



# MUKILTEO WATER & WASTEWATER DISTRICT Comprehensive Water System Plan

G&O #15424  
December 2015



**Gray & Osborne, Inc.**

# MUKILTEO WATER & WASTEWATER DISTRICT

SNOHOMISH COUNTY

WASHINGTON



## COMPREHENSIVE WATER SYSTEM PLAN



G&O #15424  
DECEMBER 2015



**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS

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## **EXECUTIVE SUMMARY**

The Mukilteo Water & Wastewater District Comprehensive Water System Plan (Plan) provides a long-term planning strategy for the District's water utility over the 10- and 20-year planning periods. The Plan has been prepared consistent with Department of Health requirements as specified in the Washington Administrative Code (WAC) Chapter 246-290. The Plan represents a commitment by the District to pursue and implement the Plan's recommendations and capital improvements.

### **PLAN SUMMARY**

Chapters 1 and 2 of the Plan provide background data, including a description of existing facilities, service area, service area policies, and projections of population and water use. Chapter 3 presents water quality standards and District monitoring requirements. Chapter 4 presents water system design standards and an analysis of the District's supply, storage and pumping capacities. Chapter 5 is a distribution system hydraulic analysis that includes a modeling summary and the basis for identification of distribution system improvements. Chapter 6 discusses the District's operation and maintenance procedures. Chapter 7 presents the District's Water Use Efficiency Program, including the District's conservation program as well as compliance with the Municipal Water Law. Chapter 8 presents the recommended capital improvements. Chapter 9 presents a summary of the District's finances. The nine chapters of this report are followed by appendices that contain supporting documentation.

### **POPULATION AND WATER USE PROJECTIONS**

The District's water service population is approximately 24,100 people served by approximately 5,700 connections. The District's water service population is expected to reach a build-out of approximately 28,500.

Since its establishment, the District has obtained all of its drinking water from the City of Everett. The District purchases treated water, while the District owns and maintains the storage, transmission, and distribution system within its service area. In 2009, the District entered into an agreement with the Alderwood Water & Wastewater District (AWWD) for the purchase of wholesale water. The new supply with AWWD has improved water quality, system pressure, and reduce regional operational costs. The project also improved source reliability and provides the District with a long-term water supply contract. AWWD purchases supply from the City of Everett and resells a portion of it to the District. The District also purchases supply directly from the City of Everett. The City of Everett treats surface water from the Sultan River and Spada Lake and has sufficient water rights and treatment capacity to meet all of its customer's demands (including the District) beyond the 20-year planning period.

Table E-1 presents the projected population and water use for the next 20 years.

**TABLE E-1**

**Population and Water Use Projections**

	<b>Projected Population<sup>(1)</sup></b>	<b>Projected Average Day Demand<sup>(2)</sup> (mgd)</b>	<b>Projected Peak Day Demand<sup>(3)</sup> (mgd)</b>	<b>Projected Peak Hour Demand<sup>(4)</sup> (gpm)</b>
2015	24,051	1.83	3.66	4,330
2016	24,177	1.84	3.68	4,350
2017	24,302	1.85	3.70	4,380
2018	24,428	1.87	3.74	4,400
2019	24,553	1.88	3.76	4,430
2020	24,679	1.89	3.78	4,460
2021	24,805	1.90	3.80	4,480
2022	24,930	1.91	3.92	4,510
2023	25,056	1.92	3.94	4,540
2024	25,182	1.93	3.96	4,560
2025	25,307	1.94	3.98	4,590
2035	28,451	2.23	4.46	5,270

(1) From Table 2-6.

(2) From Table 2-19.

(3) Based on a peak day factor of 2.0 (peak day demand = 2.0 x average day demand).

(4) Based on a peak hour factor of 1.7 (peak hour demand = 1.7 x peak day demand).

**WATER USE EFFICIENCY PROGRAM**

The District has developed a Water Use Efficiency Program in accordance with the Water Use Efficiency (WUE) Rule. The District participates in Everett’s regional program and has adopted goals consistent with Everett’s system-wide program. The District’s program includes metering all customers’ water use, displaying historical water use on customer bills, replacing failing meters through an annual program, distributing indoor and outdoor water conservation kits, and informing customers of conservation techniques. The District also aggressively attempts to reduce lost water by conducting annual leak detection surveys throughout the system, providing customer leak detection, and discussing water conservation methods with high consumption customers. The District maintains a distribution system leakage rate of less than 10 percent, which is compliant with the WUE Rule. The District plans to continue its current WUE Program into the future.

**CAPITAL IMPROVEMENT PLAN**

The Plan contains a list of projects for the District’s capital improvement plan for the 10-year and 20-year planning horizons. These projects focus on replacing water mains throughout the system to provide increased reliability, better water quality, and increased

fire flow availability to the system. The District may reprioritize projects in the future to accommodate other agencies and unforeseen events. Table E-2 provides a summary of capital improvement costs the District plans to undertake within the 10-year planning horizon.

**TABLE E-2**

**Capital Improvement Plan Summary**

<b>Year</b>	<b>District Projects</b>
2016	\$4,270,500
2017	\$852,500
2018	\$791,000
2019	\$658,000
2020	\$619,500
2021	\$2,083,500
2022	\$1,738,000
2023	\$374,000
2024	\$78,000
2025	\$223,000

**FINANCIAL**

The District intends to continue to perform regular rate studies to fund the proposed capital improvement plan, general administration, operation, and maintenance through a combination of rates, system development charges, and loans.

# CHAPTER 1

## INTRODUCTION

### INTRODUCTION

This Comprehensive Water System Plan (Plan) for the Mukilteo Water & Wastewater District (District) is an update of the *Mukilteo Water & Wastewater District Water System Comprehensive Plan* (2010). The Plan is prepared in accordance with the Washington State Department of Health (DOH) Washington Administrative Code (WAC) 246-290-100.

### SYSTEM OWNERSHIP AND MANAGEMENT

The District is located in southwest Snohomish County between Puget Sound and the City of Everett. Figure 1-1 provides a regional vicinity map in relation to the District. The DOH water system identifying number for the District is 57550J. A copy of the Water Facilities Inventory (WFI) is included in Appendix A. The District's office is located at 7824 Mukilteo Speedway in Mukilteo, Washington. The District is currently managed by a three-member Board of Commissioners who are elected to 6-year terms. The current commissioners are:

- Mike Johnson
- Thomas McGrath
- Thomas Rainville

The General Manager is appointed by the Board of Commissioners and is responsible for the day-to-day operations of the District. The current General Manager is James Voetberg.

### PURPOSE

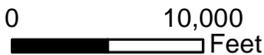
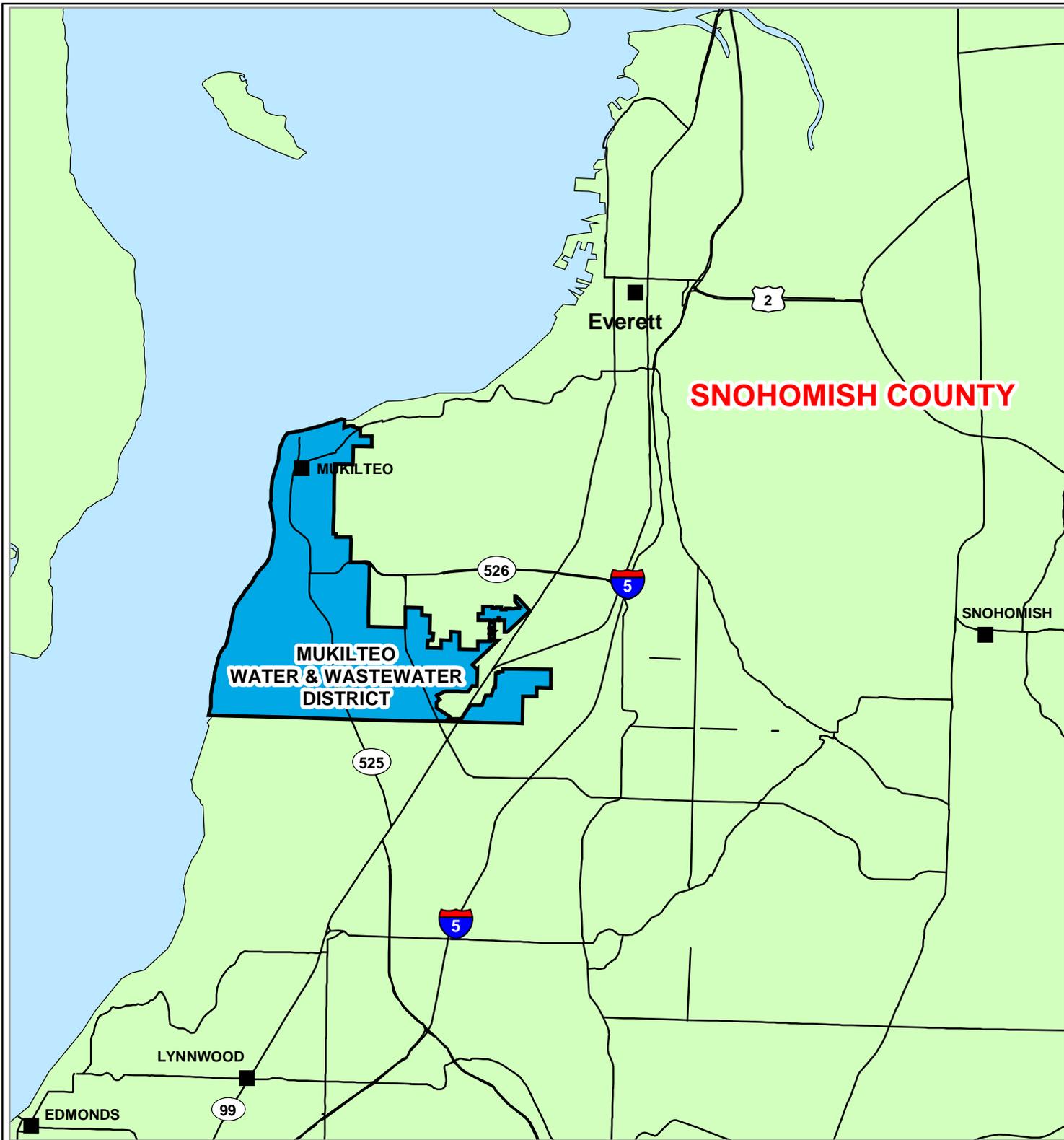
In accordance with WAC 246-290-100 and the DOH, water system plans must be updated every 10 years, or more frequently if necessary, to reflect the current conditions of the water system. In order to fulfill planning requirements, the District has authorized Gray & Osborne, Inc. to prepare an update to the Plan.

The purpose of the Plan is to assist the District with developing a long-term planning strategy for its water utility. The Plan evaluates the existing system and its ability to meet the requirements for source, quality, storage, and distribution over a 20-year planning period. Recommendations for system improvements are made in conformance with the planning requirements of the State of Washington's Growth Management Act (GMA) and in conformance with the DOH rules and regulations for public water systems.

