

EXECUTIVE SUMMARY

Purpose and Compliance

The purpose of this Comprehensive Water System Plan is to document the City of Battle Ground's (City's) water system infrastructure and evaluate the system's physical and financial adequacy to provide water to existing customers and projected growth within the water service area. This plan includes an inventory of existing facilities, development of criteria for water system analysis, a hydraulic analysis of water system performance, a capital improvement program (CIP) based on the hydraulic analysis and a financial plan to fund the proposed CIP and assess existing revenue and expenses. This plan also includes an assessment of the City's groundwater resources, water rights, operations and water use efficiency program.

This plan follows the Washington State Department of Health Office of Drinking Water's guidelines for Water System Plans and complies with Washington Administrative Code (WAC) 246-290-100.

Water System Overview

The City relies primarily on groundwater wells for its municipal supply. The City currently maintains eight (8) groundwater wells and two (2) emergency interties with Clark Public Utilities (CPU). The City uses its own groundwater wells as the primary source of supply for the system, supplementing with water from the CPU interties as necessary during peak usage periods. The City's wells are chlorinated, using liquid sodium hypochlorite, for disinfection and liquid sodium fluoride is added for dental benefits. Some of the City's wells also receive iron and manganese treatment.

Water supplied from the City's wells and CPU is stored in six (6) water storage reservoirs. Five (5) of these reservoirs, located on Tuke's Mountain, provide gravity supply to the majority of the City's distribution system which is served from a single pressure zone, the Main Pressure Zone, at an approximate hydraulic grade line (HGL) of 544 feet. The sixth reservoir, Horsethief Reservoir, provides suction supply to the adjacent Horsethief Pump Station which pumps water into the distribution system and up to the Tukes Mountain storage reservoirs. A second pump station, the Tukes Mountain Pump Station, provides added pressure to serve homes that are too high in elevation to receive adequate service pressure by gravity from the Tuke's Mountain reservoirs. This area is referred to as the Tukes Mountain Pressure Zone.

Service Area

The City currently serves residential, commercial, multi-family, and institutional customers within the city limits and less than 10 residences outside the city limits. Some residents within the city limits are served by CPU. The City and CPU have established, through

interlocal agreements, that CPU will continue to serve any of its existing service area that is annexed by the City. Consistent with the City's policies, any area within the Urban Growth Area that is annexed and is not currently served by CPU will be served by the City.

Projected Population, Equivalent Residential Units (ERUs) and Water Demand

The City has experienced rapid growth over the last two (2) decades, growing from a population of less than 4,000 in 1990 to approximately 17,780 in 2011. The City's growth is expected to continue, reaching over 34,000 residents in 2031. Future population and water demand projections for the City's water service area were developed based on population data from the Washington State Office of Financial Management, City water production records and customer billing data. City staff estimate that approximately 75 percent of the City's population is within the water service area.

Although the water service area population differs from the City's population, it is anticipated that city-wide growth will reflect growth within the water service area. Based on recent population growth within the City, projected water service area population at the 6-year planning horizon in 2018 is estimated based on an annual average growth rate of 1.5 percent. Beyond 2018, through the 20-year planning horizon population growth is projected based on an annual average growth rate of 3.93 percent as presented in the City's *2004 Comprehensive Plan*. The smaller growth rate for the 6-year planning horizon is considered appropriate for the current development climate in the City.

The demand of each customer class, such as residential, commercial or multi-family, can be expressed in terms of ERUs for demand forecasting and establishing system capacities. One (1) ERU is equivalent to the average amount of water used by a single family residence. The number of ERUs represented by the water demand of customer groups other than residential is determined from the total demand of the customer group and the demand per ERU calculated from the single family residential demand data. Table ES-1 presents the projected service area population, ERUs and water demands for current 2012, 6-year and 20-year planning horizons.

