

5. Water Resource Analysis

This chapter begins with a summary of the City's water rights, including an evaluation of capacity to meet current and projected water supply needs, as well as future plans regarding water right changes. A source of supply analysis is also provided, describing the City's diverse water supply portfolio that will be used to meet needs into the future. The chapter concludes with an assessment of the water system's reliability.

5.1 Water Rights

5.1.1 Current Water Rights

The City holds water rights that allow withdrawal of groundwater from various wells. Water rights are issued by the Washington State Department of Ecology (Ecology) and authorize defined quantities to be withdrawn at specific locations and used for specific purposes. Table 5-1 lists the water rights held by the City and the authorized maximum instantaneous flow rate (Q_i) expressed in gallons per minute (gpm) and maximum annual volume (Q_a) expressed in acre-feet per year (ac-ft/yr) associated with each groundwater right. The table is grouped by wellfield or location. Figure 5-1 displays the locations of the various wells. Water rights are then discussed in the following subsections.

Palermo Wellfield

The City currently operates six wells in the Palermo Wellfield. These wells are used in a carefully managed operational program, to maintain production of high-quality drinking water despite water quality compromises to the aquifer from past industrial activity.

Discharge from the Palermo Wellfield currently totals about 1,900 gpm in the winter, and less in the summer when aquifer water levels decline. Studies are currently underway to evaluate the feasibility of expanding the wellfield footprint to reduce drawdown interference and regain the full permitted yield. Authorization to use new or replacement wells would be processed as a *Showing of Compliance with RCW 90.44.100(3)* that allows for replacement or back-up wells to be completed in close proximity to currently permitted sources.

In 2001 the City negotiated the issuance of superseding water right documents that administratively increased the water rights for the Palermo and Port wellfields. Ecology agreed to reallocate water to the City to meet future needs that were not adequately addressed in previous permit decisions. This work resulted in issuance of an amended permit under water right G2-26816 for the Palermo Wellfield plus Bush Middle School Well 12, in the amount of 3,050 gpm and 2,100 acre-feet per year of which 2,070 gpm was non-additive and 980 gpm allowed for additional instantaneous capacity. The permit is in good standing until January 1, 2013 when the City is scheduled to submit the Proof of Appropriation and finalize the certificate.

Since the City's last Water System Plan was approved in 2003, the successful transfer of the Tye Motel water right (3547-A) increased the quantities at the Palermo Wellfield by 55 gpm, and 13 acre-feet per year bringing the total Q_i to 3,105 gpm.

Table 5-1. Authorized Water Rights - City of Tumwater

Well Name	Water Right	Priority Date	Primary or Suppl ¹	Maximum Instantaneous Flow Rate (Qi) gpm		Maximum Annual Volume (Qa) ac-ft/yr	
				Primary	Suppl.	Primary	Suppl.
Palermo 1	857-D	1/1/1931	P	220		1	
Palermo 2	858-D	5/1/1939	P	350		423	
Palermo 3	859-D	10/1/1944	P	250		135	
	3547-A	2/25/1959	P	55		13	
Palermo 4	547-A	4/23/1949	P	750		250	
Palermo 5	5402 A	5/11/1965	P/S	500		91	709
Palermo 1-6 & 8	G2-26816P ³	10/14/1985	P/S	980	2,070	2,100	
Subtotal: Palermo Wellfield				3,105		3,013	
Port 9	GWC ² 2924-A	6/18/1948	P	25		6.32	
	GWC ² 2723-A	6/27/1955	P	74		20.4	
	GWC ² 480	11/28/1947	P	30		1	
Port 9	GWP ³ 7278	8/30/1965	P	2,500		2,454	
Port 10							
Port 11							
Bush 14 ⁴							
Port 15							
Port 11,13 & 15	G2-00271C	12/12/1968	P	600		60	
Subtotal: Port Wellfield				3,229		2,541.72	
Bush 12	G2-25607 P ³	5/13/1980	P/S		450	102	
	G2-24504	4/13/1977	P	100		32	
	G2-24255	8/15/1976	P	350		90	
	G2-28195 ⁵	3/29/1991	S		910		1,465
Bush 14	G2-26815	10/14/1985	S	250			16.5
	C-7582	4/10/1968	P	500		750	
Subtotal: Bush Middle School Wellfield				1,200		974	
Lakeland Manor	C-6991A	12/5/1968	P	100		40	
Lathrop Business Park	G2-25876	4/27/1981	P	300		70	
Tumwater Golf Course	G2-01071	9/9/1970	P	2,000		400	
Total City Water Rights				9,934		7,039	