## SCOPE

The Plan provides planning information, system analysis, an operation and maintenance program, and a capital improvement plan throughout nine chapters. The basic contents of the Plan are organized into the following chapters:

- **Chapter 1, Introduction**, provides background information including system history, adjacent purveyors, inventory of existing facilities, service area agreements, interlocal agreements, and related planning documents.
- **Chapter 2, Basic Planning Data**, includes existing population and future population projections; number of service area connections; and water use data including production, consumption, distribution system leakage, peaking factors, and equivalent residential units. Service area characteristics, service area policies and conditions of service, existing and projected land use, and water demand forecasts are also included.
- **Chapter 3, Water Quality**, includes existing drinking water quality standards, water quality monitoring schedule, and water quality analysis that identifies deficiencies.
- **Chapter 4, System Analysis**, consists of system design standards, general facility standards, and an analysis of the District's source of supply, storage, and pumping capacity. The analysis identifies system deficiencies.
- **Chapter 5, Hydraulic Analysis**, discusses the hydraulic modeling program, model development, system demands, model calibration, and distribution system analysis that include peak hour and available fire flow simulations. Hydraulic deficiencies are identified in this chapter.
- **Chapter 6, Operation and Maintenance Program**, reviews the District's water system management, personnel, operator certification, routine operating procedures, preventive maintenance, record keeping, and water quality sampling procedures. It also discusses the District's coliform monitoring plan, emergency response program, safety procedures, cross-connection control program, and service reliability.
- **Chapter 7, Water Use Efficiency Program**, includes water use data collection, program development and implementation, recommended measures and level of implementation, regional conservation programs, reclaimed water opportunities, and the District's conservation program as well as compliance with the Municipal Water Law.



MUKILTEO WATER & WASTEWATER DISTRICT

WATER SYSTEM PLAN  
FIGURE 1-1  
LOCATION MAP



- **Chapter 8, Capital Improvement Plan (CIP)**, identifies improvements required to correct deficiencies identified in previous chapters and provides an implementation schedule for the 6-year, 10-year, and 20-year planning periods.
- **Chapter 9, Financial Program**, analyzes past income and expenses, the balanced 1-year operating budget, and revenue and cash flow to fund the CIP. In addition, it assesses the rate structure to consider affordability of rates and water conservation.

## **BACKGROUND INFORMATION**

### **HISTORY OF WATER SYSTEM DEVELOPMENT**

The Mukilteo Water District was formed in 1920 and is the oldest active water district in the State of Washington. The total District boundary, including open space and currently undeveloped land, is approximately 5,300 acres. Due to annexations with the City of Everett and other interlocal agreements, the current water retail service area (RSA) is 4,900 acres.

Since its establishment, the District has obtained all of its drinking water from the City of Everett. The District purchases treated drinking water, while the District owns and maintains the storage, transmission, and distribution system within its service area. In 2009, the District entered into an agreement with the Alderwood Water & Wastewater District (AWWD) for the purchase of wholesale water. AWWD purchases supply from the City of Everett and resells a portion of it to the District. The District also purchases supply directly from the City of Everett. The City of Everett treats surface water from the Sultan River and Spada Lake.

The Mukilteo Water District merged with the Olympus Terrace Sewer District (OTSD) on November 27, 2007. OTSD provided sewer service and wastewater treatment for a large portion of the City of Mukilteo and Paine Field. OTSD did not provide water service. The two districts merged to form the Mukilteo Water District in order to reduce costs and to combine workforces. In 2008, the Mukilteo Water District formally changed its name to the Mukilteo Water & Wastewater District.

### **ADJACENT PURVEYORS**

The District's boundaries are defined by Puget Sound to the north and west and by adjacent purveyors to the north, east, and south as shown on Figure 1-2. The District is bordered by the Alderwood Water & Wastewater District to the south and the City of Everett to the north and east.

## **City of Everett**

The City of Everett water service area is located to the north, northeast, and east of the District. According to the 2007 *City of Everett Comprehensive Water Plan*, the City plans to continue to supply its current wholesale customers, including the District, in the future. The City and the District do not have a formal wholesale water agreement.

The District and City of Everett have a 1984 interlocal agreement regarding annexations and service area transfers within the District's service area. Under this agreement, the City will refrain from assuming District facilities within annexed areas for a period of 10 years from the date of annexation. After 10 years, the City has the option of assuming responsibility for the water system facilities within the annexed area. A copy of the agreement is provided in Appendix B.

The District's 715 East Pressure Zone has a number of intertie connections with Everett. In these areas, the District reads the service meters and supplies the information to Everett, which adds this volume to the wholesale volumes recorded at the master meters and flow control meters. The areas that are within the current retail service area boundary of the District and within the Everett city limits are shown on Figure 1-2. The District currently owns and operates the water system facilities within such areas.

In 2009, the City of Everett constructed the Casino Road Elevated Tank. It supplies the District's 715 East Zone, one flow control meter, and one master meter. The facility is a 2 MG "Hydropillar" style elevated tank with a high water level of 747 feet (NAVD 88) and an overflow of 748 feet. The elevated tank is equipped with a pressure reducing valve (PRV) on the outlet that reduces the hydraulic grade to 715 feet. As a result of the PRV, the new facility supplies the District's 715 East Pressure Zone at a more consistent hydraulic grade than the previous facility. The tank previously supplied the 112<sup>th</sup> Street flow control meter which has been replaced with a straight section of pipe. The area previously served by the 112<sup>th</sup> Street flow control meter is now part of the 715 West Zone.

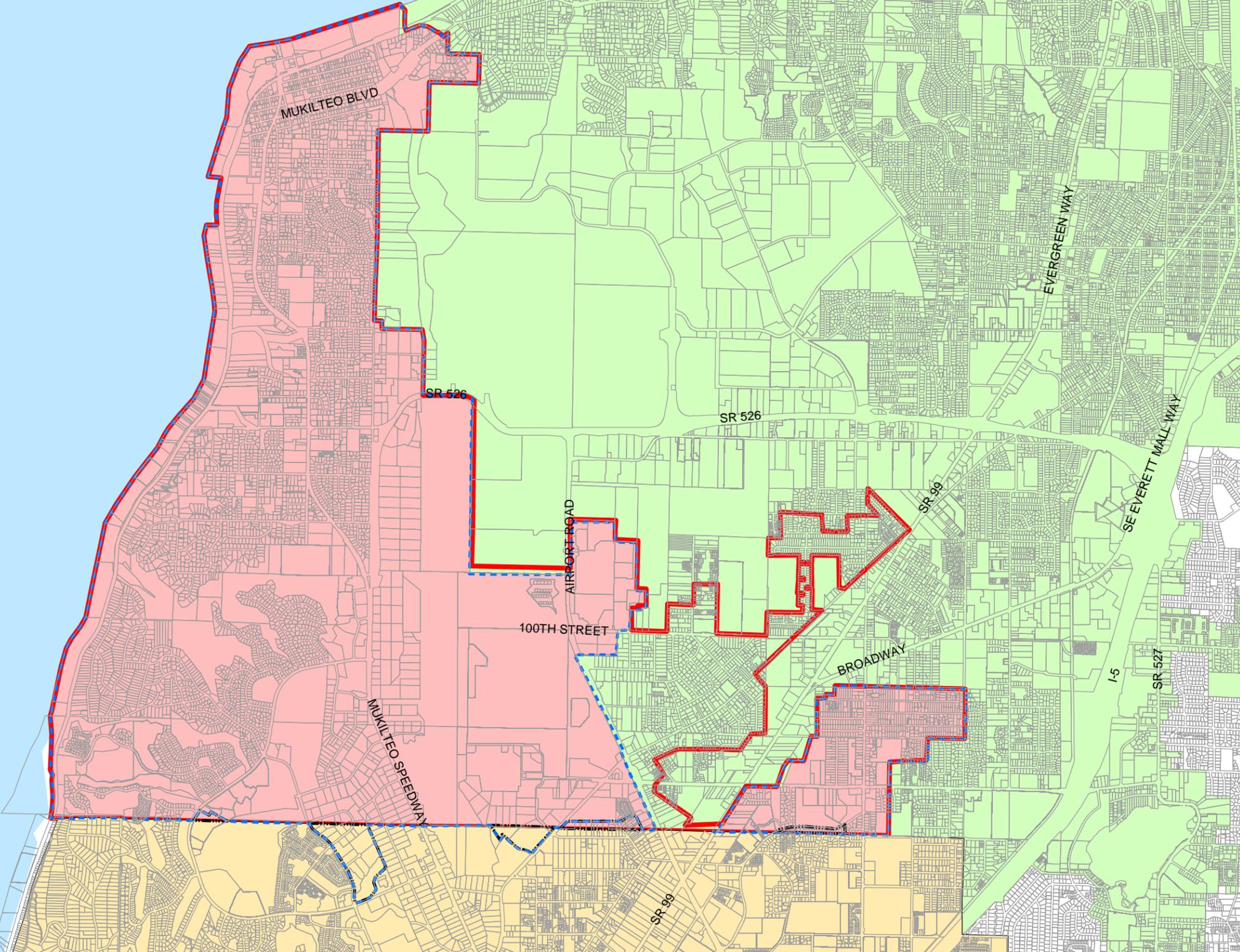
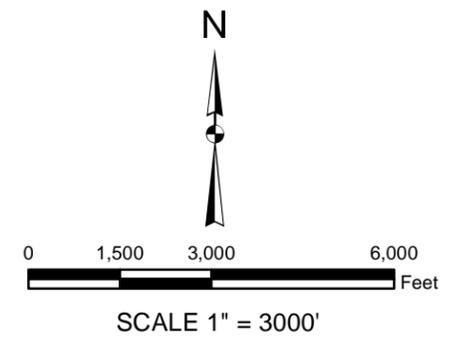
## **Alderwood Water & Wastewater District**

The AWWD purchases treated drinking water from the City of Everett and supplies water to the District as well as to the Cities of Edmonds, Brier, Bothell, Lynnwood, Mountlake Terrace, and Mill Creek as well as unincorporated areas in southwest Snohomish County.

AWWD's primary point of supply occurs at the City of Everett Reservoir 3. AWWD pumps from Reservoir 3 with its Evergreen Way Pump Station through two 30-inch transmission mains to three reservoirs totaling 76 MG of storage. One of the 30-inch mains passes through the District along Holly Drive.

The boundary between the District and AWWD is primarily along 116<sup>th</sup> Street SW. However, the District has an interlocal agreement with AWWD to serve two small areas

# PUGET SOUND



**LEGEND:**

- ALDERWOOD WATER & WASTEWATER DISTRICT
- MUKILTEO WATER & WASTEWATER DISTRICT CORPORATE BOUNDARY
- CITY OF EVERETT
- SERVICE AGREEMENT AREAS
- RETAIL SERVICE AREA

**MUKILTEO WATER & WASTEWATER DISTRICT**

**WATER SYSTEM PLAN**

**FIGURE 1-2**

**ADJACENT WATER PURVEYORS**



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UPDATED: 4/30/2015

south of 116<sup>th</sup> Street SW; a commercial area bordered by Harbour Reach Drive and Possession Way and a commercial area located to the south of Paine Field Airport. Additionally, AWWD serves three areas within the District. These areas are shown on Figure 1-2 and discussed further in Chapter 2.

Five interties connect the two districts. There are three emergency interties with normally closed valves and two master meters. The interties are listed in Table 1-1 and shown in Figure 1-5.

**TABLE 1-1**

**AWWD Intertie Locations**

<b>Intertie</b>	<b>Type</b>	<b>Pipe Diameter (inches)</b>	<b>MWWD Pressure Zone</b>	<b>AWWD Pressure Zone</b>
St. Andrews/116 <sup>th</sup> Street SW	Emergency	8 (MWWD)/ 6 (AWWD)	500	635
Harbour Pointe	Wholesale	12	620	635
Harbour Reach Drive and 49 <sup>th</sup> Place West	Emergency	12	715 West	724
115 <sup>th</sup> Place SW	Emergency	6	715 East	724
Paine Field	Wholesale	16 (MWWD)/ 30 (AWWD)	715 West via Paine Field Booster Station	635

**SOURCE OF SUPPLY**

Since its establishment, the District has met all of its water needs by purchasing treated drinking water directly from the City of Everett or through AWWD. The District receives water from Everett through two master meters, one flow control meter, and from numerous interconnections in the 715 East Zone. The District receives water from AWWD through two master meters.

