as shown in Exhibit 3-5 for the high growth assumption. The other water providers (including Adair Village) exhibit relatively small supply deficits and when treated as one entity show enough available water to meet projected 2040 demands.

However, consideration must be given as to how water surpluses could be brought to those areas with water supply deficits. In many cases, delivering surplus water will not be a feasible option due to the cost of transmission and pumping. These considerations and others will be discussed in further detail through evaluation of water supply options. From the estimates for water needs identified in this document, a list of potential water supply options will be developed along with a set of evaluation criteria with which to compare and weight those options relative to each other. The end result will be selection of the most viable supply options for all concerned parties with which to conduct future plans for source water development and infrastructure expansion.

### Exhibit 3-1

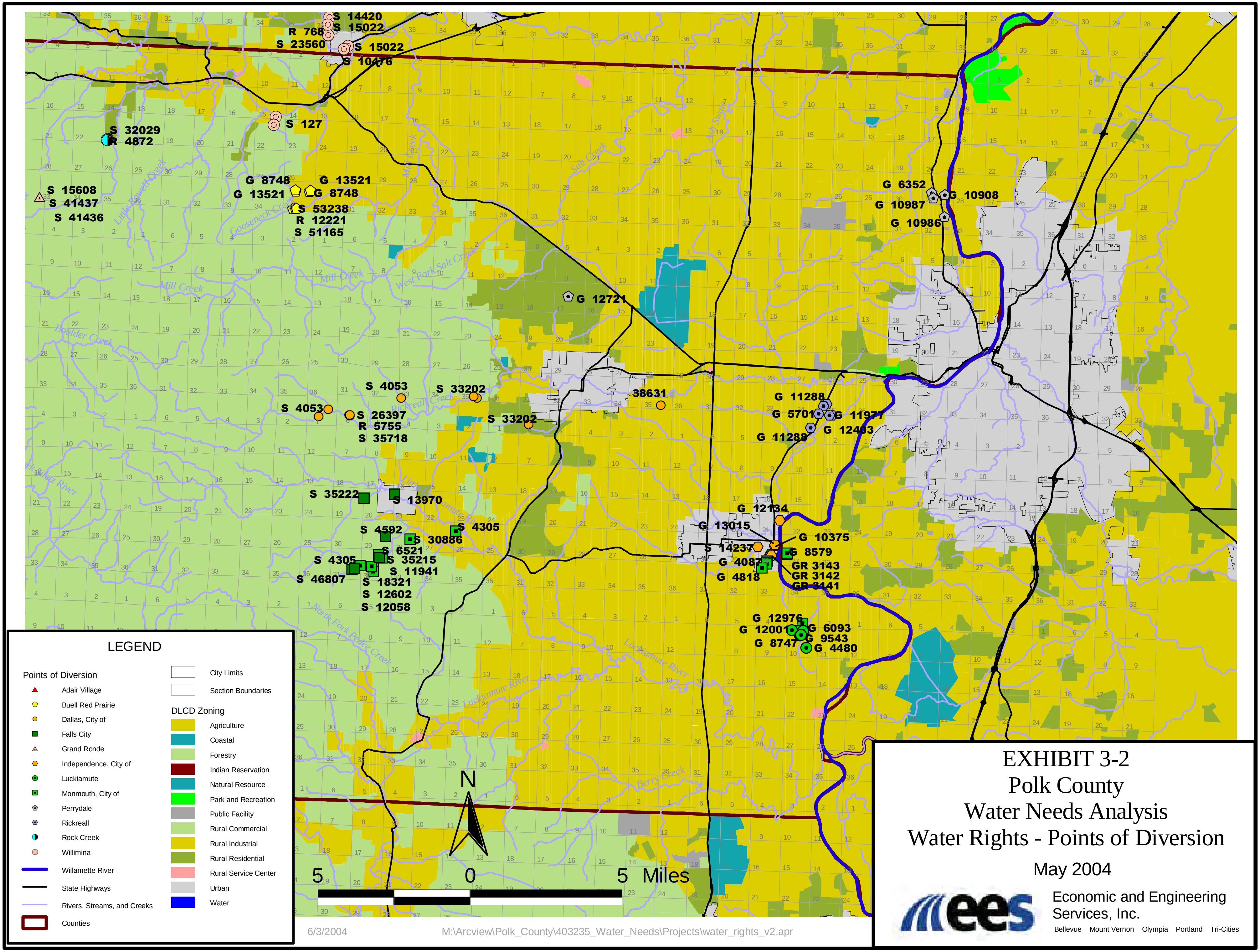
### Summary of Permitted Capacity - Polk County Water Providers and Adair Village

| Provider | Permit Type | Permit Number | Certificate | Source | Use | Permitted Rate (cfs) |
|---|---|---|---|---|---|---|
| Perrydale | G | 10986 | - | WELL 4 | QM | 0.33 |
| | G | 10987 | - | WELL 2A | QM | 0.13 |
| | G | 12721 | - | WELL A | QM | 4.00 |
| | | 12721 | - | WELL B | QM | - |
| | | 12721 | - | WELL C | QM | - |
| | | 12721 | - | WELL D | QM | - |
| | | 12721 | - | WELL E | QM | - |
| | | 12721 | - | WELL F | QM | - |
| | | 12721 | - | WELL G | QM | - |
| | | 12721 | - | WELL H | QM | - |
| | | 12721 | - | WELL I | QM | - |
| | | 12721 | - | WELL J | QM | - |
| | | 12721 | - | WELL K | QM | - |
| | | 12721 | - | WELL L | QM | - |
| | | 12721 | - | WELL M | QM | - |
| | | 12721 | - | WELL N | QM | - |
| | | 12721 | - | WELL O | QM | - |
| | | 12721 | - | WELL P | QM | - |
| | | 12721 | - | WELL Q | QM | - |
| | | 12721 | - | WELL R | QM | - |
| | G | 6352 | 60020 | A WELL | QM | 0.20 |
| | G | 10908 | - | WELL 3 | QM | 0.67 |
| **Perrydale Total** | | | | | | **5.34** |
| Monmouth, City of | G | 8579 | - | WELL #1 | MU | 5.00 |
| | | 8579 | - | WELL #2 | MU | - |
| | G | 4818 | 62436 | WELL 4 | MU | 0.55 |
| | | 4818 | 62436 | WELL 5 | MU | 0.33 |
| | G | 12976 | - | WELL A | MU | 6.00 |
| | | 12976 | - | WELL B | MU | - |
| **Monmouth, City of Total** | | | | | | **11.88** |
| Dallas, City of | | | 80166 | CANYON CR | MU | 0.77 |
| | | | 38631 | RICKREALL CR | MU | 0.50 |
| | S | 4053 | 68474 | APPLEGATE CR | MU | 4.00 |
| | | 4053 | 68474 | ROCKHOUSE CR | MU | - |
| | | 4053 | 68474 | RICKREALL CR | MU | - |
| | S | 26397 | 80163 | A RES | MU | 10.00 |
| | S | 33202 | 39181 | DALLAS RESERVOIR | DO | 0.06 |
| | | 33202 | 39181 | RICKREALL CR | DO | - |
| **Dallas, City of Total** | | | | | | **15.33** |
| Buell Red Prairie | S | 51165 | - | GOOSENECK CR | GR | 0.17 |
| | G | 8748 | - | WELL #1 | QM | 0.45 |
| | | 8748 | - | WELL #2 | QM | 0.22 |
| **Buell Red Prairie Total** | | | | | | **0.84** |

## Exhibit 3-1

## Summary of Permitted Capacity - Polk County Water Providers and Adair Village

| Provider | Permit Type | Permit Number | Certificate | Source | Use | Permitted Rate (cfs) |
|---|---|---|---|---|---|---|
| Independence, City of | S | 14237 | - | S FK ASH CR | RC | 1.00 |
| | GR | 3141 | - | WELL 1 | MU | 0.56 |
| | GR | 3142 | - | WELL 2 | MU | 0.89 |
| | GR | 3143 | - | WELL 3 | MU | - |
| | G | 10375 | - | WELL 4 | QM | 0.89 |
| | | 10375 | - | WELL 5 | QM | 1.34 |
| | G | 12134 | - | A WELL | MU | 2.00 |
| | G | 13015 | - | WELL 4 | MU | 1.00 |
| | | 13015 | - | WELL 5 | MU | - |
| **Independence, City of Total** | | | | | | **7.68** |
| Falls City | S | 2700 | 1832 | UNN STR | MU | 1.00 |
| | S | 4592 | 5072 | BOUGHEY CR | MU | 0.50 |
| | S | 13970 | 14247 | LITTLE LUCKIAMUTE R | IM | 0.50 |
| | S | 35215 | 39319 | A SPR | MU | 0.26 |
| | S | 35222 | - | BERRY CR | MU | 1.00 |
| | S | 46807 | - | GLAZE CR | MU | 2.00 |
| **Falls City Total** | | | | | | **5.26** |
| Rickreall | G | 5701 | - | WELL #1 | QM | 0.27 |
| | G | 11288 | - | WELL 2 | QM | 0.74 |
| | | 11288 | - | WELL 3 | QM | 0.74 |
| | | 11288 | - | WELL 4 | QM | 0.74 |
| | G | 11977 | - | WELL 5 | CM | 0.56 |
| | | 11977 | - | WELL 5 | DO | - |
| | G | 12403 | - | WELL 6 | QM | 1.32 |
| **Rickreall Total** | | | | | | **4.37** |
| Grand Ronde | S | 15608 | 68530 | ROCK CR | QM | 0.30 |
| | S | 41436 | - | SPR AREA | GD | 0.44 |
| | S | 41437 | - | SPR AREA | QM | - |
| **Grand Ronde Total** | | | | | | **0.74** |
| Luckiamute | G | 4480 | - | A WELL | GD | 1.00 |
| | G | 6093 | - | A WELL | QM | 0.52 |
| | G | 8747 | - | ONE WELL | GD | 0.78 |
| | G | 9543 | - | WELL 1 | DO | 0.05 |
| | | 9543 | - | WELL 2 | DO | - |
| | | 9543 | - | WELL 3 | DO | - |
| | G | 12001 | - | WELL 1 | QM | 3.70 |
| | | 12001 | - | WELL 2 | QM | - |
| | | 12001 | - | WELL 3 | QM | - |
| | | 12001 | - | WELL 4 | QM | - |
| **Luckiamute Total** | | | | | | **6.05** |
| Rock Creek | S | 32029 | - | UNN STR | MU | 0.14 |
| | | 32029 | - | ROCK CR HIDEOUT RES | MU | - |
| **Rock Creek Total** | | | | | | **0.14** |
| Adair Village | S | 15077 | 28782 | WILLAMETTE R | DO | 3.00 |
| **Adair Village Total** | | | | | | **3.00** |
| Willimina | S | 14420 | - | WILLAMINA CR | DO | 0.45 |
| | S | 15022 | - | WILLAMINA CR | MU | 0.70 |
| | | 15022 | 67793 | WILLAMINA CR | FI | 0.20 |
| | S | 127 | 1018 | LADY CR | MU | 1.00 |
| | S | 23560 | - | WILLAMINA CR | MU | 1.45 |
| **Willimina Total** | | | | | | **3.80** |
| **Grand Total** | | | | | | **64.42** |



# EXHIBIT 3-2
# Polk County
# Water Needs Analysis
# Water Rights - Points of Diversion

May 2004

ees Economic and Engineering Services, Inc.

Bellevue Mount Vernon Olympia Portland Tri-Cities

6/3/2004

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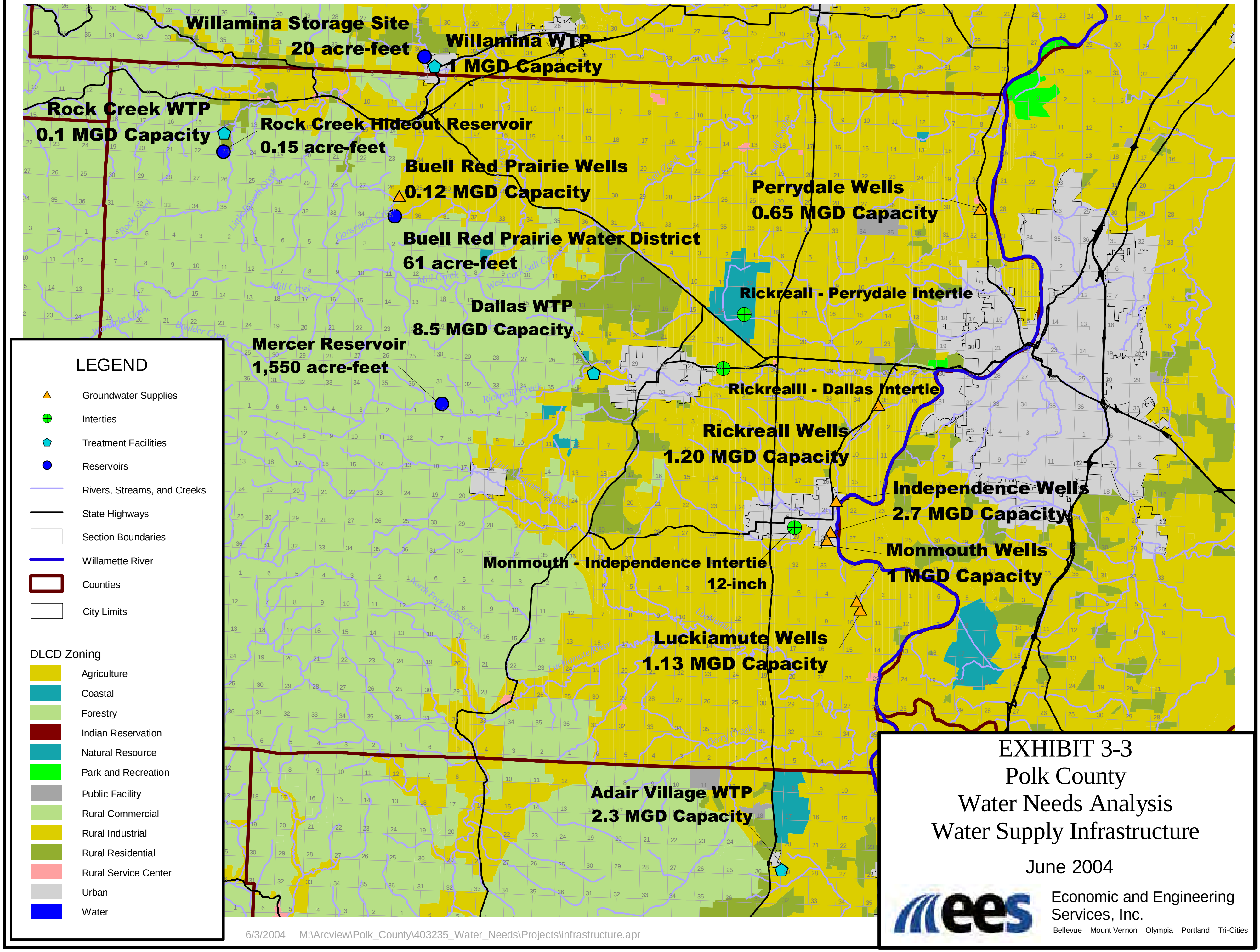


