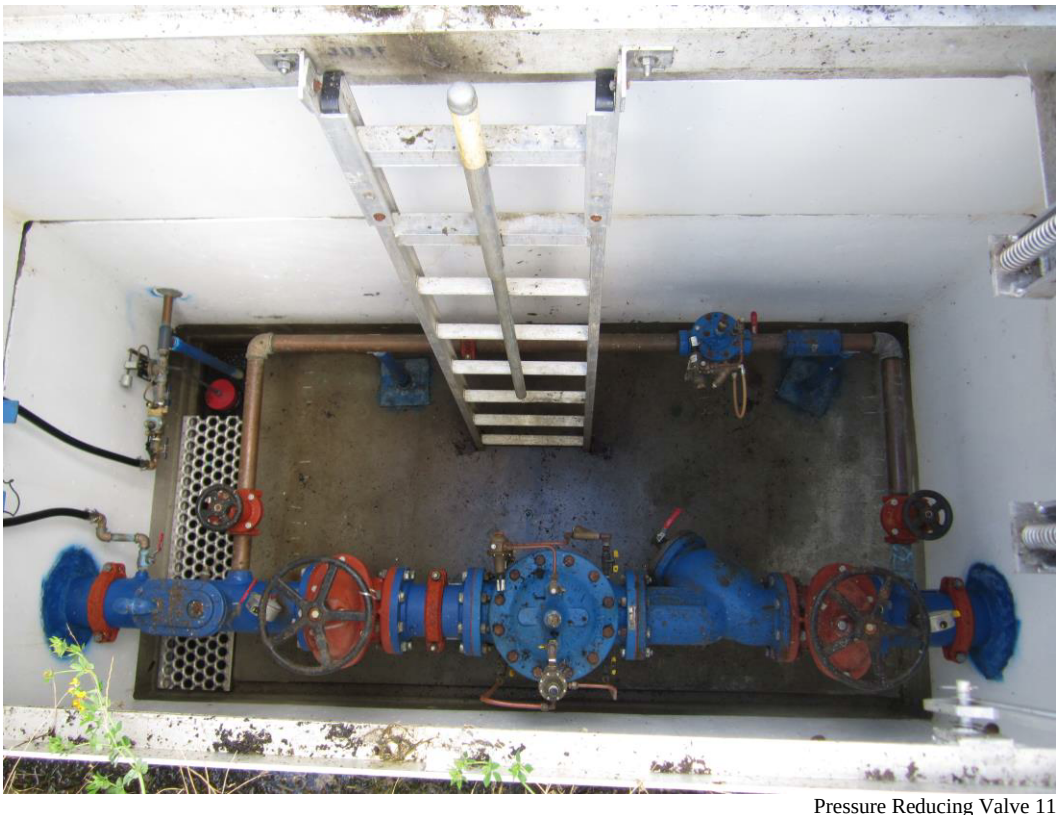
CHAPTER 6

WATER SOURCE AND QUALITY

INTRODUCTION



Pressure Reducing Valve 11

The two basic objectives of a water system are to provide a sufficient quantity of water to meet customer demands and to provide high quality water that meets local, state, and federal requirements. **Chapter 7 – *Water System Analysis***, discusses the City of Bonney Lake's (City) ability to supply a sufficient quantity of water and identifies future source requirements. This chapter discusses the City's existing water sources, water rights, water quality regulations, and water quality monitoring results.

The City currently relies upon five wells, two spring sources, and wholesale supply to meet its water demands. Water supply to meet future growth will have to be achieved within the constraints of state water law (not impairing senior water rights) and the Instream Resources Protection Program (Chapter 173-510 Washington Administrative Code (WAC)). For instance, Fennel Creek and most other tributaries to the Puyallup and White Rivers are specifically closed to further consumptive appropriations of surface water. To assess the physical conditions in which new sources of supply must be developed, and to begin identifying measures necessary to

protect existing sources, an investigation of the region's geologic and hydrogeologic characteristics was conducted. The first part of this chapter summarizes the findings and recommendations of the existing water resources investigation, including information on hydrogeology, water quality, and water rights.

EXISTING WATER SOURCES

Five wells and two springs sources comprise the City's currently owned and operated sources. Additional wholesale supply is provided by Tacoma Public Utilities (TPU). The initial delineation of recharge areas for each of these sources is based on surface water divides and geomorphology. The City's seven sources are described in the following section.

Grainger Springs

The Grainger Springs facilities are located in the southwest section of the City. Water emerges from the steep hillside above the Puyallup River at an altitude of about 600 feet, which is about 150 feet below the Lake Tapps plateau. The spring water is collected in a system of underground pipes that discharge into a clearwell. The water is pumped from the clearwell up the hill to the treatment facility and then up Eli Rim Road to the water distribution system. Historically, flows from the springs have ranged from 650 to 1,500 gallons per minute (gpm). The lowest recorded flow from this source, 650 gpm, occurred in 1985. Recharge appears to come from an area of approximately 900 acres extending to the east that encompasses Fennel Creek. The City owns all property within a 100-foot horizontal radius from each collection pipe; this allows the City to protect the immediate recharge area for this water source. The springs are approximately 1,000 feet from the nearest commercial area.

Victor Falls Springs

The Victor Falls Springs are located on Rhodes Lake Road, east of its intersection with Angeline Road near the southern limits of the City. The springs emerge at an elevation of approximately 480 feet near the toe of the slope in the steep south wall of the Fennel Creek Valley above Fennel Creek. Victor Falls occurs where Fennel Creek flows over the edge of a stratum that resists erosion more than the underlying sediments. This stratum is a dense, widespread, and nearly flat-lying volcanic mudflow deposit that is highly resistant to erosion and relatively impermeable to groundwater. Fennel Creek has swept loose sediment off the top of the dense mudflow deposit and undermined it where the creek starts spilling down into the Puyallup Valley, thus creating Victor Falls. This mudflow deposit is an aquitard, a geologic unit that is so impermeable that groundwater moves through it very slowly. Consequently, precipitation that infiltrates the ground and becomes groundwater moves down to the mudflow stratum, where it is blocked from further downward flow. Once there, it accumulates and builds a groundwater reservoir that overflows at the springs. This groundwater reservoir extends nearly 2 miles to the southeast of Victor Falls. The City's water supply springs emerge from the south valley wall a short distance above Fennell Creek, and thus they are not recharged by, nor can they become contaminated by, Fennel Creek. Surface water drainage patterns and preliminary geologic data indicate that the recharge to this source comes from an area of approximately 500 acres to the east and southeast of the

springs. Historically, flows from this source have varied from 540 to 1,700 gpm. The lowest recorded flow of 540 gpm occurred in 1985.

Ball Park Wells

The Ball Park Wellfield is located at the Emerald Hills Elementary School property. Both wells have a common header so that they may be operated as a wellfield.

Ball Park Well No. 1

Ball Park Well No.1 is located immediately south of the intersection of 192nd Avenue and 60th Street East, to the southeast of Lake Tapps. The 12-inch diameter well withdraws water through screened intervals installed at depths of 197 to 205 feet and 214 to 231 feet below ground surface. The top of the saturated zone, or water table, is 102 feet below ground surface. This well is capable of producing up to 1,300 gpm.

Ball Park Well No. 2

Ball Park Well No. 2 is located on the northwest corner of the Emerald Hills Elementary School property, located on South Tapps Drive East. The 20-inch diameter well withdraws water through a screened interval installed at a depth of 214 to 234 feet below ground surface. The top of the saturated zone, or water table, is 135 feet below ground surface. This well is capable of producing 270 to 300 gpm.

Tacoma Point Wells

The Tacoma Point wellfield is located near the north end of Lake Tapps, at 1110 182nd Avenue East. All three wells have a common header so that they may be operated as a wellfield.

Tacoma Point Well No. 2

Tacoma Point Well No. 2 is located approximately 175 feet west of 182nd Avenue East. It is a 12-inch diameter well that is screened from a depth of 289 to 307 feet below ground surface. This well is capable of producing 750 gpm. Static water level was recorded at 246 feet below ground surface on January 20, 1986. During the rehabilitation work done on November 11, 2018, a static water level of 247 feet below ground surface was measured.

Tacoma Point Well No. 4

Tacoma Point Well No. 4 lies about 60 feet east of Tacoma Point Well No. 2. It is also a 12-inch diameter well, and it withdraws water from the same aquifer as Tacoma Point Well No. 2 through screens 287 to 310 feet below ground surface. It is capable of producing approximately 1,000 gpm. Static water level was recorded at 248 feet below ground surface. During the rehabilitation work done on May 4, 2018, a static water level of 245 feet below ground surface was measured.

