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Water Demand and Availability WRIA 17 – Stage 1

Prepared for:
Public Utility District #1 of Jefferson County
& the WRIA 17 Planning Unit

June 2010

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REPORT

WATER DEMAND AND AVAILABILITY ASSESSMENT FOR WRIA 17 – STAGE 1

Prepared For: The Water Resources Inventory Area (WRIA) 17 Planning Unit

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EXECUTIVE SUMMARY

The ability of available water supply to meet projected future water demand in the Jefferson County portion of WRIA 17 is assessed for publicly-supplied demand and self-supplied demand. The assessment is conducted at the resolution of subbasins, and on an annual basis.

Publicly-served water demand was estimated using 2009 metered water data. Self-supplied water demand was estimated using per capita water use for residential use, and crop irrigation duties for agricultural use. Demand was distributed among the subbasins using water system information (*e.g.*, number of connections and service areas), the county tax parcel database, and population census data. Historical population growth trends and future Office of Financial Management population projections were used to extrapolate demand to the years 2010, 2016 and 2030.

Future water availability was estimated from the annual quantity of inchoate water rights (Cascadia, 2007) to meet publicly-supplied demand, and reservations in the water management rule (WAC 173-517) to meet self-supplied demand. There is sufficient annual water available to meet publicly-supplied water systems' demand to 2030. However, the analysis of publicly-supplied water and inchoate water rights was conducted at the resolution of a subbasin and on an annual basis. The distribution of the annual quantity may be inadequate to meet the needs of various water systems within individual subbasins. Additionally, individual systems may not have sufficient water rights or infrastructure storage capacity to meet instantaneous demand. Changes to existing water rights and/or new water rights may be needed, as partially represented by pending water right applications.

Self-supplied water is assumed to be met by water reserves under the water management rule (WAC 173-517). Projected self-supplied demand in the Chimacum and Ludlow Subbasins are projected to account for all of the water reserve by 2012 and 2020, respectively. Apparent projected shortfalls for the coastal management areas (Quimper, Miller and Indian-Marrowstone) are artifacts because there are no reserves established for these areas. All other subbasins have sufficient water reserves, at the annual resolution for individual subbasins, to meet self-supplied demand through 2030. As with publicly-supplied water, the distribution of available water supply within subbasins may present challenges to meeting individual water supply needs. Changes to existing water rights, particularly from existing to new agricultural uses, and/or new water rights may be needed.

The largest amount of reliable water available for future use is in the Big Quilcene Subbasin (slightly more than 200 afy). Additional water is available in the form of interruptible supply from the Big Quilcene River and Chimacum Creek. Making these supplies available to areas where there may be shortfalls will require significant infrastructure, which in most cases does not exist. Use of an interruptible supply may require some form of seasonal storage such as aquifer storage and recovery or off-stream storage.

Additional water supply may be available under the water management rule with mitigation of negative impacts.

This assessment is the first of a two-stage analysis. This first stage assessment provides an overview of projected demand and supply by subbasin to the year 2030. The work was conducted using available information provided by the Jefferson PUD. The reliability of data for approximately 87% of the current water demand is very high (*i.e.*, metered public water system data). Self-supplied residential use represents approximately 2% of total water demand. Refining the estimated demand for self-supplied residential water use will provide limited additional value, particularly because much of the water use is non-consumptive and returns to groundwater through septic systems. Agricultural self-supplied demand comprises approximately 8% of total water demand and is considered to be of limited reliability, primarily because of the uncertainty in the actual acreage irrigated. A better inventory of agricultural irrigated lands will provide the best improvement to water demand estimates.

This assessment was conducted at the resolution of nine subbasins, as specified in the grant contract and agreements between Jefferson County, Jefferson PUD #1 and Ecology. Resource management under the water management rule (WAC 173-517) has recently been defined at the resolution of 29 management areas (24 within the study area), and subbasins may contain several management areas. The analysis in this study could be conducted at the resolution of management areas in the future.

Options for the Stage 2 Assessment include the following:

- Addressing the projected shortfall of supply for self-supplied residential demand in the Chimacum and Ludlow Subbasins.
- Better characterization of anticipated agricultural use demand in various Subbasins/management areas, and in the Chimacum Subbasin/management area in particular, and finding a way to meet that demand.
- Addressing the operational and seasonal needs of water rights for publicly-supplied systems.

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1.0 INTRODUCTION

This report is the first stage of a two-stage assessment of current and future water demand and availability in the Quilcene-Snow Water Resource Inventory Area 17 (WRIA 17). Water demand is estimated for 2010, and projected to 2016 and 2030 using water system plans, population projections, and Washington Department of Health (DOH) data. Water availability is estimated using inchoate water rights and the water management rule for WRIA 17 (Washington Administrative Code [WAC] 173-517). Analysis is conducted on an annual resolution at the scale of subbasins. Subbasins with adequate and inadequate water supply to meet projected demand are identified. Strategies to meet future water demand within the subbasins of WRIA 17 are to be developed in the second stage of the project.

The geographic extent of this assessment is limited to the East Jefferson County portion of Water Resource Inventory Area (WRIA) 17. The Clallam County portion of WRIA 17 and the western portion of Jefferson County are not included in this analysis.

There are nine subbasins within the Jefferson County portion of WRIA 17 comprising the study area for this assessment (Figure 1):

- Big Quilcene.
- Chimacum.
- Dabob-Thorndyke.
- Indian-Marrowstone.
- Little Quilcene.
- Ludlow.
- Miller.
- Quimper.
- Salmon-Snow.

The subbasins are comprised of 29 management areas defined in the water management rule (WAC 173-517; Figure 1).

The portions of the Little Quilcene, Miller, and Salmon-Snow Subbasins or subbasins that drain into Sequim Bay located within Clallam County are not included in this analysis. This analysis has not been conducted at the same level of detail as a coordinated water system plan, which would require detailed analysis of individual water systems. The coordinated water system plan will be updated in the future by Jefferson County. In general, this demand assessment assumes that future residential development will follow existing density patterns. A full build-out analysis is not included in the scope of this assessment.

2.0 DATA SOURCES

Public Utility District #1 of Jefferson County (Jefferson PUD) provided the following water system planning documents and electronic GIS coverages used in this assessment, including:

- Water System Planning documents
  - Jefferson County PUD#1 Water System Plan (Jefferson PUD, 2005).
  - City of Port Townsend Water System Plan (CH2Mhill, 2008).
- 1997 Coordinated Water System Plan for Jefferson County (Economic and Engineering Services, 1997; updated 2004 draft revisions were provided by Marc Horton of Skillings Connolly, Inc.).
- Public water system metering data:
  - 2009 Monthly Water Use and Connections Data Aggregated by Customer Class for Jefferson PUD (Graham, 2010a and 2010b).
  - 2009 Monthly Water Use and Connections Data Aggregated by Customer Class for the City of Port Townsend (Jablonski, 2010a, 2010c).
- Electronic GIS coverages of water system boundaries, water source locations for water systems, and permit exempt well data from 2000 (Graham, 2010c).

Additional sources of information used in this assessment include:

- The inchoate water rights assessment in the Detailed Implementation Plan for the Quilcene-Snow Water Resource Inventory Area 17 (Cascadia Consulting Group, 2007).
- Washington State Office of Financial Management (OFM) annual population estimates and population projections (OFM, 2007 and 2009).
- Jefferson County Comprehensive Plan (Jefferson County, 2004).
- Stage 1 Technical Assessment for WRIA 17 (Parametrix and others, 2000).
- Water Facility Inventory Forms in Washington Department of Health (DOH) Sentry Database (DOH, 2009).
- U.S. Geological Survey (USGS) 2005 Estimates of Water Use by County (USGS, 2005).
- Jefferson County GIS parcel data (Jefferson County, 2010).
- Joint Population Forecast & Allocation – Update for Jefferson County (Cascadia Community Planning Services, 2003).
- Washington State Department of Natural Resources, Earth Resource Permit Locations Database for active mining locations (DNR, 2010).
- U.S. Department of Agriculture (USDA) 2007 Census of Agriculture Data (USDA, 2009).
- Current Water Right & Water Right Change Applications Pending with Ecology for Jefferson County (Ecology, 2010).

The PUD attempted to obtain metered water data for WRIA 17 from Ecology for the study. With some exceptions, water rights that were a part of Ecology's court ordered compliance plan - rights in the 80th percentile in the 16 critical basins - currently must meter and report water use. The existing database is not sufficient to provide a reasonable approximation of all types of water use within WRIA 17. The Ecology database may be more usable in the future.

3.0 POPULATION ESTIMATES AND PROJECTIONS

The Washington State Office of Financial Management (OFM) provides annual population estimates for each county in the state. The most recent population estimates for Jefferson County are for April 1, 2009 (OFM, 2009). The 2009 population estimates include estimates for incorporated and unincorporated areas. The only incorporated area in Jefferson County is the City of Port Townsend, located in the Quimper Subbasin in WRIA 17. The only other Urban Growth Area (UGA) in the County, other than the City of Port Townsend, is the pending Tri-Area UGA.

OFM also prepares population projections to plan for future growth under the Growth Management Act (GMA) every five years. The projections are developed within the framework of expected state growth and provide estimates of population assuming high, intermediate and low population growth for each county. Jefferson County is a participant in the GMA, and develops planning policies and regulations consistent with OFM population projections. The most recent population projections for Jefferson County were prepared in 2007 (OFM, 2007).

3.1 2009 Population

An estimated 29,000 people lived in Jefferson County in 2009 (OFM, 2009), including the incorporated area of the City of Port Townsend, and unincorporated areas of Jefferson County both inside and outside of WRIA 17. The following assumptions were used to estimate the 2009 population within WRIA 17:

- The total incorporated population (City of Port Townsend) is located within WRIA 17 (8,895 people).
- The unincorporated population of Jefferson County is distributed across residential parcels within the unincorporated portion of the county. Based on an analysis of the residential parcels in the unincorporated area (*i.e.*, outside of the City of Port Townsend) approximately 91 percent of Jefferson County's unincorporated population resides in WRIA 17.

Jefferson County provided the parcel data for the county which was used to perform the parcel analysis for the unincorporated area of Jefferson County (Jefferson County, 2010). The residential parcels within the unincorporated area (*i.e.*, outside of the City of Port Townsend) were identified and characterized as single family residential and multi-family residential using the land use description provided in the parcel database. It was assumed that each single family residential parcel could have one household per parcel and each multi-family residential parcel could have two households per parcel. Based on these assumptions, approximately 91 percent of Jefferson County's unincorporated population resides in WRIA 17. A sensitivity analysis was also performed to understand the sensitivity of the results to the assumption of the number of potential households for the multi-family parcels. Assuming three households per multi-family parcel rather than two households would increase the population within the WRIA 17 portion of unincorporated Jefferson County by approximately one-half of a percent (127 people). Assuming 10 households per multi-family parcel rather than two households would increase the

population within the WRIA 17 portion of unincorporated Jefferson County by approximately 3.4 percent (681 people).

The population is then distributed between those that have publicly-supplied and self-supplied water. Publicly-supplied water is defined as consisting of the Group A systems identified in the WRIA 17 assessment of inchoate water rights (Cascadia Consulting Group, 2007). All other users are defined as self-supplied, and include:

- Exempt wells: Exempt wells may serve up to six residential homes, or a maximum of 5,000 gallons per day.
- Group B systems: Group B systems may be served by an exempt well, or have a water right. The total population of approximately 500 people is served by 82 Group B water systems as reported in the DOH Sentry database (DOH, 2009) and accounts for approximately 12% of the total population outside Group A water systems (12% of approximately 4,600 people), or 2% of the study area.
- Group A systems that are not included in the publicly-supplied definition: There are 22 Group A systems serving a total of approximately 50 people included in the definition of self-supplied water users (DOH, 2009). These systems are characterized by non-community systems such as parks, retail outlets, churches, and fire stations.

Table 1 presents the 2009 population by subbasin served by self-supplied water users. An estimated 27,200 people lived in the Jefferson County portion of WRIA 17 in 2009. Approximately 83 percent or 22,600 people are publicly-supplied with water. Approximately 17 percent or 4,600 people are self-supplied with water. A more detailed description of the development of publicly- and self-supplied water users estimates follows.

3.1.1 Publicly-Supplied Water User Population

The population served by the Group A water systems comprising publicly-supplied water is allocated to the subbasin in which the water service area is located, with the following assumptions for systems whose service areas straddle subbasin boundaries:

- The Quilcene Group A water system population is split between Big Quilcene Subbasin (30 percent) and Little Quilcene Subbasin (70 percent), based on the proportion of the residential parcels within the service area for each subbasin.
- The MOA-TEL Group A water system population is split between Salmon-Snow Subbasin (84 percent) and Miller Subbasin (16 percent), based on the proportion of the residential parcels within the service area for each subbasin.
- The Quimper Group A water system primarily serves people within the Chimacum Subbasin, but also serves people within the Indian-Marrowstone Subbasin. The portion of the water demand and population associated with Indian-Marrowstone Subbasin was provided by the Jefferson PUD (Graham, 2010b).

TABLE A. GROUP A WATER SYSTEM POPULATION BY SUBBASIN

Big Quilcene Subbasin	21
Chimacum Subbasin	4,937
Dabob-Thorndyke Subbasin	101
Indian-Marrowstone Subbasin	493
Little Quilcene Subbasin	28
Ludlow Subbasin	3,765
Miller Subbasin	509
Quimper Subbasin	12,679
Salmon-Snow Subbasin	71
Total	**22,604**

3.1.2 Self-Supplied Water User Population

The population remaining after the publicly-supplied water users are removed from the total population is assumed to be self-supplied. This includes the population served by Group B water systems and permit-exempt wells. The Group B water systems population was distributed to each subbasin using the drinking water location GIS data provided by the PUD to Golder. This analysis assumed that the population served by the Group B water system is located in the same subbasin in which the drinking water source is located. Approximately 77 percent of the Group B water system population was associated with a subbasin.

TABLE B. GROUP B WATER SYSTEM POPULATION BY SUBBASIN

Big Quilcene Subbasin	81
Chimacum Subbasin	70
Dabob-Thorndyke Subbasin	25
Indian-Marrowstone Subbasin	47
Little Quilcene Subbasin	11
Ludlow Subbasin	76
Miller Subbasin	72
Quimper Subbasin	0
Salmon-Snow Subbasin	111
Total	**414**

The remaining population was then assumed to be served by a permit exempt well, and distributed between subbasins in proportion to the number of permit exempt wells within each subbasin. It was assumed that all Group B water systems counted in the previous step were served by permit exempt wells. Therefore, the number of Group B water systems in each subbasin was subtracted from the total number of permit exempt wells within each subbasin. Note that the permit-exempt well data used to develop these percentages is from the 2000 technical assessment and may not reflect current patterns if well development from 2000 to 2009 has not followed the density patterns shown by the 2000 data. Analyzing the well logs from the past ten years was outside the scope of work for this project and is something that could be done as part of future studies.

TABLE C

PERMIT EXEMPT WELL POPULATION DISTRIBUTION AMONG SUBBASINS

Big Quilcene Subbasin	5.1%	211
Chimacum Subbasin	14.3%	586
Dabob-Thorndyke Subbasin	11.9%	486
Indian-Marrowstone Subbasin	13.2%	539
Little Quilcene Subbasin	9.1%	373
Ludlow Subbasin	21.2%	868
Miller Subbasin	4.4%	179
Quimper Subbasin	17.5%	714
Salmon-Snow Subbasin	3.4%	138
Total	**100.0%**	**4,094**

3.2 Allocation of Population Growth

Population growth is distributed into planned or existing UGAs and rural areas based on the distribution used in the Cascadia Community Planning Services (2003) report. The population allocations and projections in the 2003 report are used as the basis for the population allocations and projections in the 2004 Jefferson County Comprehensive Plan (Jefferson County 2004), the 2005 Jefferson County Public Utility District No. 1 Water System Plan (Jefferson PUD 2005) and 2008 City of Port Townsend Water Supply Plan (CH2MHill 2008). Therefore, those population growth allocations are also used in this assessment.

The following potential geographic distribution of population growth within Jefferson County was developed by Cascadia Community Planning Services (2003, p. 8) in support of the 2004 comprehensive plan:

> *"Application of this approach results in a total of approximately 70% of the county's total 2000 - 2024 growth being allocated to urban areas, with the balance of growth being directed to unincorporated rural and resource areas of the county. Some 36% of the projected county-wide growth would be planned for and accommodated within the Port Townsend UGA, while a combined 34% would be accommodated within the Tri-Area UGA and Port Ludlow MPR [Master Planned Resort] (i.e., 17% in each)."*

In order to apply these findings to the context of this demand analysis, it is assumed that the following three Group A water systems would serve the expected population growth within the UGAs and MPR:

- The 36 percent of total county population growth allocated to the City of Port Townsend UGA will be served by the City of Port Townsend water system.
- The 17 percent of total county population growth allocated to the Irondale & Port Hadlock UGA will be served by the Quimper water system.
- The 17 percent of total county population growth allocated to the Port Ludlow MPR will be served by the Olympic Water and Sewer System.

The remaining 30 percent of population growth is distributed within and outside of WRIA 17 proportional to the population distribution estimated in 2009 (refer to Section 3.1). Therefore, approximately 91 percent of the 30 percent of Jefferson County's rural population growth would occur in WRIA 17. The other 9 percent of the 30 percent of Jefferson County's rural population growth would occur outside of WRIA 17.

The population growth within WRIA 17 is allocated to the other publicly- and self-supplied water user groups proportional to the 2009 population distribution outside of the three Group A water systems accounted for above (City of Port Townsend, Quimper, and Olympic Water and Sewer).

This assessment only allocates population growth. This assessment has assumed that there would be no change in how an existing parcel in the watershed obtains their water. Therefore, conversion of existing users from self-supplied to publicly-supplied water such as would occur in the case of a service area expansion is not accounted for in this analysis.

3.2.1 Estimated 2010 Population

Population estimates in Jefferson County from 2000 to 2009 indicate that the population has increased by approximately 10 percent over the past nine years (OFM, 2009), which results in an average annual population growth rate of approximately 1.1 percent. Therefore, the 2010 population for Jefferson County is estimated by applying the 1.1 percent average growth rate from the past nine years (2000 to 2009) to the 2009 population. Based on this assumption, the 2010 population for Jefferson County is estimated to be approximately 29,300 people. The addition of 300 people from 2009 to 2010 is distributed within and outside of WRIA 17 using the assumptions presented in Section 3.1. Table 2 presents the 2010 population by subbasin served by publicly- and self-supplied water users. Approximately 27,500 people live in the Jefferson County portion of WRIA 17 in 2010.

3.2.2 Projected 2016 and 2030 Population

OFM prepared population projections for Jefferson County through 2030, using 2005 as the base year for the projections (OFM, 2007). A comparison of the 2009 population with the 2010 low, medium, and high population projections for the county indicates that the 2009 population is intermediate to the low and medium projections (Figure 2). Therefore, the 2010 population estimate (see Section 3.2.1) is used as

the starting point, and projected assuming that the estimated population for any given year would be the average of the low and medium OFM population projection for each year from 2011 through 2030 (Figure 2). Using this new population projection, the projected 2016 population for Jefferson County is approximately 32,300 people, and the projected 2030 population for Jefferson County is approximately 39,000 people.

The addition of approximately 3,300 people from 2009 to 2016 and approximately 10,000 people from 2009 to 2030 are distributed within and outside of WRIA 17 using the assumptions presented in Section 3.1. Table 2 presents the projected 2016 and 2030 publicly- and self-supplied water user populations by subbasin. Approximately 30,400 people are projected to live in the Jefferson County portion of WRIA 17 in 2016, and this number is expected to increase to approximately 36,900 by 2030. Refer to Section 8.0 for a discussion about how the spreadsheet model developed for this analysis can be revised to incorporate new or updated data.

4.0 WATER DEMAND ESTIMATES AND PROJECTIONS

Water demand is estimated for each subbasin in 2010, and projected to 2016 and 2030 (Figures 4 through 6). The 2009 population and water use data are used as the "base year" for all publicly-supplied uses and residential self-supplied use. 2005 is used as the "base year" for non-residential self-supplied water use. Publicly-supplied and self-supplied residential water demand is estimated and projected based on population data and per capita water demand factors (*e.g.,* 80 gallons per person per day), and generally assumes future residential development will follow existing density patterns. Publicly-supplied non-residential water demand, with the exception of industrial demand, was also projected to increase at the same rate as population growth and assumed to follow existing density patterns. Publicly-supplied water for industrial use is assumed to be constant over time because there is no information provided to project a change in the demand. Self-supplied irrigation and livestock, industrial, governmental, and mining demands are assumed to be constant over time because there is no information provided to project a change in the demand. Publicly-supplied water for commercial use was assumed to increase at the same rate as population growth and assumed to follow existing density patterns.

4.1 Publicly-Supplied Water Demand

Information regarding the number of connections, population served and water use was provided by the Jefferson PUD for its water systems and for the City of Port Townsend's water system. Information regarding the number of connections and population served in 2009 for the other Group A water systems was obtained from the DOH Sentry internet database (DOH, 2009). Publicly-supplied water demand is divided into the following categories:

- Residential (single family and multi-family).
- Irrigation and livestock.
- Industrial.
- Commercial.
- Governmental.
- Mining.
- Other.

Water use and connection data provided by the Jefferson PUD and City of Port Townsend were used to develop per capita and per connection water demand factors. These factors were used to estimate water demand for publicly-supplied water systems where data were not available. The demand assessment assumed that there would be no change in the per capita or per connection water demand over time (*e.g.*, there would be no conservation). In addition, the demand assessment assumed that non-residential publicly-supplied water demand would increase at the same rate as the population served by each publicly-supplied water system. Therefore, all changes in water demand for publicly-supplied water demand follow the estimated and projected changes in population served by each Group A water system that are included within the category of publicly-supplied water. Refer to Section 8.0 for a discussion about recommendations for the Stage 2 analysis and how the spreadsheet model developed for this analysis can be revised to incorporate new data and other variables such as conservation.

Ecology's Water Rights Tracking System (WRTS) database lists eleven pending water right applications for new water rights for Group A public water systems for a variety of uses (Ecology, 2010; the listed subbasins are the points of diversion/withdrawal – the place of use is not included in the database):

- Big Quilcene Subbasin: One application for 250 gpm from surface water,
- Chimacum Subbasin: One application for 45 gpm from groundwater.
- Ludlow Subbasin: One application for 15 gpm from groundwater; one application for 60 gpm from groundwater; one application for 50 gpm from groundwater; and, one application for 200 gpm (120 acre-feet per year) from groundwater,
- Miller Subbasin: One application for 100 gpm from groundwater (Discovery Bay Village).
- Salmon-Snow Subbasin: One application for 50 gpm (30 acre-feet per year) from groundwater.
- Quimper Subbasin: One application for 150 gpm from groundwater; one application for 600 gpm from groundwater; and, one application for 379 gpm (225 acre-feet per year) from groundwater,

The status of these applications on the part of the applicant and the likelihood of approval by Ecology in the future are unknown.

4.1.1 Residential Water Demand

Residential water use and connection data provided by the Jefferson PUD and City of Port Townsend were used to develop per capita and per connection water demand factors. The publicly-supplied water systems average 2.4 people per full-time residential connection (Figure 3). The average per capita daily water demand was calculated for publicly-supplied water systems for which data was provided and rounded to the nearest ten gallons (*i.e.*, the per capita use of 78 gallons per day per person (gpd/person) was rounded to 80 gpd/per person). This per capita water use factor of 80 gallons per day per person (gpd/person) was used to estimate the water demand for the rest of the publicly-supplied water systems. Refer to Section 8.0 for a discussion about how the spreadsheet model developed for this analysis can be revised to incorporate different per capita water use factors for different subbasins.

Residential water demand for the publicly-supplied water systems without 2009 demand data is composed of single-family full-time and part-time residential water demand (DOH, 2009; Table 3). Therefore, full-time single family residential water demand was estimated by multiplying the population served by the average daily per capita water demand (80 gpd/person) and by 365 days per year. Part-time single family residential water demand was estimated by multiplying the number of part-time single family residential connections identified in the DOH (2009) data by the number people per connection calculated for that water system, by 80 gpd/person and by 180 days per year.

Two publicly-supplied water systems (Snow Creek and LUD#3) provided metered water use data for single family residences but also had part-time connections identified in the DOH database. In order to split the water demand between full-time and part-time connections, it was assumed that part-time residential connections use half of the water of full-time residential connections.

Residential water demand was estimated for 2009 (Table 3). Water demand was projected to 2010, 2016 and 2030 by multiplying the 2009 water demand by the population growth rate for each publicly-supplied Group A water systems (Tables 4, 5 and 6).

4.1.2 Irrigation and Livestock Water Demand

Jefferson PUD and the City of Port Townsend provided the total 2009 water demand and number of irrigation connections for the Quimper and City of Port Townsend water systems. These meter data were used to develop estimates of publicly-supplied irrigation water demand. Other systems may have irrigation connections but the data were not available. Irrigation water demand was projected to 2010, 2016 and 2030 by multiplying the 2009 water demand by the population growth rate for each Group A water systems (Tables 4, 5 and 6).

4.1.3 Industrial Water Demand

The City of Port Townsend supplies water to the Port Townsend Paper Company (PTPC). This is the only identified industrial connection for the publicly-supplied water systems. Operation of the PTPC's hydro turbine generator requires a constant flow of 14.5 million gallons per day (MGD; Jablonski, 2010b). A significant portion of the water use is non-consumptive, and maybe available for reuse. The City of Port Townsend provided meter records for PTPC's 2009 water use which are used in the demand analysis. Industrial water demand is estimated for 2009 and assumed to not change in the future (Table 3). Therefore, the projected industrial use for 2010, 2016 and 2030 is assumed to be the same as 2009 (Tables 4, 5, and 6).

4.1.4 Commercial Water Demand

Jefferson PUD and the City of Port Townsend provided the total 2009 water demand and number of commercial connections for the Quimper and City of Port Townsend water systems. Commercial water demand for the remaining publicly-supplied systems is assumed to be represented by the number of connections reported in DOH's Sentry Database as "Institutional, Commercial/Business, School, Day Care, Industrial Services, *etc.*"

The commercial water demand for the Quimper system includes water demand of the Port, the airport, Navy, and a USGS field station fish lab. These commercial water demands are uncharacteristic of the types of commercial water demands that would be found in the other publicly-supplied water systems. Therefore, the City of Port Townsend's meter data were used to develop estimates of the commercial water demand per connection for the rest of the publicly-supplied water systems because it serves a more urbanized area and has a smaller per connection usage which is assumed to be more characteristic of the commercial demands for the smaller publicly-supplied water systems. This per connection commercial factor (161,109 gallons per year per connection) is multiplied by the number of assumed commercial connections for the remaining publicly-supplied water systems to estimate the 2009 commercial water demands (Table 3).

Commercial water demand was projected to 2010, 2016 and 2030 by multiplying the 2009 water demand by the population growth rate for each publicly-supplied water system to 2010, 2016, and 2030 (Tables 4, 5 and 6).

4.1.5 Governmental Water Demand

Jefferson PUD and the City of Port Townsend provided the total 2009 water demand and number of governmental connections for the Quimper and City of Port Townsend water systems. The City of Port Townsend's total governmental demand includes the wholesale water that it supplies to Fort Worden State Park. Governmental connections associated with other Group A water systems are included in the aggregated "Institutional, Commercial/Business, School, Day Care, Industrial Services, etc." category provided in DOH's Sentry database, which was included in the estimate of commercial water demand.

Governmental water demand estimated for 2009 was projected to 2010, 2016 and 2030 by multiplying the 2009 water demand by the population growth rate for each publicly-supplied water system to 2010, 2016, and 2030 (Tables 4, 5 and 6)

4.1.6 Mining Water Demand

There are no publicly-supplied water systems within WRIA 17 that identified supplying water for mining activities.

4.1.7 Other Water Demand

Other water demands for publicly-supplied water which are not quantified in this analysis include the water demand associated with the recreational and/or transient accommodation connections (campsites, RV sites, hotel/motel/overnight units). These non-residential connections are identified in DOH's Sentry database; however, none of the water systems for which water demand data were available identified the water use for this group. Therefore, there was not enough information available to quantify this demand.

4.2 Self-Supplied Water Demand

The self-supplied water use is estimated for the following water use categories: residential (*e.g.,* Group B water systems and permit exempt wells); irrigation and livestock; industrial; and, mining. Other potential water demands are identified but not quantified. Population and per capita water use data are used to estimate full-time residential self-supplied use. Parcel data are used to estimate part-time self-supplied residential water use. Irrigation and livestock, industrial and mining water demands are estimated using the 2005 USGS estimates.

Estimates of future water use for residential water demand are assumed to be proportional to the change in population. This approach assumes no change in per capita water use (*e.g.,* no conservation). Refer to Section 8.0 for a discussion about how the spreadsheet model developed for this analysis can be revised to incorporate other variables such as conservation.

4.2.1 Residential Water Demand

Residential water demand includes both full-time and part-time residential water demand. Full-time residential water demand was estimated based on population data. Part-time residential water demand was estimated assuming that parcels used for cabins and vacations homes represented part-time residential water demand. Parcels and cabins are identified as a specific use code in the parcel database. It was assumed that there would be one part-time connection per parcel. Full-time residential water demand was estimated assuming 80 gpd/person for 365 days per year. Part-time residential water demand was estimated assuming one part-time connection per parcel, with 2.4 people/connection at 80 gpd/person for 180 days per year. The 2.4 people per connection factor represents the average number of people per connection for the publicly-supplied water systems within the study area (see Figure 3). The 80 gpd/person was the average per capita residential water demand calculated for the Group A water systems that provided 2009 water use data (see Section 4.1.1).

Residential water demand was estimated for 2009 and projected to 2010, 2016 and 2030 by multiplying the 2009 water demand by the population rate for the self-supplied water user population (Table 7).

The WRTS database lists 16 pending applications for new water rights for self-supplied domestic water use (Ecology, 2010).

- Big Quilcene Subbasin: One application for 20 gpm from groundwater.
- Chimacum Subbasin: One application for 50 gpm from groundwater.
- Dabob-Thorndyke Subbasin: Three applications for a total of 0.11 cfs from surface water, and one application for 120 gpm from groundwater.
- Little Quilcene Subbasin: Two applications for a total of 0.21 cfs from surface water, and one application for 250 gpm from groundwater.
- Ludlow Subbasin: One application for 0.07 cfs from surface water, and two applications totaling 196 gpm from groundwater.
- Miller Subbasin: One application for 600 gpm from groundwater.
- Quimper Subbasin One application for 0.01 cfs from surface water sources and two applications totaling 65 gpm from groundwater.