# EXHIBIT 3-3
# Polk County
# Water Needs Analysis
# Water Supply Infrastructure

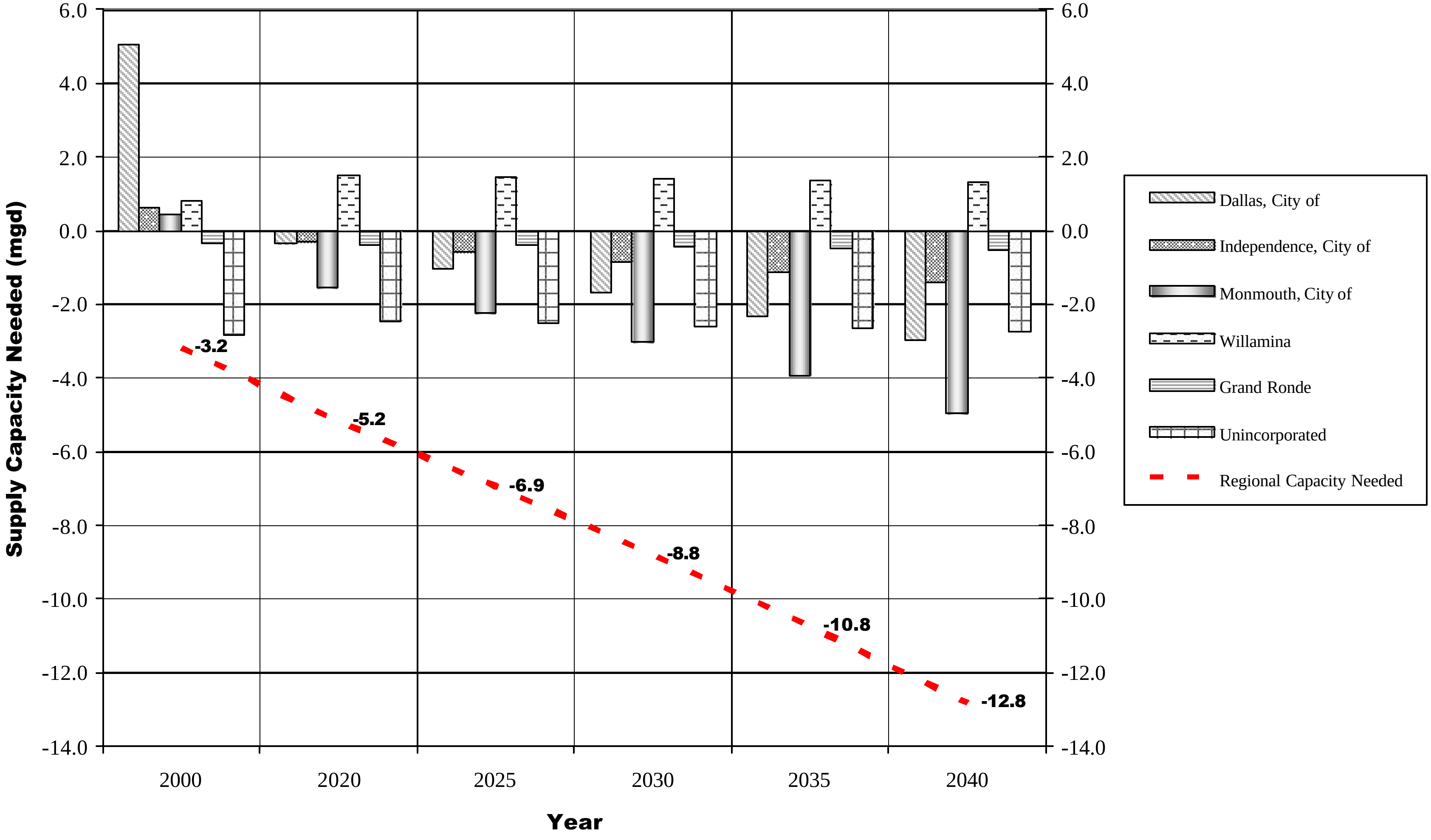
June 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

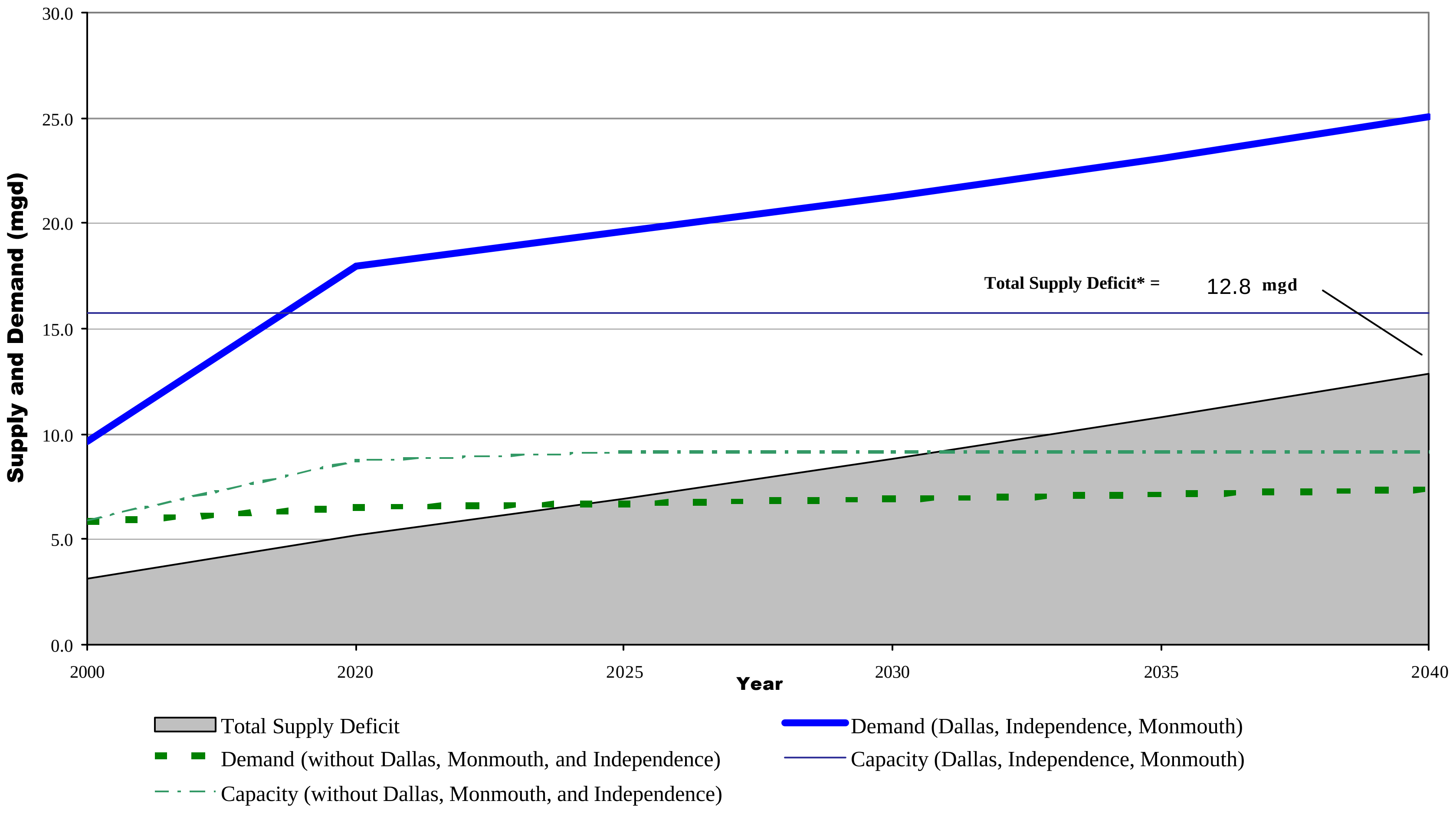
# Exhibit 3-4

## Polk County - Water Needs Analysis

## Water Supply Deficiencies (mgd) - Median Growth Assumption

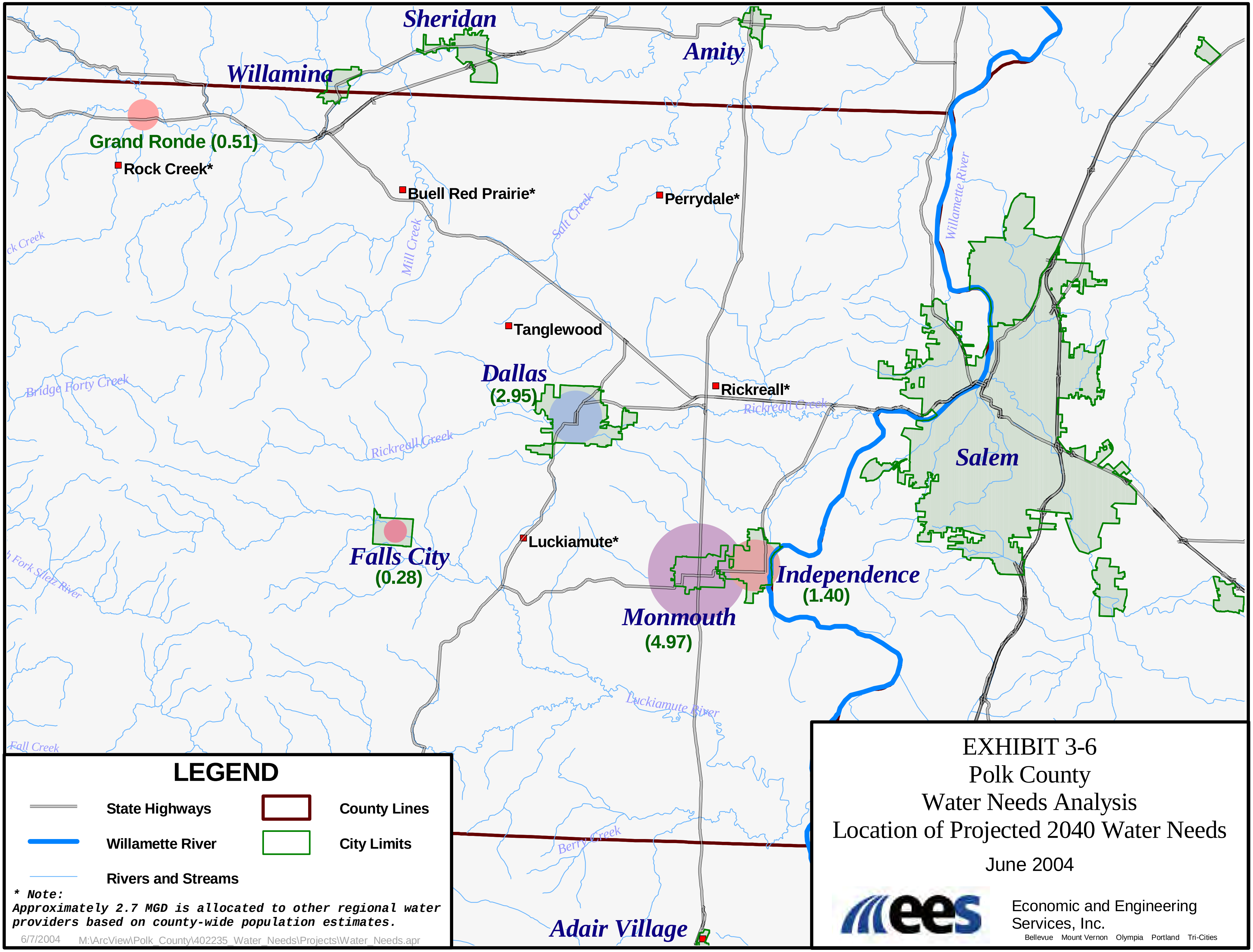


# Exhibit 3-5
## Polk County - Water Needs Analysis
## Future Supply Capacity vs. Maximum Day Demands (Median Growth Assumption)



# EXHIBIT 3-6
## Polk County
## Water Needs Analysis
## Location of Projected 2040 Water Needs

June 2004



## LEGEND

State Highways

▭ County Lines

Willamette River

▭ City Limits

Rivers and Streams

`* Note:`
`Approximately 2.7 MGD is allocated to other regional water providers based on county-wide population estimates.`

6/7/2004 M:\ArcView\Polk_County\402235_Water_Needs\Projects\Water_Needs.apr

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

# Section 4

# Supply Strategies

## 4.1 Introduction

The objective of this section is to provide a summary of source water options and to propose a set of evaluation criteria with which to guide the future selection of preferred alternatives. In developing potential supply options, primary recognition was given the many studies that have already been conducted regarding possible source option for the area. From this information, five main categories of potential supply options were established that include: (1) use of the Willamette River; (2) development of off-stream (surface water) storage; (3) expansion of ground water withdrawals; (4) creation of aquifer storage and recovery (ASR) projects and (5) conservation and reuse. Within these categories, various sub-options have also been proposed that reflect a variety of uses or implementation strategies for a particular source. The details of the various options are outlined in the sub-section that follows below.

In addition, a set of evaluation criteria was developed for use in evaluating the various options and establishing a framework for conducting a comparative analysis among approved alternatives. The criteria are similar to those used in prior assessment of source options for the Portland Metropolitan Water Provider's Consortium - Regional Water Supply Plan and for the City of Salem's Water Management Plan. Details of those propose criteria are presented at the end of this section.

## 4.2 Water Supply Alternatives

### 4.2.1 General Water Supply Conditions

The major goal of the study participants is of course to identify a cost-effective, reliable, high-quality, long-term source of water for the region. In general, the various alternatives are essentially linked to either the expansion of surface water diversions or ground water withdrawals, or the creation of additional storage of off-peak season water. In competition, of course, are a growing need to protect threatened and endangered species, particularly those of anadromous fish, and to restore impaired or contaminated sections of stream or ground water reserves.

Complicating this picture is the hydrology of the area for which there is typically an abundance of surface water available in the winter and early spring and an over appropriation of that same resource during summer and fall. Moreover, ground water resources in Polk County are somewhat limited – the geology is such that the aquifers are not highly productive and surficial units are vulnerable to contamination from agriculture or urbanization. The physical setting of the region is such that precipitation follows surface or sub-surface pathways to streams resulting in rapid runoff and limited natural water storage (McCarthy 1997). The relatively small amounts of natural storage and low permeability of the region's aquifers contribute, in general, to a quick decline in streamflow once precipitation ceases. Moreover, recharge to the ground water system, especially the deeper confined units, is limited and withdrawals are often subject to rapid water level decline.

On the surface water side, Rickreall Creek as well as the Luckiamute, Yamhill, Siletz, and Willamette River basins are the principal drainage features within the region, along with the Willamette River situated along the east side of the County. In turn, the area's ground water reserves are marked by low aquifer permeability, resulting in wells and springs with relatively low yields. The only reliable ground water supplies in the region are located in the local alluvial deposits along the Willamette River. Consolidated rocks are exposed in over 70% of the region – most of which form limited ground water reserves with low yields and poor water quality (high iron and manganese, along with hydrogen sulfide in some areas).

The limited peak season capacity of sources, coupled with mounting environmental interest, pose considerable constraints into the future for expanding withdrawals or diversions during critical times of need. Possible source alternatives must look to provide a productive, high-quality, reliable source of water for decades to come. Moreover, any such source must be able to withstand the scrutiny of potential injury to senior water right holders and public interest in the restoration of fish and wildlife habitat, in-stream water quality and natural flows.

With these constraints in mind, a series of potential source alternatives has been developed that encompass the range of feasible alternatives. Detailed descriptions for each of the proposed alternatives are outlined in the sub-sections below. In addition, a map has been created for assisting in locating the alternatives within the County and is provided as Exhibit 4-1.