**Sultan River Waterworks Complex**

The source of water for Everett is the Sultan River waterworks complex located approximately 20 miles east of Everett. The Everett waterworks complex includes the Chaplain Reservoir, the Everett filtration plant, and Spada Lake Reservoir. The Everett Regional Water System is illustrated on Figure 1-3.

**Master Meters**

Supply from Everett is provided through the Mukilteo Boulevard Master Meter and the Casino Road Master Meter. They are metered both by the District and the City of Everett using two meters in series. The Mukilteo Boulevard Master Meter supplies the 400 Zone

and 270 Zone at the north end of the system. The Casino Road Master Meter supplies the 715 West Zone at the north end of Snohomish County Airport. These meters directly connect Everett's system to the District's system at the boundary between the two systems.

Supply from AWWD is provided through the Paine Field and Harbour Pointe Master Meters. The Paine Field connection pumps water from the AWWD 30-inch transmission main on Beverly Park Road through a 16-inch main to Reservoir 4. The flow is metered near the connection in a vault on Commando Road and in the pump station. The Harbour Pointe connection is located along Harbour Pointe Boulevard near St. Andrews Drive. There are two vaults, one contains AWWD's revenue meter and the other contains the District's flow control valve. The water flows by gravity from the AWWD 635 Zone to the District's 620 Zone.

### **Flow Control Meters**

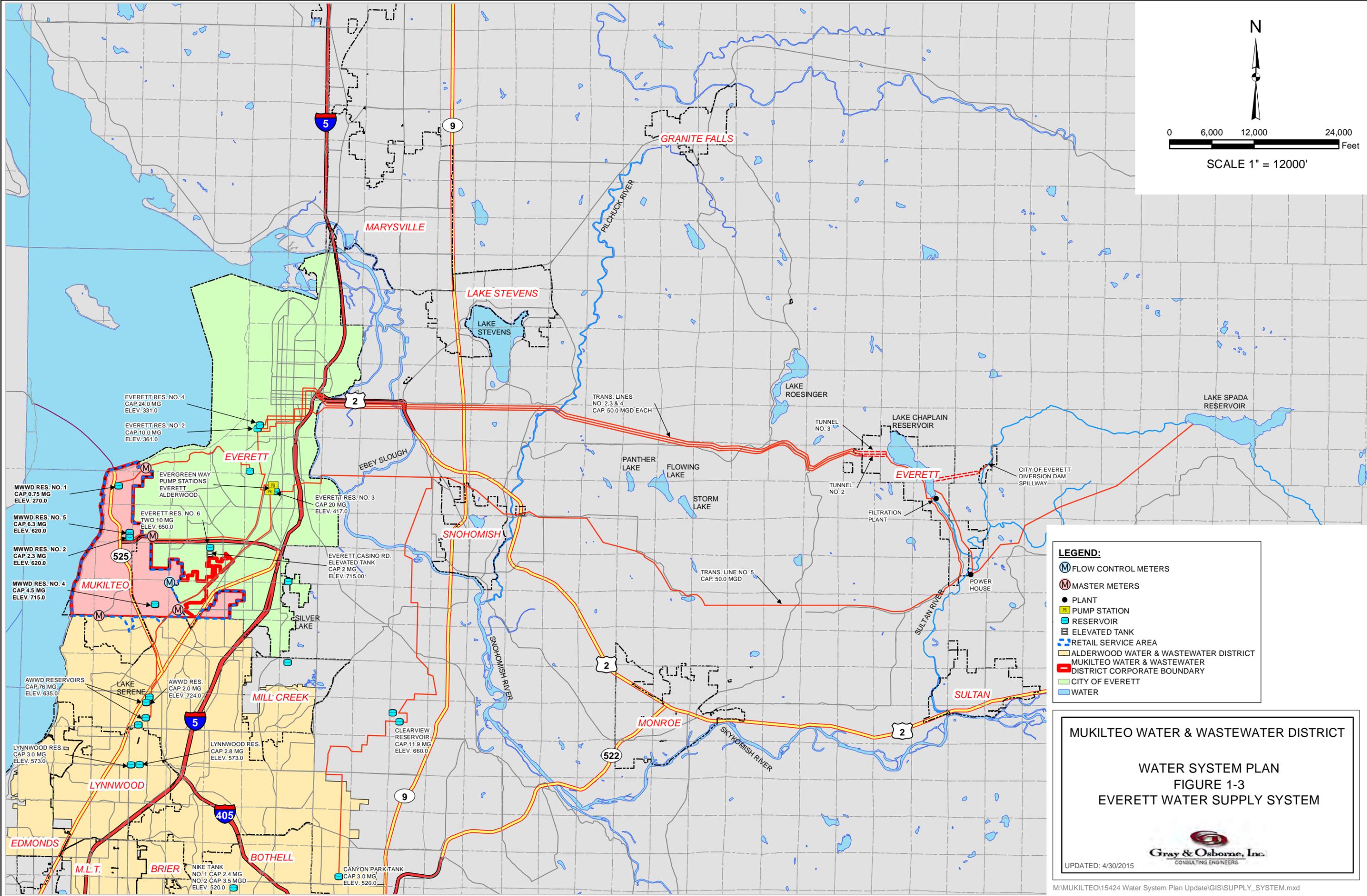
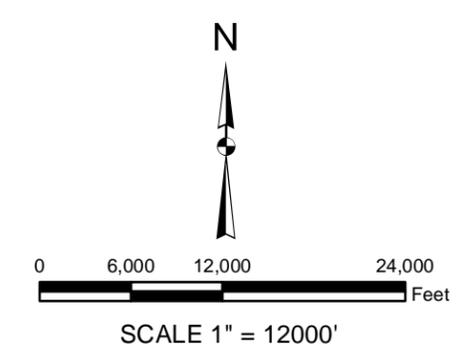
There is one flow control meter at 100<sup>th</sup> Street located between the District's 715 East and 715 West Zones. Everett bills the District for wholesale water based on readings from the flow control meter. These readings are provided to Everett by the District. There was previously a second flow meter at 112<sup>th</sup> Street located between the 715 East and 715 West Zones. In 2014, the 112<sup>th</sup> Street Flow Meter was removed and the serviced area was transferred to the 715 West Zone.

The flow control meter records the flow from the 715 East Zone into the 715 West Zone. The flow control meter directly supplies Paine Field. Supply to the rest of the District's system passes through the Westgate Flow Meter as it leaves Paine Field. The Westgate Flow Meter is used as a deduction meter for billing the Airport's water use. Readings from the Westgate Flow Meter are subtracted from the flow control meter and the Paine Field Booster Station readings to determine the Airport's total water consumption. The Paine Field Booster Station is the primary supply to Paine Field and the 100<sup>th</sup> Street Flow Meter provides a secondary supply.

### **Water Rights**

#### Surface Water

The District holds no water right certificates of its own and the source of all of the water purchased by the District is the City of Everett. Everett has four certificates of water rights that total 246 million gallons per day (mgd) for the diversion of surface water for consumptive use from the Sultan River system. A summary of Everett's surface water rights is provided in Table 1-2.



**LEGEND:**

- FLOW CONTROL METERS
- MASTER METERS
- PLANT
- PUMP STATION
- RESERVOIR
- ELEVATED TANK
- RETAIL SERVICE AREA
- ALDERWOOD WATER & WASTEWATER DISTRICT
- MUKILTEO WATER & WASTEWATER DISTRICT
- DISTRICT CORPORATE BOUNDARY
- CITY OF EVERETT
- WATER

**MUKILTEO WATER & WASTEWATER DISTRICT**

**WATER SYSTEM PLAN**

**FIGURE 1-3**

**EVERETT WATER SUPPLY SYSTEM**

UPDATED: 4/30/2015

## Groundwater

Everett currently has nine groundwater water right certificates. The permitted maximum instantaneous withdrawal ranges from 200 to 750 gpm. The total flow limit for the nine certificates is 3,510 gpm maximum instantaneous and 3,822 acre-feet per year (2 mgd) annually. A summary of Everett's groundwater rights is provided in Table 1-3.

### **Snohomish River Regional Water Authority Water Rights**

The Snohomish River Regional Water Authority (RWA) is a joint administrative entity composed of the City of Everett, the Northshore Utility District, and the Woodinville Water District. The RWA was formed by an interlocal agreement in the fall of 1996. The agreement provides that the RWA will work to promote regional cooperation in the planning and development of new water sources.

The RWA acquired the Weyerhaeuser Timber Company (WEYCO) surface water rights S1-10617C in November 1996. This certificated water right authorizes an instantaneous withdrawal of 36 mgd (56 cfs) from Ebey Slough on the Snohomish River. The RWA interlocal agreement allocates to the City approximately 15 mgd instantaneous flow and 11.7 mgd average annual flow.

**TABLE 1-2**  
**Summary of Everett Surface Water Rights<sup>(1)</sup>**

Water Source	Water Right Certificate Number <sup>(2)</sup>	Priority Date	Permitted Withdrawals		Notes
			Maximum <sup>(3)</sup> (mgd)	Annual (ac-ft/yr)	
Sultan River	C-352	09/14/1917	13	14,480	<sup>(4)</sup> <sup>(5)</sup>
Sultan River	C-1790	07/13/1924	33	36,200	<sup>(4)</sup> <sup>(5)</sup>
Sultan River	C-460	02/14/1929	71	79,640	<sup>(4)</sup> <sup>(5)</sup>
Sultan River	S1-00727C	11/29/1929	129	144,000	<sup>(5)</sup> <sup>(6)</sup> <sup>(7)</sup>
<b>Sultan River Total</b>			<b>246</b>	<b>144,000</b>	
Chaplain Creek	C-1791	11/20/1940	10	9,360	
Ebey Slough	C-10617	08/20/1951	36	11,062	<sup>(8)</sup>
<b>Surface Water Rights Total</b>			<b>270</b>	<b>164,422</b>	
Sultan River-Chaplain Reservoir	RI-02520	02/14/1929		13,200	<sup>(9)</sup>
Sultan River	S1-23398C	06/15/1979	969	506,800	<sup>(10)</sup> <sup>(11)</sup>
Spada Reservoir	R1-00733	05/03/1946		113,700	<sup>(11)</sup> <sup>(12)</sup>
Sultan River	A-13219	12/15/1954	129	144,000	<sup>(13)</sup>

- (1) Data taken from the 2007 City of Everett *Comprehensive Water Plan*.
- (2) "C" at the beginning or end of a water right number indicates a water certificate number.  
"A" at the beginning of a water right number indicates that a water right application has been filed.  
"R" at the beginning of a water right number indicates a reservoir or storage water right.
- (3) Maximum instantaneous withdrawal.
- (4) Annual quantity allowed is not indicated on the water right certificate.
- (5) One of the four base water rights, which total 246 mgd.
- (6) Annual quantity is supplemental to prior rights.
- (7) Certificate amended in 1987 to include annual withdrawal of continuous maximum instantaneous demand.
- (8) Jointly held with other members of the Snohomish River Regional Water Authority
- (9) Provides water for storage in Chaplain Reservoir; quantity not included in total.
- (10) For "municipal and industrial" purposes and supplemental to existing rights; quantity not included in total.
- (11) Right held jointly with PUD.
- (12) Joint storage rights for Spada Reservoir.
- (13) Application is pending; quantity not included in total.

**TABLE 1-3**

**Summary of Everett Groundwater Rights<sup>(1)</sup>**

Water Right Certificate Number	Priority Date	Permitted Withdrawals	
		Maximum <sup>(2)</sup> (gpm)	Annual (ac-ft/yr)
552-D	06/09/1923	200	63
553-D	05/29/1936	300	94
550-D	10/01/1943	300	275
554-D	01/01/1944	300	94
594-A	08/04/1947	250	200
2186-A	12/23/1953	750	800
2579-A	08/16/1955	475	760
2811-A	04/23/1956	585	936
3358-A	09/02/1958	350	600
<b>Total</b>		<b>3,510</b>	<b>3,822</b>

(1) Data taken from City of Everett 2007 *Comprehensive Water Plan*.