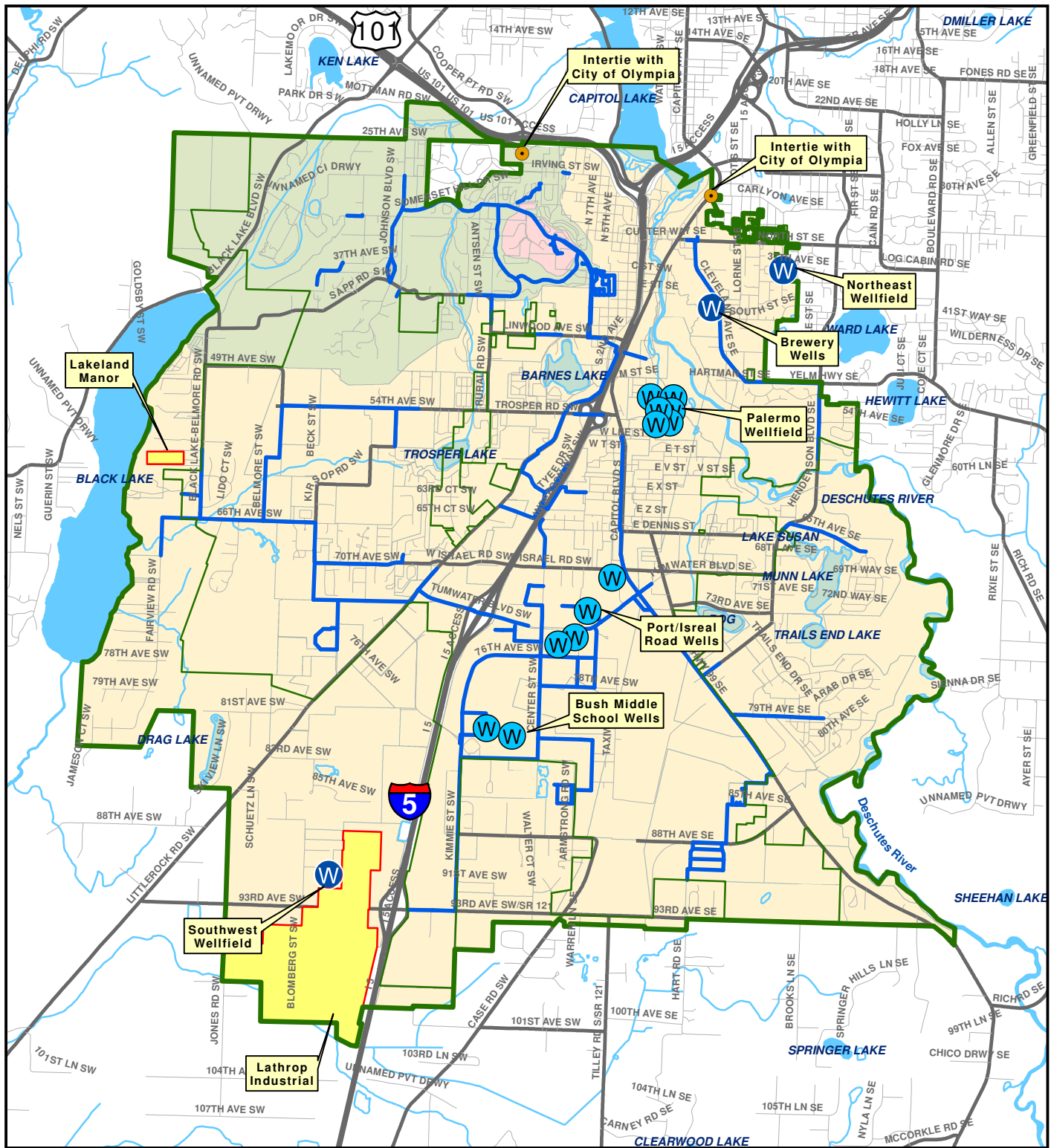
¹ Suppl. = supplemental

² GWC = Ground Water Certificate (ROE approved for change)

³ GWP = Ground Water Permit

⁴ In addition to the Port Wells, water right permit 7278 authorizes withdrawals from Bush Well 14

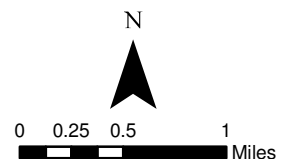
⁵ Application with approved Report of Examination.



Legend

- Tumwater UGA
- Pressure Zone 350
- Stream
- Water Distribution Piping >= 12" Diameter
- Tumwater City Limits
- Pressure Zone 454
- Major Road
- Minor Road
- Water Body
- Pressure Zone 549
- W Existing Well
- W Planned Well

**FIGURE 5.1
WATER RESOURCES
CITY OF TUMWATER
WATER SYSTEM PLAN**



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Port/Israel Road Wellfield

The City operates several wells in the general area of the Olympia Airport and Israel Road. Many of these wells and the associated water rights were acquired by the City from the Port of Olympia in 1991. Wells 9, 10, and 15 are operated as the Airport Wellfield (see Figure 5.1) which is currently capable of producing 1,628 gpm. (Well 11 was once part of the “Israel Road Wellfield,” but with the decommissioning of Wells 7 and 13 that name is no longer used).

As with the Palermo water rights, in 2001 the City negotiated with Ecology to review the quantities associated with previously issued water rights and determine whether the amounts were correctly established. As a result, Ecology issued a superseding permit (GWP 7278) that increased the City’s water right portfolio.

The main water right authorization for the Airport/Israel Road Wellfield is GWP 7278 which authorizes withdrawals from Airport Wells 9, 10, 11, and 15 plus Bush Middle School Well 14 in the amount of 2,500 gpm and 2,454 ac-ft/yr. In 2009 an additional 129 gpm, and 27.72 ac-ft/yr were transferred from the Port of Olympia to the City’s Well 9. The City considers certificate G2-00271C to be associated with Airport Wells 11 and 15, but the point of withdrawal on the water right may need to be formally modified via the *Application for Change* process.