4.2.2 Irrigation and Livestock Water Demand

Some aspects of assessing agriculture water demand are beyond the scope of this study. However a brief review of the Department of Agriculture Farm Surveys for 1997 through 2007 is provided. The following information was obtained from http://www.agcensus.usda.gov/ using the Quick Facts beta at http://quickstats.nass.usda.gov/?source_desc=CENSUS. The local narrative on local farming trends parallels that of much of the nation. Large and medium sized farms have become increasingly less common, but the number of farm operations has increased. The survey data for Jefferson County, and therefore WRIA 17, support the narrative. All of the following information is for Jefferson County, which represents the majority of farming in WRIA 17.

Farm labor hires for Jefferson County – usually associated with larger farms – have decreased 38% (from 353 to 218) between 2002 and 2007. However, the number of farm operations locally increased in the same period (207 to 211). Many traditional farms that required hired labor likely folded during this period, hence the loss of labor. While there may have been some modest improvements in technology and efficiency that might explain the decrease of labor, new smaller farms with fewer hires could explain the moderate increase in number of farm operations.

Increases in the number of operations which have some irrigated area, as well as the decrease in the amount of irrigated acreage, is consistent with the increase in the number of small farms. The number of operations that irrigate some land steadily increased from 45 in 1997, to 54 in 2002, and 63 in 2007. This trend parallels a reduction in irrigated acreage in farm operations where any irrigation is performed. This also illustrates the degree to which mid-sized family farming has steadily declined within a decade from 889 acres in 1997, to 754 acres in 2002, and 628 acres in 2007.

The data suggest the number of existing medium to large family farms is decreasing, and new smaller farms are increasing in Jefferson County. Prior to the water management rule, this demand may have been met with permit exempt wells which can pump up to 5,000 gallons per day for an “industrial” use such as agriculture regardless of acreage. Based on the modest increase in number of farms reporting with some irrigated acreage, the demand for new water for local agriculture is for approximately two new small farms a year in Jefferson County. A more detailed survey is required to determine if all or some of the new farms are actually just new, smaller operations on previously irrigated farmed lands.

Crop irrigation, golf course irrigation, and livestock water demand was estimated using the 2005 USGS estimated water use for Jefferson County. The USGS (2005) reports a total of 750 irrigated acres of crops. A total of 500 acres of irrigated land is estimated to be in the Chimacum Subbasin, with the majority of the remaining irrigated land being in the Tarboo Creek (Dabob-Thorndyke Subbasin) and the Little Quilcene River (Little Quilcene Subbasin) drainages (Jefferson County Conservation District e-mail communication, in Golder, 2003). Therefore, the remaining 250 acres identified in the USGS 2005 data were split evenly between the Dabob-Thorndyke and Little Quilcene subbasins. The total number of estimated irrigation acres was then multiplied by the per acre application rate identified in the 2005 USGS data (1.39 acre-feet per acre per year [ft/yr]) to estimate annual water demand. It was assumed that there was no change in irrigation between 2005 and 2010 because no new water rights were issued during this time. The most recent crop irrigation survey by the U.S. Department of Agriculture (USDA) reports a total of 628 irrigated acres of crops in Jefferson County in 2007 (USDA, 2009). This indicates that the total acres of irrigated crops may have decreased from 2005 to 2007. Therefore, the assumption of no change in irrigated acreage from 2005 to 2007 provides a conservatively large estimate of water demand for crop irrigation (Table 8).

The USGS (2005) reports a total of 200 acres of golf course irrigation for Jefferson County. The distribution of the 200 acres within Jefferson County was based on identifying the location of golf courses through an internet search to identify the total number of holes within each subbasin.

- Discovery Bay Golf Club, one 18-hole golf course, Quimper Subbasin
- Port Townsend Golf Club, one 9-hole golf course, Quimper Subbasin
- Port Ludlow Golf Course, three 9-hole golf courses, Ludlow Subbasin
- Morningtide Golf Club, one 9-hole golf course, Indian-Marrowstone Subbasin

It was assumed that the golf courses were all self-supplied and that golf course acreage was proportional to the number of holes on the golf courses within each subbasin. The total number of estimated acres of golf course irrigation was then multiplied by the per acre application rate identified in the 2005 USGS data (1.79 feet/year) to estimate annual water demand (Table 8).

The USGS (2005) reports a total of 0.10 MGD of livestock water use in Jefferson County. There is limited information available regarding the geographic distribution of livestock water demand; therefore, it was assumed to be distributed among the subbasins in the same proportions as crop irrigation demand (Table 8). It was assumed that irrigation and livestock water demand would not change in the future (Table 8).

The WRTS database indicated that there were 15 pending water right applications for additional water rights for self-supplied irrigation water use (Ecology, 2010).

- Chimacum Subbasin: Two applications for a total of 700 gpm from groundwater.
- Dabob-Thorndyke Subbasin: Four applications for a total of 1.57 cfs from surface water.
- Little Quilcene Subbasin: One application for 0.03 cfs from Lake Leland, and one application for 294.17 gpm from groundwater.
- Ludlow Subbasin: Three applications for a total of 0.26 cfs from surface water.
- Miller Subbasin: One application for zero cfs from an unnamed pond, and one application for 40 gpm from groundwater.
- Quimper Subbasin: Two applications for a total of 45 gpm from groundwater.

These applications indicate the need for additional water supply.

4.2.3 Industrial Water Demand

The 2005 USGS water use estimate reported no self-supplied industrial water use in Jefferson County; therefore, self-supplied industrial water demand is reported as zero in this analysis. There was no information available to project a change in the demand for self-supplied industrial water use in 2016 and 2030. A review of the WRTS database indicated that there is one pending water right application for commercial/industrial water use in the Chimacum Subbasin with a total instantaneous quantity (Q_i) of 750 gpm (Ecology, 2010). It is unknown if the purpose of this water demand would be commercial or industrial. This application is also identified in the commercial demand section (Section 4.2.4).

4.2.4 Commercial Water Demand

Self-supplied commercial water demand was assumed to be represented by the number of connections reported in DOH's Sentry Database as " Institutional, Commercial/Business, School, Day Care, Industrial Services, *etc.*" for Group B water systems. Therefore, it is possible that commercial water demands are over-estimated at the expense of industrial and governmental water demands.

The per connection commercial factor developed for publicly-supplied water systems (Section 4.1.4) is multiplied by the number of assumed commercial connections for the Group B water systems to estimate the 2009 commercial water demands (Table 9).

Commercial water demand is projected to 2010, 2016 and 2030 by multiplying the 2009 water demand by the population growth rate for the self-supplied users for each subbasin (Table 9). This assessment assumes no water conservation in the future and that future commercial demand will occur in proportion to the existing commercial demand and population growth within each subbasin.

The WRTS database lists one pending water right application for commercial/industrial water use in the Chimacum Subbasin (also identified in Section 4.2.3).

4.2.5 Governmental Water Demand

No information was available to identify self-supplied governmental water demand.

4.2.6 Mining Water Demand

Mining activity in Jefferson County consists of sand and gravel and rock quarries. A total of sixteen active mine permits were identified for Jefferson County using Washington State Department of Natural Resources' (DNR) online database (DNR, 2010). The location of each active mine permit in relation to WRIA 17 and its subbasins was identified using the latitude and longitude data available in the database. Table 10 presents a summary of the active mine permits in Jefferson County by subbasin. No information was provided indicating that the mining demands were publicly-supplied, therefore, they were assumed to be self-supplied.

The USGS reported a total water use of 0.51 MGD (186.15 million gallons in 2005) for mining activity in Jefferson County in 2005. It was assumed that mining water use has not changed from 2005 to 2009 and 2010 because no new water rights have been approved in WRIA 17. The water demand was allocated to the WRIA 17 subbasins using the percent of the total area of mining activity identified in Table 10. It was assumed that mining would not change from 2009 to 2030 (Table 11).

The WRTS database lists one pending water right application for mining water use in the Ludlow Subbasin with a total Qi of 60 gpm. This indicates potential demand within the subbasin for additional water for mining.

4.2.7 Other Water Demand

Other water demands for self-supplied water which are not quantified in this analysis include the water demand associated with recreations/transient accommodations and aquaculture. Recreational and/or transient accommodation connections (campsites, RV sites, hotel/motel/overnight units) identified for Group B water systems are identified in DOH's Sentry database; however, there was not enough information available from the publicly-supplied water systems to quantify this demand. The parcel database lists parcels used for resorts/RV parks, hotels/motels, and recreational sites. However, there was not enough information available to identify: 1) which of these parcels are accounted for within a publicly-supplied or Group B system; and, 2) how many connections should be associated with each parcel.

The USGS (2005) provides an estimate for the water used for aquaculture. However, there is insufficient information to allocate this demand to individual subbasins. Additionally, aquaculture demand is primarily a non-consumptive use that has minimal impacts.

4.3 Demand Summary

The total water demand for WRIA 17 was estimated by subbasin for the following categories of publicly-supplied and self-supplied water demand: residential; irrigation and livestock; commercial, industrial, and mining (Tables 12a, b). The total estimated 2010 water demand for WRIA 17 is approximately 19,700 acre-feet, with approximately 75 percent of that demand associated with the PTPC industrial water demand. Water demand is expected to increase by approximately 1,000 acre-feet by 2030. Assuming no change in the PTPC demand from 2010 to 2030, the PTPC will account for approximately 71 percent of the total water demand by 2030. Other potential water demands (*e.g.,* recreational/transient accommodations and aquaculture) were not quantified in this analysis. The accuracy and reliability of each estimate is summarized below:

- Industrial water demand represents approximately 75% of the total water use in the study area, and is estimated using 2009 metered data, which is a highly reliable source.
- Residential water demand represents approximately 50% of the study area water demand, excluding industrial use, and is estimated using 2009 per capita water use factors for the basin. Publicly-supplied residential use is metered and represents approximately 80% of total residential use in the study area. Metered residential use data is considered highly reliable. The allocation of population between subbasins may introduce some error in the estimate of subbasin demands, which cancel out when aggregated at the study area level.
- Publicly-supplied irrigation and livestock demand is based on 2009 meter data for two publicly-supplied water systems, which is a recent and reliable source of information.
- Self-supplied irrigation and livestock demand estimates are based on data from 2003 (Golder, 2003) and 2005 (USGS, 2005) and assumed to not change from 2005 into the future. Irrigated acreage is reported to have decreased from 2005 to 2007 (USDA, 2009). Therefore, the assumption of no change in irrigated acreage from 2005 to 2007 provides a conservatively large estimate of water demand for crop irrigation.

- Increases in the number of small farms from 1997 thru 2007 reflect demand for new appropriations. Demand for water for small farms in the past was met by using permit exempt wells. New wells are now strictly regulated by the water management rule.
- Commercial water demand is based on metered 2009 water use data for the two largest water systems in the study area. This information is recent and reliable. However, estimates of commercial water demand for the rest of the study area are less reliable due to the limited data available. In addition, the use of the aggregated DOH non-residential connection category to represent commercial demands could result in an over-estimate of the commercial demands at the expense of other water demands (*e.g.* governmental and industrial).
- Governmental water demand for publicly-supplied systems is based on metered 2009 water use data for the two largest water systems in the study area. This is a recent and reliable source of information. There is no reported privately-supplied governmental water demand.
- Total mining water demand for the study area is based on 2005 data (USGS, 2005) and is parsed out among the subbasins by the acreage of land permitted for mining (DNR, 2010). Different mining processes require different water demands and this variability was not included in the assumptions used to allocate the demand to the subbasins. Water use for mining is assumed constant over time as there is no information on how demand may change in the future.
- Other water demands were not quantified in this demand assessment. Therefore, there is the potential to underestimate the total water demand in the study area, including water right applications as an indicator of demand.

The uncertainty of the water uses is inversely proportional to the size of the water uses: that is, the largest water uses also have the highest certainty (*e.g.*, publicly-supplied uses constitute approximately 87% of the total water use in the study area and are metered). However, overall certainty is dependant upon knowledge of all uses which would come with improved metering and reporting which could be provided in a follow-up report.

Existing water system plans were reviewed to identify projected population, connections and water demand for the water systems managed by Jefferson PUD (Jefferson PUD, 2005) and the City of Port Townsend's water system (CH2MHill, 2008). Table 13 compares the water system plan projections to the projections developed in this demand assessment. In general, the water system plan projections of water demand are greater than the projections in this demand assessment, as is appropriate. The water system demand projections are larger for the following reasons:

- The water system planning documents project water demand using the intermediate OFM population forecast. Water system plans developed for DOH have to be conservative to ensure that water is available. This demand assessment uses a lower expected population growth (between the intermediate and low projections) to be consistent with recent population trends and the 2009 population estimate (Section 3.2).
- The 2009 data indicate lower water demand than projected in the water system plans. This demand assessment uses 2009 data as the "base year" for projections.
- The water system planning documents project water demand using a greater per connection water use factor than actual to be consistent with DOH planning guidelines and to be conservative in demand projections. This demand assessment is based on

metered data and does not include account for variability in water demand in different years.

Self-supplied irrigation, livestock and mining water demand are assumed to be constant over time because there no information was provided to project increases in demand. Therefore, the projected 2030 demand will not exceed the undeveloped land capacity. Projections of 2030 commercial, industrial, and governmental water demands are expected to result in an increase of approximately 26 to 33 percent depending on the subbasin, consistent with the projected population growth (Table 12). Assuming one connection per undeveloped parcel zoned for industrial, commercial, and governmental uses, there is sufficient undeveloped land zoned for these uses in the Chimacum, and Quimper Subbasins to accommodate the projected increase in those demands. Projected increases in commercial and governmental demand exceed the available undeveloped land under the assumption of one connection per parcel in the other seven subbasins. However, the land capacity is not expected to constrain growth in these areas because it is possible to have more than one connection per parcel, the demands on existing development can increase in order to meet projected demands, and land can be rezoned. Therefore, the projected demands for commercial and governmental demand were not capped at the undeveloped land capacity.

The method of projecting water demand primarily uses population growth projections. This is contrast to the method used by Washington State Department of Ecology (Ecology) in developing the water reservations under the WRIA 17 water management rule, which extrapolated historical building permit trends and identifying minimum streamflow requirements for fish (Ecology, 2009). Ecology used this information in conjunction with streamflow needs for habitat in order to set aside a percentage of the instream flow for future reservations. This is also in contrast to the build-out analysis for Chimacum Subbasin, which looked at the water demand associated with potential build-out of undeveloped parcels outside of the Jefferson County PUD #1 service area zoned for residential use (Hydrologic Services Council, 2009).

5.0 WATER AVAILABILITY

Water availability to meet future water demand is estimated as a function of inchoate municipal water rights and the water management rule (WAC 173-517). It is assumed that all current water use is met, and only future demand must be met.

5.1 Inchoate Water Rights Quantification

Steps in the development of a water right include application, issuance of a permit, and issuance of a certificate. A permit is issued upon approval of an application, and a development schedule is usually defined during which the permitted water should be applied to beneficial use. A certificate is then issued by the end of the development period for the amount that a water right permit has been applied to beneficial use. Theoretically, the portion of a water right not applied to beneficial use within the development schedule is forfeited.

In the past, certificates had been issued for the full permitted quantity before it has been applied to beneficial use, commonly for municipalities. The portion of a municipal water right that has been applied to beneficial use is called the perfected portion of the water right. The portion of the municipal water right that has not been applied to beneficial use is called the inchoate portion of the water right. Municipal water right holders have been afforded flexibility in the development and exercise of inchoate water rights.

The status of inchoate water rights has been clouded by a legal challenge to the municipal water law. There is lack of clarity among related policies, rules, and statutes, including constitutionality of statutes, definition of terms, and current appeal of the law. Inchoate water rights assumed in this assessment are those identified by Cascadia Consulting Group (2007). It is assumed, though not assured, these inchoate water rights are available to meet future under certain conditions.

The inchoate water rights assessment prepared as part of the WRIA 17 Detailed Implementation Plan (DIP) provided the basis for the inchoate water right analysis (Cascadia Consulting Group, 2007). The 2007 inchoate water rights analysis was updated using 2009 information from Jefferson PUD, the City of Port Townsend, and the DOH Sentry Database. Current (2009) water use was estimated based on the assumptions in Section 4.1. Changes to the table in the 2007 DIP included:

- Removal of the water systems located in the basins outside of the study area of this assessment, including all water systems in the Johnson subbasin and the following water systems which are located in Clallam County per DOH Sentry database: PWSID 19210 - Diamond Point; PWSID 06947 - Panorama Vista; and, PWSID 86250 - Sunshine Acres.
- Removal of PWSID 20514 - Mobile Village, which is identified as inactive as of 7/23/2009 in DOH's Sentry database.
- Reorganization of the data so that the water systems were grouped by subbasin, as opposed to management area, and based on place of use, as opposed to point of withdrawal. The place of use of the systems was identified using the service area GIS data provided by Jefferson PUD. PWSID 27047 - Jackson Cove was not in the service

area shapefile, so the subbasin location was identified using the "dw source" location GIS file provided by Jefferson PUD.

- Update of the water use and inchoate rights analysis based on:
  - Jefferson PUD systems 2009 water production and water use data.
  - City of Port Townsend 2009 water production and use data.
  - Estimated 2009 water production and use data for the remaining publicly-supplied water systems.
    - Water production was estimated for publicly-supplied water systems where data were unavailable by multiplying the estimated water use by 1.18 (*i.e.*, assuming a 15% system loss, which is the average 2009 system loss from Gardiner LUD 1, Snow Creek, Bywater Bay, and Quilcene water systems. It was assumed that these systems would be representative of the water systems for which water production data were not available.)

Table 14 presents the updated inchoate water rights analysis for 2009, 2010, 2016, and 2030 based on the water demands estimated for each publicly-supplied water system (see Section 4.1). The inchoate water rights were calculated assuming that use under the water right would be limited to production, not water use. (The difference between water production and metered use is system loss – regulated by DOH as "unaccounted for" water.) Demands that were previously split between subbasins for the analysis were aggregated to compare the total water system demand to the total water rights held by that water system. In addition, the inchoate water rights assessment does not include an assessment of the City of Port Townsend's inchoate water rights because the City of Port Townsend's Big Quilcene River and Little Quilcene River water rights are based on maximum instantaneous appropriations of 30 cfs and 9.56 cfs respectively, and not limited to annual quantities. While there are no annual acre-feet conditions associated with these water rights, the entire instantaneous rights are used periodically on an annual basis. Diversions are conditioned by minimum instream flow requirements of 27 cfs for the Big Quilcene River and 6 cfs for the Little Quilcene River. Maintenance of minimum instream flows seasonally reduces or precludes use of municipal water rights, requiring the use of stored water.

Based on the demand analysis for publicly-supplied water, all of the publicly-supplied water systems have sufficient water rights to supply the projected 2030 demand (based on annual production). This estimate excludes water demand for recreational/transient accommodations. The exercise of water rights is limited by both the annual volume of water used (annual quantity, or Qa), and the instantaneous rate of withdrawal/diversion (instantaneous quantity or Qi). The analysis conducted in this assessment and by Cascadia (2007) only considers the annual limitation. No systems have been identified as being limited by annual water right quantities. However, Cascadia (2007) identified the City of Port Townsend water system as being limited by instantaneous water right quantities because there is no annual acre-foot quantity associated with its water right. Other purveyors may also be limited by instantaneous water right quantities.

The inclusion of system loss in quantifying inchoate water rights is considered appropriate because water rights are limited by withdrawal/diversion. Water saved by reducing system losses could increase water availability to meet demand within the limitations of existing water rights.

5.2 Water Management Rule (WAC 173-517)

The 2009 water management rule (WAC 173-517) provides allowances for development of additional water supply. Table 15 presents the reserves and maximum allocations set aside in the rule by management area and aggregated by subbasin (management areas are a sub-set of subbasins).

The rule distinguishes between "reserve" and "coastal" management areas (Figure 1). Reserve management areas have a one-time, finite allocation of water for future appropriations. Future allocations in coastal management areas are generally not currently constrained by the water management rule, though they may be constrained by other factors (*e.g.*, impairment of other water users, or saline intrusion considerations). Ecology intends to consider protections for small coastal drainages in future rule-making. Three subbasins are completely comprised of coastal management areas (*i.e.,* Indian-Marrowstone, Miller and Quimper subbasins). Three subbasins are completely comprised of reserve management areas (*i.e.,* Chimacum, Little Quilcene and Snow-Salmon subbasins). The remaining three subbasins consist of both coastal and reserve management areas (*i.e.,* Big Quilcene, Dabob-Thorndyke and Ludlow subbasins).

The water management rule reserves water for future uses as a temporary bridge to allow continued growth while alternative sources of water are developed. Set quantities of water are reserved in each of the water management units for the following types of uses:

- Exempt well uses for a maximum of 500 gallons per day (gpd) or an average annual maximum of 350 gpd for an individual user or (for group domestic use) per residence (total allowable volume varies by management area). No outdoor irrigation is allowed under exempt well use in the Chimacum management area.
- A total of 3,000 gpd in the Salmon, and 5,000 gpd in each of the Big Quilcene and Snow management areas for commercial agriculture (without mitigation).
- Permits subject to the public interest test in the Big Quilcene management area, and the Little Quilcene, Thorndyke, Howe and Leland management areas.

Ecology (2009) estimates residential use to result in:

Residential Use Type	Consumptive Use	Return Flow
Interior Water Use	10% of total interior use from evapotranspiration losses over septic systems	90% of total interior use
Exterior Water Use	90% of total exterior use from landscape irrigation losses to evapotranspiration	10% of total exterior use

Ecology (2009) assumes that 63% of total peak use is consumptively lost. On this basis, and other assumptions (Ecology, 2009), Ecology will account use of water quantities reserved for single residential use at a rate of 250 gpd per residence in all management areas, except the Chimacum management area, which will be accounted at a rate of 13 gpd per residence because no landscape irrigation is allowed in this management area.

In addition to the specific reserves for each management area, water in excess of defined instream flows may be available for allocation from the Big Quilcene River and from Chimacum Creek in certain months of the year (WAC 173-517-140):

- Big Quilcene River: 15 cfs (9.69 million gpd) from November 16 to June 15.
- Chimacum Creek: 3 cfs (1.94 million gpd) from December 1 to February 29.

Allocations under these allowances will be interruptible, and will vary from year to year. Estimating the annual volume of water and the reliability of supply under WAC 173-517-140 requires processing historical streamflow data, consideration of future conditions that may affect streamflows (*e.g.*, climate change effects), and an understanding of the level at which Ecology plans to manage the instream flows (daily, weekly, monthly). This level of analysis is outside the scope of work for this project.

5.3 Projected Surplus/Shortfall

The ability of available water supply to meet projected future publicly-supplied demand and self-supplied demand is presented in Table 16, and Figures 7 through 12. Publicly-supplied demand is assumed to be met by inchoate water rights, and all of the publicly-supplied water systems have sufficient water rights to supply the projected annual 2030 demand. Individual systems may not have sufficient water rights or infrastructure storage capacity to meet instantaneous demand.

The analysis of publicly-supplied water and inchoate water rights was conducted at the resolution of a subbasin and on an annual basis. Inchoate water rights are restricted to specific places of use, which in the case of public water systems is their WA Department of Health-approved water service areas identified in their water system plans. Changes to inchoate water rights may be needed to serve water users outside of the existing place of use. Although annual quantities may be adequate, water rights and associated water supply may be inadequate to meet instantaneous peaking demand.

Self-supplied water is assumed to be met by water reserves under the water management rule (WAC 173-517). Projected self-supplied demand in the Chimacum and Ludlow Subbasins is projected to account for all of the water reserve by 2012 and 2020, respectively. Apparent projected shortfalls for the coastal management areas (Quimper, Miller and Indian-Marrowstone) are an artifact that there are no reserves established for these areas. All other subbasins have sufficient water reserves to meet self-supplied demand through 2030. Some important assumptions used in this analysis include:

- Self-supplied demand from both reserve and coastal management areas within a subbasin are aggregated, and applied to reserve quantities under the WAC 173-517. Coastal management areas do not have defined reserves and may or may not contribute to available supply/demand.
- Maximum interruptible allocations from the Big Quilcene River and Chimacum Creek are not accounted. The reliability of these potential sources has not been established, and are only available for limited duration in winter and spring months.

The largest amount of reliable water available for future use is in the Big Quilcene Subbasin (slightly more than 200 afy). Additional water is available in the form of interruptible supply from the Big Quilcene River and Chimacum Creek. Making these supplies available to areas where there may be shortfalls will require significant infrastructure, which in most cases does not exist. Use of an interruptible supply may require some form of seasonal storage such as aquifer storage and recovery or off-stream storage.

6.0 CONSUMPTIVE USE

Total consumptive use for each subbasin is calculated by subtracting return flows from total production occurring within a subbasin. Production data have already been calculated (Tables 3 through 6). Therefore, return flows from various water use types is derived in order to allow calculation of consumptive losses.

6.1 Water System Loss Return Flows

Water system loss is equal to demand plus distribution system losses (Tables 3 through 6; system losses = production - demand). Water distribution system losses represent leakage from the system, mostly through joint leaks to groundwater. Some water is lost to theft, unreported hydrant use and unquantified system blow-offs and backwash, which are assumed to be negligible for this analysis. This constitutes a non-consumptive return flow and is assumed to be 100% non-consumptive. Most of the system loss is assumed to occur in the distribution system in the area of use due to the large number of joints, and not in the major transmission lines delivering water from the sources to the areas of use. Therefore, the return flow is assigned to the subbasin containing the associated demand, rather than in the subbasins containing the source or across which transmission lines traverse.

6.2 Residential Use Return Flows

Metered water system use patterns and assumptions by Ecology (2009) are used to estimate annual consumptive quantities using the following parameters:

- Monthly single family residential demand meter data for 2009 provided by the PUD and City of Port Townsend are used (Graham, 2010a; Graham, 2010b; Jablonski, 2010a).
- Average monthly water use from November through April represents interior use and is constant year-round.
- Remaining use represents landscape irrigation use.
- Interior water use is 10% consumptive during peak summer demand (Ecology, 2009). The maximum of 10% consumptive loss in July-August is scaled to account for the seasonal variation of interior consumptive use resulting from evapotranspiration losses over a septic drain field, as follows:

$$(\text{Interior consumptive loss})_{\text{month}} = 10\% * (\text{Interior use})_{\text{month}} * \frac{(\text{Irrigation consumptive loss})_{\text{month}}}{(\text{Irrigation consumptive loss})_{\text{July-August}}}$$

- Exterior use water is 90% consumptive (Ecology, 2009).

The resulting calculations are presented in Table 18 and Figure 13. Total annual consumptive use for single family residential use with a septic system is estimated to be 28%. This compares to preliminary estimates of total annual consumptive use of:

- 10% for the City of Forks (Golder, 2005).

- 16% in the Kitsap Peninsula (publicly-supplied water for selected water systems; Golder, 2004).
- 50%-67% in the Spokane area (total municipal and exempt wells; Golder, 2003).

The maximum monthly consumptive loss calculated from single family residential metered data (53%) and that calculated by Ecology (2009; 63%) is slightly different. Following is a comparison of known variables from the two methods:

Comparison of Maximum Monthly Estimated Consumptive Residential Water Use

	Ecology (2009)	Publicly-supplied single residential connection meter data (2009)	Units
Residents per connection	2.21	2.4	People per residence
Interior water use	60	55	gpd/capita
	133	131	gpd/residence
Exterior water use	267	149	gpd/residence
	67%	53%	% of total use
Total water use (interior + exterior)	400	280	gpd/residence
Total consumptive use	63%	53%	% of total use

Ecology may have considered self-supplied metered data in the development of their estimates, which was not provided for consideration in this analysis. These data may explain the differences in the estimated consumptive use. Although the Ecology estimates provide the basis for accounting for water use under the water management rule reserves, accounting may be adjusted to reflect actual data such as meter data (WAC 173-517-160). Metering of new water use is required under WAC 173-517-180, including reporting of annual use. Data at a monthly resolution is needed to allow for an adjustment in the accounting of new water use because the accounting is based on peak water use, not annual use.

Domestic wastewater delivered to wastewater treatment plants that discharge to marine waters is considered fully consumptive except for the 10% return flow from exterior landscape irrigation (3% of total annual use; Table 18). This includes Olympic Water & Sewer, Inc. and the Port Townsend sewage treatment plant. It is assumed that all of the publicly-supplied residential water users in these areas are sewered. The planned Port Hadlock wastewater treatment plant will not discharge to marine waters, but will return all of its treated water to the freshwater environment. The influences of inflow and infiltration are not accounted for in this analysis.

6.3 Agricultural Return Flows

It is assumed that the agricultural irrigation application rates reported by the USGS (2005) are 90% consumptive, assuming a 10% return flow, consistent with Ecology (2009). The reported acreage of irrigated crops varies significantly:

- 847 acres and 36 farms in 1997 (USDA, 1999)
- 754 acres and 54 farms in 2002 (USDA, 2004)
- 500 acres in 2003 (Jefferson County Conservation District, in Golder, 2003).
- 750 acres in 2005 (USGS, 2005).
- 628 acres and 63 farms in 2007 (USDA, 2009).

Determining an accurate number of acres of agricultural irrigation would provide the best improvement in associated water use estimates. The USGS (2005) is used in this analysis as specified in the scope of work, which also provides a conservatively high estimate of water demand. Further refinements could be made by inventorying crops and applying appropriate crop irrigation duties, and irrigation methods with their associated efficiencies.

6.4 Other Return Flows

Not accounted for in this analysis are consumptive uses and return flows from the following uses because there is insufficient data to do so:

- Mining
- Commercial/Industrial
- Governmental

Therefore, these uses are effectively included as 100 percent consumptive in this analysis.

6.5 Consumptive Use Calculations

Annual return flows (non-consumptive) are estimated using the above numbers:

- Residential use on septic systems: 72%
- Residential use in sewered areas: 3%
- Distribution system losses: 100%
- Irrigation: 10%
- All other uses: Not calculated (effectively 0%)

Total consumptive use for each subbasin is calculated by subtracting return flows from total withdrawals/diversions occurring within a subbasin (Table 19). Total withdrawals/diversions are accounted for all uses; however return flows are not accounted for some uses. As a result, the unaccounted return flows are effectively assigned a zero value, or are 100% consumptive. The resulting consumptive use analysis may overestimate consumptive use. The approach used accounts for the

consumptive nature of discharges by wastewater treatment plants, and the five recognized interbasin transfers:

Recognized Interbasin Transfers

Source Subbasin	Receiving Subbasin
Big & Little Quilcene	Quimper (City of Port Townsend)
Big Quilcene	Little Quilcene (for part of the Quilcene system)
Salmon-Snow	Miller (for part of MOA-TEL system)
Chimacum	Indian-Marrowstone (for part of the Quimper system)
Chimacum	Quimper (to serve LUD #3 by 2016)

Following are some of the data used to calculate consumptive use for each subbasin (outputs represent surface water diversions and groundwater withdrawals; inputs represent return flows from various uses):

DABOB-THORNDYKE, INDIAN-MARROWSTONE, LUDLOW (and common to all subbasins)

Outputs:

- Publicly-supplied demand served by sources within the subbasin.
- Self-supplied demand.