Water System Evaluation Criteria, Analysis and Deficiencies

The City's supply, pumping, storage, and distribution facilities were analyzed based on industry standard criteria developed by the Washington State Department of Health. The water demand forecasts summarized in Table ES-1 are used in conjunction with these criteria to assess the adequacy of the water system to deliver sufficient quantities of water under peak or fire flow conditions at acceptable pipeline velocities and system pressures as well as to assess the system's reliability.

**ES-1
Population and Demand Projections Summary**

Projection Year	Estimated Service Area Population	ERUs	Pressure Zone	Water Demands		
				ADD (mgd)	MDD (mgd)	PHD (gpm)
Current 2012	13,535	6,618	Main	1.27	2.84	3,245
			Tukes Mt.	0.02	0.05	53
			Total	1.29	2.89	3,298
6-Year 2018	14,800	7,236	Main	1.39	3.11	3,540
			Tukes Mt.	0.02	0.05	58
			Total	1.41	3.16	3,598
20-Year 2032	25,390	12,412	Main	2.38	5.33	6,012
			Tukes Mt.	0.04	0.09	98
			Total	2.42	5.42	6,110

Notes:

1. ERU projections are based on ERU growth rates equivalent to the population growth rates presented in Table 2-6.
2. 195 gpd/ERU was used to forecast future average daily demand based on historical demand per ERU.
3. MDD projections are calculated by multiplying the ADD by the peaking factor 2.24.
4. PHD is projected from MDD using the estimating method described in the *December 2009 DOH Water System Design Manual*.
5. Tukes Mountain Pressure Zone demand is estimated as 1.6 percent of total system demand.

Water Supply

Supply capacity is evaluated by comparing existing and projected MDD for the City’s service area to the total available supply from all sources and the City’s existing water rights. Existing water rights are sufficient to support projected water system MDD through 2018. Currently, the City cannot use their full water rights because existing wells do not have adequate operational capacity. Based on the City’s current understanding of the potential to expand the capacity of existing wells to utilize the full water rates and volumes, no further groundwater expansion is anticipated within the City. If the City is able to drill additional wells and transfer the location of existing water rights there will still be a need for wholesale supply over the 20-year planning period. The City is currently coordinating with CPU to participate in the development of regional water supply and transmission facilities to serve the north Clark County area.

The current maximum operational supply will be insufficient within the 6-year planning horizon due to the decline of existing well yields. To address this known operational deficiency, the City is moving forward with plans to construct a larger intertie with CPU that would initially provide a supply of 1,000 gallons per minute (gpm) or 1.44 mgd. This new intertie would include provisions for a future capacity of 3,000 gpm (4.32 mgd) as CPU develops new water sources. Under existing conditions, supply reliability is deficient for

some criteria. However, with the planned addition of the 1,000 gpm CPU intertie and its eventual expansion to 3,000 gpm, all supply reliability criteria will be met within the 20-year planning period.

The City is also considering the replacement of Well No. 7 or 8, if necessary, to maintain adequate well yields pending the construction of the new intertie and associated regional groundwater supply facilities. Based on long-range demand forecasting and the uncertainty of continued supply capacity from the City's existing groundwater wells, Battle Ground is currently coordinating with CPU to develop agreements for expanding the intertie capacity and participation in the Paradise Point regional groundwater supply to a total capacity of 4,000 gpm.

Pump Stations

The capacity requirements for booster pumping facilities vary based on whether the pump station is supplying a reservoir which then serves customers by gravity in an "open pressure zone" or supplying constant pressure to an area, referred to as a "closed pressure zone". In the City's water system there are two (2) pump stations, the Horsethief and Tukes Mountain pump stations. The Horsethief Booster Pump Station supplies the Main Zone which is an open pressure zone because the HGL is dictated by water levels in the Tukes Mountain Reservoirs. The Tukes Mountain Pump Station supplies the closed Tukes Mountain Pressure Zone with constant pressure water service.

Although there is an apparent MDD deficiency at the Horsethief Pump Station in 2032, before recommending expanded station capacity, it is important to consider the contribution of supply sources simultaneously serving Main Zone customers. The capacity of existing Wells 1, 2, 4 and 5 and the existing CPU intertie offset the Horsethief Pump Station deficiency in 2032. No additional capacity is recommended at the Horsethief Pump Station.