Tacoma Point Well No. 6

Tacoma Point Well No. 6 lies about 75 feet southeast of Tacoma Point Well No. 4. It is a 12-inch diameter well that withdraws water from the same aquifer as Tacoma Point Well Nos. 2 and 4 through screens 287 to 310 feet below ground surface. It is capable of producing approximately 1,300 gpm. Static water level was recorded at 248 feet below ground surface. During the rehabilitation work done on November 21, 2018, a static water level of 243 feet below ground surface was measured.

WATER SUPPLY AQUIFERS

Regional Geology

The regional geologic history of the Bonney Lake area is well known. Sediments deposited by at least four ice sheets that advanced into the Puget lowland from Canada, and mudflows from Mount Rainier dominate the stratigraphy of the unconsolidated earth underlying the Lake Tapps Plateau. Geomorphic evidence of the most recent glaciation, called the Vashon glaciation, which culminated 14,000 years ago, is well preserved as north-south aligned ridges and troughs, and kame and kettle topography throughout much of the Bonney Lake region. Outcrops of sediments along roads, in ravines, and on hillsides, and samples of earth acquired during well drilling, permit analysis of the hydrogeologic properties of the glacial drift and volcanic mudflow deposits. The predominant components of the glacial drift are outwash sands and gravels, dense silt and clays of ancient lakes, and dense till (hardpan). Sediments deposited by glacial rivers (outwash) may occur as beds or lenses of gravel and well-sorted sand, and form aquifers that are very favorable for producing potable water. However, the dense silts, clay, till, and volcanic mudflow deposits do not have sufficient intergranular space to store and transmit water in quantities favorable for municipal supply. They form aquitards that confine or place walls between the aquifers or underground reservoirs the City depends upon for water supply.

Description

Previous hydrogeologic investigations and well logs in the region were reviewed to provide an overview of the extent and characteristics of aquifers in the Bonney Lake region (including areas beyond the present boundaries of the City). For this analysis, the region was divided into four quadrants, as follows.

- *Southwest*
  Township 20 N, Range 5 E: Sections 28, 29, 32, and 33
  Township 19 N, Range 5 E: Sections 4, 5, 8, and 9
- *Southeast*
  Township 20 N, Range 5 E: Sections 26, 27, 34, and 35
  Township 19 N, Range 5 E: Sections 2, 3, 10, and 11
- *Northwest*
  Township 20 N, Range 5 E: Sections 4, 5, 8, 9, 16, 17, 20, and 21
- *Northeast*
  Township 20 N, Range 5 E: Sections 2, 3, 10, 11, 14, 15, 22, and 23

Southwest

Topographically, much of the southwest section is characterized by steep slopes. This area contains both Grainger Springs and Victor Falls Springs. A total of 49 wells are located in this region, with productions ranging from 6 gpm to 275 gpm. Several wells with yields of more than 50 gpm withdraw water from a shallow alluvial aquifer less than 100 feet below the floor of the White and Puyallup River valleys. These wells tap an aquifer that occurs at about sea level and likely underlies much of the ancient floodplain areas of these rivers. This area shows considerable promise for groundwater development. However, the cost of pumping this water up nearly 700 feet to elevations that would serve the City, and the cost of long transmission lines required to connect to the City's system, may make this an expensive alternative.

East of the White River lies an upland area at elevations between approximately 400 feet and 650 feet mean sea level (MSL). Production from domestic wells in this area ranges from approximately 4.5 gpm to 210 gpm. These wells appear to tap two principal aquifer systems: 1) a middle aquifer between elevations of approximately 490 feet and 570 feet MSL, which yields between 17 gpm and 70 gpm; and 2) a deeper aquifer between elevations of approximately 300 feet to 400 feet MSL with yields of up to about 200 gpm. Production appears to diminish to the east where yields fall to 10 gpm to 20 gpm.

Southeast

The southeast area lies at elevations between approximately 540 feet and 650 feet MSL. A total of 108 wells, mostly small domestic wells, are recorded with the Washington State Department of Ecology (Ecology). Well yields range from 10 gpm to 40 gpm. Three wells produce 100 gpm or more, with the maximum yield at 211 gpm. This information indicates that this area is not favorable for developing a municipal supply of 500 gpm or more.

Northwest

Of the 39 wells located in the northwestern section of the City, most are relatively low production wells ranging from 4 gpm to 60 gpm. However, the City's production wells, the Ball Park and Tacoma Park Wells, are located in this quadrant to the northwest and southwest of Lake Tapps, respectively. These deep wells yield approximately 900 gpm. Careful consideration must be given to the potential for interference of these wells with each other. A pump test is planned to measure impacts of water withdrawals on nearby wells. These hydrologic tests will provide the basis for recommendations for further development in this area.

Northeast

The northeasterly portion of the City is dominated by the perched water table of Lake Tapps and steep slopes down to the White River valley. On this portion of the Lake Tapps plateau, 216 domestic wells are reported in Ecology's records. Many of these wells are deep (150 feet to 400 feet below ground surface), yet yields are generally low. Well production varies from 5 gpm to 200 gpm, with most wells yielding between 20 gpm and 40 gpm.

Additional information regarding each of the City's existing sources is presented in **Chapter 2 – *Water System Description*** and contained in **Appendix I – *Water System Facilities Data***.

WATER RIGHTS

Overview

A water right is a legal authorization to use a specified amount of public water for specific beneficial purposes. The water right amount is expressed in terms of the instantaneous withdrawal rate and annual withdrawal volume. Washington state law requires users of public water to receive approval from Ecology prior to actual use of the water. This approval is granted in the form of a water right permit or certificate. However, a water right is not required for certain purposes (typically individual residences) that use 5,000 gallons per day or less of groundwater from a well.

The process for obtaining a water right involves acquiring a water right permit first, then a water right certificate. A water right permit provides permission to develop a water right by constructing, developing, and testing the water source. A water right permit remains in effect until a water right certificate is issued (if all conditions of the permit are met) or until the permit has been canceled. A water right certificate is issued by Ecology following a review process and determination that the amount of water put to beneficial use is consistent with the amount and conditions indicated on the water right permit. The results of this review are summarized in a public document called the Report of Examination.

A water right permit is issued by Ecology, only if the proposed use meets the following requirements.

- Water will be put to beneficial use.
- No impairment to existing or senior rights.
- Water is available for appropriation.
- Issuance of the requested water right will not be detrimental to the public's interest.

The water right decision process also considers existing basin management plans, stream closures, instream flows, hydraulic continuity (surface water interconnected to groundwater), seawater intrusion, utilization of existing water sources, water conservation, and availability of alternative water supplies, among other things. The water right decision process is increasingly becoming more complex and time consuming, due to the many competing interests for water, environmental issues, and regulatory requirements. At the present time, Ecology is not granting permits for new water rights for surface water or groundwater diversions in watersheds where flows in streams have become too low due to anthropogenic changes in the hydrology. The low flows of Fennel Creek, White River, and Puyallup River are senior water rights to any new diversion and are protected from further impairment by the Instream Resources Protection Program (Chapter 173-510 WAC).

Water rights have two components. One is the maximum instantaneous flow rate allowed at any given time during the year (Qi) and is most often expressed in the units of gallons per minute

(gpm). The other is annual withdrawal (Qa) and is the total volume allowed to be used annually. Qa is most often expressed in acre-feet per year (afy).

Existing Water Rights and Interties

The City currently holds one ground water permit (GWP) (G2-27693P), six ground water certificates (GWC) (GWC 2679-A, GWC 2809-A, GWC 6671-A, G2-22219C, G2-26853C, and G2-26854C), and six surface water certificates (SWC) (SWC 6459, SWC 9328, SWC 9652, SWC 11485, S2-00840C, and S2-20715C) for its sources of municipal water supply. A summary of this water rights information is presented in **Table 6-1 – *Existing Water Rights and Interties***.

The place of use of most of the City's water rights is defined as the area served by the City. The 2003 Municipal Water Law defines the place of use as the service area of a municipality. Thus, the place of use for all of the City's water rights (except GWC 3428-A, Debra Jane Lake) is the City's water service area (WSA), which extends beyond the City's corporate boundaries. Additional water rights information for each source may be found on the certificates and permits, which are included in **Appendix G – *Water Right Certificates and Permits***.