Inputs:

- 100% of system losses.
- 72% of residential demand on septic systems.
- 3% of residential demand on sewer system.
- 10% of irrigation (publicly-supplied irrigation accounts, agricultural irrigation, and golf course irrigation).

BIG QUILCENE SUBBASIN:

Outputs:

- Publicly-supplied demand of the City of Port Townsend (shared with the Little Quilcene Subbasin).
- Publicly-supplied demand of LUD #3 (2010 only; shared with the Little Quilcene Subbasin).
- Publicly-supplied demand of the Big Quilcene Subbasin.
- Publicly-supplied demand of the Quilcene system.

CHIMACUM SUBBASIN:

Outputs:

- Publicly-supplied demand in the Chimacum Subbasin.
- Publicly-supplied demand in the Indian-Marrowstone Subbasin (served by the Quimper system).
- Future public demand in Quimper (LUD #3 in 2016 and 2030).

LITTLE QUILCENE SUBBASIN:

Outputs:

- Publicly-supplied demand of the City of Port Townsend (shared with the Big Quilcene Subbasin).
- Publicly-supplied demand LUD #3 (2010 only; shared with the Big Quilcene Subbasin).

MILLER SUBBASIN

Outputs:

- All demand within the Miller Subbasin, except for the portion of the MOA-TEL system within the Miller subbasin.

QUIMPER SUBBASIN:

Outputs:

- Publicly-supplied demand (Cape George & Kala Point).

SNOW-SALMON SUBBASIN

Outputs:

- All demand within the Snow-Salmon Subbasin.
- The portion of the publicly-supplied MOA-TEL system demand within the Miller subbasin.

7.0 OPTIONS FOR ADDITIONAL ANALYSIS

This report is the first stage of a two-stage assessment of current and future water demand and availability in WRIA 17. Strategies to meet future water demand within the subbasins of WRIA 17 are to be developed in the second stage of the project. A spreadsheet model was developed to estimate and project water demand for WRIA 17. The spreadsheet model can be used by the PUD to revise/update as the estimates and projections as additional data become available and as assumptions change. For example, one of the assumptions in the demand analysis is that there is no water conservation in the future. The PUD can incorporate conservation into the spreadsheet model in a number of ways. The complexity and effort needed to incorporate a new variable into the analysis depends on the point at which this variable is inserted into the calculations.

In addition, the analysis assumes a specific per capita water use factor for publicly supplied water systems where water demand data were not provided by the PUD and for self-supplied users in each subbasin. The per capita water use factor can be changed at the subbasin level for the self-supplied users and for each public water system as more information becomes available.

The demand analysis was performed at the subbasin level and provides a starting point for identification of water demands at the management area level to be consistent with the water management rule. In addition, the demand analysis evaluates water demand and availability on an annual basis and does not evaluate seasonal water demands or availability.

7.1 Data Sources

The demand estimate was developed using the data that were provided by the PUD and Jefferson County. Below is a brief discussion of the limitations of each data source and ways that the inputs into the analysis could be refined in the future.

- Water System Planning documents – Water system planning documents were only provided for the PUD water systems and City of Port Townsend. This assessment can be updated using new information as the plans are revised. In addition, the information from the other public water systems could be incorporated into the analysis if copies of the documents become available.
- Coordinated water system plan – The coordinated water system plan is still undergoing revision. Information from this plan could be incorporated into the analysis once it is completed.
- Public water system metering data – Recent water system meter data was incorporated for the PUD water systems and City of Port Townsend. Water use was estimated for all other public water systems. Therefore, these data could be updated as meter data becomes available. In addition, all municipal water suppliers must report annually (by July 1) on their water use efficiency performance to customers and DOH, and also make this information available to the public in order to comply with the requirements of the Water Use Efficiency Rule. These data were not available in time for inclusion in this report and could be incorporated into the spreadsheet model to update the analysis.

- GIS data – The PUD provided GIS data for the water system boundaries, water source locations, and permit exempt wells.
  - The water system boundary dataset was incomplete (*e.g.*, Quilcene was missing), and was updated using a map from the revised coordinated water system plan and the drinking water source location data.
  - The water source locations data was used to identify the subbasin in which the Group B water systems were located. Not all Group B water systems were included in this dataset, so not all of them were identified. It was assumed that the location of the Group B water system population was the same as the location of the drinking water source.
  - The permit exempt well data were used in this analysis as a way to distribute the self-supplied population amongst the subbasins. This dataset is from the 2000 technical assessment and could be updated as part of future assessments in order to develop a better understanding of how the self-supplied population between subbasins.
- Ecology meter data – The PUD attempted to obtain metered water data for WRIA 17 from Ecology for the study. With some exceptions, only water rights that were a part of Ecology's court ordered compliance plan – rights in the 80th percentile and above in the 16 critical basins – currently must meter and report water use. Ultimately all water rights and new permit exempt wells will be required to report statewide. However, the current state of the existing database in WRIA 17 is not sufficient to provide a reasonable approximation of all types of water use within WRIA 17 at this time. Much of the data is in spreadsheet form and needs to be entered into the system. Queries would not create meaningful summaries of actual water usage. At some time in the future it is expected that Ecology's metered use database will be much more populated, accessible and representative of actual water. Utilizing the Ecology database may be more appropriate in the future when the results of this water demand supply and availability study are being reassessed.
- Group B water systems – Group B water systems were included as part of the self-supplied category of water users in this analysis. This was a reflection of the water right data available from the inchoate water rights analysis (which did not include the Group B systems) and not necessarily an indication of which water systems were "public" by any legal definition. The Group B water systems could be incorporated with the Group A water systems in future analyses. Identifying the location of the population served by Group B water systems (at the subbasin level) could also help refine the distribution of the self-supplied between subbasins.
- County parcel data – Jefferson County's tax parcel data were used to identify the portion of the Jefferson County population which was located within WRIA 17. This dataset changes frequently and should be updated as part of future updates. The dataset also had some limitations in terms of identifying the location of residences because it did not include information about whether there was a structure on the property. It was necessary to remove records that were artifacts from the creation of the dataset that introduced inaccuracy (*e.g.,* in effect double-counting parcels) in the results when attempting to count the number of potential residential parcels. A better understanding of the limitations of this dataset is needed in order to determine its usefulness in future updates.
- OFM Population data – Population projections developed by OFM are from 2007 and are updated every 5 years. Population projections were modified for this analysis to reflect the 2009 population which was between the intermediate and low OFM projections. Population projections could be revised as OFM revises its projections (the next revision would be expected in 2012). The 2010 population can also be updated when OFM prepares the 2010 population estimate and when the 2010 Census data are available. Actual growth could be tracked and matched against projections and assumptions as part of follow-up work.
- Agriculture data – There was very little data available to estimate current and project future agricultural water demand. The irrigated agriculture estimates are a few years old (most recently 2007). In addition, the USDA census data only includes agriculture that it has in their

reporting system and on Ecology water right reporting. Not all agriculture data is available because very few small agriculture operations file business tax returns, instead they report on their 1040 form. Thus, their agriculture income is not reported under a standard industrial classification code and USDA does not know they exist. The trend towards small farms as seen in the 1997, 2002 and 2007 USDA data indicates that this may contribute towards the uncertainty in the estimates provided in this analysis.

7.2 Refined Geographic Analysis

This assessment was conducted at the resolution of nine subbasins, as specified in the grant contract and agreements between Jefferson County, Jefferson PUD #1 and Ecology. Resource management under the water management rule (WAC 173-517) has recently been defined at the resolution of 29 (24 within the study area) management areas, and subbasins may contain several management areas. The analysis in this study could be conducted at the resolution of management areas in the future.

7.3 Stage 2 Analysis

The Stage 2 analysis is anticipated to address potential problems identified in this Stage 1 Assessment.

The Planning Unit has repeatedly stated that there is a demand for new water supply for agricultural uses, particularly for small operations that may have been sustained by permit-exempt wells. Most of the anticipated future demand is expected to occur in the Chimacum subbasin because that is where some of the best soils are located. However, no new water allocations are allowed in the Chimacum management area (which approximates the Chimacum Subbasin) for agricultural uses under the water management rule (WAC 173-517). New water uses may be supplied by new allocations for which negative impacts are fully mitigated, or water could be imported from other management areas (*e.g.*, from the Big Quilcene management area). Additional possible means of meeting this unquantified anticipated demand may be processing changes of existing water rights from discontinued uses. Concurrent work is being conducted to use Aquifer Storage and recovery (ASR) as a tool to augment Chimacum streamflows. This could be used to mitigate new allocations.

Self-supplied demand in the Chimacum and Ludlow Subbasins is projected to have a supply shortfall within 10 years as a result of self-supplied residential population growth. Possible solutions may include converting a portion of the self-supplied population to publicly-supplied sources. There is a significant existing demand in the Ludlow Subbasin for mining use. Supplies currently serving mining uses might be converted to self-supplied residential uses, depending on the lifetime of current mining operations.

Although there are no projected shortfalls for publicly-supplied demand at the annual and subbasin resolution, new water rights or changes to existing water rights may be needed for operational and seasonal needs.

All possible solutions will require an assessment of potential impairment, as defined under the water code (RCW 90.03 and 90.44) and the water management rule (WAC 173-517).

8.0 CLOSING

The Washington Department of Ecology (Ecology) provided the funding for this project under Grant # G0700097 to Jefferson County (County). The County and the Public Utility District #1 of Jefferson County (Jefferson County PUD, or PUD) entered into an interlocal agreement to manage this work. The PUD retained Golder Associates Inc. (Golder) to conduct the work, teamed with Skillings Connolly, Inc. Phil Wiatrak of the Washington Department of Ecology (Ecology) is the watershed planning lead. Neil Harrington, Water Quality Program Manager, and Tami Pokorny are the Jefferson County representatives. Bill Graham, Resource Manager, of Jefferson PUD, is the PUD project manager. Chris Pitre is the Golder project manager for Golder. Additional key staff include Alyssa Neir of Golder and Marc Horton of Skillings Connolly, Inc.

This work was conducted in fulfillment of the scope of work, and in accordance with standard professional standards within the limitations of budget, available data and time.

We very much appreciate the opportunity to provide these services.

Sincerely,

Golder Associates

Chris V. Pitre, L.Hg.
Associate, Water Resources

Alyssa M. Neir
Project Environmental Planner

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TABLES

TABLE 1
ESTIMATED 2009 POPULATION BY SUBBASIN

Subbasin	Estimated Year 2009 Population[1]		
	Publicly-Supplied[2]	Self-Supplied[3]	Total
Big Quilcene	21	292	313
Chimacum	4,937	656	5,593
Dabob - Thorndyke	101	511	612
Indian - Marrowstone	493	586	1,079
Little Quilcene	28	384	412
Ludlow	3,765	944	4,709
Miller	509	251	760
Quimper	12,679	714	13,393
Salmon - Snow	71	249	320
Total	**22,604**	**4,587**	**27,191**

1. The 2009 population within WRIA 17 was estimated using the following assumptions: 1) the total incorporated population (City of Port Townsend) is located within WRIA 17; and 2) the portion of Jefferson County's unincorporated population within WRIA 17 is proportional to the number of residential parcels within WRIA 17. Based on an analysis of the residential parcels in the unincorporated area (*i.e.* , outside of the City of Port Townsend) approximately 91 percent of Jefferson County's unincorporated population resides in WRIA 17.

2. The 2009 population served by publicly-supplied Group A water systems in WRIA 17 was allocated to the subbasin in which the water service area is located (DOH, 2009). The Quilcene, MOA-TEL, and Quimper public water systems serve populations within more than one subbasin. In these cases, the residential parcel data and water service area GIS data were used to split the population between subbasins.

3. The population remaining after the publicly-supplied water users are removed from the total population is assumed to be self-supplied. This population is comppsed of population served by Group B water systems and permit exempt wells. The Group B water system population was identified using DOH data (DOH, 2009) and the GIS data provided by the PUD to identify the subbasin in which the Group B water system is located. The remaining population is distributed according to the distribution of the permit exempt wells. Note that the permit exempt well data is from 2000 and does not reflect any permit exempt wells developed from 2000 to 2009.

TABLE 2
ESTIMATED 2010, AND PROJECTED 2016 AND 2030 POPULATION BY SUBBASIN

WRIA 17 Subbasin	Estimated Year 2010 Population[1,2]			Projected Year 2016 Population[1,3]			Projected Year 2030 Population[1,3]		
	Publicly-Supplied	Self-Supplied	Total	Publicly-Supplied	Self-Supplied	Total	Publicly-Supplied	Self-Supplied	Total
Big Quilcene	21	295	316	23	319	342	26	371	397
Chimacum	4,991	662	5,653	5,502	715	6,217	6,639	833	7,472
Dabob - Thorndyke	102	516	618	110	557	667	129	648	777
Indian - Marrowstone	497	591	1,088	537	638	1,175	625	743	1,368
Little Quilcene	28	388	416	31	419	450	36	488	524
Ludlow	3,829	952	4,781	4,443	1,028	5,471	5,807	1,197	7,004
Miller	513	253	766	556	273	829	647	319	966
Quimper	12,821	720	13,541	14,151	778	14,929	17,115	906	18,021
Salmon - Snow	71	251	322	78	271	349	90	315	405
Total	**22,873**	**4,628**	**27,501**	**25,431**	**4,998**	**30,429**	**31,114**	**5,820**	**36,934**

1. Population growth was distributed into urban growth areas and rural areas based on the distribution used in the 2003 Cascadia Community Planning Services report: 1) The 36 percent of total county population growth that is allocated to the City of Port Townsend Urban Growth Area (UGA) would be served by the City of Port Townsend water system; 2) The 17 percent of total county population growth that is allocated to the Irondale & Port Hadlock UGA would be served by the Quimper water system; 3) The 17 percent of total county population growth that is allocated to the Port Ludlow Master Planned Resort (MPR) served by the Olympic Water and Sewer System. The remaining 30 percent of population growth allocated to the unincorporated rural and resource areas of the county would be distributed within and outside of WRIA 17 in proportion to the population distribution estimated in 2009.

2. The 2010 population for Jefferson County was estimated by applying the average annual growth rate from 2000 to 2009 (1.1 percent) to the 2009 population.

3. The 2010 population estimate was used as the starting point for developing a new population projection that represented the average of the growth expected for the low and medium OFM population projections each year from 2011 through 2030. The additional people from 2009 to 2016 and from 2009 to 2030 were distributed within and outside of WRIA 17 using the assumptions used to allocate the 2009 population.

TABLE 3
2009 ESTIMATED PUBLICLY-SUPPLIED WATER DEMAND

Group A Water System Name	PWSID	2009 Production (gal/yr)[1]	2009 Use (gal/yr)	Full-Time Residential Pop	Per Capita Residential Cons. (gpd/person)	Total Number of Active Conn	Total Number of Approved Conn	Percent Change in Pop 2009 - 2010	Percent Change in Pop 2009 - 2016	Percent Change in Pop 2009 - 2030	Single Family Residential				Multi-Family Residential			Commercial[3]		Government		Irrigation		Industrial		Other[4]	
											Full-Time Water Cons. (gal/yr)[2]	Part-Time Water Cons. (gal/yr)[2]	Full-Time Conn	Part-Time Conn	Water Cons. (gal/yr)	Full-Time Conn	Part-Time Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn
BIG QUILCENE SUBBASIN																											
JEFF. COUNTY PUD #1 - Quilcene*	AB292	493,410	423,681	12	57	8	46	0%	8%	25%	249,332	0	3	0	0	0	0	174,350	5	0	0	0	0	0	0	--	0
JACKSON COVE COMMUNITY	27047	1,452,619	1,234,800	9	0	17	23	0%	11%	22%	262,800	972,000	2	15	0	0	0	0	0	0	0	0	0	0	0	--	0
CHIMACUM SUBBASIN																											
JEFF. COUNTY PUD #1 - QUIMPER**	5783	218,086,130	189,640,113	4937	86	2354	3,149	1%	11%	34%	133,896,753	0	2,276	0	20,717,400	18	0	18,500,370	39	3,842,350	13	12,683,240	8	0	0	--	--
DABOB – THORNDYKE SUBBASIN																											
DABOB COVE COMMUNITY	29428T	1,299,245	1,104,800	26	0	29	48	0%	8%	27%	759,200	345,600	13	12	0	0	0	0	0	0	0	0	0	0	0	--	4
LINDSAY BEACH	31376	426,182	362,400	6	0	20	20	0%	17%	33%	175,200	187,200	6	13	0	0	0	0	0	0	0	0	0	0	0	--	1
JEFFERSON COUNTY WATER DISTRICT 3	36711	6,817,668	5,797,337	69	0	117	253	1%	9%	28%	2,014,800	3,460,320	26	89	0	0	0	322,217	2	0	0	0	0	0	0	--	0
INDIAN-MARROWSTONE SUBBASIN																											
JEFF. COUNTY PUD #1 - QUIMPER**	5783	27,323,448	23,759,520	493	60	224	see Chimacum Subbasin	1%	9%	27%	10,726,030	0	224	0	0	0	0	0	0	13,033,490	1	0	0	0	0	--	--
LITTLE QUILCENE SUBBASIN																											
JEFF. COUNTY PUD #1 - Quilcene*	AB292	1,151,290	988,589	28	57	18	see Big Quilcene Subbasin	0%	11%	29%	581,774	0	6	0	0	0	0	406,816	11	0	0	0	0	0	0	--	1
LUDLOW SUBBASIN																											
OLYMPUS BEACH TRACTS	63700	4,907,468	4,173,017	123	0	72	90	1%	9%	27%	3,591,600	259,200	61	9	0	0	0	322,217	2	0	0	0	0	0	0	--	0
OLYMPIC WATER AND SEWER	68700	85,882,339	73,029,200	2501	0	1471	2,197	2%	23%	68%	73,029,200	0	1,471	0	0	0	0	0	0	0	0	0	0	0	0	--	0
BRIDGEHAVEN COMMUNITY CLUB	08330	19,286,870	16,400,400	501	0	211	350	1%	9%	27%	14,629,200	1,771,200	168	41	0	0	0	0	0	0	0	0	0	0	0	--	2
SHINE PLAT	05820	980,408	833,680	25	0	18	21	0%	8%	28%	730,000	103,680	14	4	0	0	0	0	0	0	0	0	0	0	0	--	0
JEFF. COUNTY PUD #1 - Bywater Bay	02043	20,482,200	16,866,612	400	116	215	300	1%	9%	27%	16,866,612	0	215	0	0	0	0	0	0	0	0	0	0	0	0	--	0
JEFFERSON COUNTY WATER DISTRICT 1	36705	7,382,928	6,278,000	215	0	210	282	1%	9%	27%	6,278,000	0	105	0	0	0	0	0	0	0	0	0	0	0	0	--	105
MILLER SUBBASIN																											
DISCOVERY BAY LEASEHOLDERS	14071	4,054,996	3,448,126	32	0	118	120	0%	9%	28%	934,400	2,030,400	21	94	0	0	0	483,326	3	0	0	0	0	0	0	--	0
DISCOVERY BAY VILLAGE	19430	3,623,384	3,081,109	100	0	96	134	1%	9%	27%	2,920,000	0	40	0	0	0	0	161,109	1	0	0	0	0	0	0	--	55
RONDELAY MEADOWS	74130	3,296,563	2,803,200	96	0	36	37	1%	9%	27%	2,803,200	0	36	0	0	0	0	0	0	0	0	0	0	0	0	--	0
JEFF. COUNTY PUD #1 - Gardiner LUD 1	07877	12,221,600	10,982,140	275	109	128	200	1%	9%	27%	10,982,140	0	128	0	0	0	0	0	0	0	0	0	0	0	0	--	0
MOA-TEL WATER SYSTEM***	07816u	395,499	336,309	6	0	4	see Salmon-Snow Subbasin	0%	17%	33%	175,200	0	2	0	0	0	0	161,109	1	0	0	0	0	0	0	--	0
QUIMPER SUBBASIN																											
JEFF. COUNTY PUD #1 - Jeff. County LUD #3****	00058	14,276,328	13,695,900	800	47	320	505	1%	9%	27%	13,282,430	413,470	301	19	0	0	0	0	0	0	0	0	0	0	0	--	0
PORT TOWNSEND, CITY OF****	69000	5,191,447,290	5,157,059,206	9594	70	4665	not specified	1%	12%	38%	217,980,900	0	4,052	0	26,392,500	125	0	57,676,900	358	24,542,800	61	13,014,900	68	4,817,451,206	1	--	--
CAPE GEORGE COLONY CLUB INC	11050	34,682,592	29,492,000	1010	0	505	640	1%	9%	27%	29,492,000	0	505	0	0	0	0	0	0	0	0	0	0	0	0	--	0
KALA POINT	37500	44,350,871	37,713,326	1275	0	540	617	1%	9%	27%	37,230,000	0	476	0	0	0	0	483,326	3	0	0	0	0	0	0	--	61
SALMON - SNOW SUBBASIN					0	0	0				0	0	0	0	0	0	0	1,127,761	7	0	0	0	0	0	0	--	1
JEFF. COUNTY PUD #1 - Snow Creek	01220	1,589,230	1,461,940	40	100	41	77	0%	10%	28%	979,097	482,843	20	20	0	0	0	0	0	0	0	0	0	0	0	--	1
MOA TEL WATER SYSTEM***	07816u	2,390,762	2,032,961	31	0	19	23	0%	10%	26%	905,200	0	13	0	0	0	0	1,127,761	7	0	0	0	0	0	0	--	0

Grey shading indicates that the 2009 water demand was estimated and not based on 2009 meter data.

Abbreviations: Conn = Connections; Cons. = Consumption; gal/yr = gallons per year; gpd = gallons per day; pop = population; yr = year

* The Quilcene water system serves part of the Big Quilcene Subbasin and Little Quilcene Subbasin. The population and water demand has been split in proportion to the portion of residential parcels within each subbasin: 30 percent in Big Quilcene and 70 percent in Little Quilcene.

** Part of the Quimper system serves Indian-Marrowstone Subbasin. The Indian-Marrowstone Subbasin data was identified by the PUD and subtracted from the totals for the Quimper system. The remaining demand for the Quimper system was associated with Chimacum Subbasin.

*** The MOA-TEL water system serves part of the Salmon-Snow Subbasin and Miller Subbasin. The population and water demand has been split in proportion to the portion of residential parcels within each subbasin: 84 percent in Salmon-Snow and 16 percent in Miller.

**** Jefferson LUD #3 is served via contract with the City of Port Townsend. Therefore, the water demand for LUD#3 is subtracted from the total reported by the City of Port Townsend. The City of Port Townsend provides wholesale water to Fort Worden, which is included as part of the government water demand for the city in this table.

1. The average 2009 system loss from Gardiner LUD 1, Snow Creek, Bywater Bay, and Quilcene water systems was 15 percent. These systems represent smaller water systems for which water production and consumption data were available. Therefore production was calculated for Group A water systems where data were unavailable by multiplying the estimated consumption by 1.18 (i.e., assuming a 15 percent system loss).

2. Residential water consumption was split between full-time and part-time connections based on the number of reported connections. The part-time water demand was estimated using the total number of part-time connections, the water system's per capita water demand factor, 2.4 people per connection and 180 days/year. In cases where water consumption demand were available, the full-time water demand was assumed to be the remainder of the water demand not consumed by part-time connections.

3. Commercial water demand is represented by the number of connections reported in DOH's Sentry Database as " Institutional, Commercial/Business, School, Day Care, Industrial Services *etc.* " No attempt was made to split this number of reported connections into multiple categories.

4. Other water demand represents the number of connections reported in DOH's Sentry Database as "Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)". This is only reported for water systems that did not provide a break-down of 2009 connections and water demand. There was not enough information available to quantify this demand.

TABLE 4
2010 ESTIMATED PUBLICLY-SUPPLIED WATER DEMAND

Group A Water System Name	PWSID	2010 Production (gal/yr)[1]	2010 Consumption (gal/yr)	Full-Time Residential Pop	Total Number of Active Conn	Total Number of Approved Conn	Single Family Residential				Multi-Family Residential		Commercial[3]		Government		Irrigation		Industrial		Other[4]	
							Full-Time Water Cons. (gal/yr)[2]	Part-Time Water Cons. (gal/yr)[2]	Full-Time Conn	Part-Time Conn	Water Cons. (gal/yr)	Full-Time Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn
BIG QUILCENE SUBBASIN																						
JEFF. COUNTY PUD #1 - Quilcene*	AB292	493,411	423,682	12	8	46	249,332	0	3	0	0	0	174,350	5	0	0	0	0	0	0	--	0
JACKSON COVE COMMUNITY	27047	1,452,619	1,234,800	9	17	23	262,800	972,000	2	15	0	0	0	0	0	0	0	0	0	0	--	0
CHIMACUM SUBBASIN																						
JEFF. COUNTY PUD #1 - QUIMPER**	5783	220,433,741	191,681,514	4991	2383	3149	135,361,291	0	2,301	0	20,944,003	19	18,685,374	40	3,880,774	14	12,810,072	9	0	0	--	--
DABOB – THORNDYKE SUBBASIN																						
DABOB COVE COMMUNITY	29428T	1,299,245	1,104,800	26	29	48	759,200	345,600	13	12	0	0	0	0	0	0	0	0	0	0	--	4
LINDSAY BEACH	31376	426,182	362,400	6	20	20	175,200	187,200	6	13	0	0	0	0	0	0	0	0	0	0	--	1
JEFFERSON COUNTY WATER DISTRICT 3	36711	6,896,491	5,864,363	70	120	253	2,044,000	3,494,924	27	90	0	0	325,439	3	0	0	0	0	0	0	--	0
INDIAN-MARROWSTONE SUBBASIN																						
JEFF. COUNTY PUD #1 - QUIMPER**	5783	27,573,414	23,976,882	497	228	see Chimacum Subbasin	10,813,057	0	226	0	0	0	0	0	13,163,825	2	0	0	0	0	--	--
LITTLE QUILCENE SUBBASIN																						
JEFF. COUNTY PUD #1 - Quilcene*	AB292	1,151,291	988,590	28	18	see Big Quilcene Subbasin	581,774	0	6	0	0	0	406,816	11	0	0	0	0	0	0	--	1
LUDLOW SUBBASIN																						
OLYMPUS BEACH TRACTS	63700	4,948,644	4,208,031	124	74	90	3,620,800	261,792	62	9	0	0	325,439	3	0	0	0	0	0	0	--	0
OLYMPIC WATER AND SEWER	68700	87,736,656	74,606,000	2555	1503	2197	74,606,000	0	1,503	0	0	0	0	0	0	0	0	0	0	0	--	0
BRIDGEHAVEN COMMUNITY CLUB	08330	19,445,057	16,534,912	505	214	350	14,746,000	1,788,912	170	41	0	0	0	0	0	0	0	0	0	0	--	3
SHINE PLAT	05820	980,408	833,680	25	18	21	730,000	103,680	14	4	0	0	0	0	0	0	0	0	0	0	--	0
JEFF. COUNTY PUD #1 - Bywater Bay	02043	20,635,817	16,993,112	403	217	300	16,993,112	0	217	0	0	0	0	0	0	0	0	0	0	0	--	0
JEFFERSON COUNTY WATER DISTRICT 1	36705	7,451,606	6,336,400	217	213	282	6,336,400	0	106	0	0	0	0	0	0	0	0	0	0	0	--	107
MILLER SUBBASIN																						
DISCOVERY BAY LEASEHOLDERS	14071	4,054,996	3,448,126	32	118	120	934,400	2,030,400	21	94	0	0	483,326	3	0	0	0	0	0	0	--	0
DISCOVERY BAY VILLAGE	19430	3,659,618	3,111,920	101	99	134	2,949,200	0	41	0	0	0	162,720	2	0	0	0	0	0	0	--	56
RONDELAY MEADOWS	74130	3,330,902	2,832,400	97	37	37	2,832,400	0	37	0	0	0	0	0	0	0	0	0	0	0	--	0
JEFF. COUNTY PUD #1 - Gardiner LUD 1	07877	12,310,484	11,062,010	277	129	200	11,062,010	0	129	0	0	0	0	0	0	0	0	0	0	0	--	0
MOA-TEL WATER SYSTEM***	07816u	395,499	336,309	6	3	see Salmon-Snow Subbasin	175,200	0	2	0	0	0	161,109	1	0	0	0	0	0	0	--	0
QUIMPER SUBBASIN																						
JEFF. COUNTY PUD #1 - Jeff. County LUD #3****	00058	14,401,785	13,816,256	807	323	505	13,398,651	417,605	304	19	0	0	0	0	0	0	0	0	0	0	--	0
PORT TOWNSEND, CITY OF****	69000	5,195,354,739	5,160,940,772	9709	4722	not specified	220,593,763	0	4,101	0	26,708,858	127	58,253,669	362	24,788,228	62	13,145,049	69	4,817,451,206	1	--	--
CAPE GEORGE COLONY CLUB INC	11050	34,991,645	29,754,800	1019	510	640	29,754,800	0	510	0	0	0	0	0	0	0	0	0	0	0	--	0
KALA POINT	37500	44,734,286	38,039,359	1286	547	617	37,551,200	0	481	0	0	0	488,159	4	0	0	0	0	0	0	--	62
SALMON - SNOW SUBBASIN																						
JEFF. COUNTY PUD #1 - Snow Creek	01220	1,589,230	1,461,940	40	41	77	979,097	482,843	20	20	0	0	0	0	0	0	0	0	0	0	--	1
MOA TEL WATER SYSTEM***	07816u	2,390,762	2,032,961	31	20	23	905,200	0	13	0	0	0	1,127,761	7	0	0	0	0	0	0	--	0

Grey shading indicates that the 2009 water demand was estimated and not based on 2009 meter data

Abbreviations: Conn = Connections; Cons. = Consumption; gal/yr = gallons per year; gpd = gallons per day; pop = population; yr = year

* The Quilcene water system serves part of the Big Quilcene Subbasin and Little Quilcene Subbasin. The population and water demand has been split in proportion to the portion of residential parcels within each subbasin: 30 percent in Big Quilcene and 70 percent in Little Quilcene.