### 4.2.2 Willamette River

All options for securing a source of supply from a Willamette River point of diversion involve treatment and transmission of the finished water to areas with supply deficiencies. The location of this additional infrastructure should be similar under all options. Possible methods for securing Willamette River supplies involve using a portion of the Adair Village water right, purchase of uncontracted water from the Army Corps of Engineers, and application for a new water right and associated point of diversion. Each of the options mentioned above will have their own implications with regards to water availability, environmental impacts, capital and operating costs, and other criteria agreed upon by the TAC.

#### *Willamette River Option #1 (WR-1)*

The county has recently negotiated an agreement with the City of Adair Village to reserve an option on at least 50 cfs of water for a minimum three-year period. The county is committed to evaluating the feasibility of purchasing or transferring a portion of this right to a location suitable for the county's water providers. The Adair Village right (Permit S-35819) identifies the City of Adair Village and the City of Albany as places of use. In order for the county to be legally allowed access to this right a transfer application must be submitted pursuant to OAR 690-015-001. These regulations specify that any change in place of use, use, or point of diversion requires a formal water right transfer subject to public comment and administrative review. The county would need to submit a change in place of use and a secondary point of diversion closer to the county's major demand centers (i.e. the Cities of Dallas, Monmouth, and Independence).

This option, however, is intended to focus on the use of the existing City of Adair Village Willamette River diversion and treatment plant. This option would look to expand that plant under staged improvements that include an initial expansion to around 4 mgd and then a future expansion to 12 mgd or more. The initial expansion option was identified in a recent master planning effort conducted by the City of Adair Village. That report identifies a possible 4 mgd expansion for a $1 million budget. Although that cost estimate has been questioned, such an option affords a very economical means for achieving a 4 mgd capacity. However, because of the location of the City of Adair treatment facilities, this option also includes a substantial transmission component required to pump finished water to the major points of future demand.

### *Willamette River Option #2 (WR-2)*

This option involves the use Willamette River under a point of diversion near the City of Independence which would be fed by a new water right on the river or a transferred component of the existing City of Adair Village water right(s). This option includes a new diversion and intake, treatment plant, transmission main, and pumping. At issue, however, is the level of treatment that may be required for a diversion downstream of the industrial discharges in the City of Albany. Although not formally a technical question, especially in meeting federal and state safe drinking water standards, the issues really center on social and political interest that may be attached to such a point of diversion, requiring an expanded level of treatment in order to satisfy public concern - such as that experienced during the City of Wilsonville's recent decision to build a new water treatment plant using the Willamette River.

### *Willamette River Option #3 (WR-3)*

This option is really a modification of Option #2 above (but could also apply to Option #1, as well). Here, an element is added to the creation of a treatment plant, transmission main, and pumping that includes the purchase of contracted storage from the U.S. Army Corp of Engineers (USACE). The USACE owns and operates several dams and impoundments throughout the Willamette River basin. Entering into an agreement with the USACE to purchase of a portion of that storage would greatly increase the reliability of supply without acquisition of new water rights or transfer of the existing Adair Village right. Also, an agreement with USACE for stored water may be considered a more reliable source of supply than a newly acquired water right with a considerably junior priority date, since storage releases are not considered as part of live, natural stream flow. Corps of Engineers reservoirs in the Willamette River basin contain about 1.6 million acre-feet of uncontracted storage (USBR 1992).

### 4.2.3 Surface Water Storage

Various studies have already been conducted that focus on off-stream storage development throughout the County. The most prominent of these studies is a comprehensive examination of potential surface water storage options conducted by the U.S. Bureau of Reclamation (USBR) in 1992 and a more recent consulting report prepared for the cities of Dallas, Monmouth and Independence, completed in 2003. The most feasible of the supply alternatives outlined in those reports are described in their respective subsections below. In all cases, these options include not only the creation of a new dam and impoundment but also a new intake, treatment plant, transmission main, and pumping facilities (as outlined under option WR-2):

***Storage Site #1 - Gorge Dam and Reservoir (R-1)***

Storage site #1 is potential storage options in the Yamhill River Basin. Under an USBR report done in 1992, the two potential storage sites were the Gorge and Buck Hollow sites. The Buck Hollow site is located on Willamina Creek directly north of the City of Willamina. The Gorge site is located on Mill Creek directly south of State Highway 22. The USBR reported slightly higher construction and operations cost estimates for the Buck Hollow site. The Gorge site's costs were approximately 10% less on a per acre-feet basis. Under the study there were two alternatives, one which met only municipal, domestic and industrial (MD&I) needs and a second which met both MD&I and enhanced stream flows for anadromous fish. Since the Buck Hollow site is within Yamhill County and is unacceptably far from Polk County's demand centers, this report will only consider the Gorge Dam option within the Yamhill River basin. The Gorge site would provide a total of 4,600 acre-feet of storage for the Alternative 1 (MD&I only) a total of 19,500 acre-feet for Alternative 2 (MD&I and flow augmentation). Total estimated annual cost including construction, operations, and maintenance was identified as $2.10 million for Alternative 1 and $2.57 million for Alternative 2. These cost estimates are as identified in the USBR report and are based on January 1992 prices.

***Storage Site #2 - Big Rock/Sunshine Creek Dam and Reservoir (R-2)***

Storage site #2 is potential storage options on in Siletz River Basin. The two potential storage sites in the Siletz River Basin were the Big Rock Creek site and Sunshine Creek site. Estimated peak water inflow is 6,500 cfs at the Big Rock Creek site and 4,490 cfs at the Sunshine Creek site. The USBR report identified four alternatives, three of which listed Polk County's MD&I water needs as an objective. One alternative involves Big Rock Creek reservoir with up to 31,000 acre-feet of storage with a pumping plant and pipeline conveying water into the Luckiamute drainage basin for MD&I use only. A second alternative included the addition a reservoir on Sunshine Creek for a total storage of 41,600 acre-feet which would allow for flow augmentation for anadromous fish in both the Siletz and Luckiamute drainage basins. The first alternative had an annual cost, including construction, operations, and maintenance, of $1.91 million and $3.70 million for the second alternative (both Big Rock Creek and Sunshine Creek reservoirs).

*Storage Site #3 – Rickreall Creek Storage (R-3)*

Storage site #3 is one of five sites designed to store water in the Rickreall Creek drainage basin. Two sites are immediately upstream of the existing Mercer Reservoir site. The other three sties are on tributaries of Rickreall Creek. These sites would provide up to 2,200 acre-feet of stored water specifically for MD&I use (CH2MHill 2003). The five alternatives had construction costs ranging from $12.6 million to $17.9 million dollars.

### 4.2.4 Groundwater

The one major ground water supply alternative is centered around the Setnicker Well Field. This feature is an area of potentially high producing wells located in the lowlands near the Willamette River. This well field is situated near Rickreall Community Water Association's wells south of State Highway 22. These wells are completed into geologic region known as the American Bottom Area. This region consists of both old and young alluvium deposited by the Willamette River – comprised primarily of gravel, sand, and silts. The saturated thickness of the sand and gravel deposits vary from 10 to 35 feet (OWRD 1983).

This region may provide a potential source for development of high capacity wells to meet future water needs. However, the relatively small total saturated thickness and limited extent of the younger higher producing sands and gravels provide serious constraints in terms of both availability and reliability as a future supply source. Currently, the majority of ground water supply in the region are drawn from these sand and gravel formations. The cities of Monmouth and Independence, along with the Luckiamute Domestic Water Cooperative, Perrydale Domestic Water Association, and Rickreall Community Water Association, all rely on these formations as a water supply source.

*ASR Development*

This option involves the development of aquifer storage and recovery wells for off-season storage of finished water. Raw water would be diverted from an intake at one of the area's streams or rivers, treated, and pumped to the ASR wells during the winter season. Therefore, during peak season months when surface water diversion would be limited, the ASR wells would meet the deficiency in demand.

### 4.2.5 Conservation and Reuse

Effective management of water resources includes an examination of the potential for conservation and reuse. The range of sub-options here includes traditional conservation, reuse of wastewater or industrial process water, and non-potable uses of identified source water. Although not intended to be a detailed analysis of the ability to meet supply needs and the expected costs of various conservation and reuses measures, this section does provide a general discussion of these types of water supply alternatives.

### *Conservation*

Conservation covers a wide array of management and programmatic activities. Some of the more common activities include the use of low flush toilets and wash machines, pricing (rates), leak detection and repair, managed irrigation, alternative landscaping, and public education. 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.

The costs and benefits of these activities are wide ranging. Often, implementation requires a more detailed analysis of the tradeoffs for various programmatic options and technology deployment. Notwithstanding, recent new revisions regarding municipal water management and conservation planning under OAR 690-086 indicates that at a minimum water utilities should be aggressively pursuing at least:

- Full metering of customer use
- Meter testing and maintenance programs
- Leak detection and repair
- Annual water auditing
- Rate structures based on metered use
- Public education programs

### *Reuse*

One of the more widely discussed reuse options is that of recycled municipal wastewater or commercial process water. 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 the requirements for separating the distribution of “grey water sources.” However, there are a number of communities that have developed successful reuse programs. Certainly, one of the more widely known programs on the West Coast is that operated by the City of San Diego – where hundreds of miles of “purple pipe” have been laid for distributing recycled water to golf courses, commercial applications and other non-potable uses. Closer to home, the City of Medford is embarking on the development of a fairly large project that would reuse wastewater effluent for irrigation of commercial agriculture. As time moves forward, so does the technology and feasibility for such options. In general, from a perspective 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 that are not typically experienced in more rural settings.

### *Non-Potable Source*

Similar to reuse, the option here might target the use of the 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 mentioned in the discussion of reuse, this type of alternative would be most economical in an environment with large water users and a relatively large percentage of commercial/industrial customers.

A summary of the proposed source alternatives is outlined in Table 4-1.

**Table 4-1**
**Polk County**
**Proposed Water Supply Alternatives**

| Source Option | Description |
|---|---|
| **Willamette River** | |
| Willamette River #1 (WR-1)<br>Adair Village Plant | This option involves the use of the existing surface water diversions on the Willamette River and upgrades to the Adair Village Plant. |
| Willamette River #2 (WR-2)<br>Newly Acquired Water Rights | This option involves the use of a newly constructed plant on the Willamette River at a point of diversion agreed upon by the TAC near the City of Independence. |
| Willamette River #3 (WR-3)<br>Existing Corps of Engineers Storage | Contracted storage is available in existing federal reservoirs located throughout the Willamette River basin. This source of water would be purchased through contract and diverted at a Willamette River point of diversion. |
| Storage Site #1 (R-1)<br>Gorge Dam | Storage site #1 is Yamhill River basin storage along Mill Creek identified as the Gorge Dam and Reservoir site. This option involves a 4,600 acre-feet reservoir for a MD&I use for both Polk and Yamhill County or a 19,500 acre-feet reservoir for both Polk and Yamhill County MD&I use as well as streamflow augmentation in the Yamhill River basin. |
| Storage Site #2 (R-2)<br>Big Rock Creek | Storage site #2 is Siletz River basin storage along either Big Rock Creek and Sunshine Creek. The Big Rock Creek proposed dam and reservoir would provide up to 31,000 acre-feet of storage for Lincoln and Polk County MD&I use and flow augmentation in the Siletz River. A two reservoir option involving two dams on Big Rock Creek and Sunshine Creek would create 41,600 acre-feet of storage and would provide MD&I use for both Lincoln and Polk Counties and streamflow augmentation in both the Siletz River and Luckiamute River basins. |
| Storage Site #4 (R-3)<br>Rickreall Creek | Storage site #3 is one of five sites designed to store water in the Rickreall Creek drainage basin. Two sites are immediately upstream of the existing Mercer Reservoir site. The other three sties are on tributaries of Rickreall Creek. These sites would provide up to 2,200 acre-feet of stored water specifically for municipal, domestic, and industrial use (CH2M Hill 2003). |
| **Groundwater** | |
| Setniker Well Field (G-1) | The Setnicker Well Field is an area of potentially high producing wells in the low-lying areas near the Willamette River. This area is located in the northeast portion of the county directly northwest of the City of Salem. |
| **ASR Development** | |
| ASR Development (ASR-1) | This option involves the development of aquifer storage and recovery wells for off-season storage of finished water. Raw water would be diverted from an intake at one of the area's streams or rivers, treated, and pumped to the ASR wells during the winter season. Therefore, during peak season months when surface water diversion would be limited, the ASR wells would meet the deficiency in demand. |

**Table 4-1 (cont'd)**
**Polk County**
**Proposed Water Supply Alternatives**

| Source Option | Description |
|---|---|
| **Conservation and Reuse** | |
| Conservation | Conservation covers a wide array of management and programmatic activities. Some of the more common activities include the use of low flush toilets and wash machines, pricing (rates), leak detection and repair, managed irrigation, alternative landscaping, and public education. |
| Reuse | Activities targeted at the use of recycled municipal wastewater or commercial process water. 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 the requirements for separating the distribution of "grey water sources." However, there are a number of communities that have developed successful reuse programs. As time moves forward, so does the technology and feasibility for such options. |
| Non-Potable Source | Similar to reuse, the option here might target the use of the non-treated (raw) water for commercial or industrial application, such as irrigation or process operations in which a high, quality source water is not needed. |

### 4.2.6 Other Options

Through the analysis of options, three other alternatives were examined and then later excluded due to one or more fatal flaws. Those options included:

- Valsetz Dam and Reservoir
- Willamina Creek Storage
- Rickreall Creek Storage and Groundwater Development

The major reasons for exclusion of these options were owed to difficulty in delivery of source water to a regionally acceptable location, lack of sufficient supply capacity, and redundancy with regards to the other options already being considered.

## 4.3 Select Evaluation Criteria

The general approach to developing evaluation criteria is to develop a set of policy objectives, which in turn are used to develop the evaluation criteria. The policy objectives are used not only to evaluate the alternative resources, but also to design them. A collaborative process can be used to develop the policy objectives including public input.

The policy objectives are developed such that they faithfully reflected the issues important to the region and are useful to policymakers in distinguishing among alternative resource futures. The policy objectives are intended to serve as guiding principles in evaluating various resource supply strategies for the region. These policy objectives complement, compete, and/or conflict with one another in such a way as to provide a comparative framework for which various options could be analyzed. For this reason the policy objectives are not prioritized. Rather, they are used as key guidance for developing resource strategies that account for the uncertainties and tradeoffs that must be made among different, and often competing, objectives and interests.

These policy objectives are often developed as part of a public input process or as part of an open workshop conducted among water provider policy staff. As an aside, similar studies have already been conducted by several major water providers in the Portland metropolitan area. The associated policy objectives were developed in a lengthy public process and cover the range of needs identified in Polk County, as well. A summary of these policy objectives is listed in Table 4-2.