Bush Middle School Wellfield

The Bush Middle School wells were constructed to provide alternative sources to the Palermo Wellfield. As such, most of the water rights associated with these sources were transferred from other wells or were issued as “supplemental” sources and intended to provide system flexibility only.

Groundwater rights G2-25607, G2-24504 and G2-24255 were transferred from wells the City acquired with the Trails End Water System. G2-28195 was issued as supplemental or non-additive quantities for both instantaneous and annual withdrawals (Q_i and Q_a) from Bush Well 14 as an alternate source to the Palermo Wellfield. In practicality, this certificate allows the City to exercise a portion of the extensive rights they hold at the Palermo Wellfield from the Bush Wellfield. Likewise Bush Well 14 is included as an authorized point of withdrawal on GWP 7278 allowing the City some flexibility to shift pumping between sources and maximize production at Bush Middle School. Both groundwater certificates G2-26815 and C-7582 were originally associated with Airport Well 7, subsequently transferred to Airport Wells 11 and 15, and ultimately transferred to Bush Well 14.

Lakeland Manor

Lakeland Manor is a stand-alone water system operated under ground water certificate C-9038-A. The system supplies water to a 44 lot development from a single well. The Lakeland Manor system will eventually be connected to the rest of the Tumwater system.

Lathrop Business Park

Lathrop Industrial Water System is a Group A water system located within the Tumwater Urban Growth Area off 93rd Avenue SW. The water system is currently owned and operated by Thurston Public Utility District No. 1 (PUD). There is a Small Water System Management Plan in effect and the Department of Health operating permit is GREEN (substantially compliant). A

water right exists under ground water certificate G2-25876 for withdrawal from a single well in the amount of 300 gallons per minute and 70 acre-feet/year.

In 2009, the PUD and the City entered into an agreement for the City to acquire the water system and associated water rights. Staff have been meeting with PUD staff to discuss the various benefits of the City's potential acquisition of the Lathrop water system. Through these discussions, the PUD reiterated their intention as serving Tumwater's customers during a time when City water service was not readily available. That time has now come. As the Tumwater system grows, the logical progression of that growth is to the southwest, and the City is rapidly approaching a point where municipal service is becoming a reality for this area.

The primary benefits of acquiring the Lathrop system are multi-faceted.

1. **Resolution of potential service area conflicts.** The delineation of the PUDs service area is historically not well documented. Regardless, the entire service area of the Lathrop system lies within the City's service area. As the primary service provider, it is the City's duty to serve new customers within our service area, and the acquisition of this system along with an extension of the distribution network, will allow the City to enhance our service to the southwest.
2. **A point of withdrawal in the southwest.** Multiple projects initiated in the last five years have been dependent upon a point of withdrawal in this area. With the acquisition of the system, the City can revive efforts on the other projects to further long-range planning for the water utility.
3. **Immediate service for existing customers.** A number of developments have requested service from the City over the last two years, many of whose projects are on hold at this point. As the City looks to own and operate the Lathrop system independently of the "main" distribution system until such time as they can be intertwined, new customers can be immediately serviced.
4. **Room to grow.** The Lathrop system is approved to serve forty-two industrial and commercial connections; however, only 17 of those connections are currently utilized. The additional connections provide the City with flexibility to serve new customers with varied needs.

The agreement is divided into two primary components. The first addresses the water system's existing infrastructure. The second deals with the water rights. Upon execution of the agreement, the City agrees to purchase the system "as-is", to provide for the operation and maintenance of the system and transfer the existing customers. Prior to connecting the system to the City's larger distribution network, any necessary upgrades to the Lathrop system will be completed.

The water rights for the Lathrop system appear to be valid and, although not fully utilized, a portion of the rights are in active use. The remaining portions of the 300 gallons per minute and 70 acre-feet allow for growth of the system. The purchase of the water rights are contingent upon approval of the water system plan which include a service area revision for the newly created "Lathrop/Tumwater Industrial Water System" in the interest of serving the total connections authorized by DOH in a timely manner.

Tumwater Golf Course Water Right

Irrigation water for the 18-hole Tumwater Valley Golf Course is pumped from two onsite wells. This municipal course is owned by the City. Ground water certificate G2-01071 authorizes the withdrawal of 2,000 gpm and 400 acre-feet per year for the irrigation of 200 acres. Water from the golf course wells is currently used for non-potable purposes only.

5.1.2 Water Right Activity Since Approval of Last Water System Plan

Several water right actions have taken place since the City's last water system plan was approved in 2003.

- An application to change the point of withdrawal, place of use, and purpose of use, for the **Tyee Motel water right 3547-A** was approved. The superseding certificate authorizes the withdrawal of 55 gpm and 13 ac-ft/yr from Palermo Well 3.
- **Port of Olympia Transfers** - In 2009 the Thurston County Water Conservancy Board approved, and Ecology affirmed, applications to transfer Ground Water Certificates 480, 2723-A, and 2924-A. The point of withdrawal for each certificate was changed to the City's Airport Well 9 located in the NE $\frac{1}{4}$ of Section 10, T 17 N, R 2 W. The combined rate of withdrawal is 129 gpm with an annual quantity of 27.72 ac-ft/yr for the irrigation of 14 acres.
- In July of 2009 the Thurston County Water Conservancy Board recommended approval of the transfer of the **Olympia Brewery water rights** to the Cities of Lacey, Olympia, and Tumwater. The source of supply will remain the same, the Brewery Wellfield. Table 5-2 shows the individual quantities associated with the nine water right certificates acquired by the Cities from the former brewery. The Cities are to share approximately 2,284 ac-ft/yr equally, which increases the City of Tumwater's water rights by 761.18 ac-ft/yr. Ecology approved this transfer in 2009.
- Acquisition of the Lathrop Business Park water system and its water right, as discussed in the prior section.
- Acquisition of the Lakeland Manor water system and its water right, as discussed in the prior system.
- In November 2006, the City entered into condemnation proceedings to secure water right Certificate No. 4787 for future public use in the amount of 1,000 gpm and 300 ac-ft/yr. The process is on-going.