** Part of the Quimper system serves Indian-Marrowstone Subbasin. The Indian-Marrowstone Subbasin data was identified by the PUD and subtracted from the totals for the Quimper system. The remaining demand for the Quimper system was associated with Chimacum Subbasin.

*** The MOA-TEL water system serves part of the Salmon-Snow Subbasin and Miller Subbasin. The population and water demand has been split in proportion to the portion of residential parcels within each subbasin: 84 percent in Salmon-Snow and 16 percent in Miller.

**** Jefferson LUD #3 is served via contract with the City of Port Townsend. Therefore, the water demand for LUD#3 is subtracted from the total reported by the City of Port Townsend. The City of Port Townsend provides wholesale water to Fort Worden, which is included as part of the government water demand for the city in this table.

1. The average 2009 system loss from Gardiner LUD 1, Snow Creek, Bywater Bay, and Quilcene water systems was 15 percent. These systems represent smaller water systems for which water production and consumption data were available. Therefore production was calculated for Group A water systems where data were unavailable by multiplying the estimated consumption by 1.18 (*i.e.*, assuming a 15 percent system loss).

2. Residential water consumption was split between full-time and part-time connections based on the number of reported connections. The part-time water demand was estimated using the total number of part-time connections, the water system's per capita water demand factor, 2.4 people per connection and 180 days/year. In cases where water consumption demand were available, the full-time water demand was assumed to be the remainder of the water demand not consumed by part-time connections.

3. Commercial water demand is represented by the number of connections reported in DOH's Sentry Database as " Institutional, Commercial/Business, School, Day Care, Industrial Services, *etc*." No attempt was made to split this number of reported connections into multiple categories.

4. Other water demand represents the number of connections reported in DOH's Sentry Database as "Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)". This is only reported for water systems that did not provide a break-down of 2009 connections and water demand. There was not enough information available to quantify this demand.

TABLE 5
2016 ESTIMATED PUBLICLY-SUPPLIED WATER DEMAND

Group A Water System Name	PWSID	2016 Production (gal/yr)[1]	2016 Consumption (gal/yr)	Full-Time Residential Pop	Total Number of Active Conn	Total Number of Approved Conn	Single Family Residential				Multi-Family Residential		Commercial[3]		Government		Irrigation		Industrial		Other[4]	
							Full Time Water Cons. (gal/yr)[2]	Part Time Water Cons. (gal/yr)[2]	Full-Time Conn	Part-Time Conn	Water Cons. (gal/yr)	Full-Time Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn
BIG QUILCENE SUBBASIN																						
JEFF. COUNTY PUD #1 - Quilcene*	AB292	533,852	458,408	13	10	46	270,110	0	4	0	0	0	188,298	6	0	0	0	0	0	0	--	0
JACKSON COVE COMMUNITY	27047	1,639,431	1,393,600	10	20	23	292,000	1,101,600	3	17	0	0	0	0	0	0	0	0	0	0	--	0
CHIMACUM SUBBASIN																						
JEFF. COUNTY PUD #1 - QUIMPER**	5783	242,865,416	211,187,318	5502	2626	3149	149,220,161	0	2,537	0	23,088,340	21	20,535,411	44	4,265,009	15	14,078,397	9	0	0	--	--
DABOB – THORNDYKE SUBBASIN																						
DABOB COVE COMMUNITY	29428T	1,401,792	1,192,000	28	32	48	817,600	374,400	14	13	0	0	0	0	0	0	0	0	0	0	--	5
LINDSAY BEACH	31376	511,325	434,800	7	25	20	204,400	230,400	7	16	0	0	0	0	0	0	0	0	0	0	--	2
JEFFERSON COUNTY WATER DISTRICT 3	36711	7,469,313	6,351,457	75	130	253	2,190,000	3,810,240	29	98	0	0	351,217	3	0	0	0	0	0	0	--	0
INDIAN-MARROWSTONE SUBBASIN																						
JEFF. COUNTY PUD #1 - QUIMPER**	5783	29,773,302	25,889,828	537	246	see Chimacum Subbasin	11,683,323	0	244	0	0	0	0	0	14,206,505	2	0	0	0	0	--	--
LITTLE QUILCENE SUBBASIN																						
JEFF. COUNTY PUD #1 - Quilcene*	AB292	1,275,998	1,095,673	31	22	see Big Quilcene Subbasin	644,107	0	7	0	0	0	451,566	13	0	0	0	0	0	0	--	2
LUDLOW SUBBASIN																						
OLYMPUS BEACH TRACTS	63700	5,353,172	4,552,017	134	80	90	3,912,800	288,000	67	10	0	0	351,217	3	0	0	0	0	0	0	--	0
OLYMPIC WATER AND SEWER	68700	105,283,987	89,527,200	3066	1804	2197	89,527,200	0	1,804	0	0	0	0	0	0	0	0	0	0	0	--	0
BRIDGEHAVEN COMMUNITY CLUB	08330	21,035,347	17,887,200	546	232	350	15,943,200	1,944,000	184	45	0	0	0	0	0	0	0	0	0	0	--	3
SHINE PLAT	05820	1,079,568	918,000	27	21	21	788,400	129,600	16	5	0	0	0	0	0	0	0	0	0	0	--	0
JEFF. COUNTY PUD #1 - Bywater Bay	02043	22,325,598	18,384,607	436	235	300	18,384,607	0	235	0	0	0	0	0	0	0	0	0	0	0	--	0
JEFFERSON COUNTY WATER DISTRICT 1	36705	8,035,373	6,832,800	234	230	282	6,832,800	0	115	0	0	0	0	0	0	0	0	0	0	0	--	115
MILLER SUBBASIN																						
DISCOVERY BAY LEASEHOLDERS	14071	4,437,783	3,773,625	35	130	120	1,022,000	2,224,800	23	103	0	0	526,825	4	0	0	0	0	0	0	--	0
DISCOVERY BAY VILLAGE	19430	3,949,489	3,358,409	109	106	134	3,182,800	0	44	0	0	0	175,609	2	0	0	0	0	0	0	--	60
RONDELAY MEADOWS	74130	3,605,616	3,066,000	105	40	37	3,066,000	0	40	0	0	0	0	0	0	0	0	0	0	0	--	0
JEFF. COUNTY PUD #1 - Gardiner LUD 1	07877	13,332,654	11,980,516	300	140	200	11,980,516	0	140	0	0	0	0	0	0	0	0	0	0	0	--	0
MOA-TEL WATER SYSTEM***	07816u	462,048	392,898	7	5	see Salmon-Snow Subbasin	204,400	0	3	0	0	0	188,498	2	0	0	0	0	0	0	--	0
QUIMPER SUBBASIN																						
JEFF. COUNTY PUD #1 - Jeff. County LUD #3****	00058	15,575,338	14,942,097	872	350	505	14,477,848	464,248	329	21	0	0	0	0	0	0	0	0	0	0	--	0
PORT TOWNSEND, CITY OF****	69000	5,233,618,678	5,198,951,251	10790	5247	not specified	245,154,671	0	4,558	0	29,682,622	141	64,598,128	401	27,487,936	69	14,576,688	77	4,817,451,206	1	--	--
CAPE GEORGE COLONY CLUB INC	11050	37,773,120	32,120,000	1100	550	640	32,120,000	0	550	0	0	0	0	0	0	0	0	0	0	0	--	0
KALA POINT	37500	48,316,695	41,085,625	1389	590	617	40,558,800	0	519	0	0	0	526,825	4	0	0	0	0	0	0	--	67
SALMON - SNOW SUBBASIN																						
JEFF. COUNTY PUD #1 - Snow Creek	01220	1,748,153	1,608,134	44	46	77	1,077,007	531,127	22	22	0	0	0	0	0	0	0	0	0	0	--	2
MOA TEL WATER SYSTEM***	07816u	2,626,404	2,233,337	34	23	23	992,800	0	15	0	0	0	1,240,537	8	0	0	0	0	0	0	--	0

Grey shading indicates that the 2009 water demand was estimated and not based on 2009 meter data.
Abbreviations: Conn = Connections; Cons. = Consumption; gal/yr = gallons per year; gpd = gallons per day; pop = population; yr = yea
* The Quilcene water system serves part of the Big Quilcene Subbasin and Little Quilcene Subbasin. The population and water demand has been split in proportion to the portion of residential parcels within each subbasin: 30 percent in Big Quilcene and 70 percent in Little Quilcen
** Part of the Quimper system serves Indian-Marrowstone Subbasin. The Indian-Marrowstone Subbasin data was identified by the PUD and subtracted from the totals for the Quimper system. The remaining demand for the Quimper system was associated with Chimacum Subbasir
*** The MOA-TEL water system serves part of the Salmon-Snow Subbasin and Miller Subbasin. The population and water demand has been split in proportion to the portion of residential parcels within each subbasin: 84 percent in Salmon-Snow and 16 percent in Mille
**** Jefferson LUD #3 is served via contract with the City of Port Townsend. Therefore, the water demand for LUD#3 is subtracted from the total reported by the City of Port Townsend. The City of Port Townsend provides wholesale water to Fort Worden, which is included as part of the government water demand for the city in th table.

1. The average 2009 system loss from Gardiner LUD 1, Snow Creek, Bywater Bay, and Quilcene water systems was 15 percent. These systems represent smaller water systems for which water production and consumption data were available. Therefore production was calculated for Group A water systems where data were unavailable by multiplying the estimated consumption by 1.18 (*i.e.*, assuming a 15 percent system loss).
2. Residential water consumption was split between full time and part-time connections based on the number of reported connections. The part-time water demand was estimated using the total number of part-time connections, the water system's per capita water demand factor, 2.4 people per connection and 180 days/year. In cases where water consumption demand were available, the full time water demand was assumed to be the remainder of the water demand not consumed by part-time connections.
3. Commercial water demand is represented by the number of connections reported in DOH's Sentry Database as " Institutional, Commercial/Business, School, Day Care, Industrial Services*etc.* " No attempt was made to split this number of reported connections into multiple categories.
4. Other water demand represents the number of connections reported in DOH's Sentry Database as "Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)". This is only reported for water systems that did not provide a break-down of 2009 connections and water demand. There was not enough information available to quantify this demand.

TABLE 6
2030 ESTIMATED PUBLICLY-SUPPLIED WATER DEMAND

Group A Water System Name	PWSID	2030 Production (gal/yr)[1]	2030 Consumption (gal/yr)	Full-Time Residential Pop	Total Number of Active Conn	Total Number of Approved Conn	Single Family Residential				Multi-Family Residential		Commercial[3]		Government		Irrigation		Industrial		Other[4]	
							Full-Time Water Cons. (gal/yr)[2]	Part-Time Water Cons. (gal/yr)[2]	Full-Time Conn	Part-Time Conn	Water Cons. (gal/yr)	Full-Time Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn	Water Cons. (gal/yr)	Active Conn
BIG QUILCENE SUBBASIN																						
JEFF. COUNTY PUD #1 - Quilcene*	AB292	616,765	529,603	15	10	46	311,665	0	4	0	0	0	217,938	6	0	0	0	0	0	0	--	0
JACKSON COVE COMMUNITY	27047	1,826,244	1,552,400	11	22	23	321,200	1,231,200	3	19	0	0	0	0	0	0	0	0	0	0	--	0
CHIMACUM SUBBASIN																						
JEFF. COUNTY PUD #1 - QUIMPER**	5783	293,078,887	254,851,206	6,639	3,166	3,149	180,056,825	0	3,061	0	27,859,595	25	24,790,496	52	5,148,749	17	16,995,542	11	0	0	--	--
DABOB – THORNDYKE SUBBASIN																						
DABOB COVE COMMUNITY	29428T	1,675,094	1,424,400	33	38	48	963,600	460,800	17	16	0	0	0	0	0	0	0	0	0	0	--	5
LINDSAY BEACH	31376	579,533	492,800	8	27	20	233,600	259,200	8	18	0	0	0	0	0	0	0	0	0	0	--	1
JEFFERSON COUNTY WATER DISTRICT 3	36711	8,719,285	7,414,358	88	151	253	2,569,600	4,432,320	34	114	0	0	412,438	3	0	0	0	0	0	0	--	0
INDIAN-MARROWSTONE SUBBASIN																						
JEFF. COUNTY PUD #1 - QUIMPER**	5783	34,673,006	30,150,440	625	285	see Chimacum Subbasin	13,597,908	0	284	0	0	0	0	0	16,552,532	1	0	0	0	0	--	--
LITTLE QUILCENE SUBBASIN																						
JEFF. COUNTY PUD #1 - Quilcene*	AB292	1,482,262	1,272,788	36	23	see Big Quilcene Subbasin	747,995	0	8	0	0	0	524,793	14	0	0	0	0	0	0	--	1
LUDLOW SUBBASIN																						
OLYMPUS BEACH TRACTS	63700	6,244,579	5,310,016	156	93	90	4,555,200	345,600	78	12	0	0	409,216	3	0	0	0	0	0	0	--	0
OLYMPIC WATER AND SEWER	68700	144,327,658	122,727,600	4,203	2,473	2,197	122,727,600	0	2,473	0	0	0	0	0	0	0	0	0	0	0	--	0
BRIDGEHAVEN COMMUNITY CLUB	08330	24,532,301	20,860,800	636	270	350	18,571,200	2,289,600	214	53	0	0	0	0	0	0	0	0	0	0	--	3
SHINE PLAT	05820	1,281,746	1,089,920	32	24	21	934,400	155,520	18	6	0	0	0	0	0	0	0	0	0	0	--	0
JEFF. COUNTY PUD #1 - Bywater Bay	02043	25,961,189	21,378,431	507	273	300	21,378,431	0	273	0	0	0	0	0	0	0	0	0	0	0	--	0
JEFFERSON COUNTY WATER DISTRICT 1	36705	9,374,602	7,971,600	273	267	282	7,971,600	0	134	0	0	0	0	0	0	0	0	0	0	0	--	133
MILLER SUBBASIN																						
DISCOVERY BAY LEASEHOLDERS	14071	5,209,041	4,429,457	41	152	120	1,197,200	2,613,600	27	121	0	0	618,657	4	0	0	0	0	0	0	--	0
DISCOVERY BAY VILLAGE	19430	4,601,697	3,913,008	127	122	134	3,708,400	0	51	0	0	0	204,608	1	0	0	0	0	0	0	--	70
RONDELAY MEADOWS	74130	4,189,382	3,562,400	122	46	37	3,562,400	0	46	0	0	0	0	0	0	0	0	0	0	0	--	0
JEFF. COUNTY PUD #1 - Gardiner LUD 1	07877	15,510,321	13,937,334	349	163	200	13,937,334	0	163	0	0	0	0	0	0	0	0	0	0	0	--	0
MOA-TEL WATER SYSTEM***	07816u	526,701	447,875	8	4	see Salmon-Snow Subbasin	233,600	0	3	0	0	0	214,275	1	0	0	0	0	0	0	--	0
QUIMPER SUBBASIN																						
JEFF. COUNTY PUD #1 - Jeff. County LUD #3****	00058	18,159,674	17,421,362	1,016	408	505	16,868,686	552,676	383	25	0	0	0	0	0	0	0	0	0	0	--	0
PORT TOWNSEND, CITY OF****	69000	5,320,289,106	5,285,047,576	13,198	6,420	not specified	299,865,741	0	5,575	0	36,306,881	172	79,594,122	494	33,869,064	84	17,960,562	94	4,817,451,206	1	--	--
CAPE GEORGE COLONY CLUB INC	11050	44,022,854	37,434,400	1,282	641	640	37,434,400	0	641	0	0	0	0	0	0	0	0	0	0	0	--	0
KALA POINT	37500	56,317,022	47,888,624	1,619	686	617	47,274,800	0	605	0	0	0	613,824	4	0	0	0	0	0	0	--	77
SALMON - SNOW SUBBASIN																						
JEFF. COUNTY PUD #1 - Snow Creek	01220	2,039,391	1,876,045	51	53	77	1,248,349	627,695	26	26	0	0	0	0	0	0	0	0	0	0	--	1
MOA TEL WATER SYSTEM***	07816u	3,010,300	2,559,779	39	26	23	1,138,800	0	17	0	0	0	1,420,979	9	0	0	0	0	0	0	--	0

Grey shading indicates that the 2009 water demand was estimated and not based on 2009 meter data.
Abbreviations: Conn = Connections; Cons. = Consumption; gal/yr = gallons per year; gpd = gallons per day; pop = population; yr = yea
* The Quilcene water system serves part of the Big Quilcene Subbasin and Little Quilcene Subbasin. The population and water demand has been split in proportion to the portion of residential parcels within each subbasin: 30 percent in Big Quilcene and 70 percent in Little Quilcene
** Part of the Quimper system serves Indian-Marrowstone Subbasin. The Indian-Marrowstone Subbasin data was identified by the PUD and subtracted from the totals for the Quimper system. The remaining demand for the Quimper system was associated with Chimacum Subbasin
*** The MOA-TEL water system serves part of the Salmon-Snow Subbasin and Miller Subbasin. The population and water demand has been split in proportion to the portion of residential parcels within each subbasin: 84 percent in Salmon-Snow and 16 percent in Miller
**** Jefferson LUD #3 is served via contract with the City of Port Townsend. Therefore, the water demand for LUD#3 is subtracted from the total reported by the City of Port Townsend. The City of Port Townsend provides wholesale water to Fort Worden, which is included as part of the government water demand for the city in this table.

1. The average 2009 system loss from Gardiner LUD 1, Snow Creek, Bywater Bay, and Quilcene water systems was 15 percent. These systems represent smaller water systems for which water production and consumption data were available. Therefore production was calculated for Group A water systems where data were unavailable by multiplying the estimated consumption by 1.18 (*i.e.* , assuming a 15 percent system loss).

2. Residential water consumption was split between full time and part-time connections based on the number of reported connections. The part-time water demand was estimated using the total number of part-time connections, the water system's per capita water demand factor, 2.4 people per connection and 180 days/year. In cases where water consumption demand were available, the full time water demand was assumed to be the remainder of the water demand not consumed by part-time connections.

3. Commercial water demand is represented by the number of connections reported in DOH's Sentry Database as " Institutional, Commercial/Business, School, Day Care, Industrial Services,*etc* ." No attempt was made to split this number of reported connections into multiple categories.

4. Other water demand represents the number of connections reported in DOH's Sentry Database as "Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)". This is only reported for water systems that did not provide a break-down of 2009 connections and water demand. There was not enough information available to quantify this demand.

TABLE 7
2009, 2010, 2016, AND 2030 ESTIMATED SELF-SUPPLIED RESIDENTIAL WATER DEMAND

Subbasin	% Change in Self-Supplied Population from 2009	Full-Time Population	Full-Time Demand (gal/yr)[1,4]	Part-Time Connections[2,4]	Part-Time Demand (gal/yr)[3,4]	Estimated Residential Water Demand (gal/yr)
2009						
Big Quilcene	--	292	8,526,400	24	829,440	9,355,840
Chimacum	--	656	19,155,200	41	1,416,960	20,572,160
Dabob - Thorndyke	--	511	14,921,200	2	69,120	14,990,320
Indian - Marrowstone	--	586	17,111,200	44	1,520,640	18,631,840
Little Quilcene	--	384	11,212,800	26	898,560	12,111,360
Ludlow	--	944	27,564,800	17	587,520	28,152,320
Miller	--	251	7,329,200	8	276,480	7,605,680
Quimper	--	714	20,848,800	34	1,175,040	22,023,840
Salmon - Snow	--	249	7,270,800	9	311,040	7,581,840
Total	**--**	**4,587**	**133,940,400**	**205**	**7,084,800**	**141,025,200**
2010						
Big Quilcene	1.0%	295	8,614,000	24	837,735	9,451,735
Chimacum	0.9%	662	19,330,400	41	1,431,130	20,761,530
Dabob - Thorndyke	1.0%	516	15,067,200	2	69,812	15,137,012
Indian - Marrowstone	0.9%	591	17,257,200	44	1,535,847	18,793,047
Little Quilcene	1.0%	388	11,329,600	26	907,546	12,237,146
Ludlow	0.8%	952	27,798,400	17	593,396	28,391,796
Miller	0.8%	253	7,387,600	8	279,245	7,666,845
Quimper	0.8%	720	21,024,000	34	1,186,791	22,210,791
Salmon - Snow	0.8%	251	7,329,200	9	314,151	7,643,351
Total	**--**	**4,628**	**135,137,600**	**205**	**7,155,653**	**142,293,253**
2016						
Big Quilcene	9.2%	319	9,314,800	27	933,120	10,247,920
Chimacum	9.0%	715	20,878,000	45	1,555,200	22,433,200
Dabob - Thorndyke	9.0%	557	16,264,400	3	103,680	16,368,080
Indian - Marrowstone	8.9%	638	18,629,600	48	1,658,880	20,288,480
Little Quilcene	9.1%	419	12,234,800	29	1,002,240	13,237,040
Ludlow	8.9%	1,028	30,017,600	19	656,640	30,674,240
Miller	8.8%	273	7,971,600	9	311,040	8,282,640
Quimper	9.0%	778	22,717,600	38	1,313,280	24,030,880
Salmon - Snow	8.8%	271	7,913,200	10	345,600	8,258,800
Total	**--**	**4,998**	**145,941,600**	**228**	**7,879,680**	**153,821,280**
2030						
Big Quilcene	27.1%	371	10,833,200	31	1,071,360	11,904,560
Chimacum	27.0%	833	24,323,600	53	1,831,680	26,155,280
Dabob - Thorndyke	26.8%	648	18,921,600	3	103,680	19,025,280
Indian - Marrowstone	26.8%	743	21,695,600	56	1,935,360	23,630,960
Little Quilcene	27.1%	488	14,249,600	34	1,175,040	15,424,640
Ludlow	26.8%	1,197	34,952,400	22	760,320	35,712,720
Miller	27.1%	319	9,314,800	11	380,160	9,694,960
Quimper	26.9%	906	26,455,200	44	1,520,640	27,975,840
Salmon - Snow	26.5%	315	9,198,000	12	414,720	9,612,720
Total	**--**	**5,820**	**169,944,000**	**266**	**9,192,960**	**179,136,960**

1. Full-time residential water demand was estimated based on population data. Full-time residential water demand was estimate assuming 80 gpd/person for 365 days per year.

2. Part-time residential water demand was estimated assuming that parcels used for cabins and vacations homes represented part-time residential water demand. It was assumed that there would be one part-time connection per parcel. The total number of self-supplied part-time parcels was calculated by subtracting the total number of publicly-supplied part-time connections from the total number of part-time parcels.

3. Part-time residential water demand was estimated assuming one part-time connection per parcel, with 2.4 people/connection at 80 gpd/person for 180 days per year.

4. Residential water demand was projected to 2010, 2016 and 2030 by multiplying the 2009 water demand by the population growth rate for the self-supplied users for each subbasin from 2009 to 2010, 2009 to 2016, and 2009 to 2030, respectively.

TABLE 8
2005, 2010, 2016, AND 2030 ESTIMATED SELF-SUPPLIED IRRIGATION AND LIVESTOCK WATER DEMAND

Subbasin	2005 Crop Irrigation (acres)[1]	2005 Golf Course Irrigation (acres)[2]	Estimated Irrigation and Livestock Water Demand[3]			
			2005 (gal/yr)	2010 (gal/yr)	2016 (gal/yr)	2030 (gal/yr)
Big Quilcene Subbasin	0	0	0	0	0	0
Chimacum Subbasin	500	0	250,799,833	250,799,833	250,799,833	250,799,833
Dabob - Thorndyke Subbasin	125	0	62,699,958	62,699,958	62,699,958	62,699,958
Indian - Marrowstone Subbasin	0	28	16,331,644	16,331,644	16,331,644	16,331,644
Little Quilcene Subbasin	125	0	62,699,958	62,699,958	62,699,958	62,699,958
Ludlow Subbasin	0	86	50,161,478	50,161,478	50,161,478	50,161,478
Miller Subbasin	0	0	0	0	0	0
Quimper Subbasin	0	86	50,161,478	50,161,478	50,161,478	50,161,478
Salmon - Snow Subbasin	0	0	0	0	0	0
Total	**750**	**200**	**492,854,350**	**492,854,350**	**492,854,350**	**492,854,350**

1. The USGS (2005) reports a total of 750 irrigated acres for crops. Golder (2003) estimates that a total of 500 acres of crops were irrigated in the Chimacum Subbasin. The Golder (2003) report indicated that there may be additional crop irrigation in Tarboo Creek (Dabob-Thorndyke Subbasin) and the Little Quilcene River (Little Quilcene Subbasin); however, estimates for these basins were not available. Therefore, the remaining 250 acres identified in the USGS 2005 data were split evenly between the two other subbasins identified as potentially having additional irrigation in the Golder (2003) report.

2. The USGS (2005) reports a total of 200 acres of golf course irrigation for Jefferson County. The distribution of the 200 acres within Jefferson County was based on identifying the location of golf courses through an internet search to identify the total number of holes within each subbasin. The water for golf course irrigation in the Indian-Marrowstone Subbasin currently comes from the Chimacum Subbasin. The current operation; however, could be discontinued in the immediate future and will not be counted against Chimacum (Graham, 2010d).

3. The total number of estimated crop irrigation acres was multiplied by the per acre application rate identified in the 2005 USGS data (1.39 acre-feet per acre per year) to estimate annual water demand. The total number of estimated golf course acres was then multiplied by the per acre application rate identified in the 2005 USGS data (1.79 acre-feet per acre per year) to estimate annual water demand. The USGS (2005) reports a total of 0.10 MGD of livestock water use in Jefferson County. There is limited information available regarding the geographic distribution of livestock water demand; therefore, it was assumed to be distributed in the same way as the crop irrigation demand. It was assumed that there was no change in irrigation between 2005 and 2010 because no new water rights were issued during this time.

TABLE 9
2009, 2010, 2016, AND 2030 ESTIMATED SELF-SUPPLIED COMMERCIAL WATER DEMAND

Subbasin	2009 Number of Connections[1]	Percent Change in Self-Supplied Population			Estimated Commercial Water Demand[2]			
		2009 to 2010	2009 to 2016	2009 to 2030	2009 (gal/yr)	2010 (gal/yr)	2016 (gal/yr)	2030 (gal/yr)
Big Quilcene Subbasin	31	1.00%	9.2%	27.1%	4,994,379	5,044,323	5,453,862	6,347,856
Chimacum Subbasin	1	0.90%	9.0%	27.0%	161,109	162,559	175,609	204,608
Dabob - Thorndyke Subbasin	4	1.00%	9.0%	26.8%	644,436	650,880	702,435	817,145
Indian - Marrowstone Subbasin	0	0.90%	8.9%	26.8%	0	0	0	0
Little Quilcene Subbasin	16	1.00%	9.1%	27.1%	2,577,744	2,603,521	2,812,319	3,276,313
Ludlow Subbasin	2	0.80%	8.9%	26.8%	322,218	324,796	350,895	408,572
Miller Subbasin	1	0.80%	8.8%	27.1%	161,109	162,398	175,287	204,770
Quimper Subbasin	14	0.80%	9.0%	26.9%	2,255,526	2,273,570	2,458,523	2,862,262
Salmon - Snow Subbasin	1	0.80%	8.8%	26.5%	161,109	162,398	175,287	203,803
Total	**70**	**--**	**--**	**--**	**11,277,630**	**11,384,445**	**12,304,217**	**14,325,329**

1. Commercial water demand is represented by the number of connections reported in DOH's Sentry Database for Group B water systems as " Institutional, Commercial/Business, School, Day Care, Industrial Services,*etc*." (27B)

2. The 2009 water demand by one commercial connection was assumed to be equivalent to the 2009 average water use for commercial connections in the City of Port Townsend water system which is 161,109 gallons/year/commercial connection. Commercial water demand was projected to 2010, 2016 and 2030 by multiplyin the 2009 water demand by the population growth rate for self-supplied users for each subbasin from 2009 to 2010, 2009 to 2016, and 2009 to 2030, respectively.

TABLE 10
SUMMARY OF ACTIVE MINE PERMITS IN JEFFERSON COUNTY, 2010

Location	Number of Active Mine Permits	Mine Type(s) (number)	Acreage (acres)	Percent of Total Acreage in County
Big Quilcene Subbasin	1	Rock	54	5.62%
Chimacum Subbasin	0	--	0	0.00%
Dabob - Thorndyke Subbasin	2	Sand and Gravel	205	21.34%
Indian - Marrowstone Subbasin	0	--	0	0.00%
Little Quilcene Subbasin	2	Sand and Gravel	40	4.16%
Ludlow Subbasin	4	Sand and Gravel (1); Rock (3)	388.5	40.44%
Miller Subbasin	1	Sand and Gravel	20.23	2.11%
Quimper Subbasin	4	Sand and Gravel	124	12.91%
Salmon - Snow Subbasin	0	--	0	0.00%
Outside WRIA 17	2	Sand and Gravel (1); Rock (1)	129	13.43%
Total	**16**	**--**	**960.73**	**100%**

Source: DNR (2010)

TABLE 11
2005, 2010, 2016, AND 2030 ESTIMATED SELF-SUPPLIED MINING WATER DEMAND[1]

Subbasin	2005 (gal/yr)	2010 (gal/yr)	2016 (gal/yr)	2030 (gal/yr)
Big Quilcene Subbasin	10,461,630	10,461,630	10,461,630	10,461,630
Chimacum Subbasin	0	0	0	0
Dabob - Thorndyke Subbasin	39,724,410	39,724,410	39,724,410	39,724,410
Indian - Marrowstone Subbasin	0	0	0	0
Little Quilcene Subbasin	7,743,840	7,743,840	7,743,840	7,743,840
Ludlow Subbasin	75,279,060	75,279,060	75,279,060	75,279,060
Miller Subbasin	3,927,765	3,927,765	3,927,765	3,927,765
Quimper Subbasin	24,031,965	24,031,965	24,031,965	24,031,965
Salmon - Snow Subbasin	0	0	0	0
Total	**161,168,670**	**161,168,670**	**161,168,670**	**161,168,670**

1. 2005 mining water demand estimated using USGS (2005) which reported a total of 0.51 million gallons per day mining use in Jefferson County. This total was allocated to each subbasin using the percentages estimated in Table 10. It was assumed that mining demand has not changed since 2005 and would not change in the future because no additional water rights have been/would be approved by Ecology.