### Table 4-2
### Polk County Water Needs Assessment
### Potential Policy Objectives for Source Options

**Efficient Use of Water**

- Maximize the efficient use of water resources, taking into account current and emerging conservation opportunities, availability of supplies, practicality, and relative cost-effectiveness of the options
- Make the best use of available supplies before developing new ones

**Water Supply Reliability**

- Minimize the frequency, magnitude and duration of water shortages through a variety of methods including development and operation of efficient water supply systems, watershed protection, and water conservation
- Ensure that the frequency, duration and magnitude of shortages can be managed
- Ensure that decision makers retain the flexibility to choose appropriate risk of peak event shortages given applicable future conditions, constraints, and community values

**Water Quality**

- Meet or surpass all current federal and state water quality standards for finished (tap) water
- Utilize sources with the highest raw water quality
- Maximize the ability to protect and enhance water quality in the future, including support and participation in watershed-protection and pollution prevention based approaches
- Maximize the ability to deal with aesthetic factors such as taste, color, hardness, and odor

**Impacts of Catastrophic Events**

- Minimize the magnitude, frequency, and duration of water service interruptions due to natural or human-caused events, such as earthquakes, landslides, volcanic eruptions, floods, spills, fires, sabotage, etc.

**Economic Cost and Cost Equity**

- Minimize the economic impact of capital and operating costs of new water resources on customers
- Ensure the ability to allocate capital and operating costs, e.g. rate impacts for new water supply, related infrastructure, and conservation water savings, among existing customers, future customers, and other customer groups, proportional to benefits derived by the respective customer group(s)
- Maximize cooperative partnerships to co-sponsor projects and programs that provide multiple benefits

**Environmental Stewardship**

- Minimize (i.e. avoid, reduce, and/or mitigate) the impact of water resource development on the natural and human environments
- Foster protection of environmental values through water source protection and enhancement efforts and conservation

**Growth and Land Use Planning**

- Be consistent with regional growth strategy and local land-use plans
- Facilitate and promote effective implementation through local and regional land use planning and growth management programs

**Table 4-2 (Continued)**
**Polk County Water Needs Assessment**
**Potential Policy Objectives for Source Options**

**Flexibility to Deal with Future Uncertainty**

- Maximize the ability to anticipate and respond to unforeseen future events or changes in forecasted trends

**Ease of Implementation**

- Maximize the ability to address existing and future local, state, and federal legislative and regulatory requirements in a timely manner.

**Operational Flexibility**

- Maximize operational flexibility to best meet needs of region, including the ability to move water around the region and to rely on backup sources as necessary
- Ensure that the plan includes flexible strategies for meeting both sub-regional and regional water demands in the year 2000 and beyond

In addition, comparisons and analysis of tradeoffs among alternatives are facilitated by applying a set of measurable evaluation criteria. Ratings can be based on professional judgment or consolidate a large quantity of technical information. Each policy objective is associated with at least one evaluation criterion. In some instances, a single evaluation criterion is associated with more than one.

In an approach similar to that used to develop the associated policy objectives, a series of public tested evaluation criteria have been developed that include: water availability, environmental impacts, raw water quality, vulnerability to catastrophic events, ease of implementation, treatment requirements, and capital and operating costs. Descriptions of those evaluation criteria are outlined in Table 4-3.

**Table 4-3**
**Water Supply Alternatives**
**Select Evaluation Criteria**

| Source Option Issue | Description |
|---|---|
| Water Availability | Consideration of hydrology, water rights, and storage operation; water availability described in terms of monthly yield exceedance probabilities |
| Environmental Impacts | Includes impacts to natural and human environments, extensive planning-level subjective analysis of ten environmental factors; an aggregated score was given to each source option;<br>▪ Natural environment includes: fish, geotechnical and natural hazards, threatened and endangered species, wetlands, wildlife and habitat<br>▪ Human environment includes: 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 |

**Table 4-3 (Continued)**
**Water Supply Alternatives**
**Select Evaluation Criteria**

| Source Option Issue | Description |
|---|---|
| Ease of Implementation | Ability to implement 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 |

This list of evaluation criteria represents a consensus among the TAC participants. As such, it will be used in the following analysis of the proposed supply alternatives.

## 4.4 Comparison of Supply Alternatives

### 4.4.1 Comparative Analysis

A comparison was conducted of the various supply alternatives using the select evaluation criteria from the previous section. Here, each alternative was rated against the criteria under a simple qualitative assessment as being "good", "fair", or "poor" in each category. A given rating was determined by information that was readily available in existing reports or plans and through subjective comparison among the various supply options. These ratings were then reviewed by the TAC and revised to satisfy the consensus of the group. The results of those ratings are presented in Table 4-4 (next page).

As a result of this analysis, several important conclusions were drawn. First, all the supply alternatives that centered on new or expanded surface water storage were very expensive. Moreover, the uncertainty in attempting to build a new dam or storage impoundment with regards to water availability and ease of implementation made those options less preferable. These issues were also compounded by the fact that in undertaking such an option required substantial construction costs in simply creating the source, which often times was located large distances from the point of intended use. These costs would end up being added to the already inherent need for treatment, transmission and pumping. For these reasons, these options were largely thought to be infeasible.

Another potentially viable source is that of groundwater, especially that located near the Willamette River. The most abundant supplies there, however, are situated in relatively shallow aquifers. At present, there are several wells already located in that setting, serving both domestic and agricultural use – the latter being the larger in terms of current production capacity. One option includes the potential for purchasing various existing agricultural wells and converting them (i.e. through the water rights transfer process) to domestic and municipal use. By no means is that transfer process a given with regards to state or public approval. Other options also include the construction and operation of new wells. One of the major drawbacks to such a plan however surrounds the uncertainty in actual production capacity that may be achieved with any new well, especially given their costs. In addition, the productive aquifers along the river all also potentially impacted by nitrate contamination associated with area agricultural activities, domestic septic systems, and other sources.

Other areas for ground water development are not well-known. The abundance of productive aquifers in areas away from the Willamette River is sparse and subject to potentially poor water quality, including brackish and high iron contents, as well as other aesthetic impacts. In many areas of the county, ground water is limited to poor producing basalt wells and often not of sufficient capacity to meet the needs defined in this investigation. There are reports, however, of productive basalt wells which may yield useful quantities in areas interior to the county, including the City of Dallas where on-going investigations are being pursued regarding the potential for the development of an aquifer storage and recovery system. Details of those efforts were not available at the time of the creation of this report.

## Table 4-4
## Polk County
## Evaluation of Water Supply Alternatives

| ◉ Favorable | ○ Neutral | ● Unfavorable |
|---|---|---|

*Evaluation Criteria*

| Supply Alternative | Description | Water Availability | Environmental Impacts | Raw Water Quality | Vulnerability to Catastrophic Events | Ease of Implementation | Cost |
|---|---|---|---|---|---|---|---|
| Willamette River | | | | | | | |
| **WR-1****<br>*Willamette River – Adair Village POD* | ▪ Source – (J) Willamette River only – Adair Village<br>▪ RW/Treatment – (C) Willamette River POD with Regional WTP<br>▪ FW – (B) Finished water transmission from Regional WTP | ◉ | ◉ | ○ | ○ | ○ | ○ to ●<br>(See Footnote 1) |
| **WR-2****<br>*Willamette River – Independence POD (Regional WTP)* | ▪ Source – (A) Willamette River only - Independence<br>▪ RW/Treatment – (C) Willamette River POD with Regional WTP<br>▪ FW – (B) Finished water transmission from Regional WTP | ◉ | ◉ | ○ | ○ | ◉ | ◉ to ●<br>(See Footnote 2) |
| **WR-3****<br>*Willamette River – Independence POD (Regional WTP – Supplemental Storage)* | ▪ Source – (A) Willamette River with supplemental storage<br>▪ RW/Treatment – (C) Willamette River POD with Regional WTP<br>▪ FW – (B) Finished water transmission from Regional WTP | ◉ | ◉ | ○ | ○ | ◉ | ○ to ●<br>(See Footnote 2) |
| Raw Water Storage | | | | | | | |
| **R-1**<br>*Gorge Dam and Reservoir* | ▪ Source – (D) Gorge Dam and Reservoir<br>▪ RW/Treatment – (A) Rickreall Creek POD with Dallas WTP<br>▪ FW – (A) Finished water transmission from Dallas WTP | ○ | ● | ◉ | ● | ● | ● |
| **R-2**<br>*Big Rock Creek/Sunshine Creek Dam and Reservoir* | ▪ Source – (C) Big Rock Creek/Sunshine Creek Dam and Reservoir<br>▪ RW/Treatment – (C) Willamette River POD with Regional WTP<br>▪ FW – (B) Finished water transmission from Regional WTP | ○ | ● | ◉ | ● | ● | ● |
| **R-3**<br>*Rickreall Creek Storage* | ▪ Source – (E) Rickreall Creek Storage<br>▪ RW/Treatment – (A) Rickreall Creek PD with Dallas WTP<br>▪ FW – (B) Finished water transmission from Dallas WTP | ● | ● | ◉ | ● | ● | ● |
| Groundwater Development | | | | | | | |
| **G-1****<br>*Groundwater Development* | ▪ Source – (I) Groundwater Development<br>▪ RW/Treatment – n/a<br>▪ FW – (C) Finished water transmission from proposed wellfield areas | ○ | ◉ | ○ to ●<br>(See Footnote 3) | ○ | ◉ | ◉ to ○<br>(See Footnote 3) |

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(1) Range of costs in reference to possible savings in rehabilitation of existing infrastructure

(2) Range of costs in reference to possible need for advanced treatment at this point of diversion

(3) Variability in water quality and cost associated with possible presence of nitrate contamination

In discussions with the TAC and through evaluation of the alternatives, the most viable options for further consideration are those associated with withdrawals from the Willamette River, namely the rehabilitation and expansion of the City of Adair Village's water treatment plant or the construction of a new intake and treatment plant at a downstream diversion point near the City of Independence. The alternatives based on Willamette River supplies are essentially the least cost and most reliable. The only potentially cheaper option is that of ground water development but it suffers from both potential poorer quality and less capacity. However, the TAC wanted to preserve the option of examining potential ground water supplies, especially those along the Willamette River (owed to proximity) in serving as a secondary or emergency source of supply.

The option (WR-1) for expanding the City of Adair Village's existing facilities has both a number of advantages and disadvantages. The greatest advantage is the existence of an intake along the river and the current installed treatment infrastructure. A recent report prepared for the City indicates that the existing treatment plant may be expanded to around 4 mgd capacity for about $1 million. If this is true, this represents a very inexpensive expansion option for added treatment. If selected, this option would include a second expansion stage carried out later in time that would take the plant's capacity to between 12 and 15 mgd (as needed by demand). The downside to this option is its proximity to the major elements of future demand, namely the three major cities: Dallas, Monmouth and Independence. This option will require the construction of a lengthy transmission main extending from the City of Adair Village, north through the county, to points within each of the major cities. This transmission line requirement will add greatly to the option's overall cost. Moreover, the entire transmission capacity would likely have to be constructed as part of the first stage of improvements for the City of Adair Village's plant. A decision to defer a portion of that capacity would require the construction of a parallel line (or other expansion) which is simply too expensive. Having to build the entire transmission capacity up front adds to the financial issues associated with this option.

By contrast, the other option of interest is that of building a new river intake and treatment plant near the City of Independence (WR-2). This facility would be supported by a new water right from the Willamette River or by an amended permit from the City of Adair Village's water right. The closer proximity to the major demand nodes (i.e. major cities) eliminates the need for a lengthy and expensive transmission main. However, the new plant would be located downstream of the City of Albany – a potential source of concern regarding instream water quality. Whether perceived or not, public concern over the quality of the water in the Willamette River cannot be ignored. Recent experience of the City of Wilsonville saw public demand require extensive treatment technologies be put in place as part of a deal to use the Willamette River as a source of drinking water. A similar outcome may result in the placement of new treatment plant near the City of Independence. In this case, the cost of treatment may be raised 2-3 times that normally anticipated in a traditional treatment plant meeting state and federal safe drinking water standards. Hence, any savings in reduced transmission cost may be required as part of advanced treatment requirements. Thus, the actual cost between this option and that of expanding the City of Adair Village's plant may be equalized.

Before concluding this comparison, it is worthwhile to note that the City of Adair Village option may also create additional users in the area who are in need of future water. An examination is also needed of the potential for resource sharing with the Cities of Albany and Millersburg and their plans for a new treatment plant served by the South Santiam River. In addition, the most viable options for new supply described above largely center on the development of a new source of supply from the Willamette River. Several of the existing water providers in the County have traditionally relied on groundwater and any plans for a new source would be used to augment and support existing supplies. This means the resulting system would rely on a mix of ground and surface water sources in many areas, raising a variety of issues ranging from taste and odor aesthetics to continued regulatory compliance, especially with regards to corrosion control (i.e. lead and copper) within the various purveyor's distribution systems. Accordingly, the issue of blending sources will have to be addressed.

In any case, the use of the Willamette River may raise questions among the public as to the quality of that source and its long-term safety with regards to human health. From a technology and regulatory viewpoint the question is mute. Options such as those offered under conventional, membrane, or slow sand filtration (in combination with disinfection) are readily available and have a proven capacity for meeting all federal and state safe drinking water standards. Prominent examples include those of the City of Corvallis and Wilsonville. However, that may not be enough. Recent contention over the use of the Willamette River as a drinking water source came to prominence in the Portland metropolitan area – most notably for the City of Wilsonville. There, citizens demanded a higher level of protection than that called for under federal and state law, forcing the City to construct a plant that included several added advanced process steps to further ensure the quality of the water being delivered to its customers. So, while there seems to be acceptance of the Willamette River as a source, the public remains dutiful in its demand for safety and as a result may require more advanced treatment of this source than required under federal or state law. Such demands may easily raise the cost of treatment for the Willamette River to 2 or 3 times that normally thought needed for meeting the noted regulatory standards.

### 4.4.2 Summary of Cost Estimates

Among the various factors which dominate alternative selection, costs represent an important factor in the actual selection of a recommended alternative. Here, comprehensive preliminary cost estimates were generated for each supply option, documenting the estimated construction costs for required diversion or raw water storage, treatment, raw and finished water transmission, and pumping. Those cost estimates are summarized in Table 4-5 (following page), with details for each option being provided in Appendix B. Here, it is important to note that the option for diverting and treating the Willamette River downstream of the City of Albany (i.e. at or near the Town of Independence) has been separated into two sub-options – the first assume a low cost option for meeting current and anticipate federal and state drinking water standards and a second assuming the need for more advanced treatment, similar to that recently experienced at the City of Wilsonville.

### Table 4-5
### Polk County
### Summary of Preliminary Cost Estimates

| Source Option | Capital Costs ($1,000) | | | | Unit Cost ($/ccf)(1) |
|---|---|---|---|---|---|
| | Source Development | Raw Water | Treatment and Transmission | Total | |
| ***Willamette River*** | | | | | |
| Adair Village Treatment Plant (WR-1) (2) | 225 | 1,245 | 60,011 | 61,481 | 2.57 |
| Regional WTP (WR-2A) Low Cost Estimate (2) | 225 | 727 | 46,570 | 46,522 | 2.02 |
| Regional WTP (WR-2B) High Cost Estimate (3) | 225 | 727 | 71,820 | 72,772 | 2.99 |
| Regional WTP with Additional Supply (WR-3C) (2) | 3,370 | 727 | 45,570 | 49,667 | 2.14 |
| ***Surface Water Storage*** | | | | | |
| Gorge Dam and Reservoir (R-1) | 39,460 | 2,030 | 44,537 | 86,028 | 3.48 |
| Big Rock Reservoir (R-2) | 40,087 | 727 | 44,876 | 85,691 | 3.47 |
| Rickreall Creek Storage (R-3) | 39,162 | 2,031 | 44,537 | 85,730 | 3.47 |
| ***Groundwater*** | | | | | |
| Setniker Well Field (G-1) | 15,660 | 0 | 38,189 | 53,849 | 2.29 |

(1) Average unit cost including capital and operation and maintenance expense for the period 2004 to 2040.
(2) Assumes $1 million for first 4 mgd and $1.25 per gallon thereafter.
(3) Based on conventional treatment plant costs.
(4) Based on cost to develop Wilsonville plant.