Table 6-1
Existing Water Rights and Interties

DOH Source No.	Source Name	Water Right Number	Water Right Stage	Priority Date	Quantities on Water Right in Bold			
					Instantaneous (Qi)		Annual (Qa)	
					Values not in bold are calculated or from ROE		Additive	Non-Additive
					(gpm)	(cfs)	(afy)	(afy)
S12	Tacoma Point Wells 2, 4, & 6	GWC 2809-A	Certificate	1/23/1957	**100**	0.22	**45**	0
S12	Tacoma Point Wells 2, 4, & 6	G2-26854C	Certificate	2/5/1986	**1,000**	2.23	**800**	0
S12	Tacoma Point Wells 2, 4, & 6	G2-27693P	Permit	1/30/1990	**1,200**	2.67	**1,600**	0
Subtotal					*2,300*	*5.12*	*2,445*	*0*
S14	Ball Park Well No. 2	GWC 6671-A	Certificate	3/4/1968	**270**	0.60	**185**	0
S06	Ball Park Well No. 1	G2-26853C	Certificate	3/5/1986	**1,000**	2.23	**800**	0
Subtotal					*1,270*	*2.83*	*985*	*0*
S02	Grainger Springs	SWC 9328	Certificate	3/1/1961	85	**0.22**	**22.4**	0
S02	Grainger Springs	S2-20715C	Certificate	1/19/1973	1,500	**3.33**	55	1,945
Subtotal					*1,585*	*3.55*	*77.4*	*1,945*
S01	Victor Falls Spring	SWC 6459	Certificate	10/3/1955	224	**0.50**	360	0
S01	Victor Falls Spring	SWC 9652	Certificate	7/2/1963	314	**0.70**	**504**	0
S01	Victor Falls Spring	SWC 11485	Certificate	7/2/1963	314	**0.70**	**504**	0
S01	Victor Falls Spring	S2-00840C	Certificate	8/28/1956	247	**0.55**	403	0
Subtotal					*1,099*	*2.45*	*1,771*	*0*
NA	McDonald Well	GWC 2979-A	Certificate	8/28/1956	**30**	0.07	**48**	0
NA	McDonald Well	G2-22219C	Certificate	4/15/1974	**30**	0.07	0	**24**
Subtotal					*60*	*0.13*	*48*	*24*
Subtotal of Water Rights for City Operated Sources [1]					*6,314*	*14.09*	*5,326.4*	*1,969*
Wholesale Intertie (TPU)					2,778	6.19	2,727.7	
TOTAL WATER AUTHORIZATION[1]					**9,093**	**20.28**	**8,054.1**	**1,969**
Other Water Rights								
Debra Jane Lake		GWC 3428-A	Certificate	8/6/1993	**180**	0.4	**40**	0

Notes:

[1] The total of 6,314 gpm (14.07 cfs) is taken as the City's total water right. The difference between 14.07 and 14.09 comes from different values for Qi (0.22 cfs and 85 gpm) on SWC 9328 and other documents for Grainger Spring.

Tacoma Point Wells

The Tacoma Point "old well" (GWC 2809-A: 100 gpm and 45 afy) was not included by Ecology in its last review of the City's water rights [Ms. Jill Walsh, Ecology review of 1997 *Water System Plan* (WSP)] because the Tacoma Point Well No. 2 (TP2) decision stated that the City will relinquish this water right. However, this water right was never relinquished, and the City continues to need and use this water by withdrawing the water from the TP2, Tacoma Point Well No. 4 (TP4), and Tacoma Point Well No. 6 (TP6) wells.

After meeting with Ms. Jill Walsh, Ecology agreed not to pursue relinquishment and approved the inclusion of this Certificate in **Table 6-1 – *Existing Water Rights and Interties*** as an existing additive water right.

Ball Park Wells

Ball Park Well No. 2 is a replacement well within the same Tract B as the old Ball Park Well No. 2, and is associated with GWC 6671-A. An affidavit of compliance with Revised Code of Washington (RCW) 90.44.100(3) was approved by Ecology on June 29, 2005, (letter to Mr. Rick Shannon at the City from Ms. Jill Walsh of Ecology), regarding this replacement well. Ball Park Well No. 1 is associated with Certificate G2-26853C. The annual and instantaneous quantities for both these water rights are listed in **Table 6-1 – *Existing Water Rights and Interties*** as existing additive water rights.

Grainger Springs

The City believes Ecology erred in the determination of the City's future growth demand requirements when this water right for Grainger Springs was determined. The City discussed this with Ecology. The problem was the calculation of future demand using gallons per day per service rather than gallons-per-day per capita. As a result of the meeting with Ecology, it was agreed that the Grainger Springs water rights are as depicted in **Table 6-1 – *Existing Water Rights and Interties***. Specifically, there is a total of 77.4 afy (22.4 afy under SWC 9328, and 55 afy under S2-20715C) and 1,945 afy of non-additive supply (also under S2-20715C). While the water right certificate did not specify additive or non-additive supply, the Report of Examination for S2-20715C identified 2,000 afy, of which 55 afy was primary (additive) and the remaining 1,945 afy is supplemental (non-additive) to existing City water rights. **Table 6-1 – *Existing Water Rights and Interties*** reflects the current status of the water right for the Grainger Springs source.

Victor Falls

The City has four water right certificates for its Victor Falls source of supply. The oldest of these, SWC 6459, does not express an annual quantity (no afy limitation), but merely allows 0.55 cubic feet per second (cfs) or 224 gpm. The absence of an annual quantity limitation in a municipal water right certificate was not unusual for certificates issued pre-1970, before Ecology was created. Such water rights have typically been construed as allowing continuous diversion of the instantaneous quantity year-round as a primary right. This is especially common with surface water sources where a diversion works is constructed and allowed to divert water continuously, as opposed to a ground water well where a pump cycles on and off depending on system demand. Based on the record of this water right and other related rights, the annual volume of water associated with SWC 6459 is 360 afy. This volume is included **Table 6-1 – *Existing Water Rights and Interties*** as an additive water right.

McDonald Wells

Water right certificates GWC 2979-A and G2-22219C were originally associated with wells in the McDonald Tracts. These wells have not been used for many years; however, municipal water rights are not subject to relinquishment for non-use. The annual quantity of these water rights, as listed in **Table 6-1 – *Existing Water Rights and Interties***, is part of the total annual quantity of the City's additive water rights. The City's non-additive water right at Grainger Springs is used,

at least partially, as an additional source to withdraw the annual quantity of GWC 2979-A and G2-22219C.

Other Water Rights

Debra Jane Lake Beautification

Recent water rights decisions by Ecology characterize the Debra Jane Lake water right (GWC 3428-A) as municipal; however, the City changed the purpose of this water right to "Lake Beautification," and it is no longer used for municipal or domestic purposes. This water right is not included in **Table 6-1 – *Existing Water Rights and Interties*** inventory of water rights. However, because maintaining lake levels, or lake beautification, are a beneficial use of water, the water right is not being abandoned or relinquished. The City may use this water right in the future for another purpose, including municipal, or use it as mitigation for another water right or water right change application.

Wholesale Water

Although the water rights for the wholesale water supply are technically owned by TPU, they are included in the City's water authorization analysis since they are dedicated to Bonney Lake. There are two formal wholesale water agreements between TPU and the City that are currently counted towards the City's supply. The first wholesale water agreement was signed on February 1, 2005 and is for an average day demand (ADD) of 935,000 gallons per day (gpd) (649 gpm) and a maximum day demand (MDD) of 2,000,900 gpd (1,390 gpm). The second wholesale water agreement was signed November 26, 2013, and is for an ADD of 1,500,000 gpd (1,042 gpm) and an MDD of 2,000,000 gpd (1,389 gpm). These two agreements authorize the City to take an instantaneous rate (Qi) of 2,778 gpm and an annual volume (Qa) of 2,748 afy. TPU contracts are in perpetuity and there is no contract end-date. Additional information regarding the wholesale agreements is in **Appendix G – *Water Right Certificates* and Permits**.

Water Authorization Evaluation

An evaluation of the City's existing water rights and wholesale contracts was performed to determine the sufficiency of the City's authorizations to meet both existing and future water demands. **Table 6-2 – *Existing Water Authorization Evaluation*** compares the combined maximum instantaneous authorized rate of the sources with the MDD of the system, and the combined maximum annual authorized volume of the sources with the ADD of the system. As shown in the table, the City has sufficient authorizations (both instantaneous rate and annual volume) to meet the demands of existing customers.

Table 6-2
Existing Water Authorization Evaluation

Description	Instantaneous Rate Maximum Day Demand	Annual Volume Average Day Demand	
	(gpm)	(afy)	(MGD)
Total Water Authorization	9,093	8,054	7.19
Existing Water Demand[1]	6,339	4,427	3.95
Surplus (or Deficient) Authorization	2,754	3,627	3.24

Note:
[1]Calculated based on 2018 ADD with the demand peaking factors from Table 4-13 Demands Peaking Factors.