Table 5-2. Anticipated Water Right Transfers from Olympia Brewery

Certificate	Source	Priority Date	Maximum Instantaneous Flow Rate (Qi) gpm	Maximum Annual Volume (Qa) ac-ft/yr
785-D	Brewery WF	7/20/36	203	328 (additive)
784-D	Brewery WF	7/15/37	200	323 (additive)
34-A	Brewery WF	5/22/46	500	800 (additive)
453-A	Brewery WF	3/23/50	700	228.53 (additive)
4587-A	Brewery WF	1/22/60	2250	0 (additive) (1723.43 non-additive)
G2-01073C	Brewery WF	1/23/67	900	0 (additive) (1,440 non-additive)
G2-01072C	Brewery WF	4/22/71	900	0 (additive) (1,440 non-additive)
G2-20844C	Brewery WF	3/13/73	862	0 (additive) (1,379 non-additive)
G2-26058C	Well 39	1/12/82	1500 (alternate)	604 (additive) 604 (alternate)
Total Quantities			6,515 (additive) 1,500 (alternate)	2283.53 (additive) 604 (alternate) Balance is non-additive
City of Tumwater's Share			2,172	761

To utilize the Brewery Wellfield source, the three Cities will need to evaluate the current infrastructure and make decisions as to the capital facilities or other improvements to withdraw, treat, and deliver municipal water to be produced from the Brewery wells. For example, before making decisions to develop this resource the Cities will need to evaluate the condition of the wells, options for water quality treatment (if necessary), options for conveyance and delivery, and projected costs. To address this situation, the Cities intend to enter one or more regional agreements for funding, construction and management of water system infrastructure.

5.1.3 Pending Activity on the City's Water Rights

Limitations on New Water Rights

The City's water service area straddles two Water Resource Inventory Areas: WRIA 13 the Deschutes River drainage, and WRIA 23 the Chehalis River drainage. Both basins are regulated to preserve existing instream resources; therefore these are difficult areas to secure additional water rights.

Minimum instream flows, closures, and other rules that limit surface water withdrawals in the Deschutes WRIA 13 were published in the 1980 Washington Administrative Code (WAC) Chapter 173-513. From River Mile 41 (downstream of Deschutes Falls) to the confluence of the Deschutes River with Capital Lake, the river is closed to further consumptive appropriations from April 15 through October 31. For the remainder of the year, the WAC lists minimum instream flows for the river of 150 cubic feet per second (cfs) on November 1, 400 cfs on December 1 through April 1, and decreasing to 350 cfs by April 14. These minimum flow requirements limit new uses of surface or groundwater in the basin.

Similarly, seasonal minimum base flows have also been set by Chapter 173-522 WAC for the Chehalis River WRIA 23. Tributary streams such as the Black River, Scatter Creek, Salmon

Creek and Beaver Creek are closed to any further appropriation during the summer and fall months, generally from May 1 to October 31.

Applications for New Water Rights

Because new water rights in the Deschutes and Chehalis River basins are difficult to secure, the City has focused on conservation methods to extend water supplies, coupled with acquisition and transfer of existing water rights and the development of mitigation plans to support new rights.

The City's pending new water right applications are listed in Table 5-3 and discussed in the following subsections.

Table 5-3. Water Right Applications

Name	Pending Application (New Change)	Name on Application	Date Submitted	Any Portion Supplemental	Quantities from Application	
					Qi Requested (gpm)	Qa Requested (afy)
Southwest Wellfield	G2-30229 (New)	City of Tumwater	2/11/2005	No	2,226	2,154
Northeast Wellfield	G2-29888 (New)	City of Tumwater	11/23/1999	No	2,000	3,500
Israel Road to SW Wellfield	G2-00271C (Change)	City of Tumwater	1/31/2005	No	600	60
Bruhn	G2-25005G (Change)	City of Tumwater	10/24/2005	No	70	21
Total Quantity					4,296	5,675

*Since the City already owns and exercises G2-00271, the Qi and Qa are not included in table as potential new allocations.

Northeast Wellfield

The City submitted application G2-29888 in 1999 for a new municipal groundwater right in the amount of 2,000 gpm and 3,500 ac-ft/yr. The proposed well site is located near the northeast portion of the City's service area (see Figure 5.1). The City installed a test well and conducted pump tests in 2000 with the intent of assessing the potential impacts to the Deschutes River.

The City is exploring mitigation options for this water right permit. These options include evaluating the role of discharges to the Deschutes River from the Washington Department of Fish and Wildlife's proposed Pioneer Park Hatchery.