## 4.5 Future Steps

Before a recommendation of a preferred alternative can be reached, several additional steps must be pursued, including:

1. A more extensive evaluation of the expandability of the City of Adair Village's water treatment plant. Need to confirm the potential cost for staged expansion, first to 4 mgd and then to 12 or 15 mgd.

2. The development of conceptual design layouts for the infrastructure associated with the options for expanding the City of Adair Village's water treatment plant or a new intake and plant near the City of Independence. These conceptual designs would define treatment configurations and transmission main alignments, including digital base maps showing placement and alignment of needed water supply facilities in relation to existing landmark features. This step would also include refined cost estimates for each alternative. Included in these estimates, consideration should also be given to costs of security/vulnerability associated with the integration of multiple water systems.

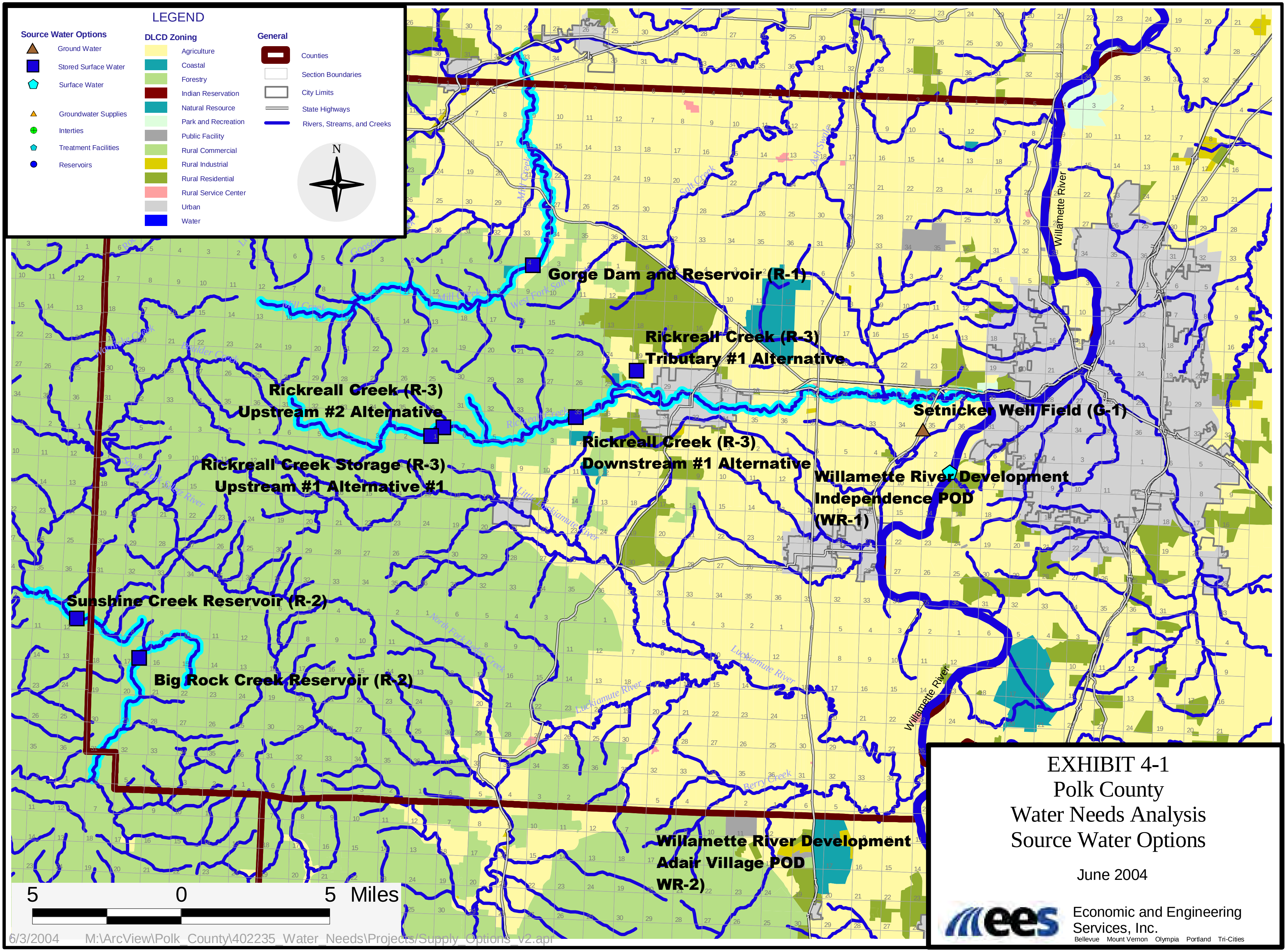
3. A review of permitting requirements for each of the select alternatives. This step would identify potential permitting restrictions for the development of the conceptual designs,

including a complete listing of the anticipated permits required, preliminary mitigation strategies (as needed), and anticipated schedule for permit approval for each project.

4. Examination of the blending issues related to mixing existing groundwater supplies form the various water purveyors with a new treated source from the Willamette River.

5. The development of estimates for the wholesale cost of water from a potential future regional supply agency. This step would assume debt service, cash reserves and system development charge (SDC) funds for the new regional supply agency, along with planning level cost estimates for capital and O&M for the needed infrastructure, in creating estimates of the future wholesale rate for water. This step would include estimates of the cost differences in rates between the various participants based on separate capital costs (such as transmission) and operation and maintenance costs to serve individual participants.

6. A decision as to the preferred supply alternative and organizational structure deemed most appropriate in the formation of a new regional water supply entity (as described in the Section 5).



# EXHIBIT 4-1
# Polk County
# Water Needs Analysis
# Source Water Options

June 2004

Economic and Engineering Services, Inc.
Bellevue Mount Vernon Olympia Portland Tri-Cities

# Section 5

# Administrative Options

## 5.1 Introduction

Beyond the technical elements of the various options, there are a variety of political and economic issues that also weigh heavily into the discussions. 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 regional supply entity. As such, the form of governance, financing and rate setting policies selected for that agency will have direct impacts on 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. Table 5-1 provides a listing of the participants and their type of legal entity.

**Table 5-1**
**Polk County Regionalization Study**
**Member and Type of Legal Entity**

| Name | Type of Legal Entity |
|---|---|
| City of Dallas | City |
| City of Independence | City |
| City of Monmouth | City |
| City of Willamina | City |
| City of Falls City | City |
| Buell Red Prairie Water District | District |
| Rickreall Community Water Association | Association |
| Grand Ronde Community Water Association | Association |
| Grand Ronde Tribe | Tribe |
| Luckiamute Domestic Water Cooperative | Cooperative |
| Rock Creek Water District | District |
| Perrydale Domestic Water Association | Association |
| Tanglewood Water Cooperative | Cooperative |
| City of Adair Village | City |

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: ownership options and rights, rate setting, financing options and 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. The advantages and disadvantages of each option is then provided in order to allow the reader to assess which option would best meet the needs and objectives of the participant. The listing of advantages and disadvantages is not intended to rank the options. Rather, the intent is to allow the participants to determine which option is best based on the advantages and disadvantages from that participant's policy perspective.

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.

## 5.2 Ownership Options

The component piece of the business model dealing with ownership options has two subcomponents. These are what demands of the participants the regional entity serve and how is ownership in the entity 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.

### 5.2.1 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.

***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 with minimizes the overall cost of operation to the region.

***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.

### 5.2.2 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 anatomy for planning.
>
> ***Disadvantages*** – The disadvantage to this approach in 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.

## 5.3 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.

### 5.3.1 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 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 may be required to be included in rates.

### 5.3.2 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 chose, there 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 chooses 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 basic 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.

### 5.3.3 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.

## 5.4 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 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.

## 5.5 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 non-participating 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.

### 5.5.1 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 difference 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 recognization 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.

Based on our initial research, it appears that there are no barriers to any of the options due to the fact that a number of the participants are cooperatives, associations and one is a sovereign tribal nation. It appears that Oregon law allows these types of organizations to be party to the various organizational options as set forth in this white paper. 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.

### 5.5.2 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.

### 5.5.3 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.

### 5.5.4 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.

### 5.5.5 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.

### 5.5.6 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.

### 5.5.7 Summary of the Options

Presented in Table 5-2 is a summary of the various issues and the provisions under each one of the organizational options as presented in this subsection.

## Table 5-2
## Polk County Regionalization Study
## 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 a majority vote of the people or by the County Commissioners | Yes | Yes By vote | Limited to contracts |
| Peoples 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. | | | | | | | |

## 5.6 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 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.

# Appendix A

# Study Participant Descriptions

## Summary of Study Water Providers

Polk County's population is served by several water providers. These providers can, in general, be further categorized into municipal water providers and community water associations and districts serving the unincorporated portions of the county. The providers specifically involved in this study are as follows:

- City of Dallas
- City of Independence
- City of Monmouth
- City of Willamina
- City of Falls City
- Buell Red Prairie Water District
- Rickreall Community Water Association
- Grand Ronde Community Water Association
- Luckiamute Domestic Water Cooperative
- Rock Creek Water District
- Perrydale Domestic Water Association
- Tanglewood Water Cooperative
- City of Adair Village

A brief description of each of the water providers is provided below:

*City of Dallas*. The City of Dallas is the county seat. It has an estimated current population of 12,450. The City's water demand is made up of approximately 60% residential and 40% commercial and industrial. The City's source of water is Rickreall Creek which is diverted and stored at their Mercer Dam site. The water rights currently on file total close to 9.0 cfs (8.5 mgd) of available water.

*City of Independence*. The City of Independence is located in the eastern portion of the county along the Willamette River. The City of Monmouth is located on the western border of the City. Independence currently has an estimated population of slightly over 6,000. The economy of the City is a primarily a mix of commercial and retail establishments. The local industry is drawn mainly from agriculture and logging activities. The City receives its water exclusively from six active groundwater wells. The latest water master plan documents a reliable yield of 1,250 gpm (2.79 cfs).

*City of Monmouth*. The City of Monmouth is located just west of the City of Independence along State Highway 51. The City has an estimated current population of 7,700. The City's largest employer is Western Oregon University with 656 employees. Like Independence, agriculture makes up the majority of the City's industrial base. The City exclusively receives its water from three individual groundwater wells. The City's latest water master plan reported a combined reliable yield from these wells of approximately 1,500 gpm (2.77 cfs).

*City of Willamina*. The City of Willamina is located in the northwestern portion of Polk County and first established a water supply system in 1911. The City currently serves a population of approximately 716 and recently built a water treatment plant with two 350gpm treatment units operated in parallel. The City has access to water rights on Willamina Creek which total 2.8 cfs.

*City of Falls City*. Falls City is a small community located in the forest-covered Coastal Range. The City was established by pioneers and became a center for the logging and sawmill industries. The City has an estimated current population of 966. The water system's source of supply is from surface water rights on Glaze Creek, Teal Creak, and the Little Luckiamute River totaling 5.26 cfs. Two cfs of these water rights are drawn from senior certificated rights with priority dates no later than 1939.

*Buell Red Prairie Water District*. The district was formed in 1979 as a private non-profit association and currently serves a population numbering over 1,000 customers. The district boundaries run from the foothills of the coastal range at an elevation of approximately 1,000 feet above sea level to the Yamhill River valley at about 300 feet elevation covering an area of approximately 50 square miles. The majority of the district's service area is located in Township 6 South and Range 6 West of the public land survey system. The district receives its water from a combination of surface water diversions from a man-made lake on Gooseneck Creek and wells that are supplemented by wet-season recharge from their surface water source.

*Rickreall Community Water Association*. The association was established in 1971 by a group of developers and homeowners in the vicinity of unincorporated areas of Rickreall, Clow Corner, and Oak Grove. Currently, the association serves a population of approximately 1,200 and includes agricultural, industrial, and public users. The commercial customers are primarily related to the food production, concrete pipe manufacturing, and wine bottling industries. The service area extends from the City of Dallas eastward along highway 22 and serves residences between 730 to 130 feet mean sea level. The association currently has a total of six wells with active permits totaling 3.72 cfs.

*Grand Ronde Community Water Association*. The Grand Ronde Community Water Association is a non-profit cooperative formed under ORS Chapter 62. As of 1998 the association served a total of 660 connections and extends from the Grand Ronde community east along state highway 18 to the town of Willamina. The association covers approximately 23 square miles of Polk County and borders the Rock Creek and Buell Red Prairie Water Districts. The association has a total of 1.54 cfs of permitted water from rights on a spring field and a 0.36 cfs right on Cow Creek a tributary of Rock Creek.

*Luckiamute Domestic Water Cooperative.* The Luckiamute Domestic Water Cooperative is a privately owned cooperative established in 1966. The cooperative serves an estimated population of 2,310 and covers an approximate service area of 165 square miles in the southeast corner of Polk County. The cooperative provides service to the unincorporated communities of Airlie, Suver, Pedee, and Buena Vista. The cooperative currently has a total of 6 cfs of permitted water authorizing water use from a series of wells within its service boundaries.

*Rock Creek Water District*. The Rock Creek Water District was originally formed as the Rock Creek Hideout Water Department in 1960. The Department was reformed into the Rock Creek Water District in 1998 in an effort to collect funds to subsidize a treatment plant and other improvements required by state regulations and the federal Safe Drinking Water Act. The district is located in the southern portion of Grand Ronde, Oregon along state highway 18. The district currently serves a total of 94 connections with an approximate population of 370. The district maintains a right to store and divert up to 0.19 cfs of water from the Rock Creek Hideout Reservoir. The reservoir's source of water is a tributary of Rock Creek.

*Perrydale Domestic Water Association.* Perrydale Domestic Water Association was incorporated as a non-profit corporation in 1970. The association serves approximately 1,625 customers (over 600 residences) in the unincorporated portions of northeast Polk County. The primary source of supply is a series of wells with a permitted maximum withdrawal rate of approximately 4.5 cfs.

*Tanglewood Water Cooperative.* The Tanglewood Area currently does not have access to its own source of supply. However, due to water use limitations and an increasing demand for water, the group has continued to explore possible options for gaining access to a long range viable water supply. The service area would include approximately 72 residences for an estimated total population of 180. The area is located to the northwest of the City of Dallas.

*City of Adair Village*. The City of Adair Village is located approximately 8 miles north of the City of Corvallis along State Highway 99W in Benton County. Over 70% of the City's area is zoned as residential, 28% as public/educational, and a small amount of commercial/industry at 1.3%. The current population is approximately 825. The City receives its water from a point of diversion on the Willamette River. The City holds two water rights at this location, one for a total of 3 cfs and a second for a total of 82 cfs. The City produces its own water from a conventional treatment plant originally constructed by the U.S. Army in 1942. The plant is currently limited to a capacity of 3.56 cfs.