The existing Tukes Mountain Pump Station meets capacity criteria through 2032, with or without the largest pump in service. The current configuration of the Tukes Mountain Pump Station meets all reliability criteria. No additional capacity is recommended at the Tukes Mountain Pump Station.

Storage Reservoirs

Water system storage is provided for different purposes which are represented by the following storage components: operational, equalizing, standby, fire, and dead storage.

- Operational storage is used to supply the water system under normal demand conditions.
- Equalizing storage must be provided when supply source pumping capacity cannot meet periodic peak demands.
- Standby, or emergency, storage is used to provide a measure of reliability should supply sources fail or unusual conditions impose higher demands than anticipated.

- Fire suppression storage provides adequate volume to supply the system at the maximum rate and duration required to extinguish a fire at the building with the highest fire flow requirement.
- Dead storage is defined as water that cannot be used because it is stored at an elevation that is too low to provide sufficient pressure by gravity within the service area.

Storage capacity and reliability for the City’s system is assessed on a system-wide basis, including customer demands from both the Main and Tukes Mountain Pressure Zones. The entire volume of the Horsethief Reservoir is considered dead storage because it is not capable of supplying the water system by gravity but only through the Horsethief Pump Station. The storage evaluation indicates that the City’s system will meet storage requirements through the 6-year planning period, but will become deficient before 2032. A new Main Zone storage reservoir with an approximate capacity of 1.4 million gallons (MG) should be planned in approximately 2023, when existing storage is estimated to become deficient. Current storage volume and operational features satisfy all reliability criteria.

Transmission and Distribution Piping

The City’s existing distribution and transmission mains were evaluated using a hydraulic network analysis model to determine if the system is sized and looped adequately to provide the necessary flow rates and service pressures to meet existing and future demands. The results of the modeling analysis indicate that the system effectively maintains a minimum pressure of 30 psi to all customers under the PHD condition. However, for the MDD plus fire flow condition, three (3) existing piping deficiencies were identified:

- An estimated 550 linear foot (LF) section of existing 2-inch main along SW 2nd Court, north of SW 4th Street. This 2-inch main should be upgraded to an 8-inch waterline that can deliver fire flows under the MDD condition at the minimum required 20 psi residual pressure, as well as reduce pipeline velocities to acceptable levels.
- A portion of the existing 2-inch main along SW 3rd Street extending from S Parkway Avenue. It is recommended that approximately 50 LF of this main between the 8-inch existing main on S Parkway Avenue and an existing fire hydrant on SW 3rd Street be upsized to meet fire flow, pressure and recommended pipeline velocity requirements. The remainder of the existing 2-inch main is located within private property and could continue to provide nominal residential demands.
- An estimated 1,190 LF of 6-inch main along NE Grace Avenue, between NE 6th Street and NE 10th Streets, should be upgraded to an 8-inch main to meet fire flow residual pressure requirements.

Construction of transmission main improvements as part of the overall transmission grid, extending on SW 20th Avenue, are also included in the CIP, anticipating that City transportation projects may occur prior to other potential drivers of this improvement associated with development in this area of the City.

Within the last 15 years, the City has undertaken a rigorous CIP that has resulted in replacement of a large portion of the older distribution system. This has allowed the newly constructed pipelines to be brought up to current industry and City standards, resulting in a distribution system that meets most reliability criteria. A continuing allowance is included in the City's updated CIP for yearly water main replacement of the remaining older system piping, further fortifying system reliability.

Water Resource Evaluation

Distribution System Leakage (DSL)

DSL is water lost from the distribution system including both apparent losses and real losses. There are many sources of DSL in a typical water system including water system leaks, inaccurate supply metering, inaccurate customer metering, water service line and main breaks from construction, illegal water system connections or water use, and malfunctioning telemetry and control equipment resulting in an overflow of storage tanks. The current three-year rolling average for DSL is 8.5 percent, which meets the City's water conservation goals by having less than 10 percent DSL by 2017.