(2) Maximum instantaneous withdrawal.

**STORAGE**

The District owns and operates four storage reservoirs. Storage volume for fire flow, equalizing, and standby is provided by District storage facilities. A summary of the four reservoirs is shown in Table 1-4 and a description of each reservoir follows.

**TABLE 1-4**

**Reservoir Inventory**

Reservoir No.	Overflow Elevation (feet)	Capacity (MG)	Height (feet)	Diameter (feet)	Material	Year Constructed
1	271	0.75	21	80	Steel	1999
2	620	2.3	40	100	Steel	1985
4	715	4.5	120	80	Steel	1989
5	620	6.3	42	160	Steel	1994

**Reservoir 1**

Reservoir 1 is a ground-level steel reservoir constructed in 1999. It has a capacity of 0.75 MG and an overflow elevation of 271 feet. The reservoir has a 21-foot maximum water depth and measures 80 feet in diameter. The reservoir is equipped with an altitude valve that shuts off the water supply when the reservoir is full.

The reservoir provides storage for the 270 Zone, which primarily serves the downtown Mukilteo area. The site also includes a booster station capable of pumping 260 gpm to the adjacent 500 Zone.

### **Reservoirs 2 and 5**

Reservoirs 2 and 5 are located on the same site at the same hydraulic grade. Reservoir 2 is a ground-level steel reservoir constructed in 1985. It has a capacity of 2.3 MG and an overflow elevation of 620 feet. Reservoir 2 has a 40-foot maximum water depth and measures 100 feet in diameter. Reservoir 5 is a ground-level steel reservoir constructed in 1994. It has a capacity of 6.3 MG with an overflow elevation of 620 feet. The reservoir has a 42-foot maximum water depth and measures 160 feet in diameter.

The on-site piping configuration allows the two reservoirs to be operated in either a parallel or series flow pattern. The District primarily operates the reservoirs in series to provide the maximum water turnover in each reservoir. The piping configuration also allows each reservoir to be isolated and shut off for maintenance purposes.

Each reservoir is equipped with its own rate-of-flow controller which allows the inlet flow to be set at variable programmed rates. The rate-of-flow control valves are combination altitude valves, with solenoids that override the rate-of-flow control when a reservoir is full.

To reduce the potential of draining the two reservoirs due to broken water mains caused by an earthquake, an automatically controlled seismic valve stops gravity flow from the reservoirs to the 620 Zone upon sensing both seismic activity and an abnormal increase in flow. The valve only closes if both conditions occur. The earthquake sensing device and valve operators have battery backup power in order to operate under power failure.

Although the reservoirs are geographically located in the 715 West Zone, they provide storage for the 620 Zone and supply the 500, 400, and 270 Zones by gravity through pressure reducing valves (PRVs). Additionally, two diesel pumps at the site provide emergency water supply to the 715 West Zone for both domestic use and fire protection.

### **Reservoir 4**

Reservoir 4 is a steel reservoir constructed in 1989. It has a capacity of 4.5 MG and an overflow elevation of 715 feet. The reservoir has a 120-foot maximum water depth and measures 80 feet in diameter. The reservoir site is owned by Snohomish County and the District has a 60-year lease on the site for the reservoir.

Approximately 21.5 feet (810,000 gallons) of reservoir capacity is reserved for a privately owned hangar deluge fire protection system. This system requires an 18,000 gpm fire flow for 45 minutes. The current owner maintains the pumps necessary to deliver the fire flow. When this capacity was purchased, the District entered into an

agreement with the original hangar owner Tramco. In the Plan, this agreement will be referred to as the Tramco Agreement.

**BOOSTER STATIONS**

The District operates five booster stations: the Lamar Hill Booster Station, the 620 Reservoirs Transfer Pump, the 620 Reservoirs Diesel Pumps, Reservoir 1 Booster Station, and the Paine Field Booster Station. Table 1-5 summarizes the five booster station facilities.

**TABLE 1-5**

**Booster Station Inventory**

<b>Booster Station</b>	<b>Pump No.</b>	<b>Capacity (gpm)</b>	<b>hp</b>	<b>Year Constructed</b>
Lamar Hill	1	80	5	Unknown
	<b>Total</b>	<b>80</b>		
620 Reservoirs Transfer Pump	1	2,600	50	1994
	<b>Total</b>	<b>2,600</b>		
620 Reservoirs Diesel Pumps	1	1,750	99	1985
	2	1,750	99	1985
	<b>Total</b>	<b>3,500</b>		
Reservoir 1 Pump	1	260	30	1997
	<b>Total</b>	<b>260</b>		
Paine Field	<b>1</b>	<b>1,000</b>	40	2012
	<b>2</b>	<b>1,000</b>	40	2012
	<b>Total</b>	<b>2,000</b>		

**Lamar Hill Booster Station**

This booster station is located on Lamar Drive and pumps water to the 400 Zone. The station consists of one pump, an Aurora-type BCH, with a 5 hp motor, rated at 80 gpm at 70 feet of total dynamic head (TDH). This area of the 400 Zone is north of Japanese Gulch and normally is served directly from the Mukilteo Boulevard Master Meter. This booster station is used to supply the area with water from Reservoir 1 in the event that supply from Everett is interrupted.

**620 Reservoirs Transfer Pump**

The transfer pump is located in the pump station at the site of Reservoirs 2 and 5. The primary purpose of the transfer pump is to limit the gravity drawdown of either reservoir to approximately one-half full and allow for water from Reservoir 5 to be transferred to Reservoir 2 to maintain pressure in the 620 Zone. The secondary purpose of the transfer pump is to empty either reservoir for maintenance.

The transfer pump is a Byron Jackson pump with a capacity of approximately 2,600 gpm. The piping, pump canister, and electrical equipment are sized such that a 3,200 gpm pump can be installed in the future.

### **620 Reservoirs Diesel Pumps**

Two diesel-powered pumps are located in the pump station at the site of Reservoirs 2 and 5. The diesel pumps can transfer water from Reservoirs 2 and 5 to the 715 West Zone. Water transferred in this fashion can flow to Reservoir 4, but not to the City of Everett because of check valves. When the diesel pumps are operating, the altitude valve on Reservoirs 2 and 5 is forced shut to prevent water being pumped out of the reservoirs then back into them. Each of the 99 hp diesel pumps has a capacity of 1,750 gpm when operating at 150 feet of TDH.

### **Reservoir 1 Booster Station**

This booster station is located on the site of Reservoir 1. It is used to transfer water from Reservoir 1 to the adjacent 500 Zone. The booster station consists of a pitless adapter, 30 hp motor, and Byron Jackson pump rated for 260 gpm at 320 feet TDH.

### **Paine Field Booster Station**

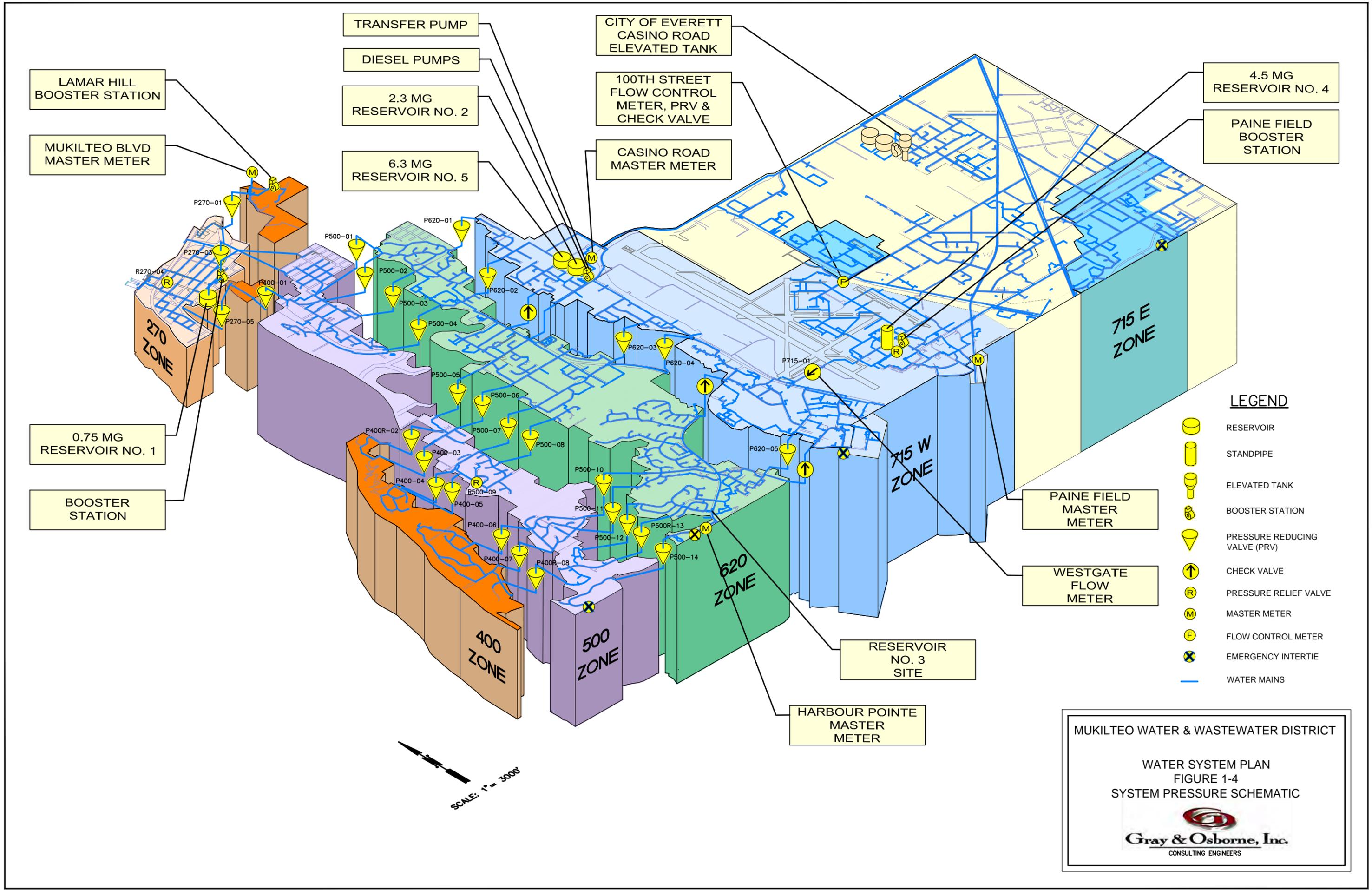
This booster station is located on the site of Reservoir 4. It is used to pump supply from AWWD's 30-inch main into the District's Reservoir 4 in the 715 West Zone. The booster station consists of two Peerless horizontal split-case, single-stage, double-suction pumps, 40 hp motors, variable frequency drives, and is rated for 1,000 gpm at 95 feet TDH.

## **TRANSMISSION AND DISTRIBUTION SYSTEM**

The District's transmission and distribution facilities include booster stations, pressure reducing valves (PRVs), major transmission lines, and the system distribution network. A schematic of the District's water system is presented on Figure 1-4 and the water distribution system is shown on Figure 1-5.

### **TRANSMISSION SYSTEM**

The District's system is primarily gridded with sources of supply adjacent to the rest of the system. Therefore, the District has little in the way of a dedicated transmission system. However, there are several water mains that serve as critical links between separated parts of the system. One such main crosses Paine Field. This line connects Reservoir 4 and AWWD supply from the Paine Field booster station to the western part of the system, including Reservoirs 2 and 5.