An evaluation of the production capacity of each source was performed and compared to the source's existing instantaneous water rights to determine the sufficiency of the source to utilize the complete water right. **Table 6-3 –** ***Instantaneous Water Authorization (Q_i) vs. Production Capacity*** shows the instantaneous water right amounts of the sources and the historic production capacity, based on a 10-year period of compiled data.

Table 6-3
Instantaneous Water Authorization (Q_i) vs. Production Capacity

Source of Supply	Water Authorization		Reliable Capacity		
	Instantaneous (Qi) (gpm)	Annual (Qa) (afy)	Normal (gpm)	10-year Average (gpm)	10-year Low (gpm)
Tacoma Point Wellfield	2,300	2,445	2,300	2,300	2,300
Ball Park Wellfield	1,270	985	1,270	1,270	1,270
Grainger Springs[1]	1,585	77	1,200	910	775
Victor Falls Springs	1,099	1,771	1,099	1,060	885
McDonald Wells	60	48	0	0	0
Wholesale Supply (TPU)	2,778	2,728	2,778	2,778	2,778
Total	**9,093**	**8,054**	**8,647**	**8,318**	**8,008**

Note:
[1] Granger Springs Qa includes 77 afy additive, plus 1,945 afy non-additive.

Little or no variation of production capacity for the wells is seen seasonally. Although fluctuations in the static water levels of the aquifers and drawdown levels do vary seasonally and with usage, the City is typically able to withdraw its full water rights on a year-round basis. Exceptions to this have been when Lake Tapps levels have been drawn down to atypical lows for extended periods in the winter to allow for lake and dam maintenance. However, production capacity at the spring sources typically falls off, starting in late summer, and usually achieving a low in late fall or early winter, and recovering by late spring. **Table 6-3 –** ***Instantaneous Water Authorization (Q_i) vs. Production Capacity*** lists the production capacity of each source during normal, or maximum production periods, the 10-year average seen at the end of the City's peak demand season (beginning of September), and the historical low that occurred in late fall. Typical peak season flows for the springs for the last 10 years is shown in **Table 6-4 –** ***Spring Source Production Capacity***. The 10-year average flow rate is used as the reliable capacity for the springs in this WSP.

Table 6-4
Spring Source Production Capacity

Source of Supply	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	10-yr Avg
Grainger Springs (gpm)	1,010	995	775	920	900	955	945	825	910	905	910 gpm
Victor Falls Springs (gpm)	1,095	1,080	885	1,095	1,095	1,095	1,090	1,090	1,000	1,090	1,060 gpm
Total	**2,105**	**2,075**	**1,660**	**2,015**	**1,995**	**2,050**	**2,035**	**1,915**	**1,910**	**1,995**	**1,970 gpm**

An evaluation of the maximum withdrawal from each source is compared to each source's annual water rights to determine the sufficiency of the water rights to meet the City's annual demands. **Table 6-5 – *Annual Water Authorization (Q_a) vs. Maximum Withdrawals*** compares the maximum total withdrawal from each source, using data from the year 2009 since it was the largest total demand year for the City-operated sources, to each source's annual water right. The City used slightly more water in 2015 than in 2009 (4,336 afy vs. 4,322 afy). However, it received substantially more supply from its intertie with TPU (891 afy vs. 143 afy) and less from its City-operated sources that year and **Table 6-5 – *Annual Water Authorization (Q_a) vs. Maximum Withdrawals*** is focusing on maximum withdrawals from the City-operated sources. As shown in ***Table 6-5 – Annual Water Authorization (Q_a) vs. Maximum Withdrawals***, the City is currently utilizing 54 percent of its existing annual water rights.

Table 6-5
Annual Water Authorization (Q_a) vs. Maximum Withdrawals

Source of Supply	Annual (Qa)		Peak Year (2009)		Percent
	afy	MGD	afy	MGD	Percent
Tacoma Point Wellfield	2,445	2.18	1,474	1.32	60%
Ball Park Wellfield	985	0.88	251	0.22	25%
Grainger Springs	77	0.07	77	0.07	100%
Grainger Non-Additive	*1,945*	*1.74*	*856*	*0.76*	*44%*
Victor Falls Springs	1,771	1.58	1,521	1.36	86%
McDonald Wells	48	0.04	0	0.00	0%
Tacoma Intertie	2,728	2.44	143	0.13	5%
Total	**8,054**	**7.19**	**4,322**	**3.86**	**54%**

Table 6-6 – *Future Water Authorization Evaluation* summarizes the results of the future water rights evaluation, which compares the water rights of the existing sources with the future 10-year and 20-year demand projections of the system. The analysis considered future demand projections with and without additional water use reductions from planned conservation efforts, as shown in the **Table 6-6 – *Future Water Authorization Evaluation***. The results of the future water rights evaluation indicate that the City has sufficient annual water rights to meet the projected ADDs through 2035, but insufficient instantaneous rights to meet the MDD by 2035. Prior to 2035, demand will exceed the available instantaneous water rights. The City should either acquire new water rights or obtain additional wholesale supplies to meet projected demands.

Table 6-6
Future Water Authorization Evaluation

Description	Instantaneous Rate Maximum Day Demand	Annual Volume Average Day Demand	
	(gpm)	(afy)	(MGD)
Year 2028 Without Conservation			
Total Water Authorization	9,093	8,054	7.19
Projected (2028) Water Demand	7,374	5,150	4.60
Surplus (or Deficient) Authorization	1,718	2,904	2.59
Year 2038 Without Conservation			
Total Water Authorization	9,093	8,054	7.19
Projected (2038) Water Demand	8,820	6,159	5.50
Surplus (or Deficient) Authorization	273	1,895	1.69
Year 2028 With Conservation			
Total Water Authorization	9,093	8,054	7.19
Projected (2028) Water Demand	7,006	4,892	4.37
Surplus (or Deficient) Authorization	2,087	3,162	2.82
Year 2038 With Conservation			
Total Water Authorization	9,093	8,054	7.19
Projected (2038) Water Demand	7,938	5,543	4.95
Surplus (or Deficient) Authorization	1,155	2,511	2.24

Water Authorization Planning

The City's well, spring, and intertie facilities currently have the capability to provide supply to the system at their authorized maximum instantaneous rate. Thus, the facilities are able to fully utilize their existing water rights. The City has sufficient water authorization to supply the water system through at least 2038 and likely beyond. In order to meet the projected future demands, additional water rights or a wholesale water supply may need to be obtained, depending on how demand factors change over the next several decades. Currently, the City has the right to pursue additional water supply using interruptible water rights purchased from the Cascade Water Alliance. Further investigation of these rights may lead to a reliable source of supply that can be used by the City to meet future demands. In addition, the City will strive to use its existing water sources efficiently by continuing its current water conservation measures, leaky main replacements, and water rate incentives, and by implementing other proposed measures, as outlined in the City's Water Use Efficiency Program, which is included in **Appendix C – *Water Use Efficiency Program***.

SOURCE WATER QUALITY AND TREATMENT

This section describes the water quality treatment provided at each of the sources and also discusses the current and upcoming water quality regulations. The City's 2014 water quality results are included in **Appendix N – *Consumer Confidence Report***.

Water Quality Treatment

Each of the City's water supply sources receives water quality treatment prior to entering the distribution system. The treatment processes and goals are described briefly for each source in the following sections.

Victor Falls Springs

The City chlorinates this source to provide a minimum of a 0.2 milligrams per liter (mg/L) free chlorine residual. The City generates a dilute sodium hypochlorite solution using a process known as on-site generation. This process uses salt, water, and electricity to generate a 0.8 percent sodium hypochlorite solution. Recent improvements include the addition of a large-diameter pipeline following injection of the hypochlorite solution in order to provide additional contact time (CT). The City now meets or exceeds the Washington State disinfection requirement of a CT of 6.0 mg/L per minute for this source.

Grainger Springs

The City chlorinates this source to provide a minimum of a 0.2 mg/L free chlorine residual. The City also adjusts the pH to 7.5 to optimize the corrosion control treatment for compliance with the Lead and Copper Rule (LCR). The City uses the same on-site generation process for chlorination as at Victor Falls Springs. Recent improvements include the addition of a large-diameter pipeline following injection of the hypochlorite solution to provide additional contact time. The City now meets or exceeds the Washington State disinfection requirement of a CT of 6.0 mg/L per minute for this source.

The pH adjustment process uses a sodium hydroxide solution. The City currently monitors the distribution system for compliance with the LCR.

Ball Park Wellfield

The two well sources at the Ball Park Wellfield are combined together in a common header to receive treatment. The well sources are high in manganese and iron, and also have a presence of hydrogen sulfide. The treatment processes for these wells include chlorination using an on-site generation process, and filtration with an adsorptive media. The water treatment goals for the facility include non-detection of hydrogen sulfide, a free chlorine residual of at least 0.2 mg/L, and removal of manganese to less than the Maximum Contaminant Level (MCL).