Water Use Efficiency (WUE)

The City updated their WUE program in 2011, according to Washington State Department of Health guidelines. The City's WUE program includes conservation measures that have resulted in a significant DSL reduction. Through these measures, the City's goal of attaining annual system leakage below 10 percent was first achieved in 2009 and continues to be maintained. Average customer demand per ERU has also decreased significantly, well in excess of the City's goal of 1 percent over six years established in 2011. With the program's success, there is limited additional conservation potential and no additional measures are currently planned for implementation.

Water Rights

An evaluation of the City's existing water rights was performed to determine the sufficiency of the water rights to meet both existing and future water demands. The City has more than enough instantaneous and primary annual water rights to meet existing MDD and ADD respectively. Based on future demand projections, the City will need to expand both instantaneous and primary annual water rights or increase the amount of water supply from CPU before 2020.

Recommended CIP

The updated CIP presented in Table ES-2 summarizes water system improvements recommended for construction within the City's 20-year planning horizon. The water system improvements recommended in the CIP address the existing system deficiencies and provide for the future needs of the City. Implementing these improvements will help ensure that the City's customers continue to receive reliable, high-quality water service.

An estimated project cost has been developed for each improvement project presented in the CIP. Cost estimates represent opinions of cost only, acknowledging that final costs of individual projects will vary depending on actual labor and material costs, market conditions for construction, regulatory factors, final project scope, project schedule and other factors. The cost estimates presented here are considered Class 4 by the Association for the Advancement of Cost Engineering International (AACE International) with an end usage being a study or feasibility evaluation and an expected accuracy range of -30 percent to +50 percent. As the project is better defined the accuracy level of the estimates can be narrowed. Estimated project costs include approximate construction costs and an allowance for administrative, engineering and other project related costs.

Table ES-2 Capital Improvement Program

Category	CIP No.	Project Description / Location	CIP Schedule and Project Cost Summary (2012 dollars)							Estimated Project Cost ^{1,2}	
			2013	2014	2015	2016	2017	2018	2019-2032		
Supply System Improvements	SS1	New Intertie/Pump Station on NE 219th	\$ 1,360,000								\$ 1,360,000
	SS2	NE 219th Intertie/Pump Station Upgrade (2021)								\$ 140,000	\$ 140,000
	SS3	Regional Source and Transmission Development			\$ 1,375,000	\$ 675,000	\$ 675,000	\$ 675,000	\$ 9,450,000	\$ 12,850,000	
		Well Replacement			\$ 800,000					\$ 800,000	
		<i>Sub-Total</i>	\$ 1,360,000	\$ -	\$ 2,175,000	\$ 675,000	\$ 675,000	\$ 675,000	\$ 9,590,000	\$ 15,150,000	
Storage Improvements	ST1	New 1.4 MG Reservoir (2023)							\$ 1,800,000	\$ 1,800,000	
		<i>Sub-Total</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,800,000	\$ 1,800,000	
Water Main Improvements	WM1	Annual Water Main Replacement Program	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 1,400,000	\$ 1,700,000	
	WM2	SW 2nd Court 8-inch Main							\$ 105,000	\$ 105,000	
	WM3	SW 3rd Street 8-inch Main to Hydrant							\$ 10,000	\$ 10,000	
	WM4	NE Grace Avenue 8-inch Main							\$ 475,000	\$ 475,000	
		SW 20th Avenue 12-inch Transmission						\$ 565,000		\$ 565,000	
		<i>Sub-Total</i>	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 615,000	\$ 1,990,000	\$ 2,855,000	
Capital Improvement Program (CIP) Total			\$ 1,410,000	\$ 50,000	\$ 2,225,000	\$ 725,000	\$ 725,000	\$ 1,290,000	\$ 13,380,000	\$ 19,805,000	

¹ Cost estimates are based on an Engineering (ENR) construction cost index of 9418 for Seattle, Washington (October 2012).