Southwest Wellfield

In 2005, the City submitted application G2-30229 for a new water right associated with the proposed Southwest Wellfield located on property owned by the Black Hills Soccer Association (see Figure 5.1). The application lists quantities of 2,226 gpm and 2,154 ac-ft/yr. The City installed and tested a well at the site. Preliminary testing indicated that suitable well yields can be developed to supply water to the City's service area west of Interstate 5. Currently there are no City supply sources west of Interstate 5.

Since groundwater withdrawals at this site could impact flows in regulated surface waters, the City is exploring mitigation options.

Acquisition of Existing Water Rights

In addition to submitting new applications to Ecology, it is possible to acquire existing water rights from current owners. The City is seeking out willing sellers of existing water rights, which can then go through an administrative procedure known as a “change” under state law. In addition, any water system acquired by the City, or property with associated water rights that wishes to secure water from the City, is asked to transfer their water rights to the City. Current examples of these are listed below.

G2-25005 - Bruhn to Southwest Wellfield Transfer

An *Application for Change* was filed in October of 2005 to change the point of withdrawal and place of use for rights granted under Ground Water Certificate G2-25005. Certificate G2-25005 was originally issued to Dennis Bruhn for 70 gpm, 21 ac-ft/ yr – for the irrigation of 10.5 acres from a well located within the SW ¼ SE ¼ of Section 10, Township 16 North, Range 2 West. The new point of withdrawal is the City’s proposed Southwest Wellfield located approximately 5.5 miles north of the permitted well location. The City proposes to use the water for the irrigation of ballfields located near the wellfield.

Ecology has identified impairment issues associated with changing the point of withdrawal and has advised the City that the change will not be approved. The application remains pending and City is considering using the right as a component of a mitigation plan.

G2-00271 – Port of Olympia to Southwest Wellfield

An application for change is pending to transfer this right from its current location to the proposed Southwest Wellfield. The original right was issued to the Port of Olympia for irrigation (600 gpm and 60 ac-ft/yr) and was used for irrigation at a Department of Natural Resources facility. The well and water right were acquired by the City in 1991.

As with the Bruhn transfer, Ecology has identified impairment issues associated with changing the point of withdrawal and has notified the City that the change will not likely be approved. The application for transfer remains pending and the City is considering using the right as a component of a mitigation plan.

5.1.4 Water Rights Summary and Assessment

Table 5-4 summarizes the water rights information described in the preceding sections. The City currently holds water rights with a total Qi of 10,106 gpm and Qa of 7,400 ac-ft/yr. These include the City’s share of recently-transferred Olympia Brewery rights. (However, they do not include the Tumwater Valley Golf Course water right, since that supply is not currently used for the potable system). With its existing water rights the City currently has sufficient water rights to meet its current needs. However, based on the demand forecast documented in Chapter 2, demand will exceed existing water rights in the 20-year period covered by this water system plan.

Therefore the City has requested additional water rights be awarded. If pending applications and changes are approved, the Qi will increase to 14,402 gpm and the Qa will increase to 13,075 ac-ft/yr. With those quantities approved, the City’s total water rights would be sufficient beyond the 20-year planning period.

The City plans to continue working with Ecology to gain approval for water rights needed for continued growth.

Table 5-4. Comparison of Water Rights with Projected Needs

	Water Right Quantities		Existing Consumption		Existing Surplus/(Deficit)		20-Year Forecast Consumption		20-Year Surplus/(Deficit)	
	Qi (gpm)	Qa (afy)	Qi (gpm) ²	Qa (afy) ²	Qi (gpm)	Qa (afy)	Qi (gpm) ³	Qa (afy)	Qi (gpm) ³	Qa (afy)
Existing Water Rights ¹	10,106	7,400	5,475	3,543	4,631	3,857	11,458	7,712	(1,352)	(312)
Pending Applications & Transfers	4,296	5,675								
Total Rights and Applications	14,402	13,075	5,475	3,543	9,427	9,544	11,458	7,712	2,944	5,363

- Existing water rights include awarded water rights from former Olympia Brewery (Tumwater share).
- Existing Qi and Qa values derived from Table 4-1, Evaluation of Source Adequacy for Total System. Qi is based on total current combined pumping capacity. Qa is based on average day demand, converted from mgd to afy.
- Forecast consumption obtained from Table 2-9 (2029 values).

Qi = Maximum instantaneous quantity (gallons per minute)

Qa = Maximum annual quantity (acre-feet per year).

5.2 Source of Supply Analysis

Because the City is seeking additional water rights within the 20-year planning period, DOH requires a source of supply analysis to evaluate the range of water supply options that are available. The sections below comprise this analysis. As shown below, the City has a history of identifying a range of alternative means of meeting its long-term needs for water supply, applying multiple strategies that are viable and reasonable. This Water System Plan reflects a continuation of this approach.

5.2.1 Groundwater Supplies

The City's primary source of supply into the future will be groundwater withdrawn from existing and planned future wells. The City plans to increase the capacity of some existing groundwater supplies while also developing new supplies at the former Olympia Brewery site, a new Southwest Wellfield and a new Northeast wellfield. These sites are identified on Figure 5-1. Water rights for these planned new supplies were discussed in Sections 5.1.2 and 5.1.3.

5.2.2 Water Rights Changes

The City has actively pursued opportunities to use water rights transfers and changes to address needs for increased supply. Several of these were listed above, in Section 5.1.2. The most significant of these is the transfer of water rights from the former Olympia Brewery to the Cities of Tumwater, Olympia and Lacey for municipal use. These changes in existing water rights reduce the need for new water rights to serve the City's growing population.