TABLE 12-a
SUMMARY OF ESTIMATED AND PROJECTED WATER DEMAND, 2009, 2010, 2016, AND 2030,GALLONS PER YEAR

WRIA 17 Subbasin	Year 2009		Estimated Year 2010		Projected Year 2016		Projected Year 2030	
	Publicly-Supplied	Self-Supplied	Publicly-Supplied	Self-Supplied	Publicly-Supplied	Self-Supplied	Publicly-Supplied	Self-Supplied
Residential Water Demand[1]	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**
Big Quilcene	1,484,132	9,355,840	1,484,132	9,451,735	1,663,710	10,247,920	1,864,065	11,904,560
Chimacum	154,614,153	20,572,160	156,305,294	20,761,530	172,308,501	22,433,200	207,916,419	26,155,280
Dabob - Thorndyke	6,942,320	14,990,320	7,006,124	15,137,012	7,627,040	16,368,080	8,919,120	19,025,280
Indian - Marrowstone	10,726,030	18,631,840	10,813,057	18,793,047	11,683,323	20,288,480	13,597,908	23,630,960
Little Quilcene	581,774	12,111,360	581,774	12,237,146	644,107	13,237,040	747,995	15,424,640
Ludlow	117,258,692	28,152,320	119,186,696	28,391,796	137,750,607	30,674,240	178,929,151	35,712,720
Miller	19,845,340	7,605,680	19,983,610	7,666,845	21,680,516	8,282,640	25,252,534	9,694,960
Quimper	324,791,300	22,023,840	328,424,876	22,210,791	362,458,189	24,030,880	438,303,184	27,975,840
Salmon - Snow	2,367,140	7,581,840	2,367,140	7,643,351	2,600,934	8,258,800	3,014,845	9,612,720
Jefferson County portion of WRIA 17 Total	**638,610,881**	**141,025,200**	**646,152,703**	**142,293,253**	**718,416,927**	**153,821,280**	**878,545,221**	**179,136,960**
Total Publicly and Self-Supplied	**779,636,081**		**788,445,956**		**872,238,207**		**1,057,682,181**	
Irrigation Water Demand	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**
Big Quilcene	0	0	0	0	0	0	0	0
Chimacum	12,683,240	250,799,833	12,810,072	250,799,833	14,078,397	250,799,833	16,995,542	250,799,833
Dabob - Thorndyke	0	62,699,958	0	62,699,958	0	62,699,958	0	62,699,958
Indian - Marrowstone	0	16,331,644	0	16,331,644	0	16,331,644	0	16,331,644
Little Quilcene	0	62,699,958	0	62,699,958	0	62,699,958	0	62,699,958
Ludlow	0	50,161,478	0	50,161,478	0	50,161,478	0	50,161,478
Miller	0	0	0	0	0	0	0	0
Quimper	13,014,900	50,161,478	13,145,049	50,161,478	14,576,688	50,161,478	17,960,562	50,161,478
Salmon - Snow	0	0	0	0	0	0	0	0
Jefferson County portion of WRIA 17 Total	**25,698,140**	**492,854,350**	**25,955,121**	**492,854,350**	**28,655,085**	**492,854,350**	**34,956,104**	**492,854,350**
Total Publicly and Self-Supplied	**518,552,490**		**518,809,471**		**521,509,435**		**527,810,454**	
Industrial Water Demand	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**
Big Quilcene	0	0	0	0	0	0	0	0
Chimacum	0	0	0	0	0	0	0	0
Dabob - Thorndyke	0	0	0	0	0	0	0	0
Indian - Marrowstone	0	0	0	0	0	0	0	0
Little Quilcene	0	0	0	0	0	0	0	0
Ludlow	0	0	0	0	0	0	0	0
Miller	0	0	0	0	0	0	0	0
Quimper	4,817,451,206	0	4,817,451,206	0	4,817,451,206	0	4,817,451,206	0
Salmon - Snow	0	0	0	0	0	0	0	0
Jefferson County portion of WRIA 17 Total	**4,817,451,206**	**0**	**4,817,451,206**	**0**	**4,817,451,206**	**0**	**4,817,451,206**	**0**
Total Publicly and Self-Supplied	**4,817,451,206**		**4,817,451,206**		**4,817,451,206**		**4,817,451,206**	
Commercial Water Demand	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**
Big Quilcene	174,350	4,994,379	174,350	5,044,323	188,298	5,453,862	217,938	6,347,856
Chimacum	18,500,370	161,109	18,685,374	162,559	20,535,411	175,609	24,790,496	204,608
Dabob - Thorndyke	322,217	644,436	325,439	650,880	351,217	702,435	412,438	817,145
Indian - Marrowstone	0	0	0	0	0	0	0	0
Little Quilcene	406,816	2,577,744	406,816	2,603,521	451,566	2,812,319	524,793	3,276,313
Ludlow	322,217	322,218	325,439	324,796	351,217	350,895	409,216	408,572
Miller	644,435	161,109	807,155	162,398	890,932	175,287	1,037,540	204,770
Quimper	58,160,226	2,255,526	58,741,828	2,273,570	65,124,953	2,458,523	80,207,946	2,862,262
Salmon - Snow	1,127,761	161,109	1,127,761	162,398	1,240,537	175,287	1,420,979	203,803
Jefferson County portion of WRIA 17 Total	**79,658,392**	**11,277,630**	**80,594,162**	**11,384,445**	**89,134,131**	**12,304,217**	**109,021,346**	**14,325,329**
Total Publicly and Self-Supplied	**90,936,022**		**91,978,607**		**101,438,348**		**123,346,675**	
Governmental Water Demand[2]	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**
Big Quilcene	0	0	0	0	0	0	0	0
Chimacum	3,842,350	0	3,880,774	0	4,265,009	0	5,148,749	0
Dabob - Thorndyke	0	0	0	0	0	0	0	0
Indian - Marrowstone	13,033,490	0	13,163,825	0	14,206,505	0	16,552,532	0
Little Quilcene	0	0	0	0	0	0	0	0
Ludlow	0	0	0	0	0	0	0	0
Miller	0	0	0	0	0	0	0	0
Quimper	24,542,800	0	24,788,228	0	27,487,936	0	33,869,064	0
Salmon - Snow	0	0	0	0	0	0	0	0
Jefferson County portion of WRIA 17 Total	**41,418,640**	**0**	**41,832,827**	**0**	**45,959,450**	**0**	**55,570,345**	**0**
Total Publicly and Self-Supplied	**41,418,640**		**41,832,827**		**45,959,450**		**55,570,345**	
Mining Water Demand	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**
Big Quilcene	0	10,461,630	0	10,461,630	0	10,461,630	0	10,461,630
Chimacum	0	0	0	0	0	0	0	0
Dabob - Thorndyke	0	39,724,410	0	39,724,410	0	39,724,410	0	39,724,410
Indian - Marrowstone	0	0	0	0	0	0	0	0
Little Quilcene	0	7,743,840	0	7,743,840	0	7,743,840	0	7,743,840
Ludlow	0	75,279,060	0	75,279,060	0	75,279,060	0	75,279,060
Miller	0	3,927,765	0	3,927,765	0	3,927,765	0	3,927,765
Quimper	0	24,031,965	0	24,031,965	0	24,031,965	0	24,031,965
Salmon - Snow	0	0	0	0	0	0	0	0
Jefferson County portion of WRIA 17 Total	**0**	**161,168,670**	**0**	**161,168,670**	**0**	**161,168,670**	**0**	**161,168,670**
Total Publicly and Self-Supplied	**161,168,670**		**161,168,670**		**161,168,670**		**161,168,670**	
Total Water Demand	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**	**gal/yr**
Big Quilcene	1,658,482	24,811,849	1,658,482	24,957,688	1,852,008	26,163,412	2,082,003	28,714,046
Chimacum	189,640,113	271,533,102	191,681,514	271,723,922	211,187,318	273,408,642	254,851,206	277,159,721
Dabob - Thorndyke	7,264,537	118,059,124	7,331,563	118,212,260	7,978,257	119,494,883	9,331,558	122,266,793
Indian - Marrowstone	23,759,520	34,963,484	23,976,882	35,124,691	25,889,828	36,620,124	30,150,440	39,962,604
Little Quilcene	988,590	85,132,902	988,590	85,284,465	1,095,673	86,493,157	1,272,788	89,144,751
Ludlow	117,580,909	153,915,076	119,512,135	154,157,130	138,101,824	156,465,673	179,338,367	161,561,830
Miller	20,489,775	11,694,554	20,790,765	11,757,008	22,571,448	12,385,692	26,290,074	13,827,495
Quimper	5,237,960,432	98,472,809	5,242,551,187	98,677,804	5,287,098,972	100,682,846	5,387,791,962	105,031,545
Salmon - Snow	3,494,901	7,742,949	3,494,901	7,805,749	3,841,471	8,434,087	4,435,824	9,816,523
Jefferson County portion of WRIA 17 Total	**5,602,837,259**	**806,325,850**	**5,611,986,019**	**807,700,718**	**5,699,616,799**	**820,148,517**	**5,895,544,222**	**847,485,309**
Total Publicly and Self-Supplied	**6,409,163,109**		**6,419,686,737**		**6,519,765,316**		**6,743,029,531**	

1. Residential demand includes full-time and part-time water demand and does not include system losses.
2. Governmental water demand includes Navy water demand on Indian Island and the wholesale water supplied by the City of Port Townsend to For Worden.

TABLE 12-b
SUMMARY OF ESTIMATED AND PROJECTED WATER DEMAND, 2009, 2010, 2016, AND 2030,ACRE-FEET PER YEAR

WRIA 17 Subbasin	Year 2009		Estimated Year 2010		Projected Year 2016		Projected Year 2030	
	Publicly-Supplied	Self-Supplied	Publicly-Supplied	Self-Supplied	Publicly-Supplied	Self-Supplied	Publicly-Supplied	Self-Supplied
Residential Water Demand[1]	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**
Big Quilcene	4.6	28.7	4.6	29.0	5.1	31.5	5.7	36.5
Chimacum	474.5	63.1	479.7	63.7	528.8	68.8	638.1	80.3
Dabob - Thorndyke	21.3	46.0	21.5	46.5	23.4	50.2	27.4	58.4
Indian - Marrowstone	32.9	57.2	33.2	57.7	35.9	62.3	41.7	72.5
Little Quilcene	1.8	37.2	1.8	37.6	2.0	40.6	2.3	47.3
Ludlow	359.9	86.4	365.8	87.1	422.7	94.1	549.1	109.6
Miller	60.9	23.3	61.3	23.5	66.5	25.4	77.5	29.8
Quimper	996.8	67.6	1,007.9	68.2	1,112.3	73.8	1,345.1	85.9
Salmon - Snow	7.3	23.3	7.3	23.5	8.0	25.4	9.3	29.5
Jefferson County portion of WRIA 17 Total	**1,960**	**433**	**1,983**	**437**	**2,205**	**472**	**2,696**	**550**
Total Publicly and Self-Supplied	**2,393**		**2,420**		**2,677**		**3,246**	
Irrigation Water Demand	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**
Big Quilcene	0	0	0	0	0	0	0	0
Chimacum	38.9	769.7	39.3	769.7	43.2	769.7	52.2	769.7
Dabob - Thorndyke	0	192.4	0	192.4	0	192.4	0	192.4
Indian - Marrowstone	0	50.1	0	50.1	0	50.1	0	50.1
Little Quilcene	0	192.4	0	192.4	0	192.4	0	192.4
Ludlow	0	153.9	0	153.9	0	153.9	0	153.9
Miller	0	0	0	0.0	0	0	0	0
Quimper	39.9	153.9	40.3	153.9	44.7	153.9	55.1	153.9
Salmon - Snow	0	0	0	0	0	0	0	0
Jefferson County portion of WRIA 17 Total	**79**	**1,513**	**80**	**1,513**	**88**	**1,513**	**107**	**1,513**
Total Publicly and Self-Supplied	**1,591**		**1,592**		**1,600**		**1,620**	
Industrial Water Demand	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**
Big Quilcene	0	0	0	0	0	0	0	0
Chimacum	0	0	0	0	0	0	0	0
Dabob - Thorndyke	0	0	0	0	0	0	0	0
Indian - Marrowstone	0	0	0	0	0	0	0	0
Little Quilcene	0	0	0	0	0	0	0	0
Ludlow	0	0	0	0	0	0	0	0
Miller	0	0	0	0	0	0	0	0
Quimper	14,784.2	0.0	14,784.2	0.0	14,784.2	0.0	14,784.2	0
Salmon - Snow	0	0	0	0	0	0	0	0
Jefferson County portion of WRIA 17 Total	**14,784**	**0**	**14,784**	**0**	**14,784**	**0**	**14,784**	**0**
Total Publicly and Self-Supplied	**14,784**		**14,784**		**14,784**		**14,784**	
Commercial Water Demand	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**
Big Quilcene	0.5	15.3	0.5	15.5	0.6	16.7	0.7	19.5
Chimacum	56.8	0.5	57.3	0.5	63	0.5	76.1	0.6
Dabob - Thorndyke	1	2.0	1	2.0	1.1	2.2	1.3	2.5
Indian - Marrowstone	0	0	0	0	0	0	0	0
Little Quilcene	1.3	7.9	1.3	8.0	1.4	8.6	1.6	10
Ludlow	1	1.0	1	1	1.1	1.1	1.3	1.3
Miller	2.0	0.5	2.5	0.5	2.7	0.5	3.2	0.6
Quimper	178.5	6.9	180.3	7.0	199.9	7.5	246.2	8.8
Salmon - Snow	3.5	0.5	3.5	0.5	3.8	0.5	4.4	0.6
Jefferson County portion of WRIA 17 Total	**244**	**35**	**247**	**35**	**274**	**38**	**335**	**44**
Total Publicly and Self-Supplied	**279**		**282**		**311**		**379**	
Governmental Water Demand[2]	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**
Big Quilcene	0	0	0	0	0	0	0	0
Chimacum	11.8	0	11.9	0	13.1	0	15.8	0
Dabob - Thorndyke	0	0	0	0	0	0	0	0
Indian - Marrowstone	40	0	40.4	0	43.6	0	50.8	0
Little Quilcene	0	0	0	0	0	0	0	0
Ludlow	0	0	0	0	0	0	0	0
Miller	0	0	0	0	0	0	0	0
Quimper	75.3	0	76.1	0	84.4	0	103.9	0
Salmon - Snow	0	0	0	0	0	0	0	0
Jefferson County portion of WRIA 17 Total	**127**	**0**	**128**	**0**	**141**	**0**	**171**	**0**
Total Publicly and Self-Supplied	**127**		**128**		**141**		**171**	
Mining Water Demand	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**
Big Quilcene	0	32	0	32	0	32.1	0	32.1
Chimacum	0	0	0	0	0	0	0	0
Dabob - Thorndyke	0	121.9	0	121.9	0	121.9	0	122
Indian - Marrowstone	0	0	0	0	0	0	0	0
Little Quilcene	0	24	0	23.8	0	23.8	0	23.8
Ludlow	0	231	0	231.0	0	231.0	0	231
Miller	0	12.1	0	12.1	0	12.1	0	12.1
Quimper	0	73.8	0	73.8	0	73.8	0	73.8
Salmon - Snow	0	0	0	0	0	0	0	0
Jefferson County portion of WRIA 17 Total	**0**	**495**	**0**	**495**	**0**	**495**	**0**	**495**
Total Publicly and Self-Supplied	**495**		**495**		**495**		**495**	
Total Water Demand	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**	**af/yr**
Big Quilcene	5.1	76.1	5.1	76.6	5.7	80.3	6.4	88.1
Chimacum	582.0	833.3	588.3	833.9	648.1	839.1	782.1	850.6
Dabob - Thorndyke	22.3	362.3	22.5	362.8	24.5	366.7	28.6	375.2
Indian - Marrowstone	72.9	107.3	73.6	107.8	79.5	112.4	92.5	122.6
Little Quilcene	3.0	261.3	3.0	261.7	3.4	265.4	3.9	273.6
Ludlow	360.8	472.4	366.8	473.1	423.8	480.2	550.4	495.8
Miller	62.9	35.9	63.8	36.1	69.3	38.0	80.7	42.4
Quimper	16,074.7	302.2	16,088.8	302.8	16,225.5	309.0	16,534.5	322.3
Salmon - Snow	10.7	23.8	10.7	24.0	11.8	25.9	13.6	30.1
Jefferson County portion of WRIA 17 Total	**17,194**	**2,475**	**17,223**	**2,479**	**17,491**	**2,517**	**18,093**	**2,601**
Total Publicly and Self-Supplied	**19,669**		**19,701**		**20,008**		**20,694**	

1. Residential demand includes full-time and part-time water demand and does not include system losses.
2. Governmental water demand includes Navy water demand on Indian Island and the wholesale water supplied by the City of Port Townsend to For Worden.

TABLE 13
COMPARISON OF WATER SYSTEM PLAN PROJECTIONS TO THIS DEMAND ASSESSMENT

Year	Population		Total Number of Connections		Total Water Demand (gallons)	
	Water System Plan	This Demand Analysis[1]	Water System Plan	This Demand Analysis[1]	Water System Plan[2]	This Demand Analysis[1,3]
JEFF. COUNTY PUD #1 - Bywater Bay						
1996	67	--	28	--	--	--
2000	250	--	105	--	13,000,000	--
2003	270	--	130	--	--	--
2005	375	--	142	--	24,200,000	--
2009	--	400	--	215	--	16,866,612
2010	480	403	162	217	27,610,000	16,993,112
2015	--	--	--	--	31,020,000	--
2016	500	436	186	235	--	18,384,607
2020	--	--	--	--	34,430,000	--
2025	550	--	222	--	--	--
2030	--	436	--	273	--	21,378,431
JEFF. COUNTY PUD #1 - Quilcene						
1996	40	--	10	--	--	--
2000	40	--	10	--	--	--
2002	--	--	--	--	1,220,000	--
2006	70	--	--	--	3,650,000	--
2009	--	40	--	25	--	1,412,270
2010	--	40	28	26	4,870,000	1,412,272
2015	120	--	50	--	6,080,000	--
2016	125	44	52	32	--	1,554,081
2020	120	--	60	--	7,300,000	--
2025	150	--	70	--	8,520,000	--
2030	180	51	80	33	--	1,802,391
2040	210	--	90	--	--	--
JEFF. COUNTY PUD #1 - QUIMPER						
2000	3,400	--	1,700	--	--	--
2002	--	--	--	--	217,000,000	--
2003	--	--	--	--	224,000,000	--
2005	3,700	--	2,271	--	290,000,000	--
2009	--	5,430	--	2,578	--	213,399,633
2010	4,600	5,488	2,496	2,611	319,000,000	215,658,396
2015	5,900	--	2,721	--	348,000,000	--
2016	--	6,039	--	2,872	--	237,077,146
2020	6,400	--	2,946	--	376,000,000	--
2024	6,600	--	3,171	--	--	--
2025	--	--	--	--	405,000,000	--
2030	--	7,264	--	3,451	--	285,001,646
JEFF. COUNTY PUD #1 - Snow Creek						
1996	42	--	18 res, 23 RV	--	--	--
2000	42	--	18 res, 23 RV	--	5,160,000	--
2005	60	--	22 res, 23 RV	--	5,160,000	--
2009	--	40	--	41	--	1,461,940
2010	66	40	24 res, 23 RV	41	5,570,000	1,461,940
2015	70	--	27 res, 23 RV	--	5,920,000	--
2016	76	44	29 res, 23 RV	46	--	1,608,134
2020	85	--	32 res, 23 RV	--	6,930,000	--
2025	95	--	35 res, 23 RV	--	7,300,000	--
2030	--	51	--	53	--	1,876,045
JEFF. COUNTY PUD #1 - Gardiner LUD 1						
1995	250	--	104	--	--	--
1996	258	--	104	--	--	--
1997	266	--	105	--	--	--
1998	274	--	106	--	--	--
1999	282	--	108	--	--	--
2000	290	--	109	--	8,700,000	--
2002	297	--	114	--	--	--
2005	329	--	116	--	9,800,000	--
2009	--	275	--	128	--	10,982,140
2010	369	277	120	129	10,120,000	11,062,010
2015	414	--	125	--	10,540,000	--
2016	--	300	--	140	--	11,980,516
2020	426	--	130	--	11,130,000	--
2025	428	--	131	--	--	--
2030	430	349	132	163	--	13,937,334
JEFF. COUNTY PUD #1 - Jeff. County LUD #3						
1995	432	--	180	--	--	--
1996	444	--	185	--	--	--
1997	470	--	196	--	--	--
1998	492	--	205	--	--	--
1999	511	--	213	--	--	--
2000	521	--	217	--	--	--
2005	586	--	244	--	13,359,000	--
2009	--	800	--	320	--	13,695,900
2010	672	807	280	323	15,330,000	13,816,256
2015	732	--	305	--	16,698,750	--
2016	--	872	--	350	--	14,942,097
2020	768	--	320	--	17,520,000	--
2025	804	--	335	--	18,341,250	--
2030	--	1,016	--	408	--	17,421,362
PORT TOWNSEND, CITY OF						
2005	9,684	--	--	--	412,450,000	--
2009	--	9,594	--	4,665	--	339,608,000
2010	--	9,709	--	4,722	--	343,489,566
2011	10,859	--	--	--	452,600,000	--
2016	--	10,790	--	5,247	--	381,500,045
2025	13,922	--	--	--	591,300,000	--
2030	--	13,198	--	6,420	--	467,596,370

-- indicates no data available

1. The 2009 data presented for this analysis represent DOH Sentry data for population and number of connections for all water systems except Quimper and City of Port Townsend. Jefferson PUD provided the number of connections for Quimper and the City of Port Townsend. Total water demand is based on metered 2009 water consumption data provided by Jefferson PUD and the City of Port Townsend. The total demand data presented for this analysis represents estimated consumtion, not production.

2. The total demand represents the following estimate from the water system plans when more than one estimate is provided in the water system plan:
   a. Total demand without conservation for Bywater Bay, LUD #3, Gardiner LUD 1, City of Port Townsend,
   b. Based on a calculated water usage rate of 345 gallons per connection per day for Snow Creek.
   c. Based on estimates using actual usage data for Quimper.

3. The City of Port Townsend's water demand does not include the water demand by the Port Townsend Paper Company or the wholesale water to LUD#3. It does include the wholesale water to Fort Worden.

TABLE 14
ESTIMATED INCHOATE WATER RIGHTS, 2009, 2010, 2016 AND 2030

Group A Water System	PWSID	Water Right			2009			2010			2016			2030		
		gpm	cfs	af/yr	Production (af/yr)	Consumption (af/yr)	Inchoate rights based on production (af/yr)	Production (af/yr)	Consumption (af/yr)	Inchoate rights based on production (af/yr)	Production (af/yr)	Consumption (af/yr)	Inchoate rights based on production (af/yr)	Production (af/yr)	Consumption (af/yr)	Inchoate rights based on production (af/yr)
BIG QUILCENE SUBBASIN																
JEFF. COUNTY PUD #1 - Quilcene*	AB292	20	--	13	5.05	4.33	7.95	5.05	4.33	7.95	5.55	4.77	7.45	6.44	5.53	6.56
JACKSON COVE COMMUNITY	27047	60	--	11.5	4.46	3.79	7.04	4.46	3.79	7.04	5.03	4.28	6.47	5.60	4.76	5.90
CHIMACUM SUBBASIN																
JEFF. COUNTY PUD #1 - QUIMPER**	5783	2,605	--	1,546	753.13	654.90	792.87	761.11	661.83	784.89	884.50	773.42	661.50	1,061.56	928.10	484.44
DABOB – THORNDYKE SUBBASIN																
DABOB COVE COMMUNITY	29428T	26	--	18.2	3.99	3.39	14.21	3.99	3.39	14.21	4.30	3.66	13.90	5.14	4.37	13.06
LINDSAY BEACH	31376	24	0.04	6.8	1.31	1.11	5.49	1.31	1.11	5.49	1.57	1.33	5.23	1.78	1.51	5.02
JEFFERSON COUNTY WATER DISTRICT 3	36711	143	--	126	20.92	17.79	105.08	21.16	18.00	104.84	22.92	19.49	103.08	26.76	22.75	99.24
LUDLOW SUBBASIN																
OLYMPUS BEACH TRACTS	63700	138	--	64.1	15.06	12.81	49.04	15.19	12.91	48.91	16.43	13.97	47.67	19.16	16.30	44.94
OLYMPIC WATER AND SEWER	68700	954	--	671	263.56	224.12	407.44	269.25	228.96	401.75	323.10	274.75	347.90	442.93	376.64	228.07
BRIDGEHAVEN COMMUNITY CLUB	08330	280	--	200	59.19	50.33	140.81	59.67	50.74	140.33	64.56	54.89	135.44	75.29	64.02	124.71
SHINE PLAT	05820	30	--	18	3.01	2.56	14.99	3.01	2.56	14.99	3.31	2.82	14.69	3.93	3.34	14.07
JEFF. COUNTY PUD #1 - Bywater Bay	02043	180	--	163	62.86	51.76	100.14	63.33	52.15	99.67	68.51	56.42	94.49	79.67	65.61	83.33
JEFFERSON COUNTY WATER DISTRICT 1	36705	98	0.16	90	22.66	19.27	67.34	22.87	19.45	67.13	24.66	20.97	65.34	28.77	24.46	61.23
MILLER SUBBASIN																
DISCOVERY BAY LEASEHOLDERS	14071	--	--	25	12.44	10.58	12.56	12.44	10.58	12.56	13.62	11.58	11.38	15.99	13.59	9.01
DISCOVERY BAY VILLAGE[1]	19430	--	--	--	11.12	9.46	--	11.23	9.55	--	12.12	10.31	--	14.12	12.01	--
RONDELAY MEADOWS	74130	65	--	64	10.12	8.60	53.88	10.22	8.69	53.78	11.07	9.41	52.93	12.86	10.93	51.14
JEFF. COUNTY PUD #1 - Gardiner LUD 1	07877	305	--	155	37.51	33.70	117.49	37.78	33.95	117.22	40.92	36.77	114.08	47.60	42.77	107.40
QUIMPER SUBBASIN																
PORT TOWNSEND, CITY OF[2]	69000	100	39.56	no Qa limitation	15,975.78	15,868.46	no Qa limitation	15,988.16	15,880.75	no Qa limitation	16,061.39	15,955.00	no Qa limitation	16,327.37	16,219.22	no Qa limitation
CAPE GEORGE COLONY CLUB INC	11050	656	--	882.2	106.44	90.51	775.76	107.39	91.31	774.81	115.92	98.57	766.28	135.10	114.88	747.10
KALA POINT	37500	415	--	634	136.11	115.74	497.89	137.28	116.74	496.72	148.28	126.09	485.72	172.83	146.96	461.17
JEFF. COUNTY PUD #1 - Jeff. County LUD #3***	00058	--	--	--	included in City of Port Townsend totals		--	included in City of Port Townsend totals		--	included in Quimper System totals		--	included in Quimper System totals		--
SALMON - SNOW SUBBASIN																
JEFF. COUNTY PUD #1 - Snow Creek	01220	50	--	13	4.88	4.49	8.12	4.88	4.49	8.12	5.36	4.94	7.64	6.26	5.76	6.74
MOA-TEL WATER SYSTEM****	07816u	--	0.02	14.48	8.55	7.27	5.93	8.55	7.27	5.93	9.48	8.06	5.00	10.85	9.23	3.63

* The Quilcene water system includes the demand within the Big Quilcene Subbasin and Little Quilcene Subbasin.

** Part of the Quimper system serves Indian-Marrowstone Island. The Indian-Marrowstone Island demand is included in the total for the Quimper system.

*** Jefferson LUD #3 is served via contract with the City of Port Townsend. Therefore, the water demand for LUD#3 is accounted for within the total reported for the City of Port Townsend in 2009 and 2010. However, LUD#3's demand is accounted for within the total reported for the Quimper system in 2016 and 2030.

**** The MOA-TEL water system includes the demand within the Salmon-Snow Subbasin and Miller Subbasin.

1. There was no water right information available for Discovery Bay Village in the 2007 inchoate water rights analysis (Cascadia Consulting Group, 2007).

2. The City of Port Townsend's Big Quilcene River and Little Quilcene River water rights are based on maximum instantaneous appropriations of 30 and 9.56 cfs respectively. While there are no annual acre-feet conditions associated with these water rights, the entire instantaneous rights are used periodically on an annual basis. Diversions are conditioned by minimum instream flow requirements of 27 cfs for the Big Quilcene River and 6 cfs for the Little Quilcene River. Maintenance of minimum instream flows seasonally reduces or precludes use of municipal water rights, requiring use of stored water.

TABLE 15
SUMMARY OF WATER RESERVES UNDER THE WATER MANAGEMENT RULE FOR WRIA 17

Management Area[1]	Type of Management Area (per WAC 173-517)	Reserve Management Area Water Source (including tributaries)	Reserve Quantity Maximum Average Daily Use in Gallons (gpd)	Allowed Uses of Reserve[2]	Water Available	
					Gallons/ year	af/yr
Big Quilcene Basin[3]					**73,949,000**	**227**
Big Quilcene	Reserve	Big Quilcene	200,400	● Permit-exempt uses under the conservation standard per WAC 173-517-120 ● Permit-exempt withdrawals for agriculture ● Water right permits subject to public interest test for domestic availability	73,146,000	224.5
Devils Lake	Coastal	--	--	--	--	--
Spencer	Reserve	Spencer	2,200	● Permit-exempt uses under the conservation standard per WAC 173-517-120	803,000	2.5
Marple	Coastal	--	--	--	--	--
Big Quilcene Subbasin	Instream Flow	Big Quilcene River	9.69 million (15 cfs)	● Available November 16 to June 15, interruptible.	--	--
Chuimacum Subbasin[3]					**708,100**	**2**
Chimacum	Reserve	Chimacum	1,940	● Permit-exempt withdrawals for domestic use, no outdoor irrigation	708,100	2.2
Chimacum Subbasin	Instream Flow	Chimacum Creek	1.94 million (3 cfs)	● Available December 1 to February 29, interruptible.	--	--
Dabob – Thorndyke Subbasin					**14,154,700**	**44**
Tarboo	Reserve	Tarboo	7,110	● Permit-exempt uses under the conservation standard per WAC 173-517-120	2,595,150	8
Thorndyke	Reserve	Thorndyke	31,670	● Permit-exempt uses under the conservation standard per WAC 173-517-120 ● Water right permits subject to public interest test for domestic availability	11,559,550	35.5
Bolton Peninsula	Coastal	--	--	--	--	--
Toandos Peninsula	Coastal	--	--	--	--	--
Indian-Marrowstone Subbasin					**--**	**--**
Indian/Marrowstone Island	Coastal	--	--	--	--	--
Little Quilcene Subbasin					**15,010,990**	**46**
Howe	Reserve	Little Quilcene (includes Leland and Howe creeks)	38,800	● Permit-exempt uses under the conservation standard per WAC 173-517-120 ● Water right permits subject to public interest test for domestic availability	14,162,000	43.5
Leland	Reserve					
Little Quilcene	Reserve					
Donovan	Reserve	Donovan	2,326	● Permit-exempt uses under the conservation standard per WAC 173-517-120	848,990	2.6
Ludlow Subbasin					**3,531,375**	**11**
Ludlow	Reserve	Ludlow	7,830	● Permit-exempt uses under the conservation standard per WAC 173-517-120	2,857,950	8.8
Squamish Harbor	Coastal	--	--	--	--	--
Piddling Creek	Reserve	Piddling	1,845	● Permit-exempt uses under the conservation standard per WAC 173-517-120	673,425	2.1
Oak Bay/Mats Mats Bay	Coastal	--	--	--	--	--
Miller Subbasin					**--**	**--**
Miller Peninsula	Coastal	--	--	--	--	--
Quimper Subbasin					**--**	**--**
Quimper Peninsula	Coastal	--	--	--	--	--
Salmon - Snow Subbasin					**4,814,350**	**15**
Salmon	Reserve	Salmon	9,050	● Permit-exempt uses under the conservation standard per WAC 173-517-120 ● Permit-exempt withdrawals for agriculture	3,303,250	10.1
Snow	Reserve	Snow	4,140	● Permit-exempt uses under the conservation standard per WAC 173-517-120 ● Permit-exempt withdrawals for agriculture	1,511,100	4.6

-- = Not applicable because no reserve has been set for that management area

1. The boundaries of the Management Areas within each subbasin do not always match exactly; therefore, each management area was associated within the subbasin in which the majority of its geographic area is located. WAC 173-517 excludes the management areas within the Clallam County portion of WRIA 17, including Chicken Coop, Dean, Jimmycomelately, Johnson, West Sequim Bay, and Miller Peninsula Clallam County.