² Cost Estimates are in current dollars. (October 2012)

6 Year Total
\$6,425,000
Annual Avg
\$1,070,833

20 Year Total
\$19,805,000
Annual Avg
\$990,250

Financial Plan

The financial plan matches funding sources with the CIP presented in Table ES-2 and develops a multi-year water rate strategy to demonstrate financial viability in meeting the total costs of providing water service, which include:

- Financial policies
- Operating and maintenance (O&M) costs
- Administrative and overhead costs
- Capital related costs

The analysis considers the historical financial performance of the utility, the financial impact of executing the capital program, the sufficiency of current utility revenues, and the affordability of rates. The current water rate structure is also evaluated in terms of achieving revenue stability, efficiency of use and customer equity.

The results of this analysis indicate that inflationary level rate increases are necessary to fund ongoing operating needs and the identified capital program. Implementation of proposed rate increases should provide for continued financial viability.

Past Financial Performance Key Findings

- Charges for Services increased 11 percent over the historical period due to a combination of customer growth and rate increases, with a peak in revenue collection in 2009.

The Operating Ratio (total operating expenses divided by total operating revenues) remained at about 60 percent in all years, indicating operating revenues are sufficient to meet operating expenses. A ratio greater than 90 percent would indicate that there is little room for new debt service and capital replacement without additional rate increases. A ratio greater than 100 percent would indicate that operating expenses exceed operating revenues and would be indicative of an unsustainable financial condition. The utility had no outstanding debt, providing ample debt capacity to fund future capital.

- A Quick Ratio (current assets divided by current liabilities) increasing from 3:1 to 38:1 reflects the positive cash position of the water utility from 2006 to 2011. Current Assets, comprised of primarily cash and investments, grew by 141 percent during this period.

Capital Costs and Funding Strategy

The capital funding plan defines a strategy for funding the CIP presented in Table ES-2 considering available cash reserves, system development charges (SDCs), external contributions from grants / developers and new debt proceeds, if required.

Capital costs are stated in 2012 dollars and escalated annually at 3 percent construction cost inflation to the year of planned spending for financing projections. The CIP identifies \$6.4 million (\$7.1 million escalated) in project costs over the 6-year planning horizon and \$19.8 million (\$26.8 million escalated) over the 20-year period. Each year has varied capital obligations depending on construction schedules and infrastructure planning needs. About 27 percent of capital program costs are scheduled for the 6-year period.

The City water utility is projected to have sufficient cash to fund the total CIP as planned without borrowing, due to significant existing cash reserves, policy for ongoing rate-funding for system reinvestment and SDC revenue collections.

Revenue Requirements Forecast

The revenue requirement analysis forecasts the amount of operating and capital related costs to determine the annual revenue required from rates. The analysis incorporates operating revenues, O&M expenses, debt service payments, rate funded capital needs, and any other identified revenues or expenses related to water utility operations, and determines the sufficiency of the current level of rates.

The financial forecast is developed from the City's 2012 projected year-end performance, along with other key factors and assumptions listed below:

- Water rate revenues are forecasted based on projected year-end 2012 water rate revenue plus 1 percent annual customer growth.
- Interest earnings on cash balances are assumed at 0.2 percent in 2013 phasing up to 2 percent by the end of the 6-year forecast.
- Operating costs are based on the 2013-2014 Biennial Budget.
- O&M expenses are escalated at 2.5 percent per year for labor and general system costs and 7 percent for employee benefit costs. State taxes are calculated using prevailing tax rates.

Current and Projected Rates

The existing water rate structure consists of a monthly basic meter charge of \$11.80, which includes three hundred cubic feet (CCF) of water. Residential customers pay \$2.05 per CCF for use above the three (3) CCF and up to 15 CCF. Use above 15 CCF is charged at \$2.56

per CCF. All other customers pay a basic meter charge that increases with meter size and a volume charge of \$2.20 per CCF for all water use.

While the existing structure adequately encourages water conservation, further refinements could be made to improve efficiency of use and customer equity including:

- Eliminate the water usage allowance and charge for all use in volume rates
- Implement a third tier in the residential block rate to target highest water users and provide greater relief to low water users
- Consider seasonal rates for non-residential customers

Table ES-3 compares existing and proposed rates under the existing water rate structure.