# Appendix B

# Supply Options Cost Analysis

## Source Option

## Adair Village Treatment Plant (WR-1)

WR-1: Adair Village Treatment Plant

| | |
|---|---|
| Source Development | J - Willamette River Development, Adair Village |
| Raw Water Transmission | D - Willamette River POD - Adair Village |
| Treatment and Finished Water Transmissior | D - Adair Village WTP |

**Source Development Option SD-J (Willamette River Development - Adair Village)**

| Project # | Project Type | Description | Unit | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|
| I-6 | Intake | Intake on Willamette River (Adair Village) | MGD | $10,000 | 18 | $180,000 | Note 1 |
| R-1 | Storage | Purchase storage from USACOE, 50% of summer season demand | ac-ft | $1,700 | 0 | $0 | |
| | | Contingency | | | 25% | $45,000 | |
| | | | subtotal | | | $225,000 | |

**Raw Water Transmission Option RW-D (Willamette River POD - Adair Village WTP)**

| Project # | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| RW-7 | Pipeline | Raw Water Pipeline from Willamette R. to Adair Village | 12 | 14 | ft | 30 | $240 | 1,336 | $320,640 | Note 2 |
| PS-3 | Pump Station | Pump Station at Willamette River Intake | -- | -- | hp | -- | $1,500 | 450 | $675,000 | Note 3 |
| | | Contingency | | | | | | 25% | $248,910 | |
| | | | subtotal | | | | | | $1,244,550 | |

**Treatment and Finished Water Transmission Option FW-D (Adair Village WTP)**

| | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| WTP-3 | Treatment | Upgrade and retrofit Adair Village WTP | 12 | 12 | MGD | -- | -- | 12 | $11,000,000 | Note 5 |
| FW-17 | Pipeline | Finished Water Pipeline from Adair Village to Voss Reservoir | 12.25 | 12.25 | MGD | 30 | $240 | 11,202 | $2,688,480 | Note 2 |
| FW-18 | Pipeline | Finished Water Pipeline from Voss Reservoir to Monmouth | 12.25 | 12.25 | MGD | 30 | $240 | 46,392 | $11,134,080 | Note 2 |
| FW-7 | Pipeline | Finished Water Pipeline from FW-6 to City of Monmouth | 3.75 | 7.00 | MGD | 20 | $160 | 6,825 | $1,091,920 | Note 2 |
| FW-12 | Pipeline | Finished Water Pipeline form north of City of Monmouth to "Point A" | 3.75 | 7.00 | MGD | 20 | $160 | 13,958 | $2,233,200 | Note 2 |
| FW-10 | Pipeline | Finished Water Pipeline to Buell Red Prairie | 0.25 | 0.25 | MGD | 4 | $32 | 20,707 | $662,616 | Note 3 |
| FW-11 | Pipeline | Finished Water from Buell Red Prairie to GRCWA | 0.25 | 0.25 | MGD | 4 | $32 | 58,439 | $1,870,056 | Note 2 |
| FW-13 | Pipeline | Finished Water Pipeline from "Point A" to City of Dallas | 3.00 | 6.00 | MGD | 18 | $144 | 20,725 | $2,984,400 | Note 2 |
| FW-14 | Pipeline | Finished Water Pipeline from "Point A" to Rickreall | 1.00 | 1.00 | MGD | 8 | $64 | 38,531 | $2,466,000 | Note 2 |
| FW-4 | Pipeline | Finished Water Pipeline from the City of Monmouth to Luckiamute | 0.50 | 0.50 | MGD | 6 | $48 | 17,397 | $835,056 | Note 2 |
| FW-7 | Pipeline | Finished Water Pipeline from FW-6 to City of Monmouth | 3.75 | 7.00 | MGD | 20 | $160 | 6,825 | $1,091,920 | Note 2 |
| FW-9 | Pipeline | Finished Water Pipeline from Rickreall to Perrydale | 1.00 | 1.00 | MGD | 8 | $64 | 21,889 | $1,400,896 | Note 2 |
| PS-9 | Pump Station | Dallas - Monmouth Booster Pump Station | -- | -- | hp | -- | $1,500 | 4,900 | $7,350,000 | Note 4 |
| PS-13 | Pump Station | Adair Village WTP to Monmouth - Booster Pump Station | -- | -- | hp | -- | $2,000 | 600 | $1,200,000 | |
| | | Contingency | | | | | | 25% | $12,002,156 | |
| | | | subtotal | | | | | | $60,010,780 | |

***Summary***

| | |
|---|---|
| Source Development | $225,000 |
| Raw Transmission | $1,244,550 |
| Treatment and Finished Water Transmission | |
| Transmission/Booster Pumping - Dallas, Monmouth, Independence | $46,700,370 |
| Transmission - All Others | *$13,310,410* |
| Total - Treatment and Finished Water Transmission | $60,010,780 |
| **Total** | **$61,480,330** |

**Estimate of cost/ccf**

| | |
|---|---|
| Average Annual Demand (2003-2040) (mgd) | 4.13 |
| Average Annual Sales (2003-2040) (ccf) | 2,016,648 |

| | |
|---|---|
| Time Period (yrs) | 25 |
| Interest Rate | 5.5% |
| Total Capital Cost | $61,480,330 |
| Annualized Cost | $4,583,319 |
| **Average Unit Costs (2005-2040)**[6] | |
| Capital Cost ($/ccf) | $2.27 |
| Operations and Maintenance Costs ($/ccf) | $0.30 |
| Total -----------------------------------------------------Average Unit Cost ($/c | $2.57 |

Notes

1. Intake cost estimate from Willamette River WTP, Wilsonville, OR construction cost of $350,000 for 70 MGD intake ($5,000/MGD). Assume $10,000/MGD to account for economy of scale.
2. Pipelines sized for a velocity of 5 fps at peak day demand.
3. Pumping capacity based on peak day demands.
4. Pump station size taken from Regional Water Supply Project, CH2MHill February 6, 2003.
5. Original Adair Village plant was designed for 8 MGD in 1942. Treatment will initially consist of approximately $1,000,000 dollars to retrofit the plant for 4 MGD production.
   The subsequent 8 MGD in treatment production is assumed to cost $1.25 million per MGD. Therefore, the total lifetime treatment costs are estimated to be $1 million + 8 MGD * $1.25 million = $11 million.
6. Average Unit costs are shown for relative comparison purposes only. Actual unit cost at startup will be greater due to smaller volume of sales and differing operations and maintenance costs.
   For example, assuming startup annual sales of 2 MGD and reduced O&M costs ($0.18/ccf) from lower labor and chemical expenditures, startup average unit costs could be as high as $5.45/ccf.

## Source Option

## Willamette River #1 (WR-2A)

WR-2A: Regional WTP (low range of treatment costs)

| | |
|---|---|
| Source Development | A - Willamette River Development - No Additional Storage |
| Raw Water Transmission | C - Willamette River POD - Regional WTP |
| Treatment and Finished Water Transmission | B - Regional WTP |

**Source Development Option SD-A (Willamette River Development - No Purchase of Contracted Storage)**

| Project # | Project Type | Description | Unit | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|
| I-1 | Intake | Intake on Willamette River | MGD | $10,000 | 18 | $180,000 | Note 1 |
| | | Contingency | | | 25% | $45,000 | |
| | | subtotal | | | | $225,000 | |

**Raw Water Transmission Option RW-C (Willamette River POD - Regional WTP)**

| Project # | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| RW-2 | Pipeline | Raw Water Pipeline from Willamette R. to Regional WTP | 12 | 14 | ft | 30 | $240 | 1,487 | $356,880 | Note 2 |
| PS-3 | Pump Station | Pump Station at Willamette River Intake | -- | -- | hp | | $1,500 | 150 | $225,000 | Note 3 |
| | | Contingency | | | | | | 25% | $145,470 | |
| | | | subtotal | | | | | | $727,350 | |

**Treatment and Finished Water Transmission Option FW-B (Regional WTP)**

| | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| WTP-2 | Treatment | Construct new regoinal Water Treatment Plant | 12 | 12 | MGD | Low | $1,250,000 | 12 | $15,000,000 | Note 5 |
| FW-12 | Pipeline | Finished Water Pipeline form north of City of Monmouth to "Point A" | 3.75 | 7.00 | MGD | 20 | $160 | 13,957 | $2,233,198 | Note 2 |
| FW-13 | Pipeline | Finished Water Pipeline from "Point A" to City of Dallas | 3.00 | 3.00 | MGD | 18 | $144 | 20,725 | $2,984,373 | Note 2 |
| FW-6 | Pipeline | Finished Water Pipeline from Regional WTP to north of City of Monmouth | 12.25 | 12.25 | MGD | 30 | $240 | 19,546 | $4,690,956 | Note 2 |
| FW-7 | Pipeline | Finished Water Pipeline from FW-6 to City of Monmouth | 4.00 | 4.00 | MGD | 18 | $144 | 6,824 | $982,723 | Note 2 |
| PS-8 | Pump Stations | Regional WTP to Dallas Booster Pump Station | -- | -- | hp | -- | $1,800 | 1,850 | $3,330,000 | Note 3 |
| FW-10 | Pipeline | Finished Water Pipeline to Buell Red Prairie | 0.25 | 0.25 | MGD | 4 | $32 | 20,707 | $662,611 | Note 2 |
| FW-11 | Pipeline | Finished Water from Buell Red Prairie to GRCWA | 0.25 | 0.25 | MGD | 4 | $32 | 58,439 | $1,870,052 | Note 2 |
| FW-14 | Pipeline | Finished Water Pipeline from "Point A" to Rickreall | 1.00 | 1.00 | MGD | 8 | $64 | 38,531 | $2,465,993 | Note 2 |
| FW-4 | Pipeline | Finished Water Pipeline from the City of Monmouth to Luckiamute | 0.50 | 0.50 | MGD | 6 | $48 | 17,397 | $835,044 | Note 2 |
| FW-9 | Pipeline | Finished Water Pipeline from Rickreall to Perrydale | 1.00 | 1.00 | MGD | 8 | $64 | 21,889 | $1,400,889 | Note 2 |
| | | Contingency | | | | | | 25% | $9,113,960 | |
| | | | subtotal | | | | | | $45,569,800 | |

***Summary***

| | |
|---|---|
| Source Development | $225,000 |
| Raw Transmission | $727,350 |
| Treatment and Finished Water Transmission | |
| Transmission/Booster Pumping - Dallas, Monmouth, Independence | *$36,526,564* |
| Transmission - All Others | *$9,043,236* |
| Total - Treatment and Finished Water Transmission | $45,569,800 |
| **Total** | **$46,522,150** |

**Estimate of cost/ccf**

| | |
|---|---|
| Average Annual Demand (2005-2040) (mgd) | 4.13 |
| Average Annual Sales (2005-2040) (ccf) | 2,016,648 |

| | |
|---|---|
| Time Period (yrs) | 25 |
| Interest Rate | 5.5% |
| Total Capital Cost | $46,522,150 |
| Annualized Cost | $3,468,196 |
| **Average Unit Costs (2005-2040)**[4] | |
| Capital Cost ($/ccf) | $1.72 |
| Operations and Maintenance Costs ($/ccf) | $0.30 |
| Total ------------------------------------------------------Average Unit Cost ($/ccf) | $2.02 |

Notes

1. Intake cost estimate from Willamette River WTP, Wilsonville, OR construction cost of $350,000 for 70 MGD intake ($5,000/MGD). Assume $10,000/MGD to account for economy of scale.
2. Pipelines sized for a velocity of 5 fps at peak day demand.
3. Pumping capacity based on peak day demands.
4. Average Unit costs are shown for relative comparison purposes only. Actual unit cost at startup will be greater due to smaller volume of sales and differing operations and maintenance costs.
   For example, assuming startup annual sales of 2 MGD and reduced O&M costs ($0.18/ccf) from lower labor and chemical expenditures, startup average unit costs could be as high as $3.78/ccf.
5. Planning level treatment costs are typically $1.25 per gallon of production per day. However, the Wilsonville Water Treatment plant, the most recent treatment plant on the Willamette River downstream of Albany, had a construction cost of approximately $3.00 per gallon. As a result, it is assumed that for Willamette River treatment, costs will range from $1.25 per gallon to $3.00 per gallon.

## Source Option

## Willamette River #1 (WR-2B)

WR-2B: Regional WTP (high range of treatment costs)

| | |
|---|---|
| Source Development | A - Willamette River Development - No Additional Storage |
| Raw Water Transmission | C - Willamette River POD - Regional WTP |
| Treatment and Finished Water Transmission | B - Regional WTP |

**Source Development Option SD-A (Willamette River Development - No Purchase of Contracted Storage)**

| Project # | Project Type | Description | Unit | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|
| I-1 | Intake | Intake on Willamette River | MGD | $10,000 | 18 | $180,000 | Note 1 |
| | | Contingency | | | 25% | $45,000 | |
| | | subtotal | | | | $225,000 | |

**Raw Water Transmission Option RW-C (Willamette River POD - Regional WTP)**

| Project # | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| RW-2 | Pipeline | Raw Water Pipeline from Willamette R. to Regional WTP | 12 | 14 | ft | 30 | $240 | 1,487 | $356,880 | Note 2 |
| PS-3 | Pump Station | Pump Station at Willamette River Intake | -- | -- | hp | | $1,500 | 150 | $225,000 | Note 3 |
| | | Contingency | | | | | | 25% | $145,470 | |
| | | | subtotal | | | | | | $727,350 | |

**Treatment and Finished Water Transmission Option FW-B (Regional WTP)**

| | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| WTP-2 | Treatment | Construct new regoinal Water Treatment Plant | 12 | 12 | MGD | Low | $3,000,000 | 12 | $36,000,000 | Note 5 |
| FW-12 | Pipeline | Finished Water Pipeline form north of City of Monmouth to "Point A" | 3.75 | 7.00 | MGD | 20 | $160 | 13,957 | $2,233,198 | Note 2 |
| FW-13 | Pipeline | Finished Water Pipeline from "Point A" to City of Dallas | 3.00 | 3.00 | MGD | 18 | $144 | 20,725 | $2,984,373 | Note 2 |
| FW-6 | Pipeline | Finished Water Pipeline from Regional WTP to north of City of Monmouth | 12.25 | 12.25 | MGD | 30 | $240 | 19,546 | $4,690,956 | Note 2 |
| FW-7 | Pipeline | Finished Water Pipeline from FW-6 to City of Monmouth | 4.00 | 4.00 | MGD | 18 | $144 | 6,824 | $982,723 | Note 2 |
| PS-8 | Pump Stations | Regional WTP to Dallas Booster Pump Station | -- | -- | hp | -- | $1,800 | 1,850 | $3,330,000 | Note 3 |
| FW-10 | Pipeline | Finished Water Pipeline to Buell Red Prairie | 0.25 | 0.25 | MGD | 4 | $32 | 20,707 | $662,611 | Note 2 |
| FW-11 | Pipeline | Finished Water from Buell Red Prairie to GRCWA | 0.25 | 0.25 | MGD | 4 | $32 | 58,439 | $1,870,052 | Note 2 |
| FW-14 | Pipeline | Finished Water Pipeline from "Point A" to Rickreall | 1.00 | 1.00 | MGD | 8 | $64 | 38,531 | $2,465,993 | Note 2 |
| FW-4 | Pipeline | Finished Water Pipeline from the City of Monmouth to Luckiamute | 0.50 | 0.50 | MGD | 6 | $48 | 17,397 | $835,044 | Note 2 |
| FW-9 | Pipeline | Finished Water Pipeline from Rickreall to Perrydale | 1.00 | 1.00 | MGD | 8 | $64 | 21,889 | $1,400,889 | Note 2 |
| | | Contingency | | | | | | 25% | $14,363,960 | |
| | | | subtotal | | | | | | $71,819,800 | |

***Summary***

| | |
|---|---|
| Source Development | $225,000 |
| Raw Transmission | $727,350 |
| Treatment and Finished Water Transmission | |
| Transmission/Booster Pumping - Dallas, Monmouth, Independence | *$62,776,564* |
| Transmission - All Others | *$9,043,236* |
| Total - Treatment and Finished Water Transmission | $71,819,800 |
| **Total** | **$72,772,150** |

**Estimate of cost/ccf**

| | |
|---|---|
| Average Annual Demand (2005-2040) (mgd) | 4.13 |
| Average Annual Sales (2005-2040) (ccf) | 2,016,648 |

| | |
|---|---|
| Time Period (yrs) | 25 |
| Interest Rate | 5.5% |
| Total Capital Cost | $72,772,150 |
| Annualized Cost | $5,425,117 |
| **Average Unit Costs (2005-2040)[4]** | |
| Capital Cost ($/ccf) | $2.69 |
| Operations and Maintenance Costs ($/ccf) | $0.30 |
| Total -----------------------------------------------------Average Unit Cost ($/ccf) | $2.99 |

Notes

1. Intake cost estimate from Willamette River WTP, Wilsonville, OR construction cost of $350,000 for 70 MGD intake ($5,000/MGD). Assume $10,000/MGD to account for economy of scale.
2. Pipelines sized for a velocity of 5 fps at peak day demand.
3. Pumping capacity based on peak day demands.
4. Average Unit costs are shown for relative comparison purposes only. Actual unit cost at startup will be greater due to smaller volume of sales and differing operations and maintenance costs.
   For example, assuming startup annual sales of 2 MGD and reduced O&M costs ($0.18/ccf) from lower labor and chemical expenditures, startup average unit costs could be as high as $3.78/ccf.
5. Planning level treatment costs are typically $1.25 per gallon of production per day. However, the Wilsonville Water Treatment plant, the most recent treatment plant on the Willamette River downstream of Albany, had a construction cost of approximately $3.00 per gallon. As a result, it is assumed that for Willamette River treatment, costs will range from $1.25 per gallon to $3.00 per gallon.