Tacoma Point Wellfield

All three Tacoma Point wells are combined into a common header pipe for water quality treatment prior to entering the distribution system. Treatment includes disinfection with chlorination and pH adjustment with sodium hydroxide. Disinfection is provided by an on-site chlorine generation system. Chlorination provides a minimum free chlorine residual of at least 0.2 mg/L. The target range is 0.5 mg/L to 0.7 mg/L. The target pH is 7.5, and pH adjustment for corrosion control is optimized along with the process at Grainger Springs.

DRINKING WATER REGULATIONS

Overview

The quality of drinking water in the United States is regulated by the Environmental Protection Agency (EPA). Under provisions of the Safe Drinking Water Act (SDWA), the EPA is allowed to delegate primary enforcement responsibility for water quality control to each state. The Washington State Department of Health (DOH) is the agency responsible for implementing and enforcing the drinking water regulations. For the state of Washington to maintain primacy (delegated authority to implement requirements) under the SDWA, the state must adopt drinking water regulations that are at least as stringent as the federal regulations. In meeting these requirements, the state, in cooperation with DOH, has published drinking water regulations that are contained in Chapter 246-290 WAC.

Existing Regulations

The SDWA was enacted in 1974, as a result of public concern regarding water quality. The SDWA sets standards for quality of drinking water and requires water treatment if these standards are not met. The SDWA also sets water testing schedules and methods that water systems must follow. The SDWA was amended in 1986 as a result of additional public concern and frequent contamination of groundwater from industrial solvents and pesticides. The 1986 Amendments require water systems to monitor and treat for a continuously increasing number of water contaminants identified in the new federal regulations. The EPA regulated approximately 20 contaminants between 1974 and 1986. The 1986 Amendments identified 83 contaminants that the EPA was required to regulate by 1989. Implementation of the new regulations has been marginally successful due to the complexity of the regulations and the associated high costs. To rectify the slow implementation of the new regulations, the SDWA was amended again and reauthorized in August 1996.

In response to the 1986 SDWA Amendments, the EPA established nine rules, known as the Phase I Rule, Phase II & IIb Rules, Phase V Rule, Surface Water Treatment Rule, Interim Enhanced Surface Water Treatment Rule, Long Term 1 Enhanced Surface Water Treatment Rule, Total Coliform Rule, and the LCR. All of the City's currently active groundwater sources are affected by these rules. The EPA regulates most chemical contaminants through the Phase I, II, IIb, and V Rules.

The EPA set two limits for each contaminant that is regulated under the rules. The first limit is a health goal, referred to as the Maximum Contaminant Level Goal (MCLG). The MCLG is zero for many contaminants, especially known cancer-causing agents (carcinogens). The second limit is a legal limit, referred to as the MCL. MCLs are equal to or higher than MCLGs. However, most MCLs and MCLGs are the same, except for contaminants that are regulated as carcinogens. The health goals (MCLGs) for these are typically zero because they cause cancer and it is assumed that any amount of exposure may pose some risk of cancer. A summary of each rule follows.

To fully understand the discussion that follows, a brief definition of several key terms is provided below:

- Organic Chemicals – Animal or plant-produced substances containing carbon and other elements, such as hydrogen and oxygen.
- Synthetic Organic Chemicals (SOCs) – Man-made organic substances, including herbicides, pesticides, and various industrial chemicals and solvents.
- Volatile Organic Chemicals (VOCs) – Chemicals, such as liquid, which evaporate easily.
- Inorganic Chemicals (IOCs) – Chemicals of mineral origin that are naturally occurring elements. These include metals, such as lead and cadmium.

Phase I Rule

The Phase I Rule, which was EPA's first response to the 1986 Amendments, was published in the Federal Register on July 8, 1987, and became effective on January 9, 1989. This rule provided limits for eight VOCs that may be present in drinking water. VOCs are used by industries in the manufacture of rubber, pesticides, deodorants, solvents, plastics, and other chemicals. VOCs are found in everyday items such as gasoline, paints, thinners, lighter fluid, mothballs, and glue, and are typically encountered at dry cleaners, automotive service stations, and elsewhere in industrial processes.

The City currently complies with all regulated chemicals tested under this rule.

Phase II & IIb Rules

The Phase II & IIb Rules were published in the Federal Register on January 30, 1991, and July 1, 1991, and became effective on July 30, 1992, and January 1, 1993, respectively. These rules updated and created limits for 38 contaminants (organics and inorganics), of which 27 were newly regulated. Some of the contaminants are frequently applied agricultural chemicals (nitrate), while others are more obscure industrial chemicals.

The City currently complies will all regulated chemicals tested under this rule.

Phase V Rule

The Phase V Rule was published in the Federal Register on July 17, 1992, and became effective on January 17, 1994. This rule set standards for 23 additional contaminants, of which 18 are organic chemicals (mostly pesticides and herbicides) and 5 are inorganic chemicals (such as cyanide).

The City currently complies will all regulated chemicals tested under this rule.

Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) was published in the Federal Register on June 29, 1989, and became effective on December 31, 1990. Surface water sources, such as rivers, lakes, and reservoirs (which are open to the atmosphere and subject to surface runoff), and groundwater sources that are under the direct influence of surface water (GWI) are governed by this rule. The SWTR seeks to prevent waterborne diseases caused by microbes, *Legionella*, and *Giardia Lamblia* that are present in most surface waters. The rule requires disinfection of all surface water sources and GWI sources. All surface water sources and GWI sources must also be filtered unless a filtration waiver is granted. A filtration waiver may be granted to systems with pristine sources that continuously meet stringent source water quality and protection requirements.

The City does not currently operate any sources that are classified as surface water or GWI; therefore, this rule does not currently affect the City. Wholesale supplies are provided from TPU's surface water source, but the City is not responsible for operating the treatment facility for this source.

Interim Enhanced Surface Water Treatment Rule

EPA proposed the Interim Enhanced Surface Water Treatment Rule (IESWTR) on July 29, 1994. The final rule was published in the Federal Register on December 16, 1998, and became effective on February 16, 1999, concurrent with the Stage 1 Disinfectants/Disinfection Byproducts Rule. The rule primarily applies to public water systems that serve 10,000 or more people and use surface water sources or GWI sources. The rule also requires primacy agencies (i.e., DOH in Washington State) to conduct sanitary surveys of all surface water and GWI sources, regardless of size. The rule is the first to directly regulate the protozoan *Cryptosporidium* and has set the MCLG for *Cryptosporidium* at zero. Water systems affected by this rule needed to comply with it by December 16, 2001.

The City does not currently operate any sources that are surface waters; therefore, this rule does not currently affect the City.

Long Term 1 Enhanced Surface Water Treatment Rule

This is the follow up rule to the IESWTR, which became effective in February 1999. The final Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was published on January 14, 2002, and became effective February 13, 2002. The rule addresses water systems using surface water or GWI serving fewer than 10,000 people. The rule extends protections against *Cryptosporidium* for smaller water systems.

The City does not currently operate any sources that are surface waters; therefore, this rule does not currently affect the City.

Revised Total Coliform Rule

The Total Coliform Rule (TCR) was published in the Federal Register on June 29, 1989, and became effective on December 31, 1990. The rule set both MCLGs and MCLs for total coliform levels in drinking water, and the type and frequency of testing that is required for water systems. The rule requires more monitoring than under prior requirements, especially for small systems. In addition, every public water system is required to develop a coliform monitoring plan, subject to approval by DOH.

On February 13, 2013, the EPA published revisions to the rule in the Federal Register, and the rule was renamed to the Revised Total Coliform Rule. This rule eliminated the coliform MCL, sets an MCL for Escherichia Coli (*E. coli*), and specifies the frequency and timing of coliform testing based on population served, public water system type, and source water type. When total coliform is detected, this is now known as a treatment technique trigger and public notice is no longer required. Instead, the water system must conduct an assessment of their water system facilities and operations and fix any sanitary defects. For confirmed *E. coli* incidents, now known as an *E. coli* MCL violation, the water system must perform a Level 2 assessment and provide public notice within 24 hours. If a positive sample is collected on a consecutive system, the City will also need to collect source samples.

Coliforms are a group of bacteria that live in the digestive tract of humans and many animals, and are excreted in large numbers in the feces. Coliforms can be found in sewage, soils, surface waters, and vegetation. The presence of any coliforms in drinking water indicates a health risk and potential waterborne disease outbreak, which may include gastroenteric infections, dysentery, hepatitis, typhoid fever, cholera, and other infectious diseases.