**LEGEND**

- RESERVOIR
- STANDPIPE
- ELEVATED TANK
- BOOSTER STATION
- PRESSURE REDUCING VALVE (PRV)
- CHECK VALVE
- PRESSURE RELIEF VALVE
- MASTER METER
- FLOW CONTROL METER
- EMERGENCY INTERTIE
- WATER MAINS

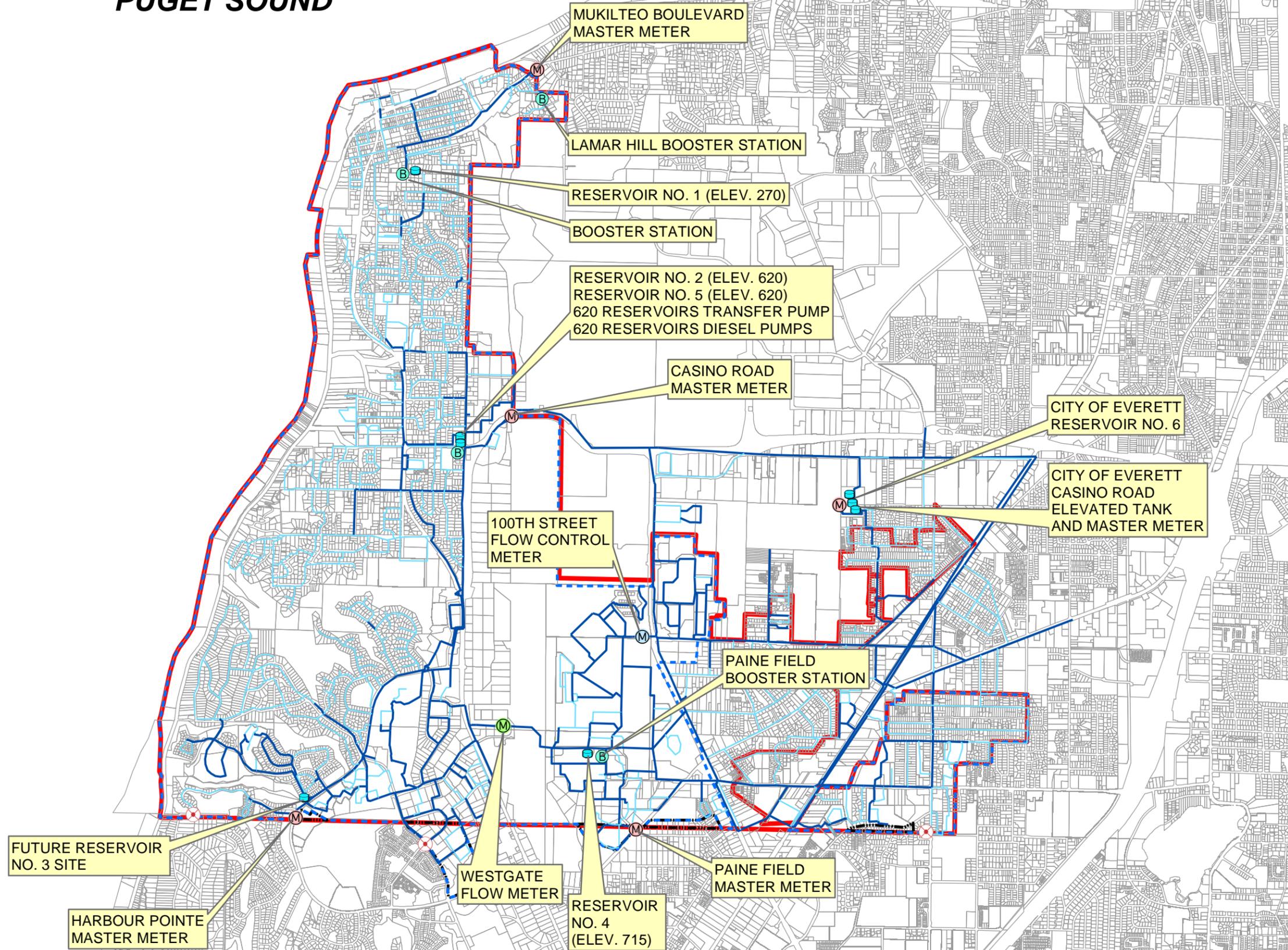
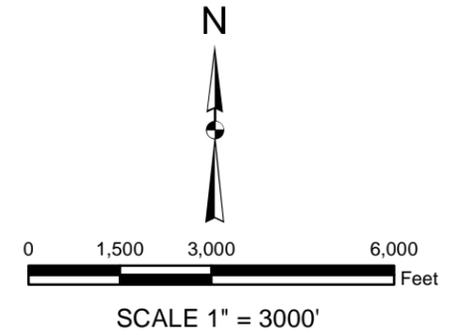
MUKILTEO WATER & WASTEWATER DISTRICT

WATER SYSTEM PLAN  
FIGURE 1-4  
SYSTEM PRESSURE SCHEMATIC



SCALE: 1" = 3000'

# PUGET SOUND



- LEGEND:**
- BOOSTER STATION
  - EMERGENCY INTERTIE
  - FLOW CONTROL METERS
  - MASTER METERS
  - RESERVOIR
  - WESTGATE FLOW METER
- DISTRIBUTION SYSTEM:
- DIAMETER**
- LESS THAN 12-INCH
  - 12-INCH AND LARGER
  - RETAIL SERVICE AREA
  - SERVICE AGREEMENT AREAS
  - MUKILTEO WATER & WASTEWATER DISTRICT CORPORATE BOUNDARY

MUKILTEO WATER & WASTEWATER DISTRICT

WATER SYSTEM PLAN  
FIGURE 1-5  
DISTRIBUTION SYSTEM

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UPDATED: 5/1/2015

The mains supplying the master meters are also critical to the normal operation of the system. The Mukilteo Boulevard Master Meter is supplied by a City of Everett 8-inch transmission line. The Casino Road Elevated Tank supplies the Casino Road Master Meter through a 16-inch diameter transmission main. The Harbour Pointe Master Meter includes a 12-inch water main from AWWD’s system that feeds directly through a flow control valve into the 620 Zone by gravity. The Paine Field Master Meter connects AWWD’s 30-inch transmission main to the District’s 16-inch transmission main that supplies the Paine Field Booster Station and the 715 West Zone.

**DISTRIBUTION SYSTEM**

The District water system is primarily a gravity-fed system. Water flows from the higher elevations to the lower elevations through a system of pressure reducing valves, which are used to control the water pressure supplied to the lower elevation pressure zones. The District has six pressure zones: 715 East (715E), 715 West (715W), 620, 500, 400, and 270, with the designation of each zone based on hydraulic grade line elevation. Most of the pressure zones are in turn divided into separate, non-continuous service areas due to the uneven topography in the area.

As with most water utilities, the District’s existing distribution system has developed continuously over several decades. This has created areas of older, undersized mains and newer, appropriately sized lines. The system is composed primarily of cast and ductile iron pipe with some newer HDPE. The transmission and distribution system includes approximately 92 miles of pipe ranging in size from 4- to 24-inch diameter. Table 1-6 provides a distribution system inventory.

**TABLE 1-6**

**Distribution System Inventory (December 2015)**

Pipe Diameter (inches)	Approximate Total Length <sup>(1)</sup>	
	(feet)	(miles)
4	4,207	0.8
6	66,107	12.5
8	188,689	35.7
10	3,342	0.6
12	172,846	32.7
16	46,923	8.9
24	1,284	0.2
<b>Total</b>	<b>483,398</b>	<b>91.6</b>

(1) Estimated using District hydraulic model.

The District’s distribution system contains pressure relief valves. These valves function as a safety mechanism, preventing potentially damaging pressures from occurring in the distribution system. The normal distribution system water pressure is maintained within

a range of 35 to 135 psi by a series of PRVs. The location of each PRV is described in Table 1-7 and shown on a District water system schematic on Figure 1-4.

**TABLE 1-7**  
**Pressure Reducing Valve Inventory**

Station No.	Downstream Pressure Zone	Elevation (feet) <sup>(1)</sup>	Valve 1 Size (inch)	Pressure Setting (psi)	Hydraulic Grade <sup>(1)</sup> (feet)	Valve 2 Size (inch)	Pressure Setting (psi)	Hydraulic Grade <sup>(1)</sup> (feet)
P270-01	270	125	8	55	252	3	70	287
P270-03	270	150	6	40	242	3	48	261
P270-05	270	250	6	36	333	—	—	—
P400-01	400	245	4	42	342	4	49	358
P400R-02	400	330	6	40	422	—	—	—
P400-03	400	330	3	45	434	—	—	—
P400-04	400	296	6	45	400	3	40	388
P400-05	400	312	6	42	409	—	—	—
P400-06	400	275	6	36	358	3	42	372
P400-07	400	245	4	50	361	—	—	—
P400R-08	400	210	10	67	365	3	77	388
P500-01	500	369	4	64	517	—	—	—
P500-02	500	369	6	56	498	2	65	519
P500-03	500	409	6	45	513	3	46	515
P500-04	500	407	6	49	520	—	—	—
P500-05	500	360	6	57	492	2	61	501
P500-06	500	361	8	62	504	3	60	500
P500-07	500	368	6	59	504	3	61	509
P500-08	500	400	6	43	499	2	49	513
P500-10	500	460	6	32	534	3	45	564
P500-11	500	410	6	37	495	—	—	—
P500-12	500	374	6	58	508	2	61	515
P500R-13	500	485	10	15	520	3	37	570
P500-14	500	340	6	25	398	3	30	409
P620-01	620	475	6	48	591	—	—	—
P620-02	620	509	6	40	601	3	50	625
P620-03	620	532	6	49	645	—	—	—
P620-04	620	495	10	50	611	3	54	620
P620-05	620	513	6	40	605	3	43	612

(1) Elevations based on NGVD 1929.

The distribution system also contains check valves and normally closed valves between pressure zones. The check valves and normally closed valves prevent water flow from the higher to the lower elevation pressures zones. If the higher pressure zones should experience a drop in pressure, the check valves allow water to be transferred from the lower pressure zones to the higher zones, if necessary. Table 1-8 is a list of major

distribution system valves (including check valves, relief valves, control valves, normally closed valves, and normally open valves) in the District’s water system.

**TABLE 1-8**  
**Major Distribution System Valve Inventory**

Valve No.	Pressure Zone	Valve Type <sup>(1)</sup>	Valve Size	Supply Main
—	715W	CHECK	8	12
—	715W	CHECK	8	8
—	715W	CHECK	12	12
—	715W	CHECK	12	12
—	400	CHECK	6	6
—	715W	ELECT	8	12
—	715W	ELECT	8	12
—	715W	NC	6	6
—	715W	NC	8	8
—	715W	NC	8	8
—	715W	NC	6	6
—	715W	NC	8	8
—	715W	NC	12	12
—	620	NC	8	8
—	620	NC	16	16
—	500	NC	6	8/6
—	715W	NO	8	8
—	715W	NO	8	8
—	715W	NO	8	8
P500R-13	620	RELIEF	3	12
—	620	RELIEF	4	12
R500-09	500	RELIEF	4	8
—	500	RELIEF	3	12
R270-04	270	RELIEF	4	6

- (1) RELIEF = Pressure Relief Valve  
 CHECK = Check Valve  
 NO = Normally Open Valve  
 NC = Normally Closed Valve  
 ELECT = Electrically Controlled Valve

NOTE: There are numerous normally open interties with the City of Everett water system in the 715E Zone.