5.2.3 Water Conservation

The City has implemented a water conservation program since the early 1990s. The City's program consists of both independent and regional cooperative efforts with the LOTT Alliance. Specific features of the City's conservation program, including established conservation goals, existing and planned conservation measures and activities, and estimates of future water savings are presented in Chapter 3. The City's water conservation program substantially exceeds DOH's minimum requirements for a water system of this size. In total, the City's conservation program is anticipated to reduce water consumption by approximately 40 million gallons annually by 2015, helping to reduce the need for additional supplies.

5.2.4 Reclaimed Water

Reclaimed water is highly treated wastewater that can be used for beneficial purposes. As available water supplies become increasingly scarce, reclaimed water offers one way to extend existing sources.

Although the use of reclaimed water is not as common in Washington as in the arid southwestern states, its use is increasing. About 20 reclaimed water projects are currently operating in the State, and many others are in various stages of planning, design or construction. The most common use of reclaimed water is for irrigation, including agricultural lands, golf courses and parks. It can also be used some industrial processes. Other beneficial uses for reclaimed water include environmental projects such as groundwater recharge and stream flow and wetland enhancement.

This section describes reclaimed water regulations in Washington, regional efforts to develop infrastructure for treatment and distribution, and potential opportunities for reclaimed water use in Tumwater.

Reclaimed Water Regulations

State law (Chapter 90.46 RCW) supports the use of reclaimed water to help meet growing water requirements and directs Ecology and DOH) to encourage the development of water reclamation facilities. Recent amendments to this law directed Ecology to develop and adopt rules on all aspects of reclaimed water use by December 31, 2010. The new rule will update and replace the existing state reclaimed water standards, which were published in 1997.

State guidelines describe four classes of reclaimed water: A, B, C and D. Class A has the highest quality and is considered safe for public contact and virtually all uses except human consumption.

The Municipal Water Law (70.119A.180 RCW) requires utilities to evaluate potential uses of reclaimed water in their water system plans.

Regional Reclaimed Water Program

The LOTT Alliance (Lacey, Olympia, Tumwater, and Thurston County) is a regional entity providing wastewater conveyance, treatment, and disposal services for the Tumwater area. Generation of Class A reclaimed water is one of LOTT's key strategies in meeting regulatory restrictions on the volume of treated wastewater that can be discharged into Budd Inlet. Two reclaimed water facilities have been constructed thus far to implement this strategy: the Budd

Inlet and Martin Way Reclaimed Water Plants. LOTT produces reclaimed water at these facilities and provides it to its partner jurisdictions, who then have the responsibility to distribute the resource to end users within their service areas.

Reclaimed water transmission infrastructure in the Olympia area has taken the form of “purple” piping that conveys reclaimed water from the Budd Inlet Reclaimed Water Plant to Marathon Park on the west side of Capitol Lake in Olympia. In 2009, LOTT extended this transmission line south towards Tumwater, along Deschutes Parkway. During the 2009-2010 winter, the line will be extended into Tumwater, terminating within the Tumwater Valley Municipal Golf Course and making reclaimed water available at this site. LOTT is also planning extension of this line further south, beyond Pioneer Park.

Future reclaimed water production increases that are in LOTT’s 2010-2053 CIP, and which may benefit the City, include expansion of the Budd Inlet facility’s capacity (anticipated to increase from 1.0 mgd to 3.5 mgd by 2020), and development of a satellite reclaimed water facility in the City of Tumwater between 2035 and 2040.

Potential Uses of Reclaimed Water in Tumwater

Potential future uses of reclaimed water in the City include:

- a) **Water Rights Mitigation.** Reclaimed water from the Budd Inlet Reclaimed Water Plant or a future satellite facility located in the Tumwater area may provide a valuable resource that could be used in mitigating for potential surface water impacts associated with planned future additional groundwater withdrawals by the City in the Deschutes River Basin. Using reclaimed water for groundwater recharge via surface percolation can potentially increase baseflow discharges to the river to bolster stream flow. This option is being considered by Tumwater, Olympia and Lacey as an element in various water right applications.
- b) **Irrigation.** This includes irrigation of parks, schools, cemeteries, and the Tumwater Valley municipal golf course. Table 5.5 summarizes the quantities of reclaimed water that could potentially be used at four sites by 2015, with extension of the LOTT transmission line. The irrigation demand associated with these four sites exceeds 900,000 gpd on an average irrigation day during July or August. Additional large irrigation sites exist throughout the City and will be identified and evaluated as regional reclaimed water production and transmission facilities are developed.
- c) **Commercial/Industrial Use.** There are many commercial and industrial water users in the City, some of which may be able to meet a portion of their water needs with reclaimed water. For example, some customers in the Mottman Industrial Area have expressed an interest in using reclaimed water to reduce their potable water demand. Such opportunities will be explored in greater detail as transmission and distribution facilities are constructed in closer proximity to this area.