2. This table lists the types of allowable uses. See the text of the rule (WAC 173-517) for specific requirements for each use.
3. "Water Available" excludes conttribution from instream flow controlled reserves.

TABLE 16
COMPARISON OF ESTIMATED DEMANDS AND WATER AVAILABILITY IN 2016 AND 2030

Subbasin	Water Available in 2010 (acre-feet)	Additional Water Demand by 2016 (acre-feet)[1]	Surplus (+) or Shortfall (-) in Meeting 2016 Demand (acre-feet)	Additional Water Demand by 2030 (acre-feet)[1]	Surplus (+) or Shortfall (-) in Meeting 2030 Demand (acre-feet)
Publicly-Supplied					
Big Quilcene	15	1	14	2	13
Chimacum	785	66	719	213	572
Dabob - Thorndyke	125	2	123	6	118
Indian - Marrowstone[2]	--	--	--	--	--
Little Quilcene[3]	--	--	--	--	--
Ludlow	773	57	716	184	589
Miller	184	5	178	17	167
Quimper[4]	1,272	137	1,135	446	826
Salmon - Snow	14	1	13	3	11
Total	**3,166**	**269**	**2,897**	**870**	**2,296**
Self-Supplied					
Big Quilcene[5]	227	4	223	12	215
Chimacum	2	5	(3)	17	(14)
Dabob - Thorndyke[5]	44	4	40	12	31
Indian - Marrowstone[6]	--	5	**(5)**	15	**(15)**
Little Quilcene	46	4	42	12	34
Ludlow[5]	11	7	4	23	**(12)**
Miller[6]	--	2	**(2)**	6	**(6)**
Quimper[6]	--	6	**(6)**	20	**(20)**
Salmon - Snow	15	2	13	6	9
Total	**344**	**38**	**306**	**122**	**222**
Total Publicly and Self-Supplied	**3,511**	**307**	**3,204**	**992**	**2,518**

Notes

1. "Additional" is compared to the 2010 water demand.

2. Indian-Marrowstone is served by the Quimper system whose water right is accounted for in the Chimacum subbasin. Therefore the publicly-supplied demand is reported in the Chimacum subbasin.

3. Little Quilcene has part of the Quilcene water system whose water right is accounted for in the Big Quilcene Subbasin. Therefore the publicly-supplied demand is reported in the Big Quilcene Subbasin.

4. The values reported for the Quimper Subbasin do not include water available from the City of Port Townsend because the City's water rights do not have an annual limitation, just an instantaneous limitation, and were therefore not included in the inchoate water rights analysis. See Table 14 for more information about what water systems the values reported in this table represent.

5. The Big Quilcene Subbasin, Dabob-Thorndyke Subbasin, and Ludlow Subbasin have some management areas where reserves have not been set. In these cases, the total reserve reported in this table does not include management areas where reserves have not been set.

6. Reserves have not been set for management areas within the Indian-Marrowstone Subbasin, Miller Subbasin and Quimper Subbasin.

TABLE 17
ESTIMATED 2010, AND PROJECTED 2016 AND 2030 POPULATION AND TOTAL WATER DEMAND BY SUBBASIN

WRIA 17 Subbasin	Year 2010		Year 2016		Year 2030	
	Population[1]	Total Water Demand (AF)[2]	Population[1]	Total Water Demand (AF)[2]	Population[1]	Total Water Demand (AF)[2]
Big Quilcene	316	82	342	86	397	95
Chimacum	5,653	1,422	6,217	1,487	7,472	1,633
Dabob - Thorndyke	618	385	667	391	777	404
Indian - Marrowstone	1,088	181	1,175	192	1,368	215
Little Quilcene	416	265	450	269	524	277
Ludlow	4,781	840	5,471	904	7,004	1,046
Miller	766	100	829	107	966	123
Quimper	13,541	16,392	14,929	16,534	18,021	16,857
Salmon - Snow	322	35	349	38	405	44
Total	**27,501**	**19,701**	**30,429**	**20,008**	**36,934**	**20,694**

1. From Table 2.
2. From Table 12-b.

TABLE 18
RESIDENTIAL CONSUMPTIVE WATER USE AND RETURN FLOWS

	Total	Interior Use (Ave. of Nov-Apr.)	Total Irrigation Use	Irrigation Return Flow (10% of total irr. use)	Irrigation Consumptive Use (90% of total irr. use)	Interior Consumptive Loss (9.5% of exterior consumptive use)	Interior Return Flow	Total Consumptive Loss		
								From water system data.		Ecology (2009) [1]
Jan	38,778,108	37,544,686	-	-	-	-	37,544,686	-	-	-
Feb	38,288,618	37,544,686	-	-	-	-	37,544,686	-	-	-
Mar	30,133,340	37,544,686	-	-	-	-	37,544,686	-	-	-
Apr	41,223,730	37,544,686	-	-	-	-	37,544,686	-	-	-
May	50,981,452	37,544,686	13,436,766	1,343,677	12,093,089	1,145,889	36,398,797	13,238,979	26%	31%
Jun	75,114,940	37,544,686	37,570,254	3,757,025	33,813,229	3,203,996	34,340,690	37,017,225	49%	58%
Jul	81,562,260	37,544,686	44,017,574	4,401,757	39,615,817	3,753,825	33,790,861	43,369,641	53%	63%
Aug	81,569,810	37,544,686	44,025,124	4,402,512	39,622,612	3,754,469	33,790,217	43,377,080	53%	63%
Sep	71,469,860	37,544,686	33,925,174	3,392,517	30,532,657	2,893,143	34,651,543	33,425,800	47%	55%
Oct	44,503,400	37,544,686	6,958,714	695,871	6,262,843	593,440	36,951,246	6,856,283	15%	18%
Nov	39,676,630	37,544,686	-	-	-	-	37,544,686	-	-	-
Dec	37,167,690	37,544,686	-	-	-	-	37,544,686	-	-	-
Total	**630,469,838**	**450,536,232**	**179,933,606**	**17,993,361**	**161,940,245**	**15,344,763**	**435,191,469**	**177,285,008**		
% of Total	**100%**	**71%**	**29%**	**3%**	**26%**	**2%**	**69%**	**28%**	**28%**	**33%**

1. Maximum monhtly consumptive use (July-August) is calculated from Ecology (2009). Remaining months are scaled proportional to total consumptive loss calculated from metered data.

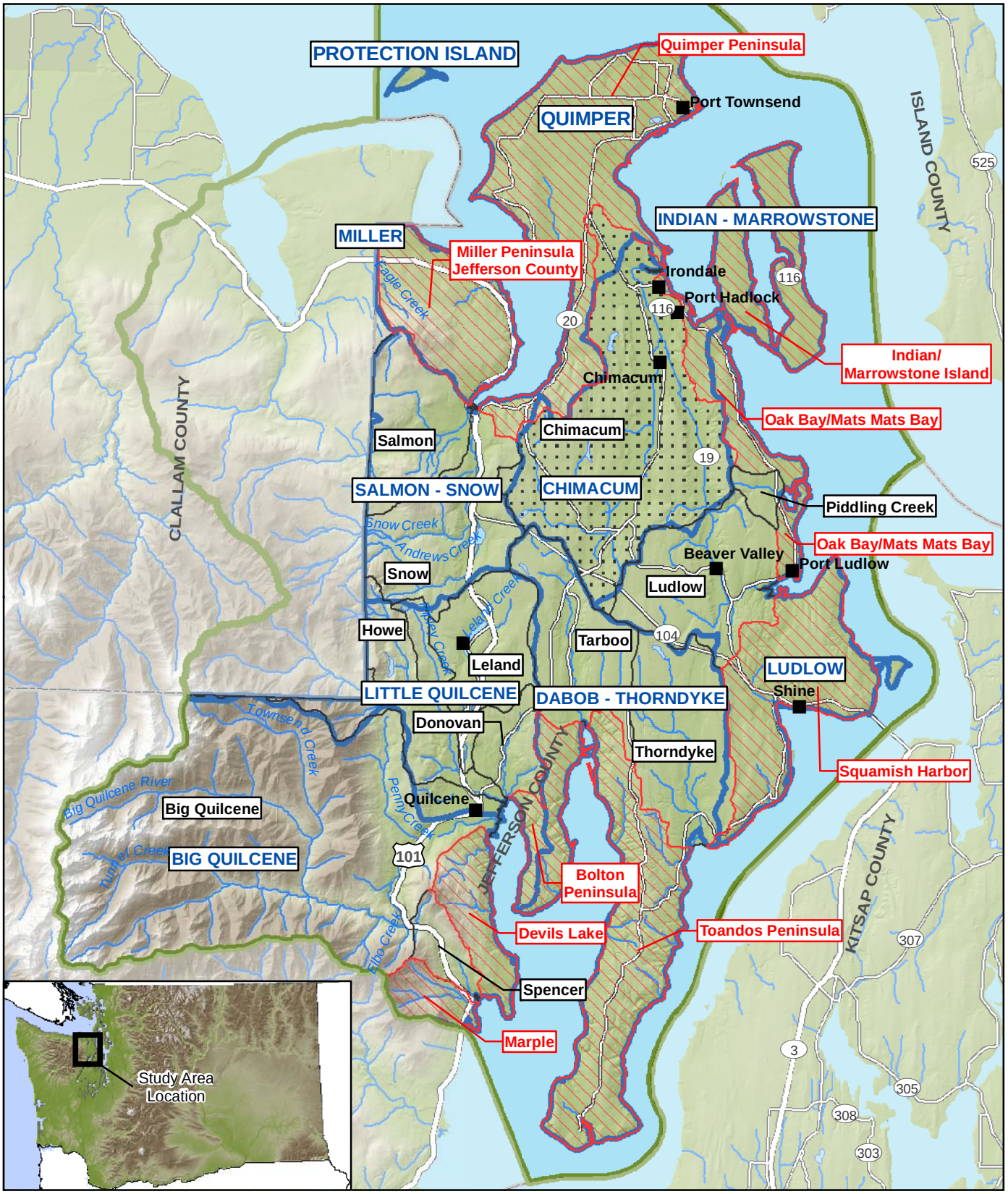
TABLE 19
ESTIMATED 2010, AND PROJECTED 2016 AND 2030 CONSUMPTIVE USE BY SUBBASIN

WRIA 17 Subbasin	Year 2010			Year 2016			Year 2030		
	Withdrawals (Output) (AFY)[1]	Return Flows (Input) (AFY)[2]	Consumptive Use (AFY)	Withdrawals (Output) (AFY)[1]	Return Flows (Input) (AFY)[2]	Consumptive Use (AFY)	Withdrawals (Output) (AFY)[1]	Return Flows (Input) (AFY)[2]	Consumptive Use (AFY)
Big Quilcene	13,836	25	-13,811	13,904	27	-13,876	14,142	31	-14,110
Chimacum	1,595	560	-1,035	1,724	608	-1,115	1,912	716	-1,196
Dabob - Thorndyke	389	72	-317	396	76	-319	409	86	-323
Indian - Marrowstone	108	81	-26	112	87	-25	123	101	-22
Little Quilcene	2,500	48	-2,452	2,514	50	-2,464	2,559	56	-2,504
Ludlow	906	250	-657	981	274	-706	1,146	329	-817
Miller	108	70	-38	116	76	-40	133	89	-44
Quimper	548	414	-133	573	439	-134	630	495	-135
Salmon - Snow	37	24	-14	41	26	-15	47	30	-18
Total	**20,027**	**1,544**	**-18,483**	**20,360**	**1,665**	**-18,694**	**21,101**	**1,932**	**-19,168**

1. Withdrawals (based on production) are assumed to occur in the basin in which the demand is located except for the following instances: 1) The City of Port Townsend obtains its water from the Big Quilcene and Little Quilcene Subbasins. In 2009, approximately 86 percent of the total volume of water diverted was from the Big Quilcene River and 14 percent was from the Little Quilcene River. Therefore, the City of Port Townsend's production was assumed to be split between the two subbasins based on those percentages in 2010, 2016 and 2030. 2) The Quilcene water system obtains its water from the Big Quilcene Subbasin to supply demand in the Big Quilcene and Little Quilcene Subbasins; 3) The MOA-TEL water system obtains its water from the Salmon-Snow Subbasin to supply demand in the Salmon-Snow and Miller Subbasins; 4) The Quimper system obtains its water from the Chimacum Subbasin to supply demand in the Indian-Marrowstone Island Subbasin and will supply the LUD#3 demand (Quimper Subbasin) in 2016 and 2030.

2. Return flows (based on demand) were estimated using the following assumptions: residential use on septic systems assumed to be 34 percent consumptive (66 percent of total annual use becomes return flows), residential use in sewered areas (City of Port Townsend, Olympic Water and Sewer System) is 97 percent consumptive (3 percent of total annual use becomes return flows), irrigation use is 90 percent consumptive (10 percent of total annual use becomes return flows), system loss is non-consumptive (100 percent of total annual loss becomes return flows), and all other uses are 100 percent consumptive (0 percent of total annual use becomes return flows).

FIGURES



LEGEND

- Community
- Water Course
- County Boundary
- WRIA Boundary
- Subbasin Boundary

Management Area Type

- Coastal Management Area (Red Labels)
- No Outdoor Irrigation Reserve
- Reserve Management Area

0 4
Scale in Miles

Map Projection:
Washington State Plane
North Zone NAD 1983
Source:
NHD, NED, ESRI, WSDOE,
Jefferson PUD#1

N

This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

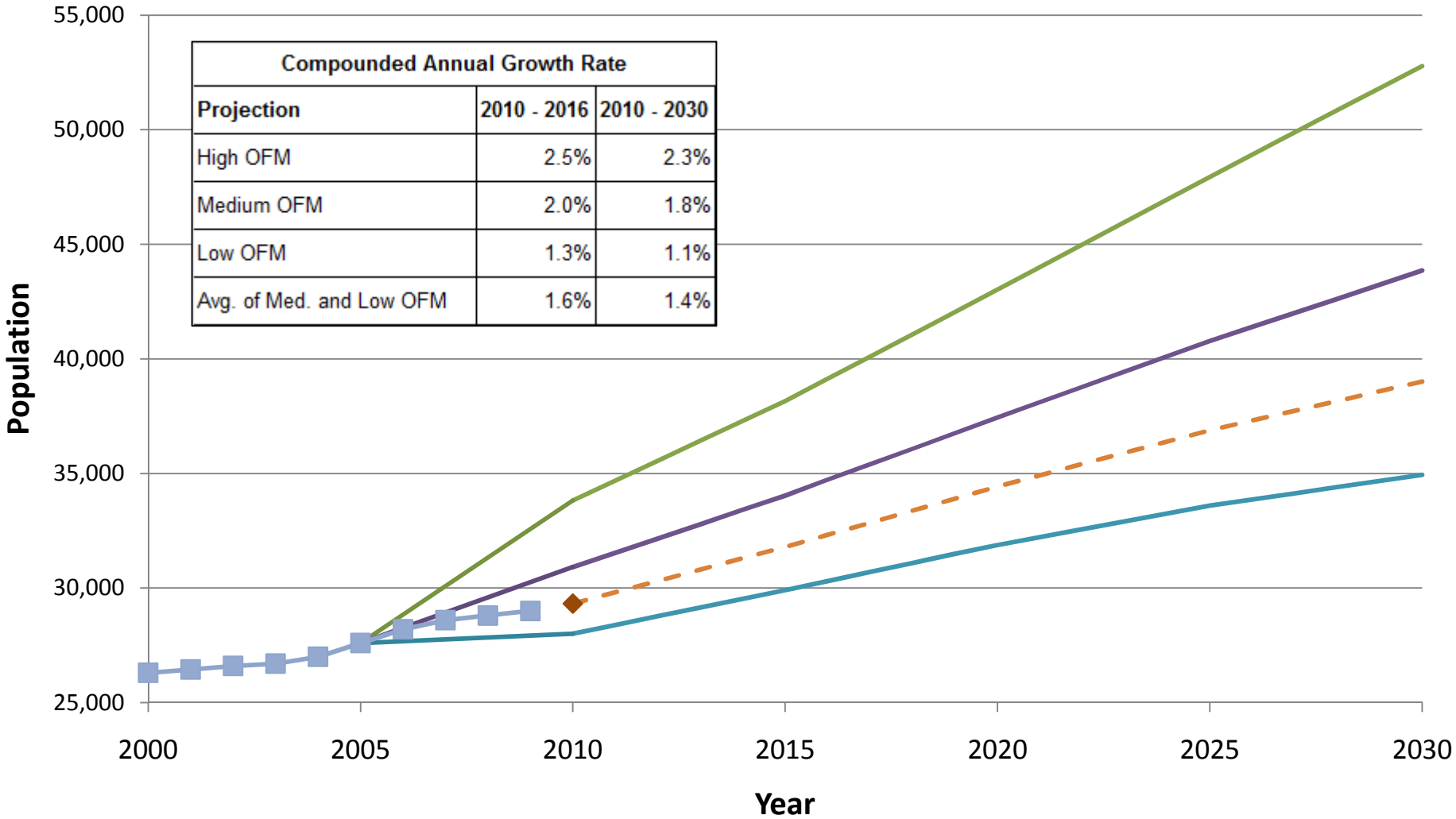
FIGURE **1**

WRIA 17 SUBBASINS AND MANAGEMENT AREAS

WRIA 17 DEMAND

0739318301001F03R01_Subbasins.mxd | 6/30/2010 | THAMMOND

Golder Associates



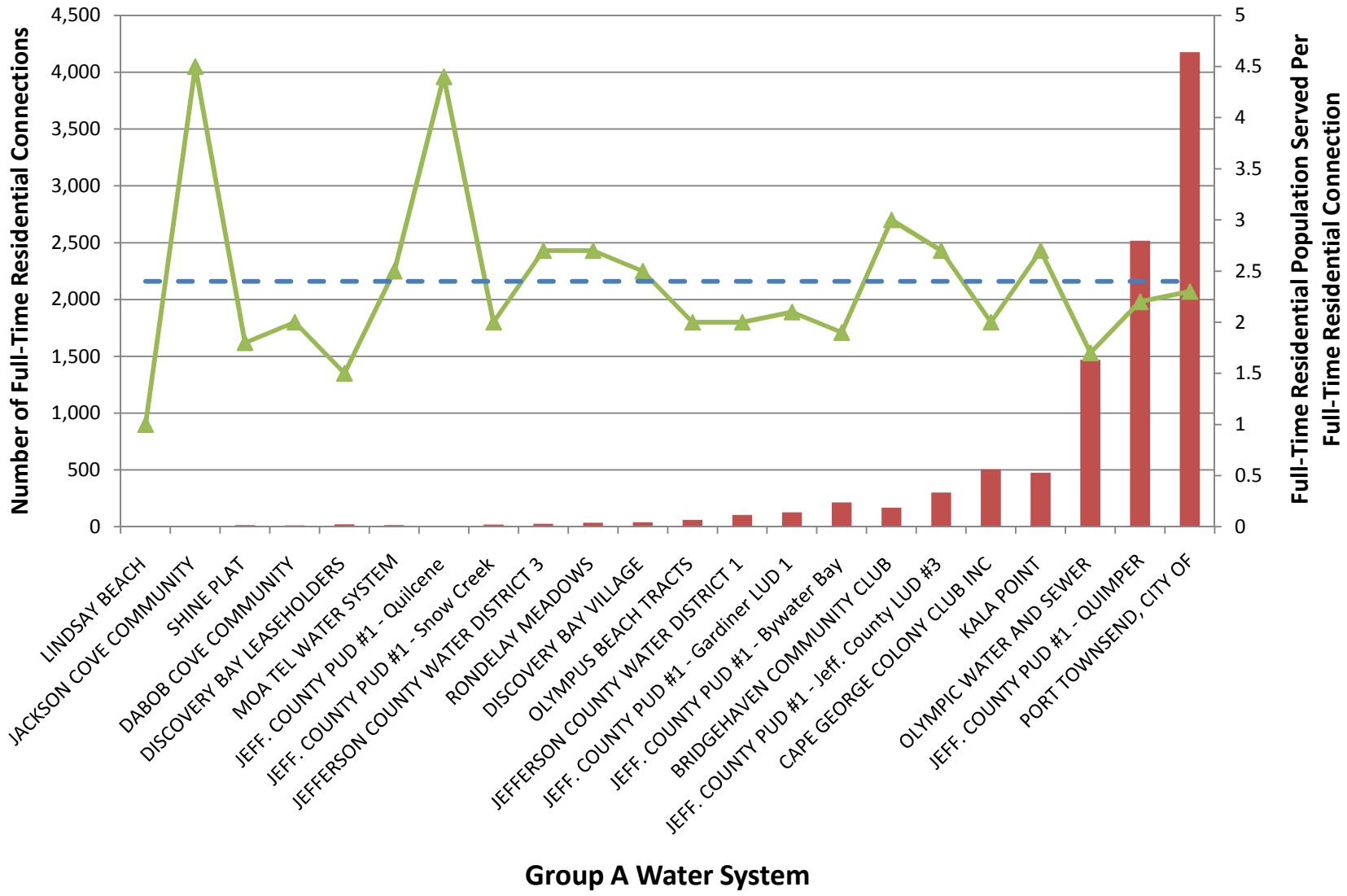
Compounded Annual Growth Rate		
Projection	**2010 - 2016**	**2010 - 2030**
High OFM	2.5%	2.3%
Medium OFM	2.0%	1.8%
Low OFM	1.3%	1.1%
Avg. of Med. and Low OFM	1.6%	1.4%

- High OFM Projection (OFM, 2007)
- Medium OFM Projection (OFM, 2007)
- Low OFM Projection (OFM, 2007)
- Projection Based on the Average of the Medium and Low OFM Projection Trends
- OFM Annual Estimate
- 2010 Population Estimate

FIGURE 2:
2000 to 2009 ANNUAL OFM POPULATION ESTIMATES AND 2010 THROUGH 2030 POPULATION PROJECTIONS

WRIA 17 Demand Analysis
073-93183-01.004

Golder Associates



Full-Time Residential Connections

Full-Time Population Served Per Full-Time Residential Connection

Average Population Per Connection

FIGURE 3:
2009 GROUP A WATER SYSTEM FULL-TIME RESIDENTIAL POPULATION PER FULL-TIME RESIDENTIAL CONNECTION

WRIA 17 Demand Analysis
073-93183-01.004

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WRIA 17 Demand Calculations.xlsx; F3-gpdpc

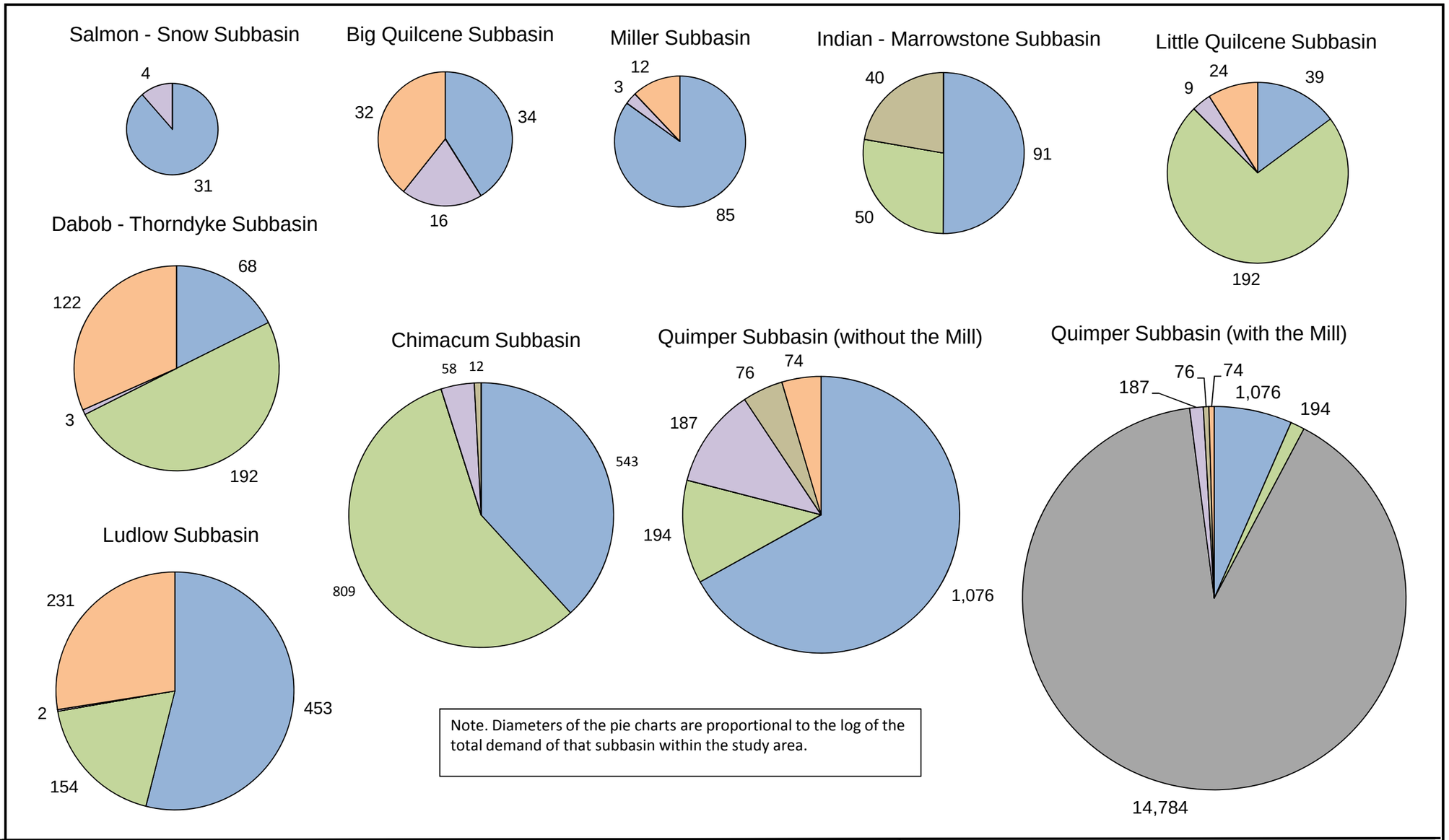
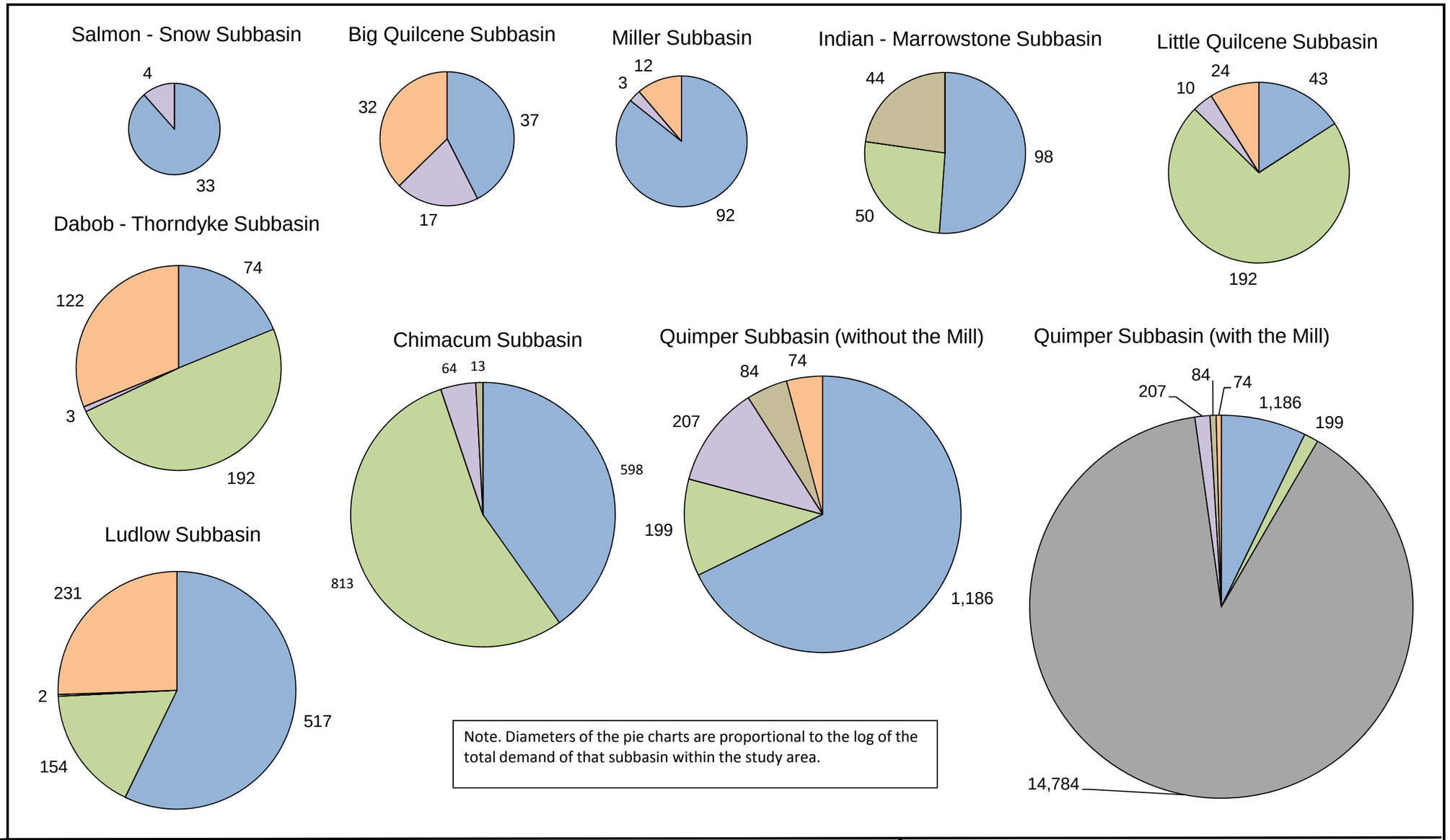