## **OPERATIONAL CONTROL AND MONITORING SYSTEM**

The Supervisory Control and Data Acquisition (SCADA) system allows the District to remotely monitor and control facilities within the distribution system. The District's SCADA system has a central control station located at the District office. Information is transmitted via telephone lines. SCADA allows the District to determine the amount of water entering the system per day and to limit the peak demands on Everett and AWWD.

The SCADA system monitors and controls flow rates through the District's source meters as well as the inlet flow rate of Reservoirs 1, 2, 4, and 5. The on/off conditions of the 620 Reservoirs Diesel Pumps, the Paine Field Booster Station pumps and generator, the 620 Reservoirs Transfer Pump and Reservoir 1 Booster Station are also monitored. The set points of various system facilities are controlled by the SCADA system.

The SCADA system provides alarms for conditions of low or high water at all four reservoirs. System pressures are monitored at Reservoirs 1, 2 and 4, and the 112<sup>th</sup> Street Flow Control Valve. The 100<sup>th</sup> Street Flow Control Valve is controlled by pressure or flow. The 620 Reservoirs Diesel Pumps are controlled by pressure in the 715 West Zone.

The SCADA system continuously monitors chlorine residual at the 620 Reservoirs inlet/outlet, Reservoir 1, Harbour Point Master Meter, and Reservoir 4 inlet/outlet. This information, along with other parameters, is used to determine operational set points to allow drawdown of reservoirs to maintain chlorine residual levels.

## **DISTRICT OFFICE FACILITY**

The District constructed a new office and maintenance facility in 2002. The office houses the SCADA system, allowing District staff convenient access to its monitoring system. The District's storage and maintenance facility is also located at the same site.

The District currently owns the office from the former Mukilteo Water District.

## **RELATED PLANNING DOCUMENTS**

Several planning documents include information that is necessary for the development of the Plan. Related water system planning documents, regional plans, and water system plans are provided.

### **WATER SYSTEM PLANNING DOCUMENTS**

- *Water System Design Manual* prepared by the Washington State Department of Health in December 2009
- *Water System Planning Handbook* prepared by the Washington State Department of Health in April 1997

- *Water Use Efficiency Guidebook* prepared by the Washington State Department of Health in January 2011

## **REGIONAL PLANS AND DOCUMENTS**

- Snohomish County 2015–2020 Transportation Improvement Program
- Snohomish County 2015–2020 Capital Improvement Program
- *Mukilteo Comprehensive Plan* prepared by the City of Mukilteo and last amended on October 15, 2012. The purpose of this document is to meet the requirements of the Growth Management Act. It provides a consistent policy framework for adopting regulations. This document addresses land use, housing, transportation, capital facilities, and utilities.
- *City of Everett Comprehensive Plan* updated by the City of Everett Department of Planning and Community Development in 2015. This document meets the requirements of the Growth Management Act for the City of Everett area.
- *Snohomish County Airport/Paine Field Master Plan Update*, updated in 2002 by the Snohomish County Planning Division. This document is the land use guide for the Paine Field community and provides direction for future growth and land use changes.
- *Snohomish County Comprehensive Plan* prepared by the Snohomish County Planning Commission and amended by the County Council on December 21, 2013. This document includes all mandatory elements including economic development and natural environment, as well as policies on population and employment growth.
- *Soil Survey of Snohomish County Area, Washington*, United States Department of Agriculture, Soil Conservation Service, July 1983.
- *Distribution and Description of Geologic Units in the Mukilteo Quadrangle, Washington* prepared by James P. Minard in 1982 for the U.S. Geological Survey.
- *Forecasts of Population and Employment*, released by the Puget Sound Regional Council in April 2014.

## **ADJACENT WATER PURVEYOR WATER SYSTEM PLANS**

- *City of Everett, 2014 Addendum to the 2007 Comprehensive Water Plan* prepared by HDR Engineering, Inc.
- *Alderwood Water & Wastewater District Water System Plan* prepared August 2009 by HDR Engineering, Inc.

## **EXISTING MUKILTEO WATER & WASTEWATER DISTRICT PLANNING DOCUMENTS**

- *Mukilteo Water & Wastewater District Comprehensive Water System Plan* prepared February 2010 by Gray & Osborne, Inc.
- *IDSE Standard Monitoring Plan* prepared September 2006 by Gray & Osborne, Inc.
- *Mukilteo Water & Wastewater District Wastewater Comprehensive Plan* prepared February 2012 by Gray & Osborne, Inc.
- *Developer Standards for Water and Sewer Systems* prepared in 2009 by Gray & Osborne, Inc.

## **INTERLOCAL AGREEMENTS**

### **EVERETT ASSUMPTION AGREEMENT**

The District and Everett have an interlocal agreement relating to annexations by the City of parts of the District. A copy of the agreement is included in Appendix B.

### **AWWD WATER SUPPLY AGREEMENT**

The District and AWWD's interlocal agreement is included in Appendix C.

### **MUTUAL AID AGREEMENTS**

The District has entered into interlocal agreements with the Everett Water Utility Committee (EWUC) and the Washington Association of Sewer & Water Districts (WASWD) providing for mutual aid and assistance in the event of an emergency. These agreements detail protocols for providing resources to other Districts in order to assist them. A copy of each of these agreements is included in Appendix C.

## **CHAPTER 2**

### **BASIC PLANNING DATA**

#### **INTRODUCTION**

This chapter presents basic planning data that is essential for assessment of the District's current and future conditions. The information presented includes historical population growth, water production data, and water consumption data. Also included are zoning, urban growth area, climatic, and environmental information.

#### **STUDY AREA**

The total District Boundary, including open space and currently undeveloped land, is approximately 5,300 acres. The study area for this Plan, which is the current water retail service area, covers approximately 4,900 acres. The study area lies within the jurisdictions of the City of Mukilteo, the City of Everett, and Snohomish County. Of this area, 335 acres are within Everett's Urban Growth Area (UGA). Everett does not plan on annexing any of this area within the 10-year planning period. The District boundary with respect to adjacent political jurisdictions is illustrated on Figure 2-1. Per the 1984 annexation agreement between the District and the City of Everett, there is a 10-year period before Everett can assume control of water service after annexation. Since there are currently no planned annexations, this Plan will not account for any loss in service area. Everett is expected to eventually annex its entire UGA so future Plan updates will take into account the loss of these areas from the District's retail service area as the annexations occur.

#### **GROWTH MANAGEMENT ACT**

The 1990 Washington State Growth Management Act (GMA) required counties and cities experiencing or predicting a high rate of growth to prepare comprehensive plans. The plans must contain elements addressing land use, transportation, housing, capital facilities, and utilities. The purpose of the GMA plan is to guide growth for the next 20 years by defining special distribution and levels of population growth. The land use element designates the desired use of land for various activities in the future. It is expected that future zoning will be based on the land use designations in order to ensure consistency.

In response to the GMA, both the City of Everett and the City of Mukilteo prepared updates to their Comprehensive Plans in 2007. These plans have been amended since their original adoption and are both in the process of being fully updated. These plans identify land use within the District's service area. Paine Field and unincorporated areas within the District service area are included in the Everett GMA plan. Snohomish County currently has jurisdiction over the land use and zoning in the unincorporated

areas. However, since it is anticipated that the City of Everett will annex portions of these areas, the City of Everett zoning is used for the purposes of this Plan.

Major land use categories include residential, commercial, industrial, and public facilities, which also include parks and schools. Future land use within the District service area, based on GIS data provided by the City of Mukilteo and City of Everett, is illustrated on Figure 2-2.

## **SERVICE AREA**

In accordance with the Municipal Water Law (MWL), the District is required to designate a retail service area within which it has a duty to serve all customers, and if appropriate, also designate a future service area and wholesale service area. At this time, the District only provides retail service within the service area established and has no intention to wholesale water. Consequently, no wholesale service areas are described in this Plan.

### **RETAIL SERVICE AREA**

The District acknowledges that it has a duty to serve all new connections within its retail service area. The retail service area is defined by the District and is required to include the current service area and areas where new service is proposed. Due to the District being confined by Puget Sound, AWWD, and the City of Everett, it has no potential areas of new service. The District's existing boundary includes all water and wastewater services. The retail service area is only the water customers of the District.

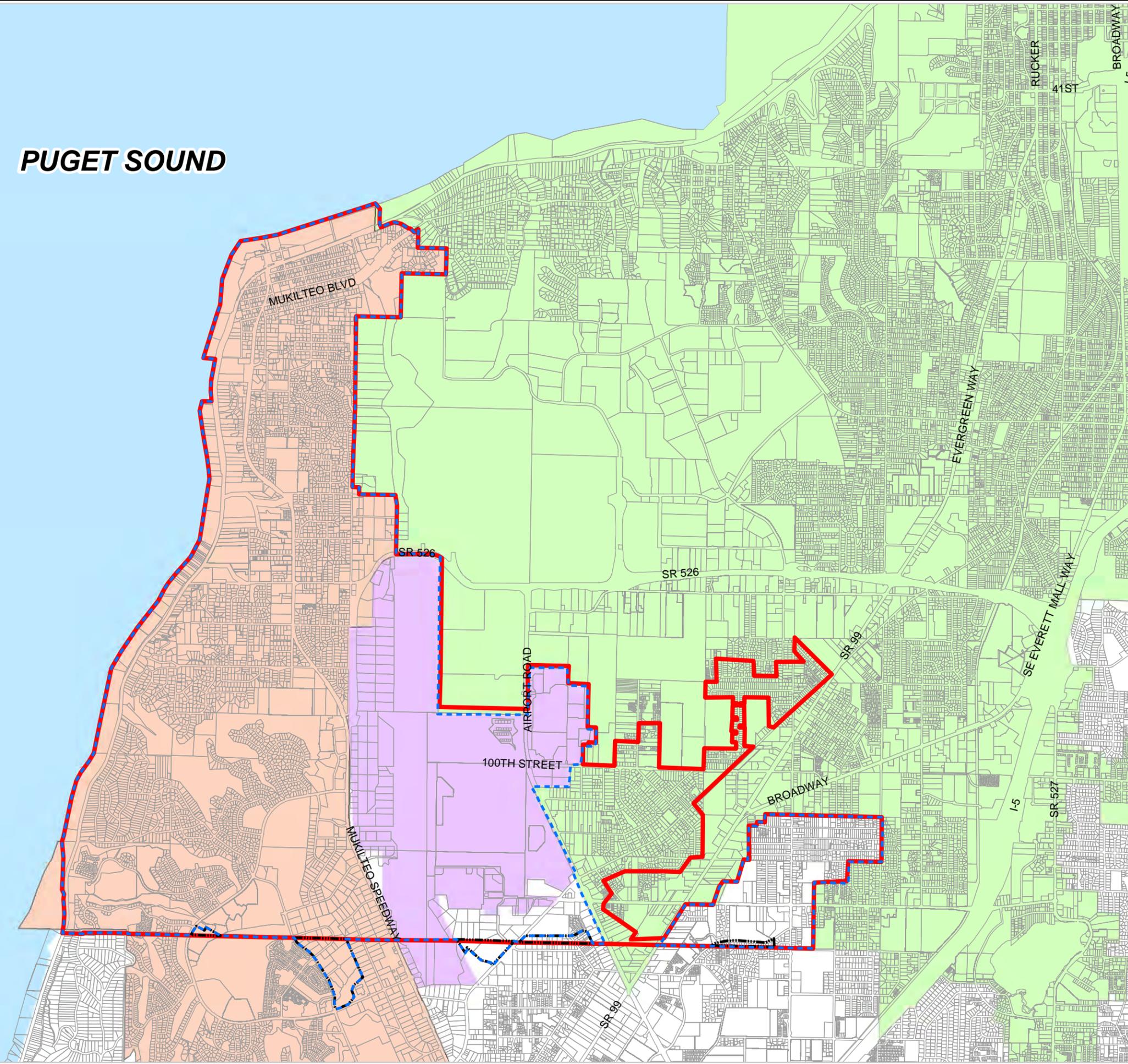
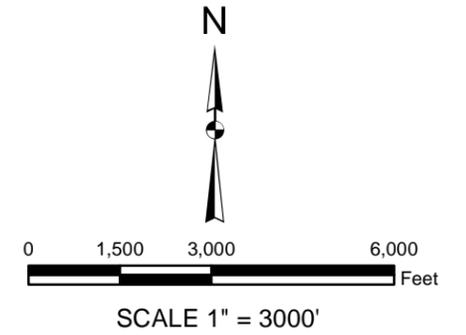
While the District has a duty to serve new connections, there are four threshold factors that the circumstances must meet. These are:

1. The municipal water supplier has sufficient capacity to serve water in a safe and reliable manner.
2. The service request is consistent with adopted local plans and development regulations.
3. The municipal water supplier has sufficient water rights to provide service.
4. Service can be provided in a timely and reasonable manner.