Table 5-5. Potential Near-Term Irrigation Uses of Reclaimed Water in Tumwater

Use Location	Average Day Usage in Maximum Summer Month (gpd)	Annual Usage (gallons)
Tumwater Valley Municipal Golf Course	637,000	37,400,000
Tumwater Falls Park	150,000	6,900,000
Pioneer Park	90,000	3,700,000
Historical Park	46,000	1,800,000
Total	923,000	49,800,000

Future of Tumwater’s Reclaimed Water Program

The following represent activities the City will implement as its reclaimed water program continues to develop:

- Once the LOTT reclaimed water line to the Tumwater Valley Golf Course has been completed, and related engineering studies are completed regarding necessary regional storage facilities or other infrastructure, the city intends to begin delivering reclaimed water to this site.
- The City plans to develop policies and standard operating procedures to support reclaimed water program implementation for its customers.
- The City will continue to review additional potential uses of reclaimed water, particularly as regional infrastructure expands/extends in such a way as being able to support increased usage in the City.
- The City will continue to participate in LOTT reclaimed water initiatives by providing technical assistance as requested and working with LOTT’s Reclaimed Water Task Force to establish policies and procedures for reclaimed water program implementation at the regional level.

5.2.5 Interties

Water systems sometimes have the opportunity to acquire supply through interties with adjacent water systems that have surplus supply. In Tumwater’s case, this does not appear to be a viable option. This is because nearby water systems such as the Cities of Olympia and Lacey are also seeking new supplies to meet their own growth needs. While Tumwater does have two interties with Olympia, these are designed solely for emergency backup supply purposes.

Development of the new source of supply at the former Olympia Brewery may possibly include installation of an additional intertie between the Cities of Tumwater and Olympia.

5.2.6 Artificial Recharge

DOH planning requirements indicate that artificial recharge should also be considered as a means of extending available supplies. Artificial recharge involves taking surplus surface water supplies available during the wet season and using infiltration or injection to recharge ground water aquifers. The additional ground water can then be pumped in the summer months to meet peak season demands.

Tumwater plans to explore artificial recharge options as a component of the mitigation plan being developed for the Southwest Wellfield. The City intends to use a ground water model to simulate the water-balance effects of pumping shallow groundwater during the wet season and injecting this water into a deeper aquifer at a site within the upper Salmon Creek basin. Pumping from the deeper aquifer at the Southwest wellfield will also be modeled. Results of this simulation will be used to assess viability of this type of mitigation activity.

5.2.7 Water Treatment

Another means of extending available water supplies is to use water treatment to remove undesirable contaminants or from source waters. This is particularly applicable when high-quality sources of drinking water have become contaminated from industrial activities in urban areas.

The City has employed this strategy for many years at its Palermo wellfield, where ground water was affected by past commercial/industrial processes. Aeration treatment is used to remove trichloroethylene from ground water at this location. Together with blending of supplies from multiple wells, this permits the ground water resource to be used to the maximum extent feasible while still providing high-quality water for the City's supply system.

5.3 Water System Reliability

This section summarizes the City's effort to ensure an adequate quantity of water is provided at all times. Public health may be threatened when water shortages or interruptions in service occur. The City has taken several actions to reduce the risk of water shortages and to plan for activities which can be taken when water shortages do occur.

5.3.1 Source Reliability

Groundwater supplies all of the water currently used by the City's system. Reliable water supplies must provide a sufficient quantity of water as well as maintain adequate water quality. The City's existing and planned future sources are distributed throughout its service area. This distribution of sources reduces the risk that disruptions to supply in one area will impact a large proportion of the City's water customers. The planned addition of the new Southwest Wellfield will further enhance system reliability.

The Tumwater design criteria promote a reliable system by requiring that sources of supply be able to provide maximum day demand plus fire volume replenishment with the largest supply out of service. Emergency power supplies are installed at several wells so that water can continue to be supplied during power outages. The Capital Improvement Plan described in Chapter 6 includes additional generators, so that backup power will be available at all of the City's primary wells.

Water quality from each well is monitored on a regular basis in compliance with State and federal requirements. Any trends in water quality are noted and if water quality is degrading, the City will consider installation of treatment facilities and/or development of new sources. In the mid-1990's TCE contamination was detected in several of the Palermo wells. The City shifted water supply to other wells in the system as the contamination was investigated and options were developed and evaluated. A new treatment facility was constructed to serve the Palermo wells and the wells have since been placed back in service.

Additional source reliability is provided by the two emergency interties the City has with Olympia. The interties provide another means of supplying water to the City’s system and further reduces the risk of water shortages. Tumwater and Olympia have executed a Mutual Aid Agreement governing the conditions for use of the interties. As discussed in Section 1.3, however, the SR 101/Crosby intertie has limited capacity to deliver water into the Tumwater system due to the pressure differential between the two systems.

Table 5-6. Tumwater-Olympia Interties

Location	Size	Pressure Zone	Configuration
Capital Blvd. & Carlyon Ave.	10-inch	350 Zone	Closed Valve
SR 101 Overpass & Crosby Blvd.	8-inch	454 Zone	Closed Valve

Wellhead Protection

The City developed a Wellhead Protection Ordinance in 1997 (97-028) that provides a basis for managing risks to ground water quality in areas that supply water to Tumwater’s drinking water wells. Wellhead Protection Areas (WHPAs) are established, based on ground water capture zones determined by hydrogeologic analysis. Within the WHPAs, the City inspects businesses regularly to address hazardous materials storage, handling and disposal practices. Businesses deemed to have elevated risk for introduction of contaminants to groundwater are inspected regularly, with the last round of inspections conducted in 2007 and 2008. New companies within the WHPAs receive an inspection during their first year of business. Other businesses within WHPAs receive an inspection at least once every six years. Businesses that are not visited in a given year receive a self-reporting inventory form. If this form indicates that business practices have changed considerably, the business is inspected in the next round of inspections.