The rule established the health goal for total coliforms at zero. To comply with the legal limit, systems must not find coliforms in more than 5 percent of the samples taken each month. For systems like the City, which take 40 samples per month, having more than one sample that contains coliforms would exceed the legal limit and trigger the follow-up sampling requirements. A Level 1 assessment is required if coliform is present in more than 5 percent of routine and repeat samples. A Level 2 assessment is required if there is an *E. coli* violation or if a water system incurs a second treatment technique trigger in a rolling 12-month period. Only a state-qualified person can perform a Level 2 assessment. There are three parts of each assessment: evaluation, where sanitary defects are identified; discussion, where corrective action is identified to fix the sanitary defect; and corrective action, which involves recording the steps taken to fix the sanitary defect. A water system will receive a treatment technical violation if it: fails to conduct a Level 1 or Level 2 assessment within 30 days of a trigger or fails to correct all sanitary defects form a Level 1 or Level 2 Assessment within 30 days of a trigger or within the state-approved timeframe.

The City's current water quality and chlorination practices have resulted in compliance with this rule. A copy of the City's coliform monitoring program and *E. coli* response plan is contained in **Appendix F – *Coliform Monitoring Plan*** of this WSP

Lead and Copper Rule

The LCR was published in the Federal Register on June 7, 1991, and became effective on December 7, 1992. On January 12, 2000, the EPA published some minor revisions to the rule in the Federal Register, which primarily improved the implementation of the rule. The rule identifies "action levels" for both lead and copper. An action level is different than an MCL in that a MCL is a legal limit for a contaminant, and an action level is a trigger for additional prevention or removal steps. The action level for lead is greater than 0.015 mg/L. The action level for copper is greater than 1.3 mg/L. If the 90^{th} percentile concentration of either lead or copper from the group of samples exceeds these action levels, a corrosion control study must be undertaken to evaluate strategies and make recommendations for reducing the lead or copper concentration to below the action levels. The rule requires systems that exceed the lead level to educate the affected public about reducing its lead intake. Systems that continue to exceed the lead action level after implementing corrosion control and source water treatment may be required to replace piping in the system that contains the source of lead. Corrosion control is typically accomplished by increasing the pH of the water to make it less corrosive, which reduces its ability to breakdown water pipes and absorb lead or copper.

Lead is a common metal found throughout the environment in lead-based paint, air, soil, household dust, food, certain types of pottery, porcelain, pewter, and water. Lead can pose a significant risk to health if too much of it enters the body. Lead builds up in the body over many years and can cause damage to the brain, red blood cells, and kidneys. The greatest risk is to young children and pregnant women. Lead can slow down normal mental and physical development of growing bodies.

Copper is a common, natural, and useful metal found in our environment. It is also a trace element needed in most human diets. The primary impact of elevated copper levels in water systems is stained plumbing fixtures. At certain levels (well above the action levels), copper may cause nausea, vomiting, and diarrhea. It can also lead to serious health problems in people with Wilson's disease. Long-term exposure to elevated levels of copper in drinking water could also increase the risk of liver and kidney damage.

The City's monitoring program found that it was in compliance with the lead action level, but was above the copper action level. The City instituted a corrosion control program that first treated water from the Tacoma Point Wellfield and more recently started treating water from the Grainger Springs source. The City is now in compliance with the LCR.

Radionuclides Rule

The EPA established interim drinking water regulations for radionuclides in 1976, under the SDWA. MCLs were established for alpha, beta, and photon emitters, and radium 226/228. Radionuclides are elements that undergo a process of natural decay and emit radiation in the form of alpha or beta particles and gamma photons. The radiation can cause various kinds of cancers, depending on the type of radionuclide exposure from drinking water. The regulations address both man-made and naturally occurring radionuclides in drinking water.

The 1986 Amendments to the SDWA finalized the regulations for radionuclides by eliminating the term interim. The amendments also directed the EPA to promulgate (publish as law) health-based MCLGs, as well as MCLs. The EPA failed to meet the statutory schedules for promulgating the radionuclide regulations, which resulted in a lawsuit. In 1991, the EPA proposed revisions to the regulations, but a final regulation based on the proposal was never promulgated. The 1996 Amendments to the SDWA directed the EPA to revise a portion of the earlier proposed revisions, adopt a schedule, and review and revise the regulations every 6 years, as appropriate, to maintain or improve public health protection. Subsequent to the 1996 Amendments, a 1996 court order required the EPA to either finalize the 1991 proposal for radionuclides or to ratify the existing standards by November 2000.

The final rule was published in the Federal Register on December 7, 2000, and became effective on December 8, 2003. The rule established an MCLG of zero for the four regulated contaminates, and MCLs of 5 picocuries per Liter (pCi/L) for combined radium-226 and radium-228, 15 pCi/L for gross alpha (excluding radon and uranium), 4 millirem per year (mrem/year) for beta particle and photon radioactivity, and 30 micrograms per liter (µg/L) for uranium.

The City currently complies will all regulated chemicals tested under this rule.

Wellhead Protection Program

Section 1428 of the 1986 SDWA Amendments mandates that each state develop a wellhead protection program. The Washington State mandate for wellhead protection and the required elements of a wellhead protection program are contained in WAC 246-290-135 – Source Protection, which became effective in July of 1994. In Washington State, DOH is the lead agency for the development and administration of the state's wellhead protection program.

A wellhead protection program is a proactive and ongoing effort of a water purveyor to protect the health of its customers by preventing contamination of the groundwater that it supplies for drinking water. All federally-defined Group A public water systems that use ground water as their source are required to develop and implement a wellhead protection program. All required elements of a local wellhead protection program must be documented and included in either the Water System Plan (applicable to the City) or Small Water System Management Program document (not applicable to the City).

A copy of the City's Wellhead and Watershed Protection Program is contained in **Appendix H – *Wellhead and Watershed Protection Program*** of this WSP.

Consumer Confidence Report

The final rule for the Consumer Confidence Report (CCR) was published in the Federal Register on August 19, 1998, and became effective on September 18, 1998. Minor revisions were posted in the Federal Register on May 4, 2000. The CCR is the centerpiece of the right-to-know provisions of the 1996 Amendments to the SDWA. All community water systems like the City's were required to issue the first report to customers by October 19, 1999. The annual report must be updated and re-issued to all customers by July 1st of each year thereafter.

The CCR is a report on the quality of water that was delivered to the system during the previous 12 months. The reports must contain certain specific elements, but may also contain other information that the purveyor deems appropriate for public education. Some, but not all, of the information that is required in the reports includes the source and type of the drinking water, type of treatment, contaminants that have been detected in the water, potential health effects of the contaminants, identification of the likely source of contamination, violations of monitoring and reporting, and variances or exemptions to the drinking water regulations.

A copy of the City's latest CCR is contained in **Appendix N – *Consumer Confidence Report*** of this WSP.

Stage 1 Disinfectants/Disinfection Byproducts Rule

Disinfection byproducts (DBPs) are formed when free chlorine reacts with organic substances, most of which occur naturally. These organic substances (called "precursors") are a complex and variable mixture of compounds. The disinfection by-products themselves may pose health risks. Trihalomethanes are a category of disinfection byproducts that have been regulated. However, systems with groundwater sources that serve a population of less than 10,000 people have not been required to monitor for trihalomethanes (THMs) in the past.

The EPA proposed the Stage 1 Disinfectants/Disinfection Byproducts Rule (D/DBPR) on July 29, 1994. The final rule was published in the Federal Register on December 16, 1998, and became effective on February 16, 1999. The rule applies to the City and most other water systems, including systems serving fewer than 10,000 people that add a chemical disinfectant to drinking water during any part of the treatment process. The rule reduced the MCL for total trihalomethanes, which are a composite measure of four individual trihalomethanes, from the previous interim level of 0.10 mg/L to 0.08 mg/L. The rule established MCLs and requires monitoring of three additional categories of disinfectant byproducts (0.06 mg/L for five haloacetic acids (HAA5), 0.01 mg/L for bromate, and 1.0 mg/L for chlorite). The rule also established maximum residual disinfectant levels (MRDLs) for chlorine (4.0 mg/L), chloramines (4.0 mg/L), and chlorine dioxide (0.8 mg/L). The rule requires systems using surface water or GWI to implement enhanced coagulation or softening to remove DBP precursors, unless alternative criteria are met. Compliance with this rule was to be satisfied by December 16, 2001, for large surface water systems (those serving over 10,000 people) and by December 16, 2003, for smaller surface water systems and all groundwater systems (i.e., the City).

The City currently complies will all regulated chemicals tested under this rule.