FIGURE 4:
ESTIMATED 2010 WATER DEMAND BY SUBBASIN AND USE CATEGORY, ACRE-FEET/YEAR

WRIA 17 Demand Analysis
073-93183-01.004

Golder Associates



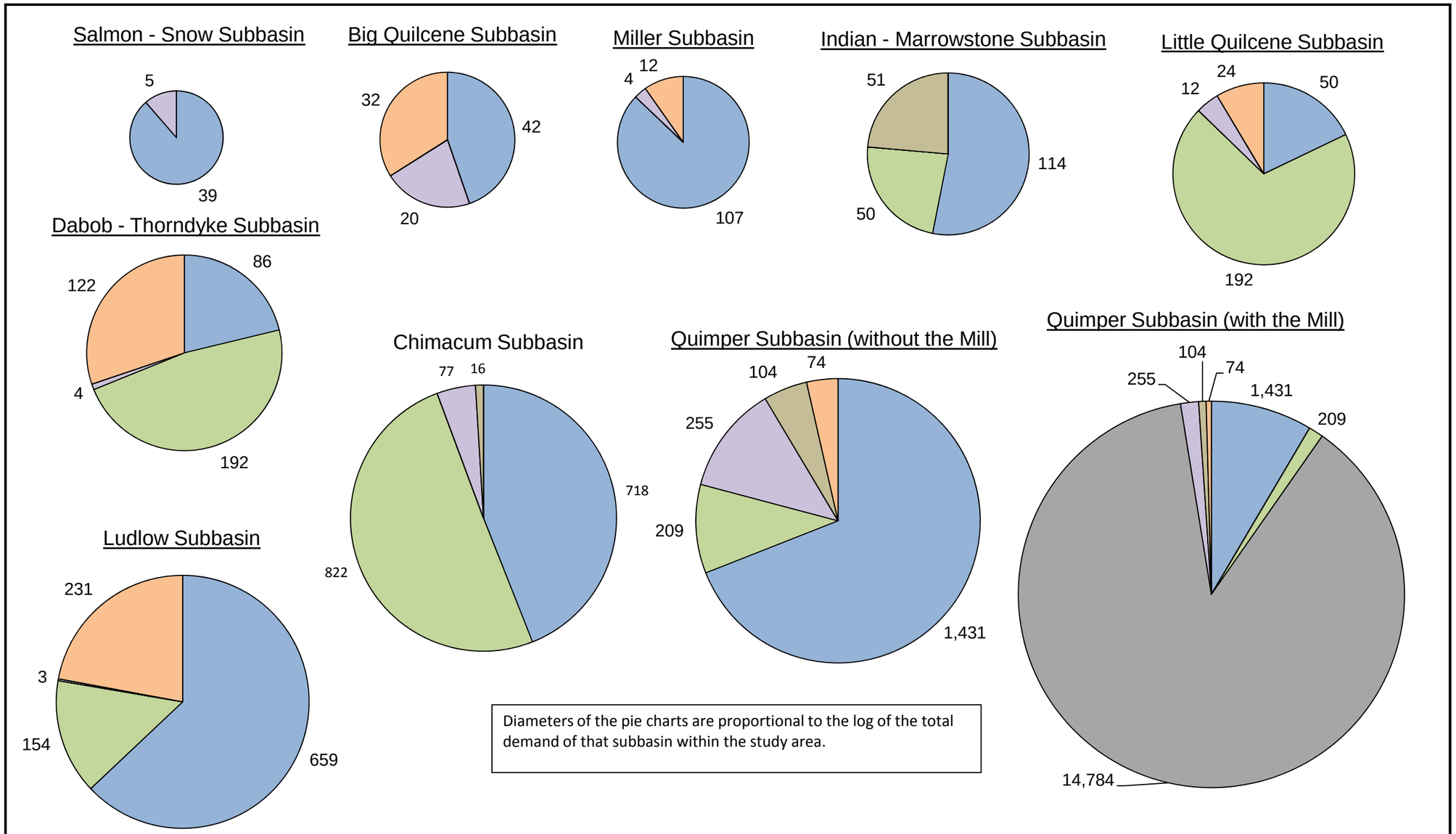
Residential | Irrigation and Livestock | Industrial

Commercial | Governmental | Mining

FIGURE 5:
ESTIMATED 2016 WATER DEMAND BY SUBBASIN AND USE CATEGORY, ACRE-FEET/YEAR

WRIA 17 Demand Analysis
073-93183-01.004

Golder Associates

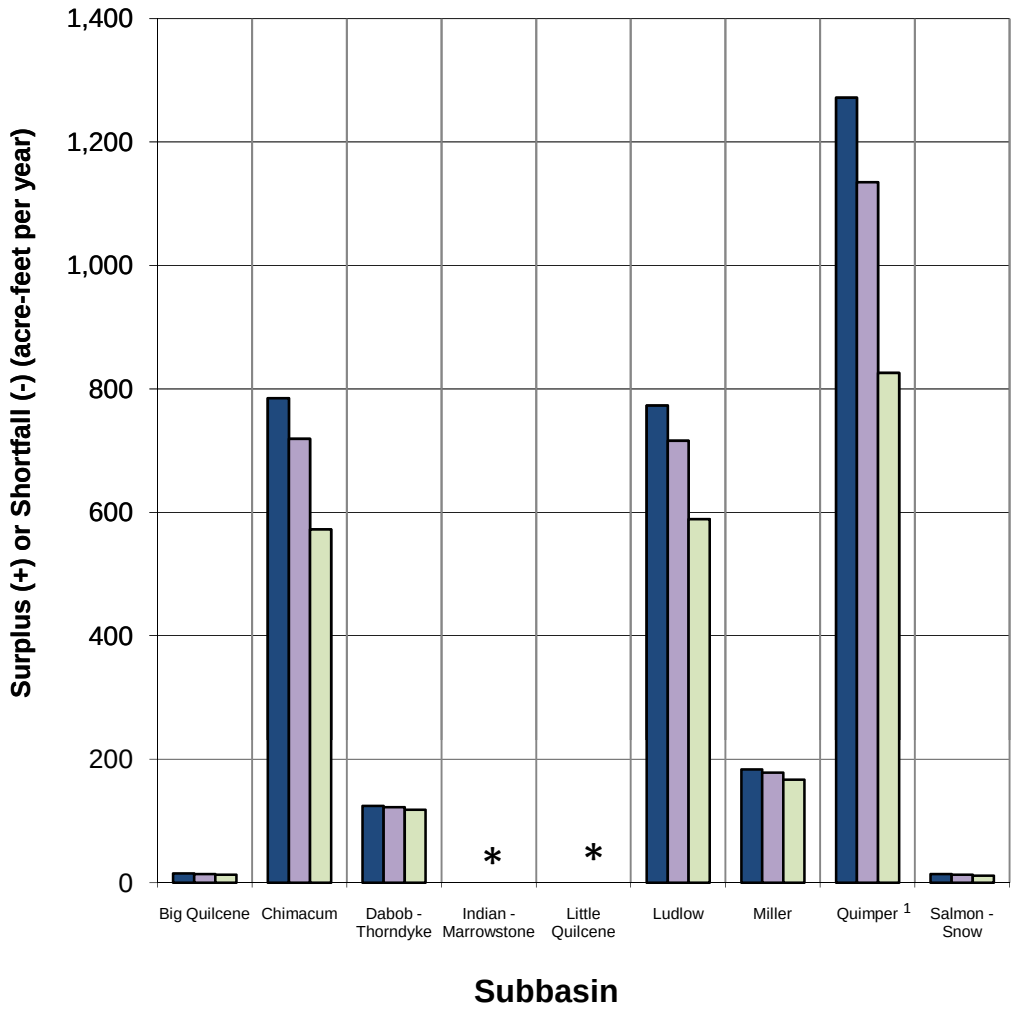


Residential | Irrigation and Livestock | Industrial | Commercial | Governmental | Mining

FIGURE 6:
ESTIMATED 2030 WATER DEMAND BY SUBBASIN AND USE CATEGORY, ACRE-FEET/YEAR

WRIA 17 Demand Analysis
073-93183-01.004

Golder Associates



Notes
* Indian-Marrowstone Subbasin demand is included in the Chimacum Subbasin (Quimper water system). Little Quilcene Subbasin demand is included in the Big Quicene Subbasin (Quilcene water system).
1. The values reported for the Quimper Subbasin do not include water available from the City of Port Townsend because the City's water rights do not have an annual limitation, just an instantaneous limitation, and were therefore not included in the inchoate water rights analysis. See Table 14 for more information about what water systems the values reported in this figure represent.

- Water Available in 2010 (acre-feet)
- Surplus (+) or Shortfall (-) in Meeting 2016 Demand (acre-feet)
- Surplus (+) or Shortfall (-) in Meeting 2030 Demand (acre-feet)

FIGURE 7a:
SURPLUS (+) OR SHORTFALL (-) IN WATER AVAILABLE TO MEET PUBLICLY-SUPPLIED DEMAND

WRIA 17 Demand Analysis
073-93183-01.004

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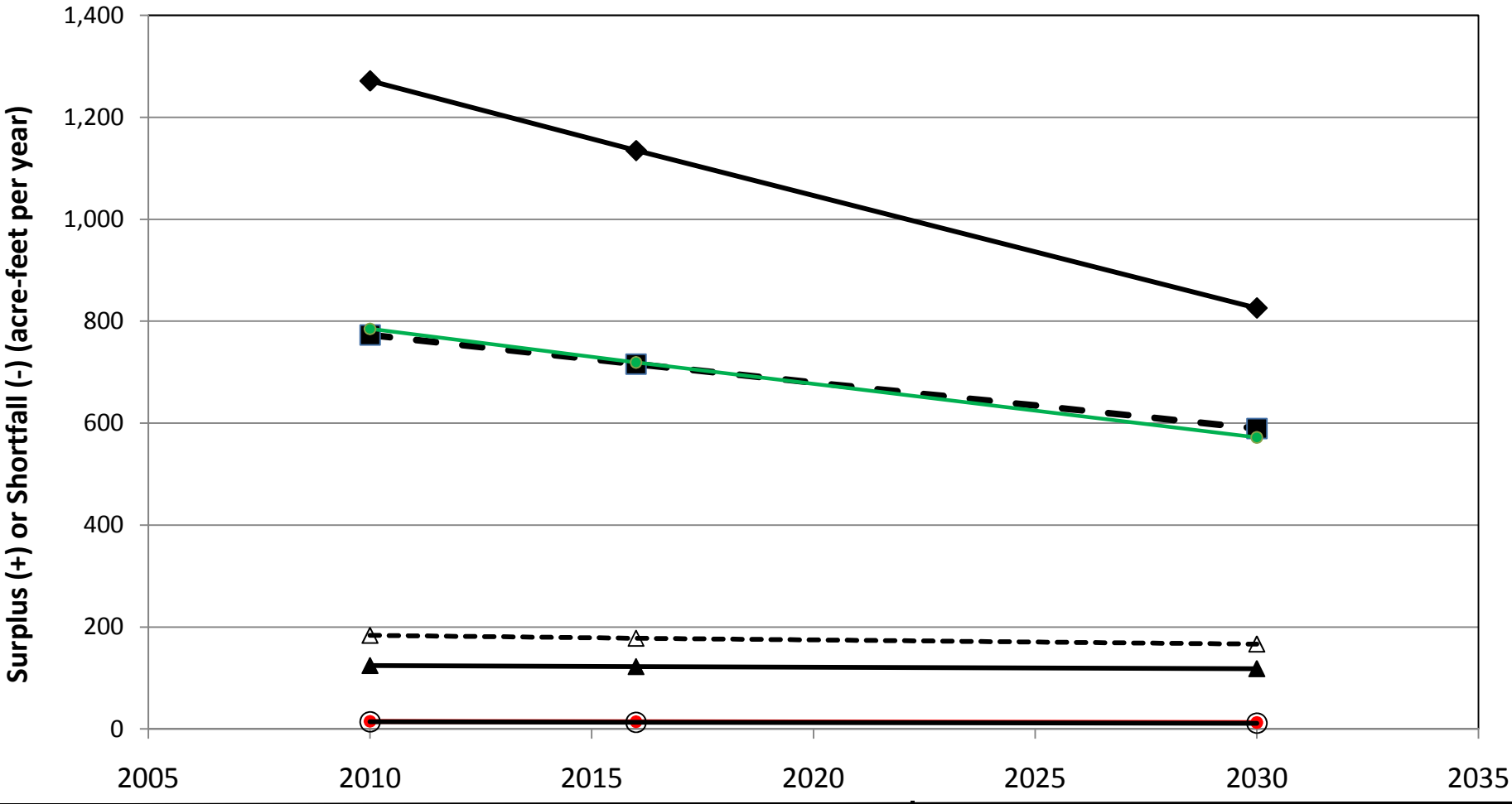


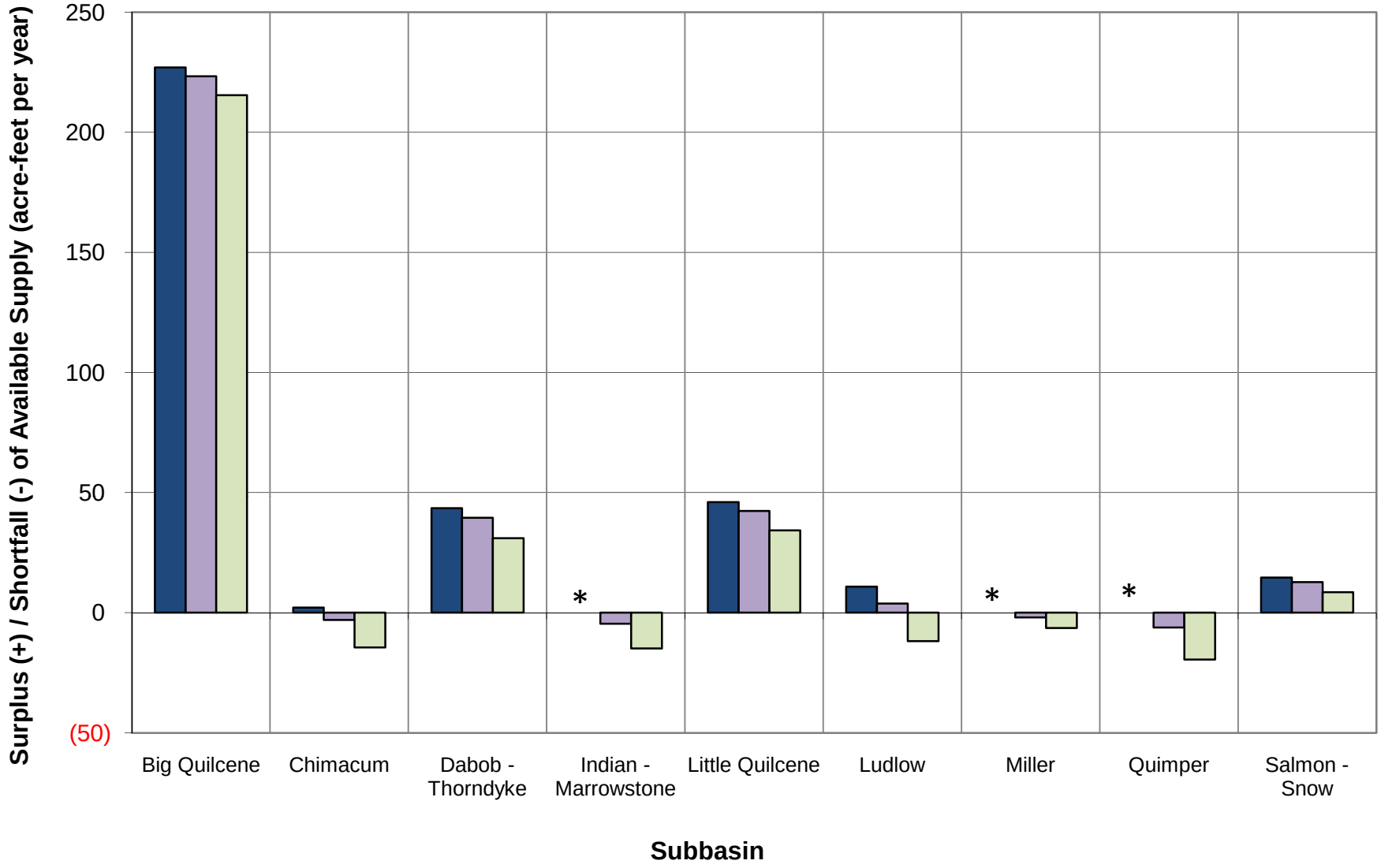
Ludlow
Quimper
Chimacum
Miller
Dabob - Thorndyke
Big Quilcene
Salmon - Snow

* Indian-Marrowstone Subbasin demand is included in the Chimacum Subbasin (Quimper water system). Little Quilcene Subbasin demand is included in the Big Quicene Subbasin (Quilcene water system).
** The values reported for the Quimper Subbasin do not include water available from the City of Port Townsend. See Table 14 for more information about what water systems the values reported in this figure represent.

FIGURE 7b:
SURPLUS (+) OR SHORTFALL (-) IN WATER AVAILABLE TO MEET PUBLICLY-SUPPLIED DEMAND

WRIA 17 Demand Analysis
073-93183-01.004

Golder Associates



Water Available in 2010 (acre-feet)

Surplus (+) or Shortfall (-) in Meeting 2016 Demand (acre-feet)

Surplus (+) or Shortfall (-) in Meeting 2030 Demand (acre-feet)

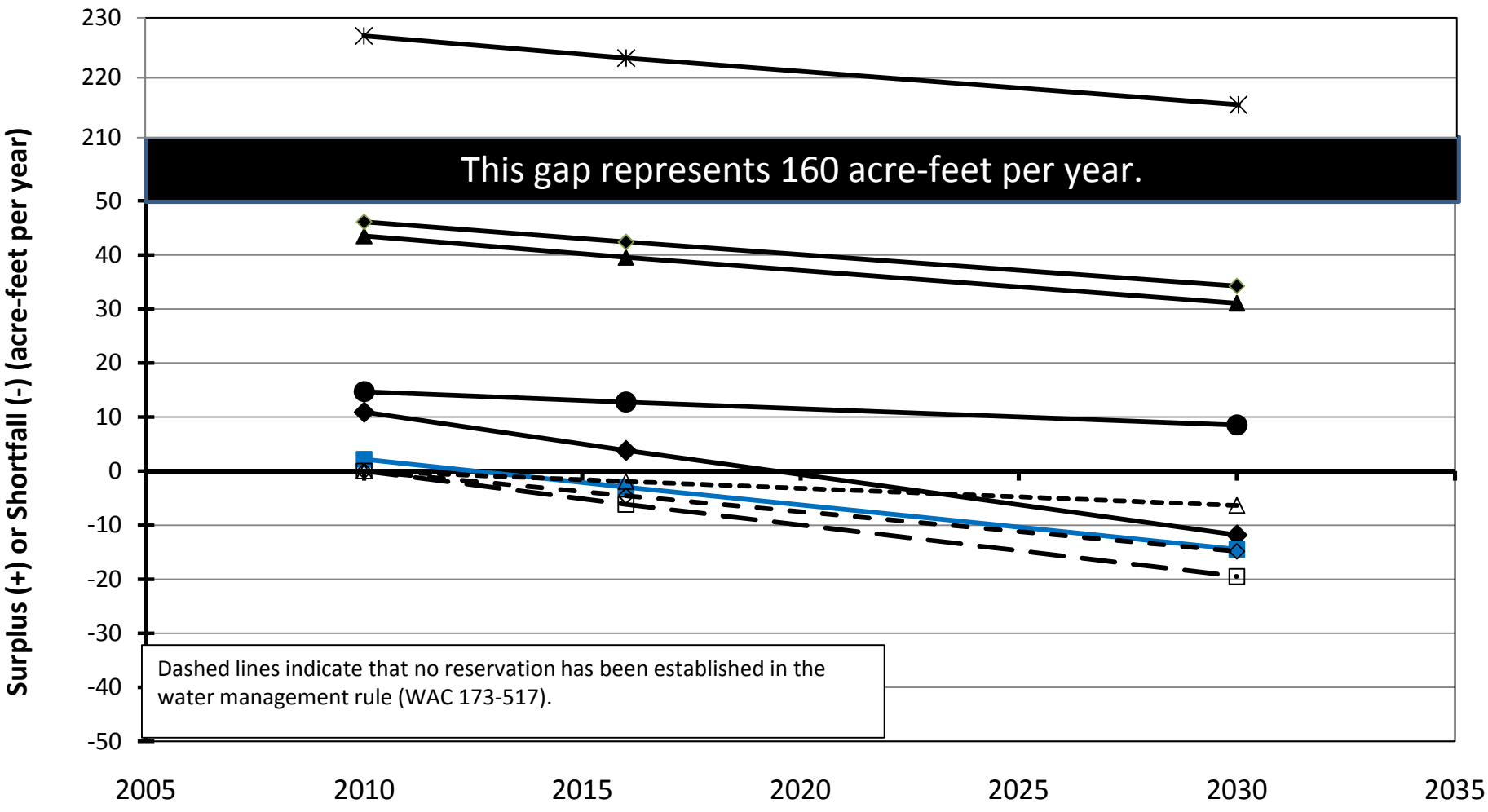
* indicates that no reservation has been established in the water management rule (WAC 173-517)

FIGURE 8a:
SURPLUS (+) OR SHORTFALL (-) IN WATER AVAILABLE TO MEET SELF-SUPPLIED DEMAND

WRIA 17 Demand Analysis
073-93183-01.004

Golder Associates

WRIA 17 Demand Calculations.xlsx; F8a-PriSur

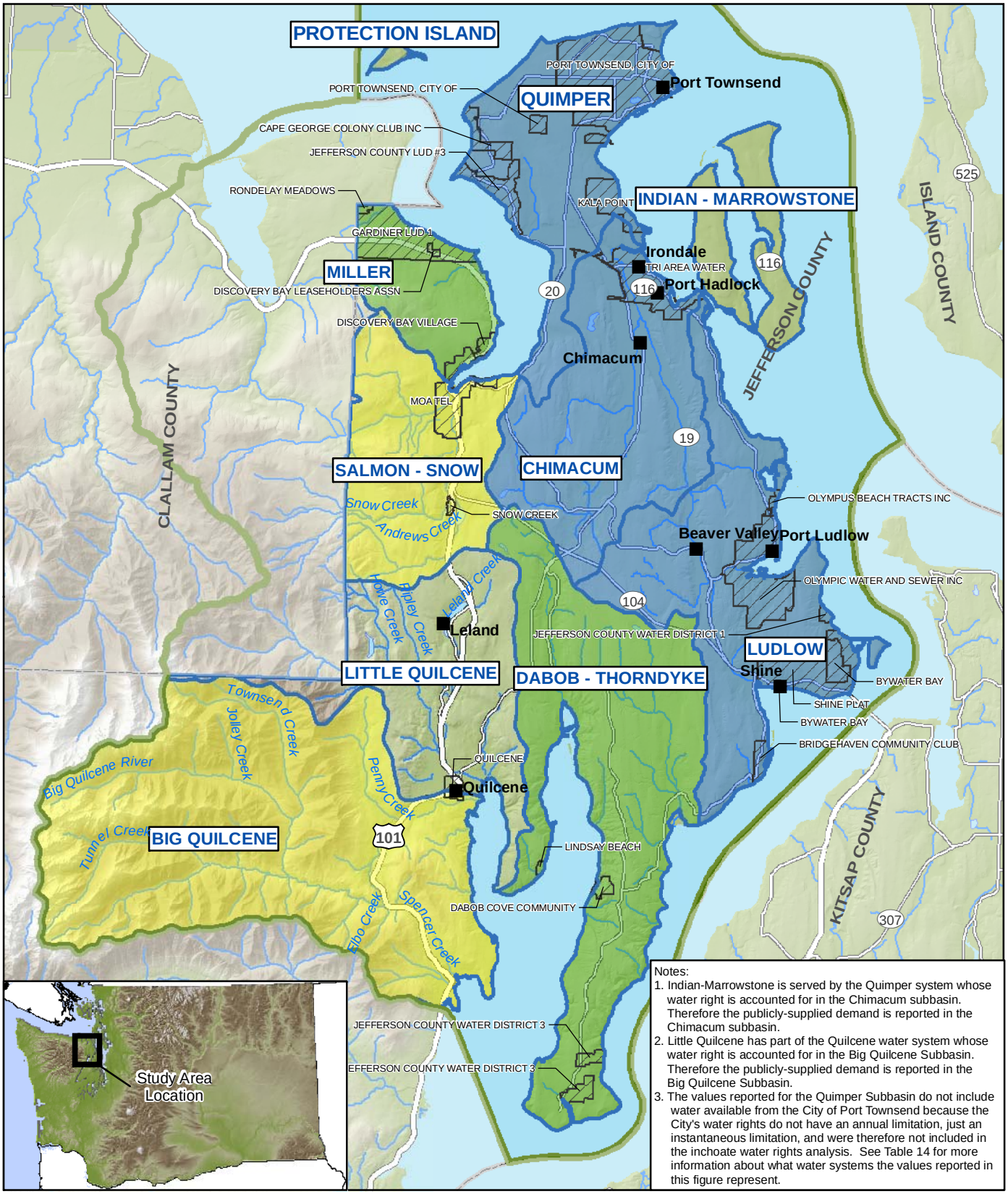


Big Quilcene
Ludlow
Dabob - Thorndyke
Salmon - Snow
Little Quilcene
Chimacum
Indian - Marrowstone
Miller
Quimper

FIGURE 8b:
SURPLUS (+) OR SHORTFALL (-) IN WATER AVAILABLE TO MEET SELF-SUPPLIED DEMAND

WRIA 17 Demand Analysis
073-93183-01.004

Golder Associates



Notes:
1. Indian-Marrowstone is served by the Quimper system whose water right is accounted for in the Chimacum subbasin. Therefore the publicly-supplied demand is reported in the Chimacum subbasin.
2. Little Quilcene has part of the Quilcene water system whose water right is accounted for in the Big Quilcene Subbasin. Therefore the publicly-supplied demand is reported in the Big Quilcene Subbasin.
3. The values reported for the Quimper Subbasin do not include water available from the City of Port Townsend because the City's water rights do not have an annual limitation, just an instantaneous limitation, and were therefore not included in the inchoate water rights analysis. See Table 14 for more information about what water systems the values reported in this figure represent.

This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

LEGEND

- Community
- Water Course
- County Boundary
- WRIA Boundary
- Subbasin Boundary
- Public Water System Boundary

Water Surplus (acre-feet)
- >700
- 700-300
- 300-100
- 100-0

0 4
Scale in Miles

N

Map Projection:
Washington State Plane
North Zone NAD 1983
Source:
NHD, NED, ESRI, WSDOE,
Jefferson PUD#1

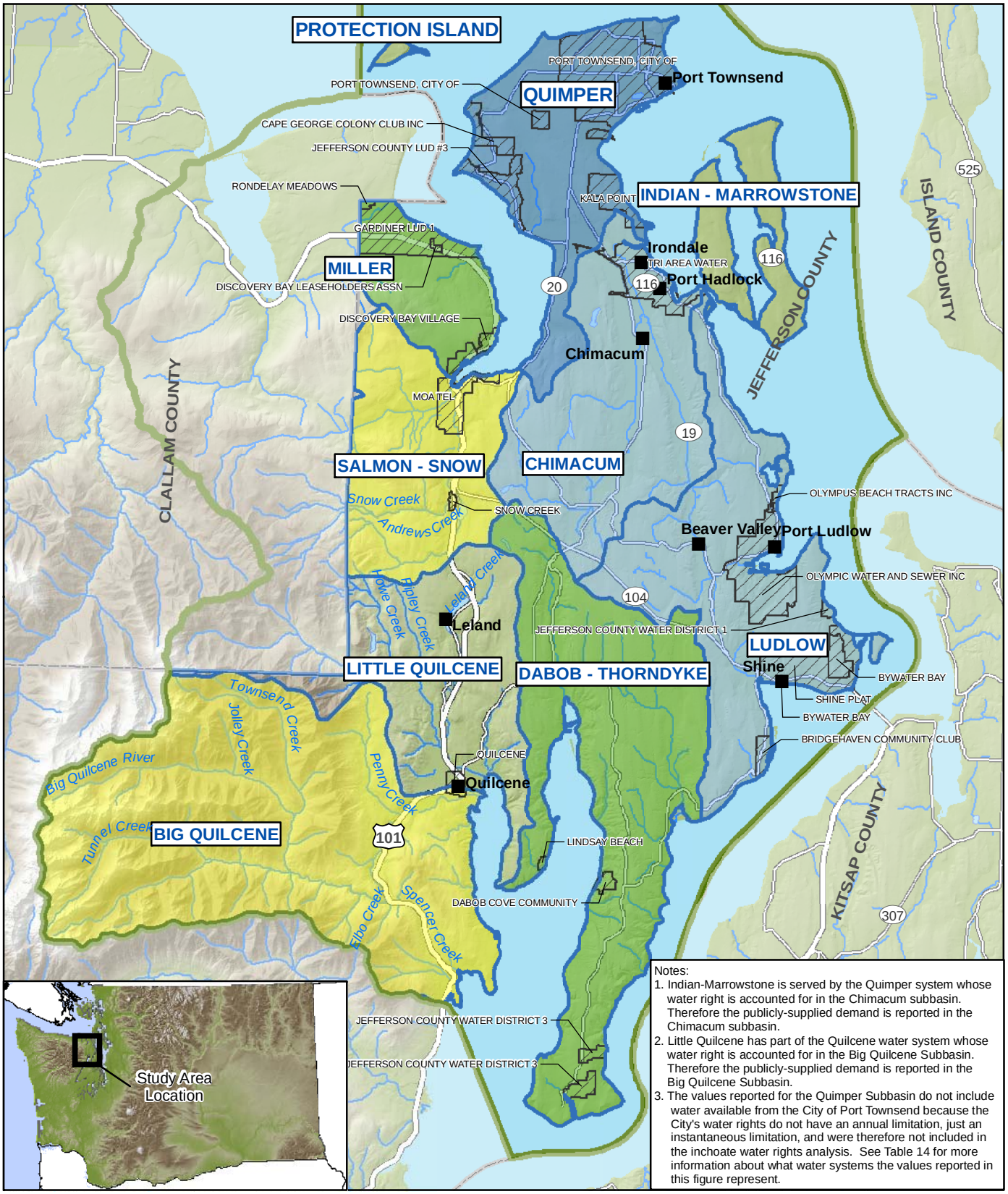
FIGURE **9**

SURPLUS (+) OR SHORTFALL (-) IN WATER AVAILABLE TO MEET 2016 PUBLICLY-SUPPLIED DEMAND

WRIA 17 DEMAND

0739318301001F07R01_SurplusShortfall2016.mxd | 6/29/2010 | THAMMOND

Golder Associates



Notes:
1. Indian-Marrowstone is served by the Quimper system whose water right is accounted for in the Chimacum subbasin. Therefore the publicly-supplied demand is reported in the Chimacum subbasin.
2. Little Quilcene has part of the Quilcene water system whose water right is accounted for in the Big Quilcene Subbasin. Therefore the publicly-supplied demand is reported in the Big Quilcene Subbasin.
3. The values reported for the Quimper Subbasin do not include water available from the City of Port Townsend because the City's water rights do not have an annual limitation, just an instantaneous limitation, and were therefore not included in the inchoate water rights analysis. See Table 14 for more information about what water systems the values reported in this figure represent.