The list of businesses requiring inspections was updated in November 2009, based on information provided by Thurston County Environmental Health.

For this update to the Water System Plan, capture zones for the City’s wells were updated to reflect current pumping conditions and projected demands. Findings were then compared with the existing WHPAs established by ordinance. The WHPAs are sized to be larger than the capture zones to accommodate model and operational uncertainty. The analysis indicated that the existing WHPAs remain adequate based on current pumping. However, the WHPA established for the Bush Middle School well field is now only 18% wider than the current capture zone. In addition, as new ground water sources are brought on line, capture zones for both the new sources and the existing sources will need to be re-assessed, and interference among multiple capture zones will need to be considered. Therefore, the City plans to undertake a more advanced delineation of all capture zones for the current sources and planned new sources. This activity is identified in the Capital Improvement Plan in Chapter 6. Delineation of the City’s WHPAs will be reviewed based on the updated information.

Water Quality Data

As part of this Water System Plan update, water quality data for the past 10 years from the City’s WHPA monitoring well network were reviewed for notable issue or trends. Additionally, water quality data for nine wells near the City’s WHPAs from Thurston County’s groundwater

monitoring network were reviewed, with data from 1992 to 2001, providing useful background information. Groundwater quality is generally very good based on this review. However, locally elevated nitrate, iron and manganese concentrations occur. Increasing concentration trends were not observed.

Water quality data from the past 10 years on volatile organic compounds, inorganic compounds, and nitrate from the water quality monitoring program for the City's water supply wells were also reviewed. No trends were observed, and with adequate treatment of water affected by historic trichloroethylene concentrations near the Palermo well field, water supplied to the system is of good quality.

Monitoring Well Levels

Groundwater elevations from the Salmon Creek Basin monitoring network were reviewed for the time period of 2003 through 2009, with data obtained from the Thurston County Monitoring Data website. Monitoring network data came from 10 monitoring wells, with data collected at roughly daily (or more frequent) intervals by pressure transducers. Annual fluctuations in groundwater levels were generally between 10 and 14 feet. Many wells had higher water levels from 2006 through 2008 likely due to greater precipitation recharge for those years relative to years prior. No wells showed obvious long term increasing or decreasing trends.

Groundwater elevations from the City's WHPA monitoring well network were also examined (Earth Tech, 2003), with data from 1998 through 2008 reviewed. Two wells which were added more recently (Jacobson and Zorad) were also reviewed. A total of 19 wells had groundwater data spanning two years or more with either quarterly or more frequent monitoring. Most wells were monitored on a roughly monthly basis. Annual fluctuations in groundwater elevation were generally between three and 10 feet. No wells showed obvious increasing or decreasing trends, and any trends observed appear to reflect variations in precipitation recharge.

5.3.2 Facility Reliability

The analyses summarized in Chapter 3 indicate that the supply, distribution, pumping, and storage facilities are adequate to reliably provide a sufficient quantity of water at sufficient pressure to meet domestic, commercial, industrial, and fire suppression water demands. Facility improvements such as additional pipelines, pump stations modifications, and new sources of supply are identified in Chapter 3. Emergency power facilities are provided at several wells as well as at the pumping stations. Pumping facilities include redundant components so that maximum day demands plus fire volume replenishment can be provided with the largest component out of service. Additional reliability criteria are included in the System Design Standards identified in Chapter 3 and the Service Area Policies in Appendix B.

5.3.3 Water Shortage Response Planning

Tumwater has developed a plan with procedures for reviewing and addressing emergency situations where water shortages may impact the City's ability to serve customers during water outages and shortages. Specific components of the plan are discussed in the City's "Water Shortage Response Plan (WSRP)", included as Appendix G. The steps of the plan are summarized as follows:

1. Continuously monitor water supplies and demands. Continuously monitor reservoir levels and determine if reservoirs refill each day.

2. Continuously monitor calendar and near term weather expectations. If water demands are trending high and supplies are reduced, it is reasonable to expect some shortages may occur in mid to late summer.
3. *Advisory Stage* – The public is informed as early as possible (April) once triggering data has been evaluated and the possibility of a shortage may occur.
4. *Voluntary Stage* – If supply conditions continue to deteriorate (usually late June/early July), the plan moves to the voluntary stage, which relies on voluntary cooperation and support of utility customers to meet target consumption goals. During this stage, specific voluntary actions are suggested for both residential and commercial customers.
5. *Mandatory Stage* – If the voluntary stage does not result in the reduction needed, the mandatory stage prohibits or limits certain acts. This stage would be accompanied by an enforcement plan, which could include fines for repeated violations.
6. *Emergency Curtailment* – This addresses the most severe need for demand reduction and could include a combination of mandatory measures and penalties. This could be used as the last stage of a progressive situation, such as a drought of increasing severity, or to address an immediate crisis, such as a facility failure.

In addition to the above, the WSRP outlines specific infrastructure triggers which are reviewed on an annual basis to address supply and demand issues separate from climatic and other emergency situations. If the demand increases to predetermined levels as outlined in the WSRP, the City will implement WSRP measures to slow or halt the growing demands and recover the well's ability to produce water.