Unregulated Contaminant Monitoring Regulation

The EPA established the Unregulated Contaminant Monitoring Regulation (UCMR) to generate data on contaminants that are being considered for inclusion in new drinking water standards. The information collected by select public water systems will ensure that future regulations established by the EPA are based on sound science.

Three separate lists of unregulated contaminants are maintained under the UCMR: List 1, List 2, and List 3. Contaminants are organized on the tiered lists based on the availability of standard

testing procedures and the known occurrence of each contaminant, with List 1 containing contaminants that have established standard testing procedures and some, but insufficient, information on their occurrence in drinking water. Monitoring for contaminants on the three lists is limited to a maximum of 30 contaminants within a 5-year monitoring cycle, and the EPA is required to publish new contaminant monitoring lists every 5 years. As new lists are published, contaminants will be moved up on the lists if adequate information is found to support additional monitoring. All public water systems serving more than 10,000 people and a randomly selected group of smaller water systems are required to monitor for contaminants. The City currently monitors for some unregulated contaminants.

Arsenic Rule

The EPA established interim drinking water regulations for arsenic in 1976, under the SDWA. Arsenic is highly toxic, affects the skin and nervous system, and may cause cancer. The 1996 SDWA Amendments require the EPA to conduct research to assess health risks associated with exposure to low levels of arsenic. The EPA issued a proposed regulation on June 22, 2000, and allowed a 90-day public review period. The final rule, which was published in the Federal Register on January 22, 2001, was to become effective on March 23, 2001, except for certain amendments to several sections of the rule. However, on May 22, 2001, the EPA announced that it was delaying the effective date for the rule until February 22, 2002, to allow time to reassess the rule and to afford the public a full opportunity to provide further input. On October 31, 2001, the EPA implemented the final rule.

The rule sets the MCLG of arsenic at zero and reduces the MCL from the current standard of 0.05 mg/L to 0.01 mg/L. Arsenic's monitoring requirements will be consistent with the existing requirements for other inorganic contaminants. The regulation required the City to have met the lower MCL by January 23, 2006.

Current monitoring results from the City's sources indicate that the arsenic level is less than the new MCL; therefore, the City is in compliance with this rule.

Filter Backwash Recycling Rule

The 1996 SDWA Amendments required the EPA to promulgate a regulation governing the recycling of filter backwash water within a public water system's treatment processes. Public water systems using surface water or GWI, which utilize filtration processes and recycling must comply with the rule. The rule aims to reduce risks associated with recycling contaminants removed during filtration. The EPA issued a proposed regulation on June 22, 2000, and allowed a 90-day public review period. The final rule was published in the Federal Register on June 8, 2001, and became effective on August 7, 2001.

The rule requires filter backwash water be returned to a location that allows complete treatment. In addition, filtration systems must provide detailed information regarding the treatment and recycling process to the state. The regulation requires compliance with the rule as of December 8, 2003, if filter backwash water was recycled.

The City does not currently operate a surface water filtration facility or filter groundwater under the direct influence of surface water; therefore, the City does not need to comply with this rule.

Stage 2 Disinfectants/Disinfection Byproducts Rule

This rule is the second part of the D/DBPR, of which the Stage 1 D/DBPR became effective in February 1999. The Stage-2 D/DBPR was published on January 4, 2006, in the Federal Register, and became effective on March 6, 2006. The EPA implemented this rule simultaneously with the Long term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).

Similar to the Stage 1 D/DBPR, this rule applies to most water systems that add a disinfectant to the drinking water other than ultraviolet light or systems that deliver such water. The Stage 2 D/DBPR changes the calculation procedure requirement of the MCLs for two groups of disinfection byproducts, total THM (TTHM) and HAA5. The rule requires each sampling location to determine compliance with MCLs based on their individual annual average DBP levels (termed the Locational Running Annual Average), rather than utilizing a system-wide annual average. The rule also proposes new MCLs for chloroform (0.07 mg/L.), trichloroacetic acid (0.02 mg/L), and monochloroacetic acid (0.03 mg/L).

Additionally, the rule requires systems to document peak DBP levels and prepare an Initial Distribution System Evaluation (IDSE) to identify Stage 2 D/DBPR compliance monitoring sites. IDSEs require each water system to prepare a separate IDSE plan and report, with the exception of those systems who obtain a 40/30 Certification or a Very Small System Waiver. In order to qualify for the 40/30 Certification, all samples collected during Stage 1 monitoring must have TTHM and HAA5 levels less than or equal to 0.040 mg/L and 0.030 mg/L, respectively. The first stage of the IDSE schedule required systems serving 100,000 or more people to submit IDSE plans by October 1, 2006. Systems serving 50,000 to 99,999 people had to submit IDSE plan by April 1, 2007, while systems serving 10,000 to 49,999 people had to submit plans by October 1, 2007. Systems serving fewer than 10,000 people must submit an IDSE plan by April 1, 2008, if they did not qualify for 40/30 Certification or a Very Small System Waiver. The City currently complies with contaminant monitoring requirements under this rule and has completed its IDSE, which is included in **Appendix U – *Initial Distribution System Evaluation***.

Long Term 2 Enhanced Surface Water Treatment Rule

Following the publishing of the IESWTR, the EPA introduced the LT1ESWTR to supplement the preceding regulations. The second part of the LT1ESWTR regulations, which became effective in February 2002, will be mandated in the LT2ESWTR. The final rule was published in the Federal Register on January 5, 2006, and became effective March 6, 2006. The final rule was implemented simultaneously with the Stage 2 D/DBPR, described in the previous section. This rule has not been published at the time of this writing. This rule applies to all systems that use surface water or GWI sources.

This rule establishes treatment technique requirements for filtered systems, based on their risk level for contamination, calculated from the system's average *Cryptosporidium* concentration. Additional requirements will include up to 2.5-log *Cryptosporidium* treatment, in addition to existing requirements under the IESWTR and LT1ESWTR. Filtered systems, that demonstrate low levels of risk will not be required to provide additional treatment. Unfiltered systems must achieve at least a 2-log inactivation of *Cryptosporidium* if the mean level remains below 0.01 oocysts/L. If an unfiltered system elects not to monitor, or the mean level of *Cryptosporidium*

exceeds 0.01 oocysts/L, the LT2ESWTR will require the system to provide a minimum 3-log inactivation of *Cryptosporidium*. All unfiltered systems will also be required to utilize a minimum of two disinfectants in their treatment process.

The LT2ESWTR also addresses systems with unfinished water storage facilities. Under this rule, systems must either cover their storage facilities or achieve inactivation and/or removal of 4-log virus, 3-log *Giardia Lamblia*, and 2-log *Cryptosporidium* on a state-approved schedule. Lastly, the rule extends the requirement of the disinfection profiles mandated under the LT1ESWTR to the proposed Stage 2 D/DBPR. Since this rule applies only to systems that use surface water or GWI sources, it does not impact the City.

Groundwater Rule

The EPA promulgated the Groundwater Rule (GWR) to reduce the risk of exposure to fecal contamination that may be present in public water systems that use ground water sources. The GWR also specifies when corrective action (which may include disinfection) is required to protect consumers who receive water from ground water systems from bacteria and viruses. The GWR applies to public water systems that use ground water and to any system that mixes surface and ground waters if the ground water is added directly to the distribution system and provided to consumers without treatment equivalent to surface water treatment. The final rule was published in the Federal Register in November 8, 2006, and became effective on January 8, 2007.

The rule targets risks through an approach that relies on the four following major components.

1. Periodic sanitary surveys of groundwater systems that require evaluation of eight critical elements and the identification of significant deficiencies (such as a well located near a leaking septic system). States must complete the initial survey for most community water systems by December 31, 2012, and for community water systems with outstanding performance and all non-community water systems by December 31, 2014. DOH conducted its most recent sanitary survey of the City's water system on October 4, 2007, under the state's existing sanitary survey program.

2. Source water monitoring to test for the presence of *E. coli*, enterococci, or coliphage in the sample. There are two monitoring provisions;

    - Triggered monitoring for systems that do not already provide treatment that achieves at least 99.99 percent (4-log) inactivation or removal of viruses and that have a total coliform positive routine sample under the Total Coliform Rule sampling in the distribution system; and

    - Assessment monitoring as a complement to triggered monitoring. A state has the option to require systems to conduct source water assessment monitoring at any time to help identify high risk systems.

3. Corrective action required for any systems with a significant deficiency or source water fecal contamination. The system must implement one or more of the following corrective action options: correct all significant deficiencies; eliminate the source of contamination;

provide an alternate source of water; or provide treatment that reliably achieves 99.99 percent inactivation or removal of viruses.

4. Compliance monitoring to ensure that treatment technology installed to treat drinking water reliably achieves at least 99.99 percent inactivation or removal of viruses.