This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

LEGEND

- Community
- Water Course
- County Boundary
- WRIA Boundary
- Subbasin Boundary
- Public Water System Boundary

Water Surplus (acre-feet)
- >700
- 700-300
- 300-100
- 100-0

0 4
Scale in Miles

N

Map Projection:
Washington State Plane
North Zone NAD 1983
Source:
NHD, NED, ESRI, WSDOE,
Jefferson PUD#1

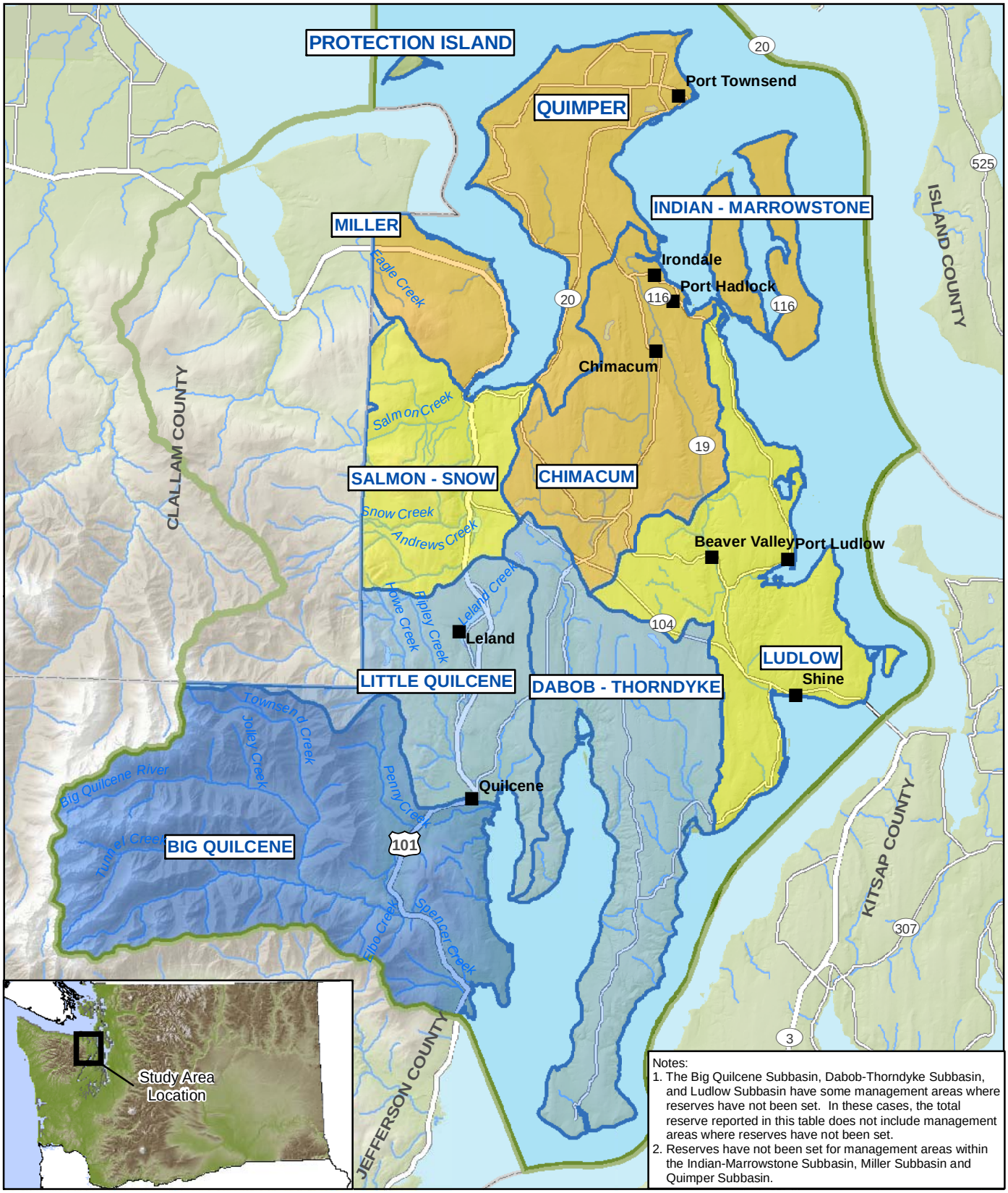
FIGURE **10**

SURPLUS (+) OR SHORTFALL (-) IN WATER AVAILABLE TO MEET 2030 PUBLICLY-SUPPLIED DEMAND

WRIA 17 DEMAND

0739318301001F08R01_SurplusShortfall2030.mxd | 6/29/2010 | THAMMOND

Golder Associates



Notes:
1. The Big Quilcene Subbasin, Dabob-Thorndyke Subbasin, and Ludlow Subbasin have some management areas where reserves have not been set. In these cases, the total reserve reported in this table does not include management areas where reserves have not been set.
2. Reserves have not been set for management areas within the Indian-Marrowstone Subbasin, Miller Subbasin and Quimper Subbasin.

This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

LEGEND

- Community
- Water Course
- County Boundary
- WRIA Boundary
- Subbasin Boundary

Water Surplus (acre-feet)
- >45
- 45-30
- 30-15
- 15-0
- 0- -15
- -15- -30
- <-30

0 4
Scale in Miles

N

Map Projection:
Washington State Plane
North Zone NAD 1983
Source:
NHD, NED, ESRI, WSDOE,
Jefferson PUD#1

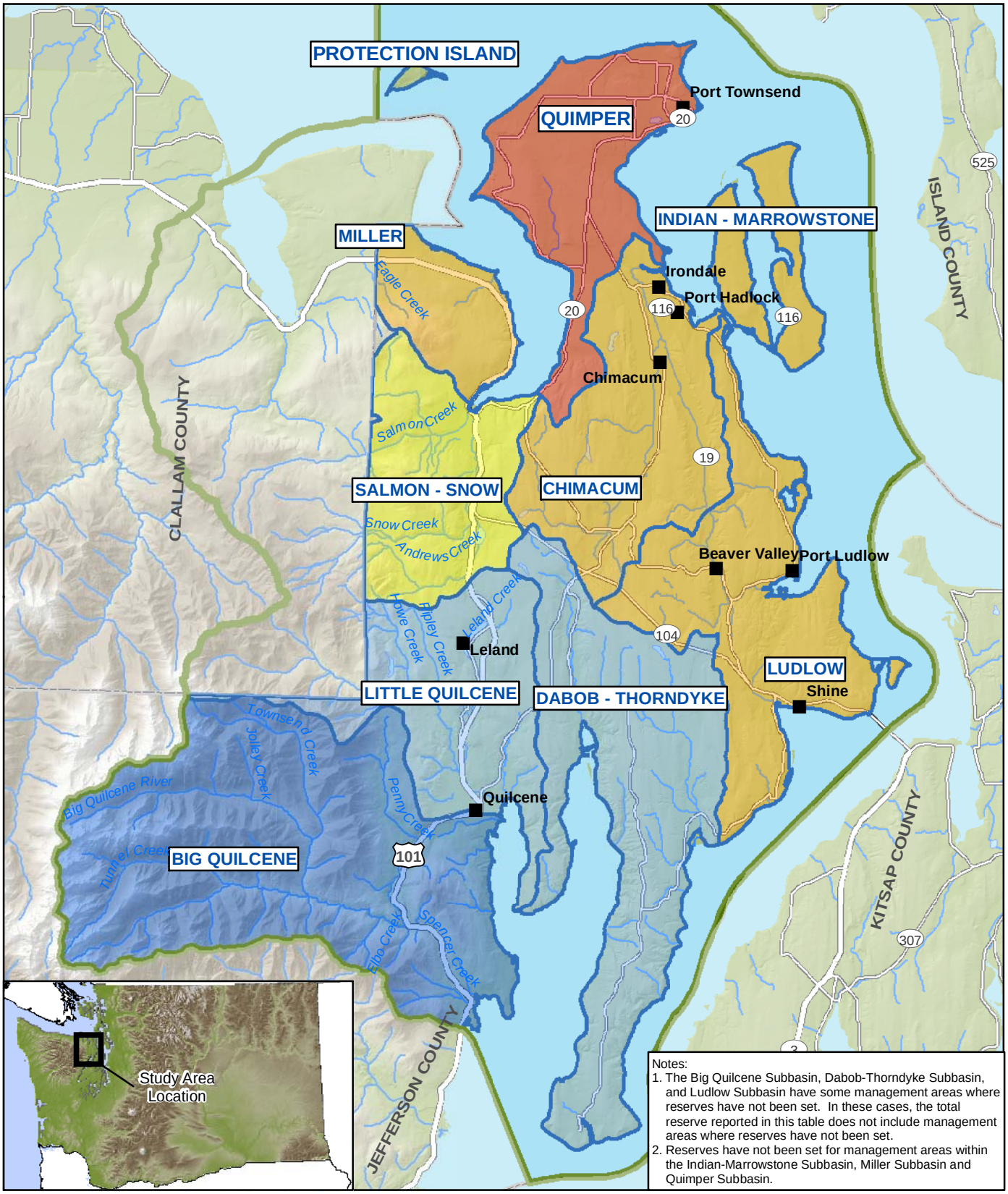
FIGURE **11**

SURPLUS (+) OR SHORTFALL (-) IN WATER AVAILABLE TO MEET 2016 SELF-SUPPLIED DEMAND

WRIA 17 DEMAND

0739318301001F09_SurplusShortfallSelf2016.mxd | 6/29/2010 | THAMMOND

Golder Associates



Notes:
1. The Big Quilcene Subbasin, Dabob-Thorndyke Subbasin, and Ludlow Subbasin have some management areas where reserves have not been set. In these cases, the total reserve reported in this table does not include management areas where reserves have not been set.
2. Reserves have not been set for management areas within the Indian-Marrowstone Subbasin, Miller Subbasin and Quimper Subbasin.

This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

LEGEND

- Community
- Water Course
- County Boundary
- WRIA Boundary
- Subbasin Boundary

Water Surplus (acre-feet)
- >45
- 45-30
- 30-15
- 15-0
- 0- -15
- -15- -30
- <-30

0 4
Scale in Miles

N

Map Projection:
Washington State Plane
North Zone NAD 1983
Source:
NHD, NED, ESRI, WSDOE,
Jefferson PUD#1

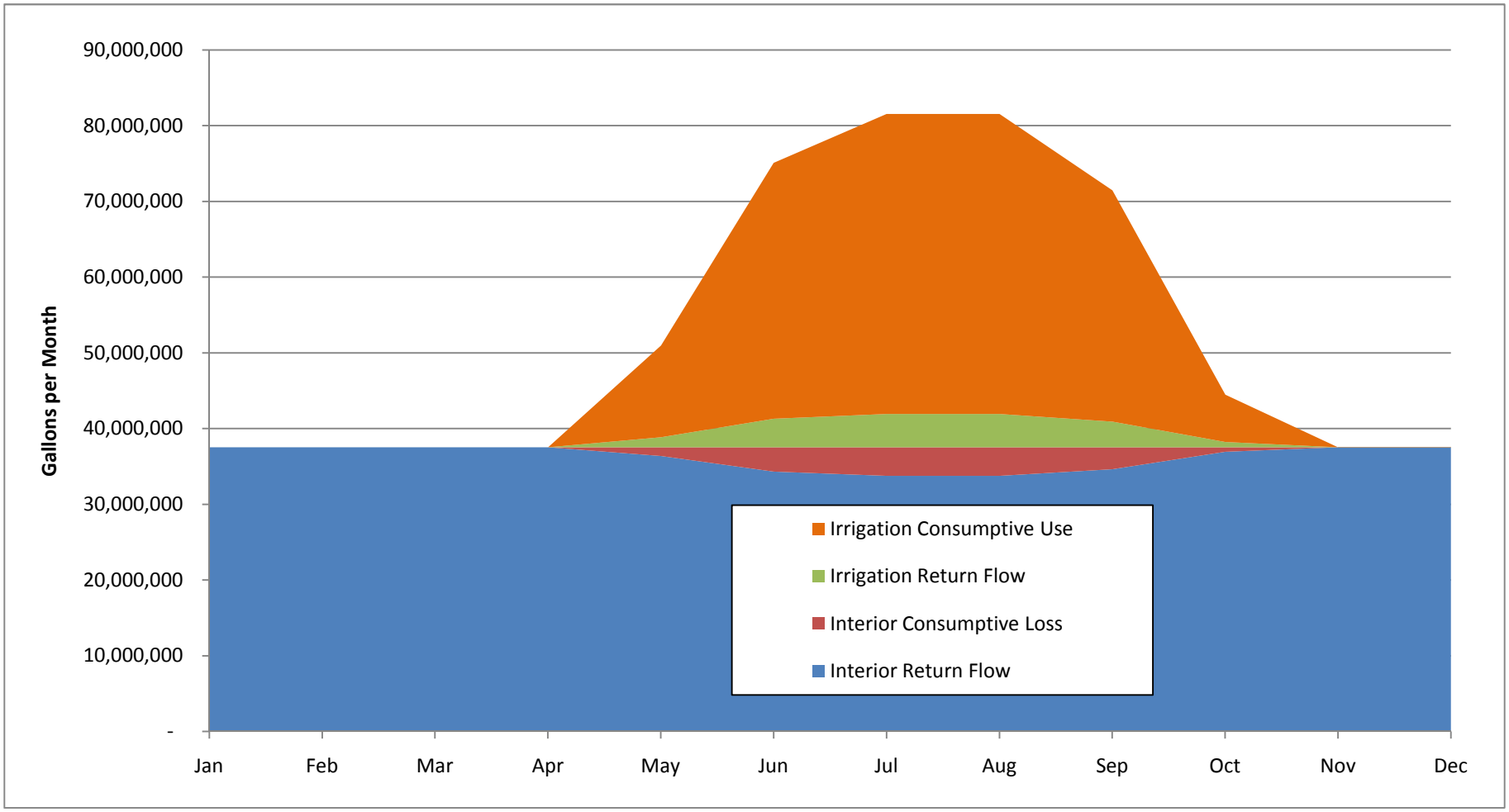
FIGURE **12**

SURPLUS (+) OR SHORTFALL (-) IN WATER AVAILABLE TO MEET 2030 SELF-SUPPLIED DEMAND

WRIA 17 DEMAND

0739318301001F10_SurplusShortfallSelf2030.mxd | 6/29/2010 | THAMMOND

Golder Associates



Water system data provided by PUD (2010).
Nov-Apr total average use is used to represent total interior year-round use.
May-Oct total Exterior use is calculated as the difference between total and total nterior use. Consumptive quantities are from Ecology (2009; 10% of interior use, 90% of exterior use).

FIGURE 13:
TOTAL AND CONSUMPTIVE RESIDENTIAL WATER USE AND RETURN FLOWS

WRIA 17 Demand Analysis
073-93183-01.004

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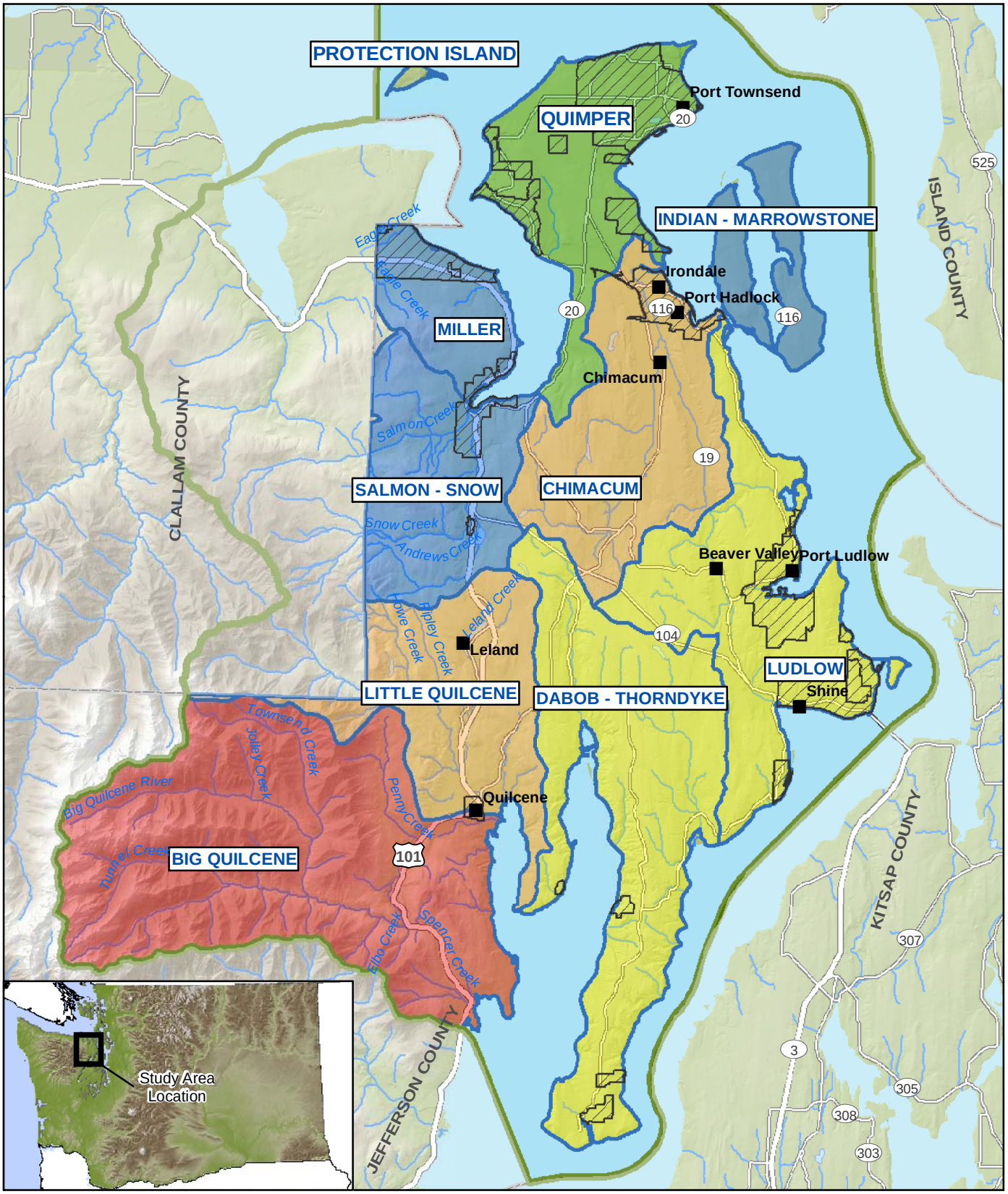


This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

LEGEND

- Community
- Water Course
- County Boundary
- WRIA Boundary
- Subbasin Boundary
- Public Water System Boundary

2010 Net Inflow (+) or Outflow (-) (acre-feet)

- 0--100
- -100--300
- -300--1000
- -1,000- -2,500
- <-2,500

0 4
Scale in Miles

N

Map Projection:
Washington State Plane
North Zone NAD 1983
Source:
NHD, NED, ESRI, WSDOE,
Jefferson PUD#1

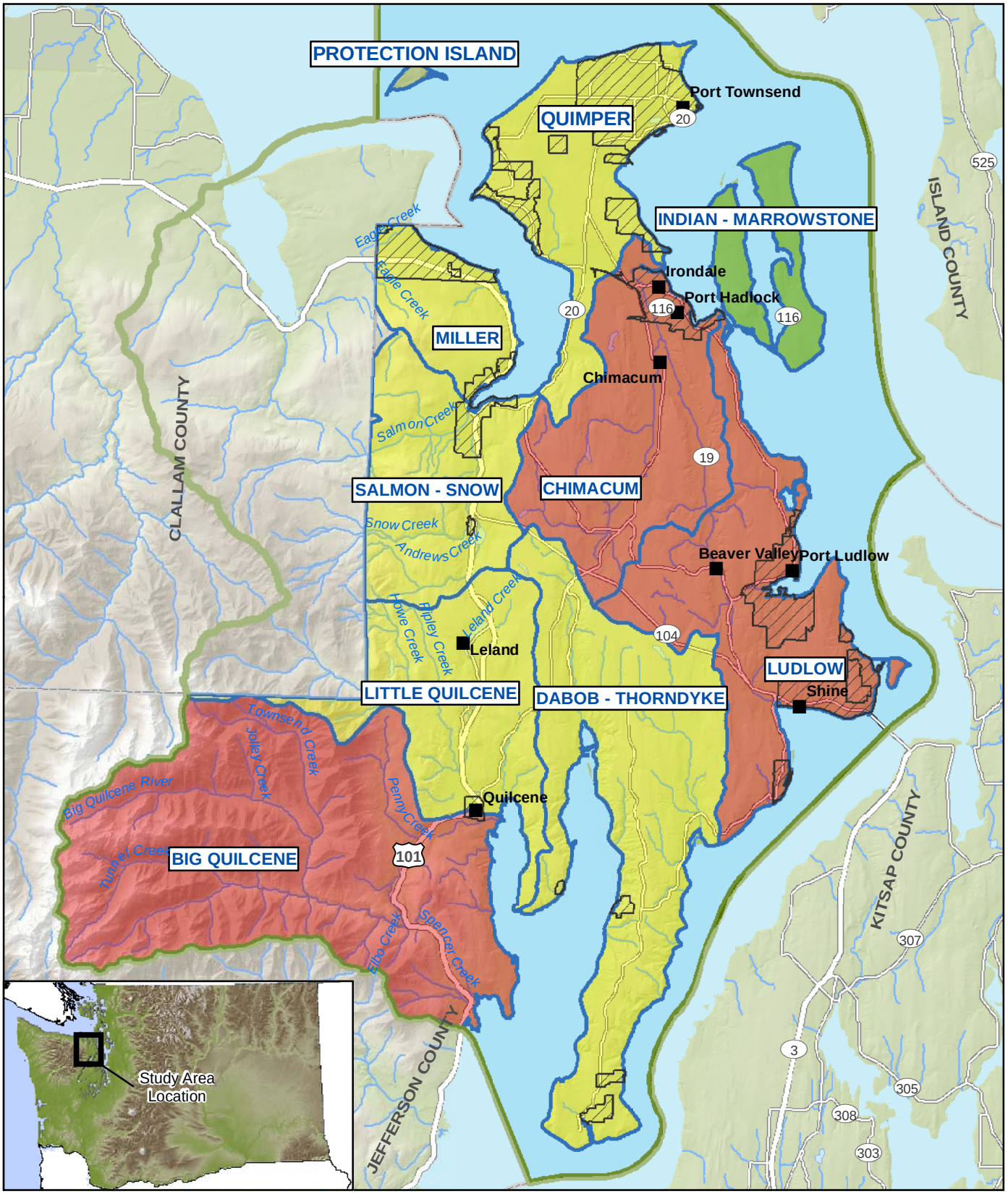
FIGURE **14**

ESTIMATED 2010 CONSUMPTIVE USE BY SUBBASIN

WRIA 17 DEMAND

0739318301001F11R01_ConsumptiveUse.mxd | 6/29/2010 | THAMMOND

Golder Associates



This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

LEGEND

- Community
- Water Course
- County Boundary
- WRIA Boundary
- Subbasin Boundary
- Public Water System Boundary

2010 to 2016 Change in Inflow (+) or Outflow (-) (acre-feet)

- >20
- 20-0
- 0- -20
- -20- -50
- -50- -100
- <-100

0 4
Scale in Miles

N

Map Projection:
Washington State Plane
North Zone NAD 1983

Source:
NHD, NED, ESRI, WSDOE,
Jefferson PUD#1

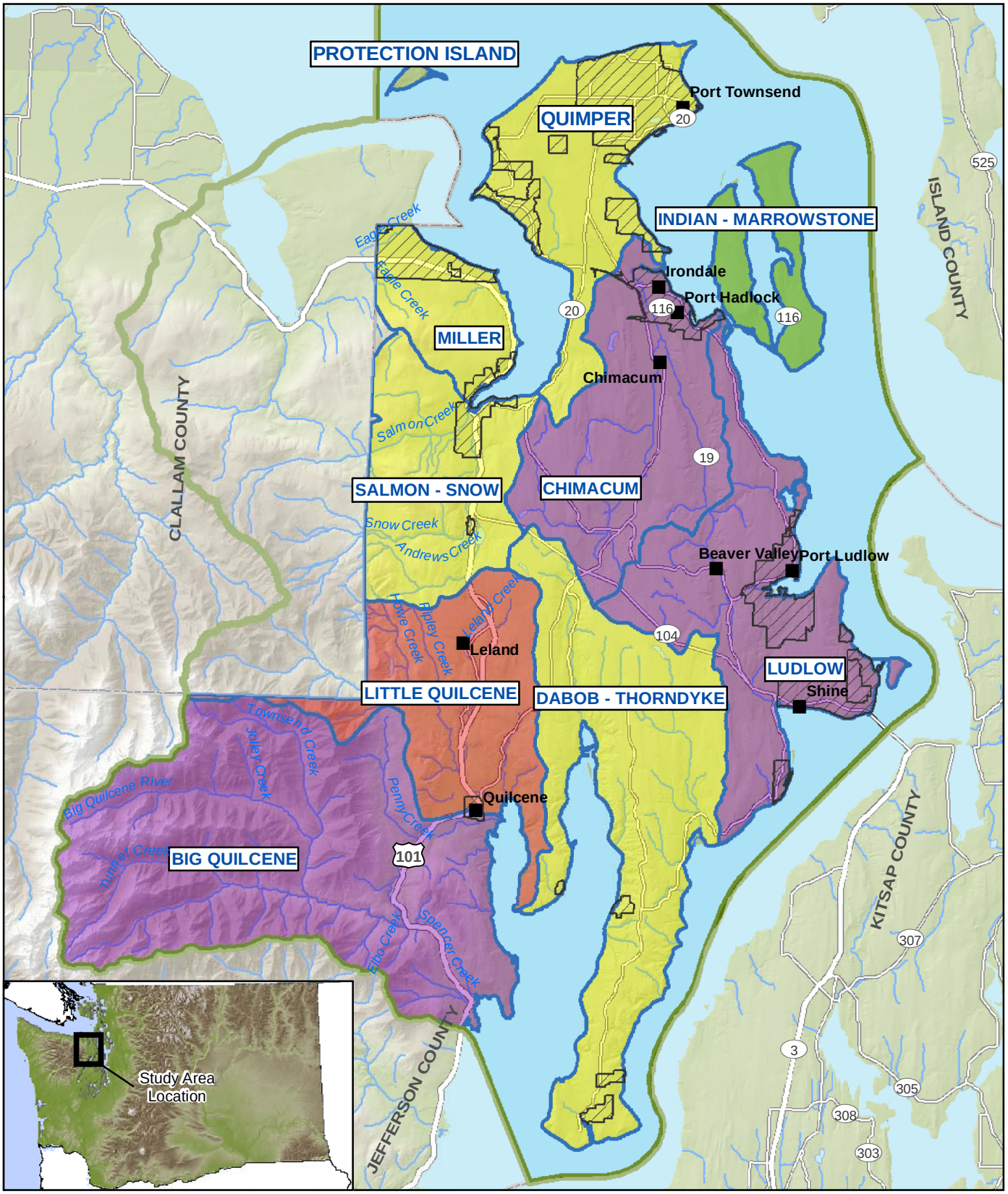
FIGURE **15**

PROJECTED CHANGE IN CONSUMPTIVE USE FROM 2010 TO 2016 BY SUBBASIN

WRIA 17 DEMAND

0739318301001F12R01_ProjectedChangeConsumptiveUse.mxd | 6/29/2010 | THAMMOND

Golder Associates



This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

LEGEND

- Community
- Water Course
- County Boundary
- WRIA Boundary
- Subbasin Boundary
- Public Water System Boundary

2010 to 2016 Change in Inflow (+) or Outflow (-) (acre-feet)

- >20
- 20-0
- 0- -20
- -20- -50
- -50- -100
- <-100

0 4
Scale in Miles

N

Map Projection:
Washington State Plane
North Zone NAD 1983

Source:
NHD, NED, ESRI, WSDOE,
Jefferson PUD#1

FIGURE **16**

PROJECTED CHANGE IN CONSUMPTIVE USE FROM 2010 TO 2030 BY SUBBASIN

WRIA 17 DEMAND

0739318301001F13R01_ProjectedChangeConsumptiveUse2.mxd | 6/29/2010 | THAMMOND

Golder Associates

Golder Associates

0739318301004cv01.indd