## Source Option

## Willamette River #1 (WR-3)

WR-3: Regional WTP with Addtiional Supply (low range of treatment costs)

| | |
|---|---|
| Source Development | B - Willamette River Development, With Additional Storage |
| Raw Water Transmission | C - Willamette River POD - Regional WTP |
| Treatment and Finished Water Transmissior | B - Regional WTP |

**Source Development Option SD-B (Willamette River Development - With Supplemental Storage)**

| Project # | Project Type | Description | Unit | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|
| I-1 | Intake | Intake on Willamette River | MGD | $10,000 | 18 | $180,000 | Note 1 |
| R-1 | Storage | Purchase storage from USACOE, 50% of summer season demand | ac-ft | $1,700 | 1,850 | $3,145,000 | |
| | | Contingency | | | 25% | $45,000 | |
| | | subtotal | | | | $3,370,000 | |

**Raw Water Transmission Option RW-C (Willamette River POD - Regional WTP)**

| Project # | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| RW-2 | Pipeline | Raw Water Pipeline from Willamette R. to Regional WTP | 12 | 14 | ft | 30 | $240 | 1,487 | $356,880 | Note 2 |
| PS-3 | Pump Station | Pump Station at Willamette River Intake | -- | -- | hp | -- | $1,500 | 150 | $225,000 | Note 3 |
| | | Contingency | | | | | | 25% | $145,470 | |
| | | | subtotal | | | | | | $727,350 | |

**Treatment and Finished Water Transmission Option FW-B (Regional WTP)**

| | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| WTP-2 | Treatment | Construct new regoinal Water Treatment Plant | 12 | 12 | MGD | -- | $1,250,000 | 12 | $15,000,000 | Note 5 |
| FW-12 | Pipeline | Finished Water Pipeline form north of City of Monmouth to "Point A" | 3.75 | 7.00 | MGD | 20 | $160 | 13,957 | $2,233,198 | Note 2 |
| FW-13 | Pipeline | Finished Water Pipeline from "Point A" to City of Dallas | 3.00 | 3.00 | MGD | 18 | $144 | 20,725 | $2,984,373 | Note 2 |
| FW-6 | Pipeline | Finished Water Pipeline from Regional WTP to north of City of Monmouth | 12.25 | 12.25 | MGD | 30 | $240 | 19,546 | $4,690,956 | Note 2 |
| FW-7 | Pipeline | Finished Water Pipeline from FW-6 to City of Monmouth | 4.00 | 4.00 | MGD | 18 | $144 | 6,824 | $982,723 | Note 2 |
| PS-8 | Pump Stations | Regional WTP to Dallas Booster Pump Station | -- | -- | hp | -- | $1,800 | 1,850 | $3,330,000 | Note 3 |
| FW-10 | Pipeline | Finished Water Pipeline to Buell Red Prairie | 0.25 | 0.25 | MGD | 4 | $32 | 20,707 | $662,611 | Note 2 |
| FW-11 | Pipeline | Finished Water from Buell Red Prairie to GRCWA | 0.25 | 0.25 | MGD | 4 | $32 | 58,439 | $1,870,052 | Note 2 |
| FW-14 | Pipeline | Finished Water Pipeline from "Point A" to Rickreall | 1.00 | 1.00 | MGD | 8 | $64 | 38,531 | $2,465,993 | Note 2 |
| FW-4 | Pipeline | Finished Water Pipeline from the City of Monmouth to Luckiamute | 0.50 | 0.50 | MGD | 6 | $48 | 17,397 | $835,044 | Note 2 |
| FW-9 | Pipeline | Finished Water Pipeline from Rickreall to Perrydale | 1.00 | 1.00 | MGD | 8 | $64 | 21,889 | $1,400,889 | Note 2 |
| | | Contingency | | | | | | 25% | $9,113,960 | |
| | | | subtotal | | | | | | $45,569,800 | |

***Summary***

| | |
|---|---|
| Source Development | $3,370,000 |
| Raw Transmission | $727,350 |
| Treatment and Finished Water Transmission | |
| Transmission/Booster Pumping - Dallas, Monmouth, Independence | *$36,526,564* |
| Transmission - All Others | *$9,043,236* |
| Total - Treatment and Finished Water Transmission | $45,569,800 |
| **Total** | **$49,667,150** |

**Estimate of cost/ccf**

| | |
|---|---|
| Average Annual Demand (2003-2040) (mgd) | 4.13 |
| Average Annual Sales (2003-2040) (ccf) | 2,016,648 |

| | |
|---|---|
| Time Period (yrs) | 25 |
| Interest Rate | 5.5% |
| Total Capital Cost | $49,667,150 |
| Annualized Cost | $3,702,654 |
| **Average Unit Costs (2005-2040)[4]** | |
| Capital Cost ($/ccf) | $1.84 |
| Operations and Maintenance Costs ($/ccf) | $0.30 |
| Total -----------------------------------------------------Average Unit Cost ($/cc | $2.14 |

Notes

1. Intake cost estimate from Willamette River WTP, Wilsonville, OR construction cost of $350,000 for 70 MGD intake ($5,000/MGD). Assume $10,000/MGD to account for economy of scale.
2. Pipelines sized for a velocity of 5 fps at peak day demand.
3. Pumping capacity based on peak day demands.
4. Average Unit costs are shown for relative comparison purposes only. Actual unit cost at startup will be greater due to smaller volume of sales and differing operations and maintenance costs. For example, assuming startup annual sales of 2 MGD and reduced O&M costs ($0.18/ccf) from lower labor and chemical expenditures, startup average unit costs could be as high as $4.02/ccf.
5. Planning level treatment costs are typically $1.25 per gallon of production per day. However, the Wilsonville Water Treatment plant, the most recent treatment plant on the Willamette River downstream of Albany, had a construction cost of approximately $3.00 per gallon. As a result, it is assumed that for Willamette River treatment, costs will range from $1.25 per gallon to $3.00 per gallon.

## Source Option

## Gorge Dam and Reservoir (R-1)

R-1: Gorge Dam and Reservoir - Dallas WTP Upgrade

| | |
|---|---|
| Source Development | D - Gorge Dam and Reservoir |
| Raw Water Transmission | A - POD on Rickreall Creek - Dallas WTP |
| Treatment and Finished Water Transmission | A - Dallas WTP Upgrade |

**Source Development Option SD-D (Gorge Dam and Reservoir)**

| Project # | Project Type | Description | Unit | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|
| I-3 | Intake | Intake at Gorge Dam and Reservoir Site | MGD | $10,000 | 18 | $180,000 | Note 1 |
| R-3 | Storage | Construct Dam, Reservoir, Environmental Mitigation | ac-ft | $6,058 | 3,700 | $22,414,100 | Note 2 |
| RW-4 | Pipeline | Raw Water Pipeline from Reservoir to Rickreall Creek Tributary | ft | $240 | 17,391 | $4,173,840 | |
| PS-5 | Pump Stations | Raw Water Pump Station from Reservoir to Rickreall Creek Tributary | hp | $1,500 | 3,200 | $4,800,000 | |
| | | Contingency | | | 25% | $7,891,985 | |
| | | subtotal | | | | $39,459,925 | |

**Raw Water Transmission Option RW-A (POD on Rickreall Creek - Dallas WTP)**

| Project # | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| RW-5 | Pipeline | Raw Water Pipeline from Rickreall Creek to Dallas WTP | 12 | 14 | ft | 30 | $240 | 2,082 | $499,680 | Note 3 |
| PS-6 | Pump Station | Raw Water Pump Station from Rickreall Creek to Dallas WTP | -- | -- | hp | -- | $1,500 | 750 | $1,125,000 | Note 4 |
| | | Contingency | | | | | | 25% | $406,170 | |
| | | | subtotal | | | | | | $2,030,850 | |

**Treatment and Finished Water Transmission Option FW-A (Dallas WTP Upgrade)**

| | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| WTP-1 | Treatment | Upgrade Existing Dallas WTP | 12 | 12 | MGD | -- | $1,000,000 | 12 | $12,000,000 | Note 5 |
| FW-1 | Pipeline | Finished Water Pipeline from Dallas WTP to the City of Dallas | 12.25 | 12.25 | MGD | 30 | $240 | 11,011 | $2,642,617 | Note 3 |
| FW-2 | Pipeline | Finished Water Pipeline from the City of Dallas to the City of Monmouth (Dallas WTP) | 5.75 | 6.00 | MGD | 18 | $144 | 41,513 | $5,977,810 | Note 3 |
| FW-3 | Pipeline | Finished Water Pipeline from the City of Monmouth to the City of Independence | 2.00 | 2.00 | MGD | 12 | $96 | 16,505 | $1,584,497 | Note 3 |
| PS-2 | Pump Stations | Dallas - Monmouth Booster Pump Station | -- | -- | hp | -- | $1,500 | 4,900 | $7,350,000 | Note 6 |
| FW-10 | Pipeline | Finished Water Pipeline to Buell Red Prairie | 0.25 | 0.25 | MGD | 4 | $32 | 20,707 | $662,611 | Note 3 |
| FW-11 | Pipeline | Finished Water from Buell Red Prairie to GRCWA | 0.25 | 0.25 | MGD | 4 | $32 | 58,439 | $1,870,052 | Note 3 |
| FW-4 | Pipeline | Finished Water Pipeline from the City of Monmouth to Luckiamute | 0.50 | 0.50 | MGD | 6 | $48 | 17,397 | $835,044 | Note 3 |
| FW-8 | Pipeline | Finished Water Pipeline from Dallas to Rickreall | 1.00 | 1.00 | MGD | 8 | $64 | 20,413 | $1,306,403 | Note 3 |
| FW-9 | Pipeline | Finished Water Pipeline from Rickreall to Perrydale | 1.00 | 1.00 | MGD | 8 | $64 | 21,889 | $1,400,889 | Note 3 |
| | | Contingency | | | | | | 25% | $8,907,481 | |
| | | | subtotal | | | | | | $44,537,404 | |

***Summary***

| | |
|---|---|
| Source Development | $39,459,925 |
| Raw Transmission | $2,030,850 |
| Treatment and Finished Water Transmission | |
| Transmission/Booster Pumping - Dallas, Monmouth, Independence | *$36,943,655* |
| Transmission - All Others | *$7,593,749* |
| Total - Treatment and Finished Water Transmission | $44,537,404 |
| **Total** | **$86,028,178** |

**Estimate of cost/ccf**

| | |
|---|---|
| Average Annual Demand (2003-2040) (mgd) | 4.13 |
| Average Annual Sales (2003-2040) (ccf) | 2,016,648 |

| | |
|---|---|
| Time Period (yrs) | 25 |
| Interest Rate | 5.5% |
| Total Capital Cost | $86,028,178 |
| Annualized Cost | $6,413,345 |
| **Average Unit Costs (2005-2040)[4]** | |
| Capital Cost ($/ccf) | $3.18 |
| Operations and Maintenance Costs ($/ccf) | $0.30 |
| Total ---------------------------------------------------Average Unit Cost ($/ccf) | $3.48 |

Notes

1. Intake cost estimate from Willamette River WTP, Wilsonville, OR construction cost of $350,000 for 70 MGD intake ($5,000/MGD). Assume $10,000/MGD to account for economy of scale.
2. Storage costs taken from 1992 USBOR Report. Construction costs adjusted using ENR 20 Cities construction cost indices.
3. Pipelines sized for a velocity of 5 fps at peak day demand.
4. Pumping capacity based on peak day demands.
5. Assumes no excess capacity in Dallas WTP
6. Pump station size taken from Regional Water Supply Project, CH2MHill February 6, 2003.