### **FUTURE RETAIL SERVICE AREA**

The District's service area boundary is not likely to expand due to the constraint of adjacent water purveyors. In contrast, future reduction in area is likely due to annexation by the City of Everett and the eventual transferal of water service facilities. The District

# PUGET SOUND



- LEGEND:**
- RETAIL SERVICE AREA
  - SERVICE AGREEMENT AREAS
  - MUKILTEO WATER & WASTEWATER DISTRICT CORPORATE BOUNDARY
  - PAINE FIELD AIRPORT (SNOHOMISH COUNTY)
  - CITY OF MUKILTEO
  - CITY OF EVERETT
  - UNINCORPORATED SNOHOMISH COUNTY

MUKILTEO WATER & WASTEWATER DISTRICT

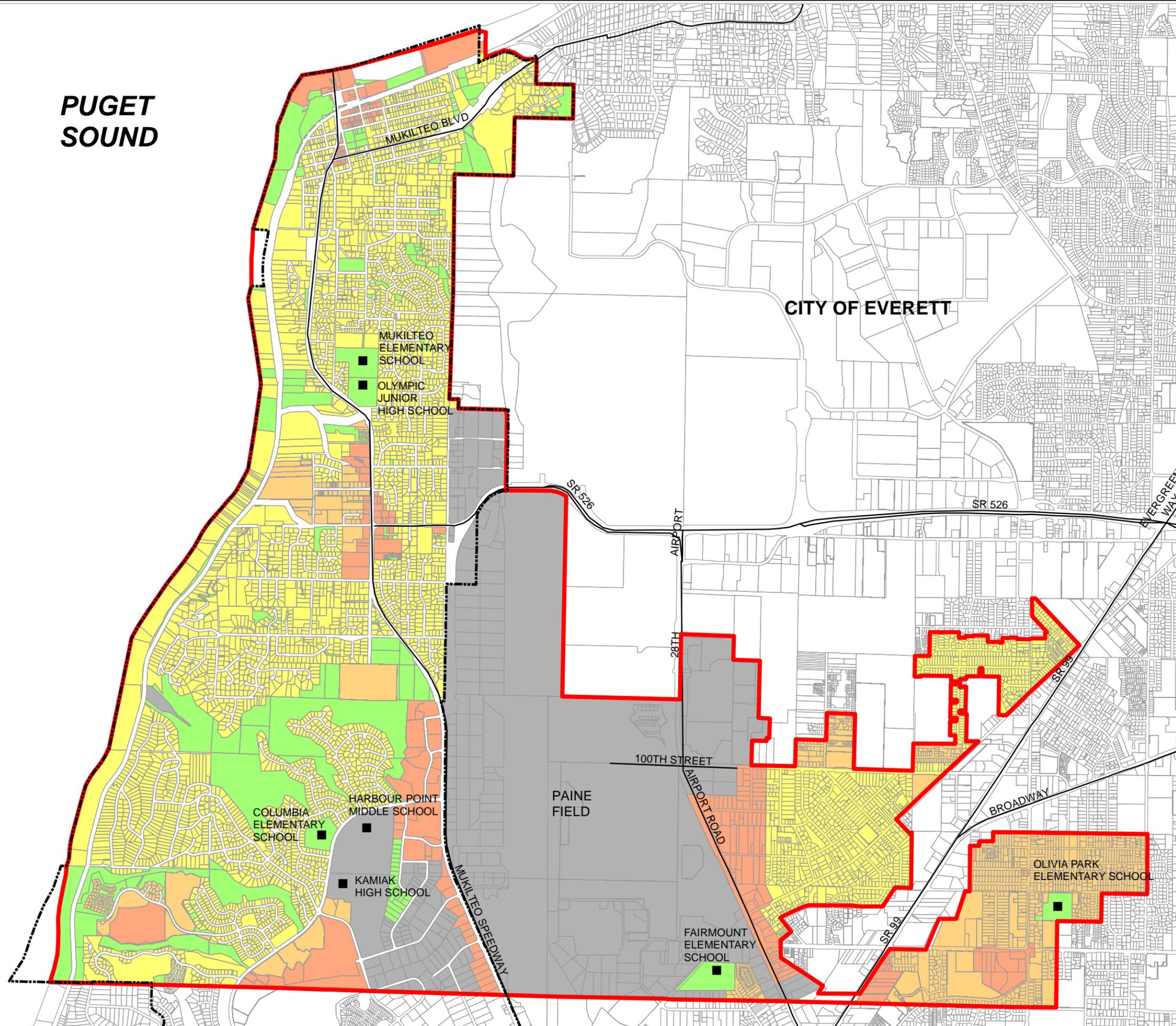
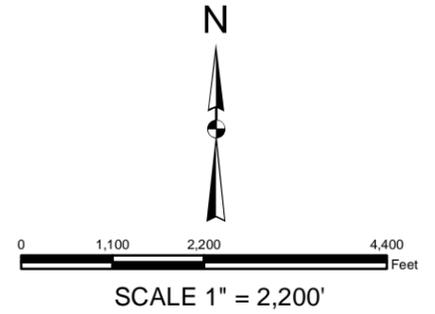
WATER SYSTEM PLAN  
FIGURE 2-1  
POLITICAL JURISDICTIONS



UPDATED: 5/1/2015

PUGET SOUND

CITY OF EVERETT



**Legend**

- MUKILTEO CITY LIMITS
- MUKILTEO WATER & WASTEWATER DISTRICT CORPORATE BOUNDARY
- DISTRICT LAND USE:**
- COMMERCIAL
- INDUSTRIAL
- MULTI FAMILY RESIDENTIAL
- PARKS, SCHOOLS, OPEN SPACE
- SINGLE FAMILY RESIDENTIAL

DATA SOURCE:  
 1. City of Mukilteo (2015)  
 2. Snohomish County GIS (2013)  
 3. City of Everett (2015)

MUKILTEO WATER & WASTEWATER DISTRICT

WATER SYSTEM PLAN  
 FIGURE 2-2  
 LAND USE

and Everett have a 1984 agreement regarding annexations within the District boundary. The agreement states that Everett will only take over District water facilities in annexed areas a minimum of 10 years after annexation. There are currently no annexed areas within the District's service boundary that will be transferred to Everett within the 10-year planning period. Although service area expansion is not expected, the potential does exist for additional development and population in-fill within the low population density areas of the District's service area.

## **RETAIL SERVICE AREA BY AGREEMENT**

In addition to providing retail water service to customers located within the District's designated retail service area, the District also provides retail water service to a limited number of customers located outside of its retail service area. Such retail service is provided by agreement with AWWD. The District provides water to two small areas south of 116<sup>th</sup> Street SW: one area that is bordered by Harbour Reach Drive and Possession Way, and another area known as the Naval Housing Area located south of Paine Field. AWWD similarly provides water for three small areas that are inside of the District's boundary. These areas are shown on Figure 2-1.

Retail water service will continue to be provided by the District until such time as AWWD advises the District in writing of: its intent to terminate such agreements, and its ability to fully assume all retail service area responsibilities for the connections. AWWD will similarly serve the connections it has within the District's boundary.

## **SERVICE AREA POLICIES**

Service area policies are important in guiding the development of a water system. The DOH has established a list of service area policies to be referenced in water system plans. Table 2-1 lists the type of service area policy, the current District policies, and the reference source.

**TABLE 2-1**

**Service Area Policies**

<b>Policy Name</b>	<b>District Policy</b>	<b>Reference</b>
Connections to Existing System	The District specifies that pressure and purity tests of new water mains be successfully completed before they are connected to the system.	Mukilteo Water & Wastewater District Developer Standards, Part 2 – Water Mains
Design and Performance Standards	Design and performance standards are provided outlining the minimum general standards required by the District for developer-constructed water main extensions and improvements that are to be acquired by the District.	Mukilteo Water & Wastewater District Developer Standards, Part 2 – Water Mains
Developer Extension	The District has developed requirements for the planning, construction, and approval of developer-funded extensions to the water system.	Mukilteo Water & Wastewater District Developer Standards, Part 1 – Provisions Applicable to Water and Sewer Extensions
General Facilities Charge	The District defines their General Facilities Charge based on their Water System Plan and the expected costs of improvements necessary to provide service to new customers.	Resolution No. 340-15
Water Service Connection Fees	The District charges for new service connections based on size of service or square footage.	Resolution No. 340-15
Cross-Connection Control Program	WAC 246-291-490, MWWD Cross-Connection Control Program.	Resolution No. A-1548
Oversizing	Developer extensions shall be constructed based on the sizing requirements outlined in this Plan. The District may also enter into an agreement to compensate developers for oversizing if the project is not specifically identified.	<i>Water System Plan</i> (2015)
Water Rates	The District defines their water rates based on customer class and updates the rates when charges for supply from Everett increase.	Resolution No. 336-14

**TABLE 2-1 (continued)**

**Service Area Policies**

<b>Policy Name</b>	<b>District Policy</b>	<b>Reference</b>
Leak Adjustment	Customers may be credited for correcting leaks on their side of the meter.	Resolution No. 100-09
Water Service Shutoff	The District has a policy governing the procedures for dealing with failure to pay for water service.	Resolution No. 295-13

(1) Water rate, general facility charge, and service connection charge resolutions included in Appendix D.

**TIMELINES, EXTENSIONS, AND DISPUTE RESOLUTION**

**Developer Extension Agreements**

Applicants for developer extensions are advised that a timely service response commences on the date a Developer Extension Agreement (DEA) is executed with the District and ends upon the prescribed expiration date of the DEA.

Time extensions involving the DEA may be granted, provided that good-faith effort is being made to complete the extension or other activity deemed necessary to connect to the District’s water system. In this regard, the District allows up to 12 months for construction of a developer extension from the date of the approved plans. Requests for additional time can be made if needed.

In the event a party seeking a developer extension agreement has a grievance regarding the timely and reasonable response of the District to their application, the applicant is directed to submit in writing to the District General Manager a request for said grievance to be heard before the District Board of Commissioners.

**Service Connections**

Applicants for a new individual water service are advised that a timely service response period commences on the date the complete Certificate for Water Availability is issued by the District and ends upon the prescribed expiration date of the Certificate.

Connections to the District’s water system for individual applicants generally occur within 2 to 3 weeks of approval of the Application for Water Service form by the District.

Time extensions involving individual applications for water service are generally and quickly addressed through the issuance of a new Certificate of Water Availability.

In the event an individual water service applicant has a grievance regarding the timely and reasonable response of the District to their application, the applicant is directed to submit in writing to the District General Manager a request for said grievance to be heard before the District Board of Commissioners.