The compliance date for requirements of this rule, other than the sanitary survey, was December 1, 2009. The City's last sanitary survey was completed in August 2016. The City has addressed all of the deficiencies identified in this sanitary survey and complies with all other requirements of this rule.

Future Regulations

The drinking water regulations are continuously changing in an effort to provide higher quality and safer drinking water. Modifications to the existing rules described above and implementation of new rules are planned for the near future. A summary of upcoming drinking water regulations that will most likely affect the City is presented in the following section.

Radon Rule

In July 1991, the EPA proposed a regulation for radon, as well as three other radionuclides. The 1996 SDWA Amendments required the EPA to withdraw the 1991 proposal, due to several concerns that were raised during the comment period. A new proposed regulation was published in the Federal Register on November 2, 1999. Comments on the proposed rule were due to the EPA by February 4, 2000. Final federal requirements for addressing radon were expected to be implemented in 2003; however, they have not been published to date. The rule proposes a 300 pCi/L MCL for community water systems that use ground water, or an alternative, less-stringent MCL of 4,000 pCi/L for water systems where their state implements an EPA-approved program to reduce radon risks in household indoor air and tap water.

It is not currently known what the implementation of this rule in the state will be and also what the concentrations of radon are in the City's sources. Therefore, the impact of this rule is unknown at this time.

Unregulated Contaminant Monitoring Regulation Revisions

In accordance with the original UCMR, the EPA is proposing an updated contaminants monitoring list for the next 5-year monitoring cycle, in addition to other minor revisions to the UCMR. The proposed rule was published August 22, 2005, in the Federal Register, and the comment period for the proposed revisions closed on October 21, 2005. The proposed revisions include a list of 26 chemicals that must be monitored and approves several new testing methods to conduct the monitoring. For this upcoming cycle, all systems serving 100,000 people, and a larger representative sample of smaller water systems than mandated under the original rule, will be required to monitor for contaminants. The rule also requires additional water system data to be reported with the monitoring results, establishes a procedure for determining minimum reporting levels, and proposes several revisions to the implementation of the monitoring program.

SOURCE WATER QUALITY

This section presents the current water quality standards for groundwater sources and the results of the City's recent source water quality monitoring efforts. A discussion of the water quality requirements and monitoring results for the City's distribution system is presented in the section that follows.

Drinking Water Standards

Drinking water quality is regulated at the federal level by EPA and at the state level by DOH. Drinking water standards have been established to maintain high-quality drinking water by limiting the levels of specific contaminants (i.e., regulated contaminants) that can adversely affect public health and are known or are likely to occur in public water systems. Non-regulated contaminants do not have established water quality standards and are generally monitored at the discretion of the water purveyor and in the interest of customers.

The regulated contaminants are grouped into two categories of standards – primary standards and secondary standards. Primary standards are drinking water standards for contaminants that could affect health. Water purveyors are required by law to monitor and comply with these standards and notify the public if water quality does not meet any one of the standards. Secondary standards are drinking water standards for contaminants that have aesthetic effects, such as unpleasant taste, odor, or color (staining). The national secondary standards are unenforceable federal guidelines or goals where federal law does not require water systems to comply with them. States may, however, adopt their own enforceable regulations governing these contaminants. The State of Washington has adopted regulations that require compliance with some of the secondary standards. Water purveyors are not required to notify the public if water quality does not meet the secondary standards.

Source Monitoring Requirements and Waivers

The City is required to perform water quality monitoring at each of the active sources for inorganic chemical and physical substances, organic chemicals, and radionuclides. The monitoring requirements that the City must comply with are specified in WAC 246-290-300. A description of the source water quality monitoring requirements and procedures for each group of substances is contained in **Appendix F – *Coliform Monitoring Plan*** of this WSP.

In 1994, DOH developed the Susceptibility Assessment Survey Form for water purveyors to complete for use in determining a drinking water source's potential for contamination. The results of the susceptibility assessment may provide monitoring waivers that allow reduced source water quality monitoring. DOH assigned a high susceptibility rating to the City's spring sources, a moderate susceptibility rating to the Ball Park Wellfield, and a low susceptibility rating for the Tacoma Points Wellfield based on the results of the susceptibility assessment survey for each source. A rating of high susceptibility is typically ascribed to spring sources. The high ratings for Victor Falls and Grainger Springs are not substantiated by any water quality or other evidence of surface water contamination.

The sources were granted a susceptibility waiver that allowed the City to avoid monitoring of synthetic organic chemicals (SOCs) through 2021. The sources were also granted a 9-year inorganic contaminant (IOC) waiver through 2019. Although the City has obtained these waivers, it has historically completed the water quality testing for information purposes.

Source Monitoring Results

The quality of the City's sources has been good and meets or exceeds all drinking water standards, except for slightly higher than allowable levels of manganese at the Ball Park Wells. The City monitored each source for VOCs in 2017. Monitoring of inorganic chemical and physical substances has been accomplished once per year since 1993, although monitoring is only required once every 3 years. Nitrate monitoring has also been performed once per year since 1993. The results of inorganic chemical (including nitrate) monitoring and VOC monitoring for the City's sources indicate that all primary and secondary standards were met. The results of radionuclide monitoring, which was done in 2016, 2017 and 2018, indicated that all of the City's sources were in compliance with the regulations.

DISTRIBUTION SYSTEM WATER QUALITY

Monitoring Requirements and Results

The City is required to perform water quality monitoring within the distribution system for coliform bacteria, disinfectant (chlorine) residual concentration, lead and copper, and asbestos in accordance with Chapter 246-290 WAC. A description of the distribution system water quality monitoring requirements and procedures are contained in that is included in **Appendix F – *Coliform Monitoring Plan*** of this WSP.

The City has been in compliance with all monitoring requirements for the past several years. A summary of the results of distribution system water quality monitoring within the City's system is presented below.

Coliform Monitoring

The City is required to collect a minimum of 40 coliform samples per month from different locations throughout the system, based on an estimated population served of over 38,000 in 2018. The results of coliform tests from 2008 through 2018 were all satisfactory.

Lead and Copper Monitoring

The LCR identifies the action level for lead as being greater than 0.015 mg/L and the action level for copper as being greater than 1.3 mg/L. The results of the tests from 2017, which included 38 sample sites, indicated a range of less than 0.001 mg/L to 1.6 mg/L for copper. These results have all been satisfactory, since the 90th percentile concentration of either lead or copper from each group of samples has not exceeded the action levels.

Disinfectant Residual Concentration Monitoring

Disinfection requirements applicable to the City are contained in WAC 246-290-310, which states that a disinfectant residual concentration shall be detectable in all active parts of the distribution system and that the maximum residual disinfectant level shall be 4.0 mg/L for chlorine and chloramines. The City's chlorination targets are to maintain a free chlorine residual above 0.5 mg/L at entry points to distribution at all times, and to ensure a distribution free chlorine residual that is equal to or above 0.2 mg/L in at least 95 percent of monthly samples. In 2018, free chlorine ranged between 0.34 and 1.62 mg/L and averaged 0.75 mg/L throughout the distribution system. The water samples collected by the City for coliform analysis are also tested for residual disinfectant concentration. The results of residual disinfectant concentration tests indicate that the City is in compliance with the regulations.

Disinfectants/Disinfection Byproducts Monitoring

THM and HAA5 are disinfection byproducts that are formed when free chlorine reacts with organic substances (i.e., precursors), most of which occur naturally. Formation of THM and HAA5 are dependent on such factors as the amount and type of chlorine and contact time. THM have been found to cause cancer in laboratory animals and are suspected to be human carcinogens. The City has been sampling for THM and HAA5 quarterly since 2012, and revealed concentrations lower than their MCLs. Therefore, the City is in compliance with this regulation.

In response to the Stage 1 and Stage 2 D/DBPR, the City expanded its distribution system monitoring to include THM and HAA5. The City also completed an IDSE standard monitoring plan, which was submitted to the EPA for compliance. The IDSE standard monitoring plan is included in **Appendix V – *IDSE Standard Monitoring Plan*** of this WSP.

Asbestos

Asbestos monitoring is required if the sources are vulnerable to asbestos contamination or if the distribution system contains more than 10 percent of asbestos cement (AC) pipe. Although none of the City's sources are susceptible to asbestos contamination, AC pipe composes more than 10 percent of the City's distribution system. Therefore, the City must monitor for asbestos in the distribution system. The current MCL for asbestos is 7 million fibers per liter and greater than 10 microns in length. Monitoring must be accomplished during the first 3-year compliance period of each 9-year compliance cycle. The water sample must be taken at a tap that is served by an AC pipe under conditions where AC contamination is most likely to occur. The City's most recent sample in 1998 did not contain asbestos contamination.