## Source Option

## Big Rock Creek Reservoir (R-2)

R-2: Big Rock Creek Reservoir - Regional WTP (low range of treatment costs)

| | |
|---|---|
| Source Development | C - Big Rock Creek/Sunshine Creek Dam and Reservoir |
| Raw Water Transmission | C - POD on Willamette River - Regional WTP |
| Treatment and Finished Water Transmissi | B - Regional WTP |

**Source Development Option SD-C (Big Rock Creek/Sunshine Creek Dam and Reservoir)**

| Project # | Project Type | Description | Unit | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|
| I-2 | Intake | Intake at Big Rock Creek/Sunshine Creek Dam and Reservoir Site | MGD | $10,000 | 18 | $180,000 | Note 1 |
| R-2 | Storage | Construct Dam, Reservoir, Environmental Mitigation | ac-ft | $8,000 | 3,700 | $29,600,000 | Note 2 |
| RW-3 | Pipeline | Raw Water Pipeline from Reservoir to Luckiamute R. Tributary | ft | $240 | 7,353 | $1,764,720 | |
| PS-4 | Pump Stations | Raw Water Pump Station from Reservoir to Luckiamute R. Tributary | hp | $1,500 | 350 | $525,000 | |
| | | Contingency | | | 25% | $8,017,430 | |
| | | subtotal | | | | $40,087,150 | |

**Raw Water Transmission Option RW-C (POD on Willamette River - Regional WTP)**

| Project # | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| RW-2 | Pipeline | Raw Water Pipeline from Willamette R. to Regional WTP | 12 | 14 | ft | 30 | $240 | 1,487 | $356,880 | Note 3 |
| PS-3 | Pump Station | Pump Station at Willamette River Intake | -- | -- | hp | -- | $1,500 | 150 | $225,000 | Note 4 |
| | | Contingency | | | | | | 25% | $145,470 | |
| | | | subtotal | | | | | | $727,350 | |

**Treatment and Finished Water Transmission Option FW-B (Regional WTP)**

| | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| WTP-2 | Treatment | Construct new regional Water Treatment Plant | 12 | 12 | MGD | -- | $1,250,000 | 12 | $15,000,000 | Note 5 |
| FW-12 | Pipeline | Finished Water Pipeline form north of City of Monmouth to "Point A" | 3.75 | 7.00 | MGD | $20 | $160 | 13,957 | $2,233,198 | Note 3 |
| FW-13 | Pipeline | Finished Water Pipeline from "Point A" to City of Dallas | 3.00 | 3.00 | MGD | $18 | $144 | 20,725 | $2,984,373 | Note 3 |
| FW-6 | Pipeline | Finished Water Pipeline from Regional WTP to north of City of Monmouth | 12.25 | 12.25 | MGD | $30 | $240 | 19,546 | $4,690,956 | Note 3 |
| FW-7 | Pipeline | Finished Water Pipeline from FW-6 to City of Monmouth | 4.00 | 4.00 | MGD | $18 | $144 | 6,824 | $982,723 | Note 3 |
| PS-8 | Pump Stations | Regional WTP to Dallas Booster Pump Station | -- | -- | hp | -- | $1,500 | 1,850 | $2,775,000 | Note 4 |
| FW-10 | Pipeline | Finished Water Pipeline to Buell Red Prairie | 0.25 | 0.25 | MGD | $4 | $32 | 20,707 | $662,611 | Note 3 |
| FW-11 | Pipeline | Finished Water from Buell Red Prairie to GRCWA | 0.25 | 0.25 | MGD | $4 | $32 | 58,439 | $1,870,052 | Note 3 |
| FW-14 | Pipeline | Finished Water Pipeline from "Point A" to Rickreall | 1.00 | 1.00 | MGD | $8 | $64 | 38,531 | $2,465,993 | Note 3 |
| FW-4 | Pipeline | Finished Water Pipeline from the City of Monmouth to Luckiamute | 0.50 | 0.50 | MGD | $6 | $48 | 17,397 | $835,044 | Note 3 |
| FW-9 | Pipeline | Finished Water Pipeline from Rickreall to Perrydale | 1.00 | 1.00 | MGD | $8 | $64 | 21,889 | $1,400,889 | Note 3 |
| | | Contingency | | | | | | 25% | $8,975,210 | |
| | | | subtotal | | | | | | $44,876,050 | |

***Summary***

| | |
|---|---|
| Source Development | $40,087,150 |
| Raw Transmission | $727,350 |
| Treatment and Finished Water Transmission | |
| Transmission/Booster Pumping - Dallas, Monmouth, Independence | *$35,832,814* |
| Transmission - All Others | *$9,043,236* |
| Total - Treatment and Finished Water Transmission | $44,876,050 |
| **Total** | **$85,690,550** |

**Estimate of cost/ccf**

| | |
|---|---|
| Average Annual Demand (2003-2040) (mgd) | 4.13 |
| Average Annual Sales (2003-2040) (ccf) | 2,016,648 |

| | |
|---|---|
| Time Period (yrs) | 25 |
| Interest Rate | 5.5% |
| Total Capital Cost | $85,690,550 |
| Annualized Cost | $6,388,175 |
| **Average Unit Costs (2005-2040)[4]** | |
| Capital Cost ($/ccf) | $3.17 |
| Operations and Maintenance Costs ($/ccf) | $0.30 |
| Total ----------------------------------------------------Average Unit Cost ($ | $3.47 |

Notes

1. Intake cost estimate from Willamette River WTP, Wilsonville, OR construction cost of $350,000 for 70 MGD intake ($5,000/MGD). Assume $10,000/MGD to account for economy of scale.
2. Storage costs taken from 1992 USBOR Report. Construction costs adjusted using ENR 20 Cities construction cost indices.
3. Pipelines sized for a velocity of 5 fps at peak day demand.
4. Pumping capacity based on peak day demands.
5. Planning level treatment costs are typically $1.25 per gallon of production per day. However, the Wilsonville Water Treatment plant, the most recent treatment plant on the Willamette River downstream of Albany, had a construction cost of approximately $3.00 per gallon. As a result, it is assumed that for Willamette River treatment, costs will range from $1.25 per gallon to $3.00 per gallon.

## Source Option

## Rickreall Creek Storage (R-3)

R-3: Rickreall Creek Storage - Dallas WTP Upgrade

| | |
|---|---|
| Source Development | E - Rickreall Creek Storage |
| Raw Water Transmission | A - POD on Rickreall Creek - Upgrade Dallas WTP |
| Treatment and Finished Water Transmission | A - Dallas WTP Upgrade |

**Source Development Option SD-E (Rickreall Creek Storage)**

| Project # | Project Type | Description | Unit | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|
| I-4 | Intake | Intake on Rickreall Creek | MGD | $10,000 | 18 | $180,000 | Note 1,2 |
| R-4 | Storage | Construct Dam, Reservoir, Environmental Mitigation | ac-ft | $8,000 | 3,700 | $29,600,000 | |
| RW-5 | Pipeline | Raw Water Pipeline from Rickreall Creek to Dallas WTP | ft | $240 | 2,082 | $499,680 | |
| PS-6 | Pump Stations | Raw Water Pump Station from Rickreall Creek to Dallas WTP | hp | $1,500 | 700 | $1,050,000 | |
| | | Contingency | | | 25% | $7,832,420 | |
| | | subtotal | | | | $39,162,100 | |

**Raw Water Transmission Option RW-A (POD on Rickreall Creek - Upgrade Dallas WTP)**

| Project # | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| RW-2 | Pipeline | Raw Water Pipeline from Rickreall Creek to Dallas WTP | 12 | 14 | ft | 30 | $240 | 2,082 | $499,680 | Note 3 |
| PS-6 | Pump Station | Raw Water Pump Station from Rickreall Creek to Dallas WTP | -- | -- | hp | -- | $1,500 | 750 | $1,125,000 | Note 4 |
| | | Contingency | | | | | | 25% | $406,170 | |
| | | | subtotal | | | | | | $2,030,850 | |

**Treatment and Finished Water Transmission Option FW-A (Upgrade Dallas WTP)**

| | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| WTP-1 | Treatment | Upgrade Existing Dallas WTP | 12 | 12 | MGD | -- | $1,000,000 | 12 | $12,000,000 | Note 5 |
| FW-1 | Pipeline | Finished Water Pipeline from Dallas WTP to the City of Dallas | 12.25 | 12.25 | MGD | 30 | $240 | 11,011 | $2,642,617 | Note 3 |
| FW-2 | Pipeline | Finished Water Pipeline from the City of Dallas to the City of Monmouth (Dallas WTP) | 5.75 | 6.00 | MGD | 18 | $144 | 41,513 | $5,977,810 | Note 3 |
| FW-3 | Pipeline | Finished Water Pipeline from the City of Monmouth to the City of Independence | 2.00 | 2.00 | MGD | 12 | $96 | 16,505 | $1,584,497 | Note 3 |
| PS-2 | Pump Stations | Dallas - Monmouth Booster Pump Station | -- | -- | hp | -- | $1,500 | 4,900 | $7,350,000 | Note 6 |
| FW-10 | Pipeline | Finished Water Pipeline to Buell Red Prairie | 0.25 | 0.25 | MGD | 4 | $32 | 20,707 | $662,611 | Note 3 |
| FW-11 | Pipeline | Finished Water from Buell Red Prairie to GRCWA | 0.25 | 0.25 | MGD | 4 | $32 | 58,439 | $1,870,052 | Note 3 |
| FW-4 | Pipeline | Finished Water Pipeline from the City of Monmouth to Luckiamute | 0.50 | 0.50 | MGD | 6 | $48 | 17,397 | $835,044 | Note 3 |
| FW-8 | Pipeline | Finished Water Pipeline from Dallas to Rickreall | 1.00 | 1.00 | MGD | 8 | $64 | 20,413 | $1,306,403 | Note 3 |
| FW-9 | Pipeline | Finished Water Pipeline from Rickreall to Perrydale | 1.00 | 1.00 | MGD | 8 | $64 | 21,889 | $1,400,889 | Note 3 |
| | | Contingency | | | | | | 25% | $8,907,481 | |
| | | | subtotal | | | | | | $44,537,404 | |

***Summary***

| | |
|---|---|
| Source Development | $39,162,100 |
| Raw Transmission | $2,030,850 |
| Treatment and Finished Water Transmission | |
| Transmission/Booster Pumping - Dallas, Monmouth, Independence | *$36,943,655* |
| Transmission - All Others | *$7,593,749* |
| Total - Treatment and Finished Water Transmission | $44,537,404 |
| **Total** | **$85,730,354** |

**Estimate of cost/ccf**

| | |
|---|---|
| Average Annual Demand (2003-2040) (mgd) | 4.13 |
| Average Annual Sales (2003-2040) (ccf) | 2,016,648 |

| | |
|---|---|
| Time Period (yrs) | 25 |
| Interest Rate | 5.5% |
| Total Capital Cost | $85,730,354 |
| Annualized Cost | $6,391,142 |
| **Average Unit Costs (2005-2040)[4]** | |
| Capital Cost ($/ccf) | $3.17 |
| Operations and Maintenance Costs ($/ccf) | $0.30 |
| Total -----------------------------------------------------Average Unit Cost ($/ccf) | $3.47 |

Notes

1. Intake cost estimate from Willamette River WTP, Wilsonville, OR construction cost of $350,000 for 70 MGD intake ($5,000/MGD). Assume $10,000/MGD to account for economy of scale.
2. Assumes no excess capacity at existing intake structure.
3. Pipelines sized for a velocity of 5 fps at peak day demand.
4. Pumping capacity based on peak day demands.
5. Assumes no excess capacity in Dallas WTP
6. Pump station size taken from Regional Water Supply Project, CH2MHill February 6, 2003.

## Source Option

## Groundwater Development (G-1)

G-1:  Groundwater Development Only

| | |
|---|---|
| Source Development | I - Groundwater Development |
| Raw Water Transmission | n/a |
| Treatment and Finished Water Transmissio | C - Groundwater Development |

**Source Development Option SD-I (Groundwater Development)**

| Project # | Project Type | Description | Unit | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|
| G-1 | Well Development | Upgrade Marion County Well | gpm | $1,200 | 300 | $360,000 | Note 1 |
| G-2 | Well Development | American Bottom Well | gpm | $1,200 | 700 | $840,000 | Note 1 |
| G-3 | Well Development | Setnicker Well Field | gpm | $1,200 | 7,700 | $9,240,000 | Note 1 |
| | | Contingency | | | 50% | $5,220,000 | |
| | | subtotal | | | | $15,660,000 | |

**Raw Water Transmission (Not Applicable)**

| Project # | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | Contingency | | | | | | 25% | $0 | |
| | | subtotal | | | | | | | $0 | |

**Treatment and Finished Water Transmission Option FW-C (Groundwater Development)**

| | Project Type | Description | Supply Deficit (mgd) | Capacity Needs (mgd) | Unit | Diameter (in) | $/Unit | Qty | Total | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| FW-16 | Pipeline | Finished Water Pipeline from Setnicker Area to Dallas - Monmouth Pipeline | 12.00 | 12.00 | MGD | 30 | $240 | 21,867 | $5,248,080 | Note 2 |
| FW-15 | Pipeline | American Bottom Wellfield Regional Transmission Line | 4.00 | 4.00 | MGD | 18 | $144 | 17,690 | $2,547,360 | Note 2 |
| FW-12 | Pipeline | Finished Water Pipeline form north of City of Monmouth to "Point A" | 3.75 | 7.00 | MGD | 20 | $160 | 13,957 | $2,233,198 | Note 2 |
| FW-13 | Pipeline | Finished Water Pipeline from "Point A" to City of Dallas | 3.00 | 3.00 | MGD | 18 | $144 | 20,725 | $2,984,373 | Note 2 |
| FW-6 | Pipeline | Finished Water Pipeline from Regional WTP to north of City of Monmouth | 12.25 | 12.25 | MGD | 30 | $240 | 19,546 | $4,690,956 | Note 2 |
| FW-7 | Pipeline | Finished Water Pipeline from FW-6 to City of Monmouth | 4.00 | 4.00 | MGD | 18 | $144 | 6,824 | $982,723 | Note 2 |
| PS-10 | Pump Stations | Finished Water Pump Station from Setnicker Wells | -- | -- | hp | -- | $1,800 | 1,850 | $3,330,000 | Note 3 |
| PS-11 | Pump Stations | Finished Water Pump Station from American Bottom Wells | -- | -- | hp | -- | $2,000 | 650 | $1,300,000 | Note 3 |
| FW-10 | Pipeline | Finished Water Pipeline to Buell Red Prairie | 0.25 | 0.25 | MGD | 4 | $32 | 20,707 | $662,611 | Note 2 |
| FW-11 | Pipeline | Finished Water from Buell Red Prairie to GRCWA | 0.25 | 0.25 | MGD | 4 | $32 | 58,439 | $1,870,052 | Note 2 |
| FW-14 | Pipeline | Finished Water Pipeline from "Point A" to Rickreall | 1.00 | 1.00 | MGD | 8 | $64 | 38,531 | $2,465,993 | Note 2 |
| FW-4 | Pipeline | Finished Water Pipeline from the City of Monmouth to Luckiamute | 0.50 | 0.50 | MGD | 6 | $48 | 17,397 | $835,044 | Note 2 |
| FW-9 | Pipeline | Finished Water Pipeline from Rickreall to Perrydale | 1.00 | 1.00 | MGD | 8 | $64 | 21,889 | $1,400,889 | Note 2 |
| | | Contingency | | | | | | 25% | $7,637,820 | |
| | | subtotal | | | | | | | $38,189,100 | |

***Summary***

| | |
|---|---|
| Source Development | $15,660,000 |
| Raw Transmission | $0 |
| Treatment and Finished Water Transmission | |
| Transmission/Booster Pumping - Dallas, Monmouth, Independence | *$29,145,864* |
| Transmission - All Others | *$9,043,236* |
| Total - Treatment and Finished Water Transmission | $38,189,100 |
| **Total** | **$53,849,100** |

**Estimate of cost/ccf**

| | |
|---|---|
| Average Annual Demand (2005-2040) (mgd) | 4.13 |
| Average Annual Sales (2005-2040) (ccf) | 2,016,648 |

| | |
|---|---|
| Time Period (yrs) | 25 |
| Interest Rate | 5.5% |
| Total Capital Cost | $53,849,100 |
| Annualized Cost | $4,014,416 |
| **Average Unit Costs (2005-2040)[4]** | |
| Capital Cost ($/ccf) | $1.99 |
| Operations and Maintenance Costs ($/ccf) | $0.30 |
| Total -------------------------------------------------------Average Unit Cost ($/c | $2.29 |

Notes

1. Well development estimated at $1,200 / gpm (accounts for drilling, well head facility, treatment, and pump installation)
2. Pipelines sized for a velocity of 5 fps at peak day demand.
3. Pumping capacity based on peak day demands.
4. Average Unit costs are shown for relative comparison purposes only.  Actual unit cost at startup will be greater due to smaller volume of sales and differing operations and maintenance costs.
   For example, assuming startup annual sales of 2 MGD and reduced O&M costs ($0.18/ccf) from lower labor and chemical expenditures, startup average unit costs could be as high as  $4.34/ccf.