**Table ES-3
Existing and Projected Water Rates**

Monthly Rates		Existing	Across-the-Board Increases					
		2012	2013	2014	2015	2016	2017	2018
Basic Meter Charge	Inside-City per month rate - includes 3 ccf	\$11.80	\$11.80	\$12.80	\$13.18	\$13.58	\$13.99	\$14.41
Residential Consumption	Inside-City per 100 cubic feet							
	4 - 15 ccf	\$2.05	\$2.05	\$2.05	\$2.11	\$2.17	\$2.24	\$2.31
	>15 ccf	\$2.56	\$2.56	\$2.56	\$2.64	\$2.72	\$2.80	\$2.88
Basic Meter Charge Commercial	5/8" meter	\$19.35	\$19.35	\$19.35	\$19.93	\$20.53	\$21.14	\$21.78
	3/4" meter	\$21.35	\$21.35	\$21.35	\$21.99	\$22.65	\$23.33	\$24.03
	1" meter	\$36.50	\$36.50	\$36.50	\$37.60	\$38.72	\$39.88	\$41.08
	1.5" meter	\$65.20	\$65.20	\$65.20	\$67.16	\$69.17	\$71.25	\$73.38
	2" meter	\$101.00	\$101.00	\$101.00	\$104.03	\$107.15	\$110.37	\$113.68
	3" meter	\$201.00	\$201.00	\$201.00	\$207.03	\$213.24	\$219.64	\$226.23
	4" meter	\$321.00	\$321.00	\$321.00	\$330.63	\$340.55	\$350.77	\$361.29
Commercial Consumption	Inside-City per 100 cubic feet	\$2.20	\$2.20	\$3.20	\$3.30	\$3.39	\$3.50	\$3.60
Commercial Irrigation	Annual connection	\$45.00	\$45.00	\$45.00	\$46.35	\$47.74	\$49.17	\$50.65
	De-activation charge	\$20.00	\$20.00	\$20.00	\$20.60	\$21.22	\$21.85	\$22.51
Outside the City	Rates and charges are all 1.5 times the in-City rates and charges							

Note: Table ES-3 reflects changes to basic residential meter charges and commercial consumption charges adopted in 2014.

System Development Charge

A SDC is a one-time charge imposed on new customers as a condition of connecting to the utility system. SDCs provide a mechanism for new customers to share in the capital costs incurred to support their addition to the system. The revenue from SDCs can only be used to fund water utility capital projects or pay debt service incurred to finance capital projects. In the absence of such charges, growth-related capital costs would be borne in large part by existing customers.

For the purposes of the financial analysis, the existing (2012) SDC is \$2,210 for new single family residential water customers. Based on projected infrastructure needs identified in the 20-year CIP presented in Table ES-2 and system capacity, an updated charge of \$3,074 per ERU was calculated for 2013. The updated SDC will be implemented in 2014 and adjusted for 2015 inflation. The proposed 2015 charge, incorporating inflation projected at 3 percent annually, is \$3,261 per ERU. The updated schedule of SDCs is summarized in Table ES-4.

**Table ES-4
SDC by Meter Size**

Existing Water SDCs		Planned 2014 SDC		Proposed 2015 SDCs	
Meter Size	Charge	Meter Size	Charge	Meter Size	Charge
5/8"	\$ 2,210	5/8"	\$ 3,074	5/8"	\$ 3,261
3/4"	\$ 3,315	3/4"	\$ 4,611	3/4"	\$ 4,892
1"	\$ 5,525	1"	\$ 7,685	1"	\$ 8,153
1.5"	\$ 13,260	1.5"	\$ 18,444	1.5"	\$ 19,568
2"	\$ 22,100	2"	\$ 30,741	2"	\$ 32,613
3"	\$ 50,830	3"	\$ 70,704	3"	\$ 75,010
4"	\$ 90,610	4"	\$ 126,037	4"	\$ 133,713