### **Policies for Service Shutoff**

If payment is not made for water service, the District will take the following actions, as detailed in District Resolution No. 295-13:

1. Notice is generally sent after 15 days of delinquency.
2. The second notice is generally sent after 30 days. At this point, a late fee is charged.
3. If after a further 45 days no payment is received, the customer is charged a termination notice charge and a termination notice is mailed.
4. If payment is not received by the due date on the termination notice, the service is shutoff and a lien is applied.

Arrangements for payment are made at the discretion of the Board on a case-by-case basis. Arrangements for payment may be made prior to the Commissioner Meeting at the discretion of the General Manager.

### **SATELLITE SYSTEM MANAGEMENT**

The District is not prepared at this time to provide and/or contract for satellite system management or ownership services within or adjacent to the District's service area.

### **SERVICE AREA CHARACTERISTICS**

A general description of the District's physical environment is provided in the following sections. A working knowledge of the area is useful in identifying any constraints that may affect the development of the water system.

Much of the information summarized in this section was obtained from *Distribution and Description of Geologic Units in the Mukilteo Quadrangle, Washington* by James P. Minard (1982) and *Soil Survey of Snohomish County Area* published by the Soil Conservation Service (1983). The history of record for the Soil Conservation Service documents is from 1951 to 1978. The Soil Conservation Service now operates under the name Natural Resource Conservation Service.

## **Topography**

Elevations within the District range from sea level at Puget Sound to 620 feet above sea level at the eastern perimeter. Most of the District lies on a plateau. The western edge of the plateau is intersected at several points by deep ravines. The ravines function as natural barriers that in effect, create separate water distribution areas. A topographical map of the District is shown on Figure 2-3.

## **Geology and Soils**

The geological formations exposed in the District are primarily deposits of glacial, fluvial, and lacustrine origin. Geologists indicate these deposits were formed during a series of glacial advances and recessions.

The topmost layer that covers most of high plateau in the District service area is a non-sorted till (known as the Vashon till) composed of variable amounts of clay, silt, sand, pebbles, cobbles, and boulders. The till contains lenses of stratified material, particularly near the base, referred to as “hardpan.” Water drainage is greatly retarded by the unweathered hardpan material. Surface water tends to percolate readily through the top 3 to 10 feet of till, but ponds and moves laterally along the buried hardpan surface.

Located below the till is an outwash formation that is composed primarily of clean, gray, pebbly sand, with increasing amounts of gravel in the top layers. This layer outcrops along the eastern side of the plateau and reaches a thickness of approximately 260 feet in some areas. It is a source of clean sand and gravel and is one of the most extensive aquifers in the region.

Figure 2-4 shows the soil classifications within the District boundary.

## **Critical Areas**

The District’s service area includes areas with steep slopes, wetlands, and areas with potential for flooding. The basic surface water drainage travels from the east to Puget Sound in the west. Surface water runoff flows to Puget Sound via the deep ravines located along the western side of the District. Two large ravines that influence the layout of the water distribution system are Big Gulch and Japanese Gulch. Big Gulch is located in the southern half of the District and runs from east to west. Japanese Gulch runs northward along the northeastern perimeter of the District. Paine Field and areas to the east drain to the south into Swamp Creek.

Site-sensitive areas including wetlands, lakes, and the 100-year floodplain are shown on Figure 2-5.

The Whidbey Island Fault runs from the Strait of Juan de Fuca along the southwestern edge of Whidbey Island, crosses Puget Sound, and continues through the Cities of

Mukilteo, north Lynnwood, and south Mill Creek to Duvall. The fault is estimated to be within 2 miles of Reservoir 4. The Whidbey Island Fault has seen increased activity in the past several years including three earthquakes with a magnitude greater than 3.7 on the Richter scale since 1970. The Geological Society of America Bulletin, March 1996 states “The southern Whidbey Island Fault should be considered capable of generating large earthquakes (Magnitude equal to or greater than 7.0) and may represent a significant seismic hazard to residents of the Puget Lowland.”

## **Climate**

The climate of the Snohomish County area is tempered by winds from the Pacific Ocean. Summers are fairly warm with an occasional hot day. The average summer temperature is 62 degrees F in Everett, located just north and east of the District, with an average daily maximum temperature of approximately 72 degrees F. Winters are cool with occasional snow and freezing temperatures. The average winter temperature in Everett is 40 degrees F with an average daily minimum temperature of 34 degrees F. Summer rainfall is light, but rains during the rest of the year are frequent, especially in fall and winter. The average total annual precipitation for Everett is 36 inches. Approximately 20 to 30 percent of the total precipitation falls during the period of April through September.

Average wind speed is approximately 10 mph and is highest in winter. Usually one or two storms per winter bring damaging winds and heavy rains, which may result in power outages and flooding.

## **POLITICAL JURISDICTIONS WITHIN THE DISTRICT SERVICE AREA**

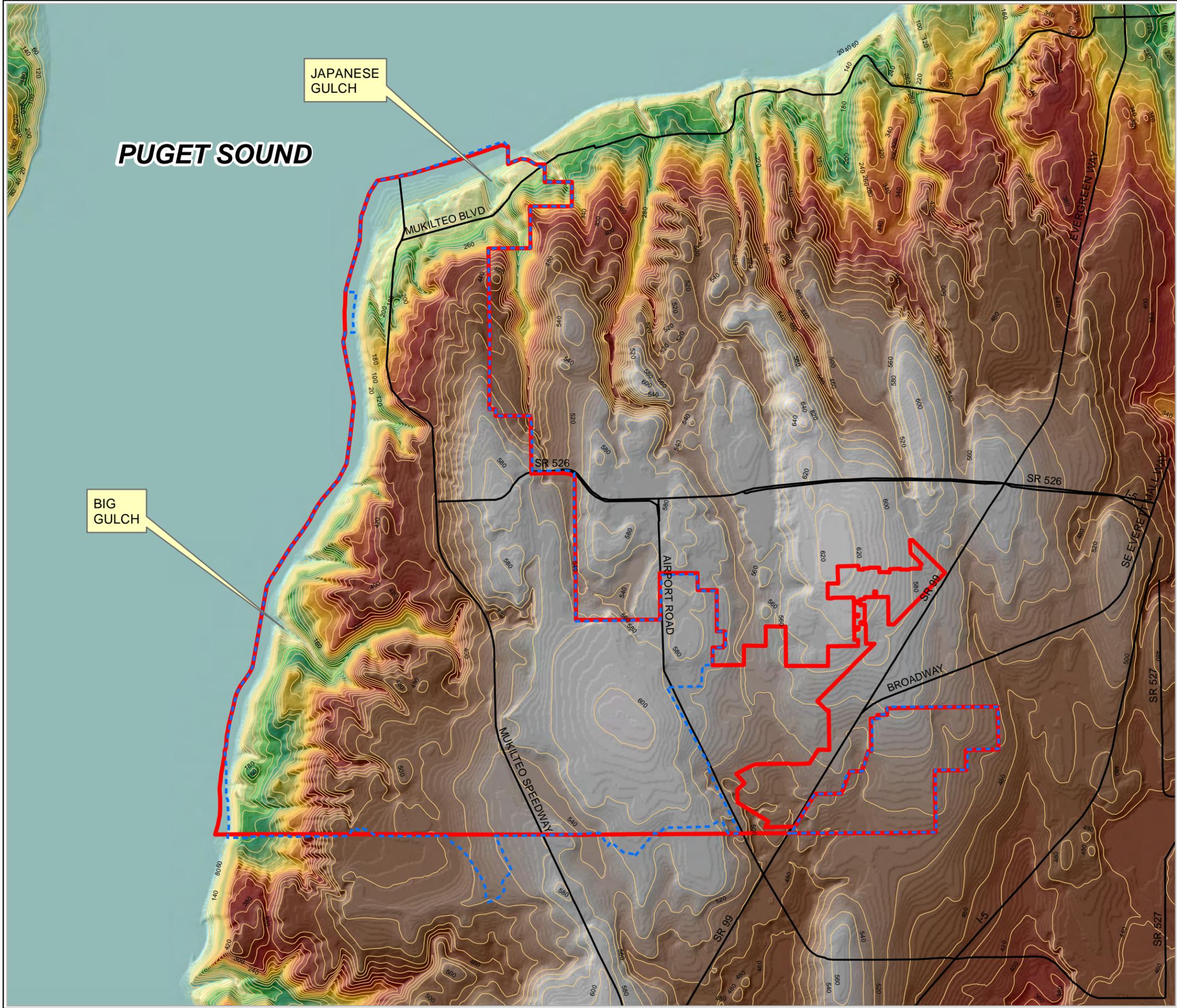
The District provides water to the City of Mukilteo, Paine Field, and unincorporated areas of southwest Snohomish County, as well as areas within the urban growth area of the City of Everett. The political jurisdictions located within the District service area are shown on Figure 2-1.

### **City of Mukilteo**

The District serves approximately 80 percent (approximately 4.9 square miles) of the City of Mukilteo. The Alderwood Water & Wastewater District serves the portion of the City of Mukilteo located south of 116<sup>th</sup> Street SW.

### **Paine Field Airport**

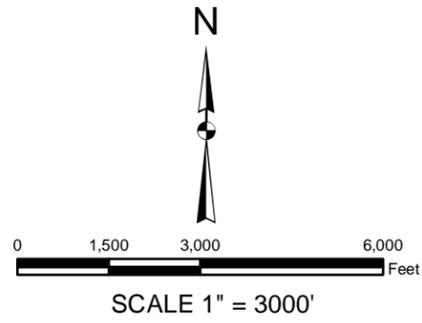
The Paine Field Airport is owned and operated by Snohomish County. It is the primary general aviation and industrial aviation airport serving Snohomish County and the northern metropolitan Seattle area. The airport’s historical role has been to encourage activities such as general aviation, repair of large aircraft, corporate and business activity, and Boeing Company operations.



**PUGET SOUND**

JAPANESE GULCH

BIG GULCH



**Legend**

- - - RETAIL SERVICE AREA
- - - MUKILTEO WATER WASTEWATER DISTRICT CORPORATE BOUNDARY
- 20' CONTOURS - USGS

Source: USGS 2014

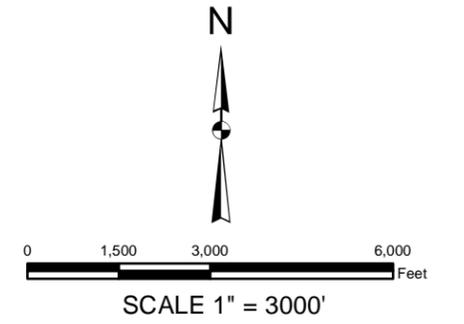
**MUKILTEO WATER & WASTEWATER DISTRICT**

**WATER SYSTEM PLAN**  
**FIGURE 2-3**  
**TOPOGRAPHY**

  
Gray & Osborne, Inc.  
CONSULTING ENGINEERS

UPDATED: 5/1/2015

# PUGET SOUND



**LEGEND:**

- MUKILTEO WATER AND WASTEWATER DISTRICT CORPORATE BOUNDARY
- RETAIL SERVICE AREA

**SOILS**

- ALDERWOOD - AD
- BELLINGHAM - BE
- CATHCART - CA
- CUSTER - CU
- EVERETT - EV
- INDIANOLA - IN
- KITSAP - KI
- MCKENNA - MC
- MUKILTEO - MU
- NORMA - NO
- PASTIK - PA
- PILCHUCK - PI
- PITS - PIT
- PUGET - PU
- PUYALLUP - PUY
- RIVERWASH - RI
- ROCK OUTCROP - RO
- SNOHOMISH - SNO
- SULTAN - SU
- SUMAS - SUM
- TERRIC MEDISAPRISTS - TE
- TOKUL - TO
- URBANLAND - UR
- XERORTENTS - XE
- WATER - WA

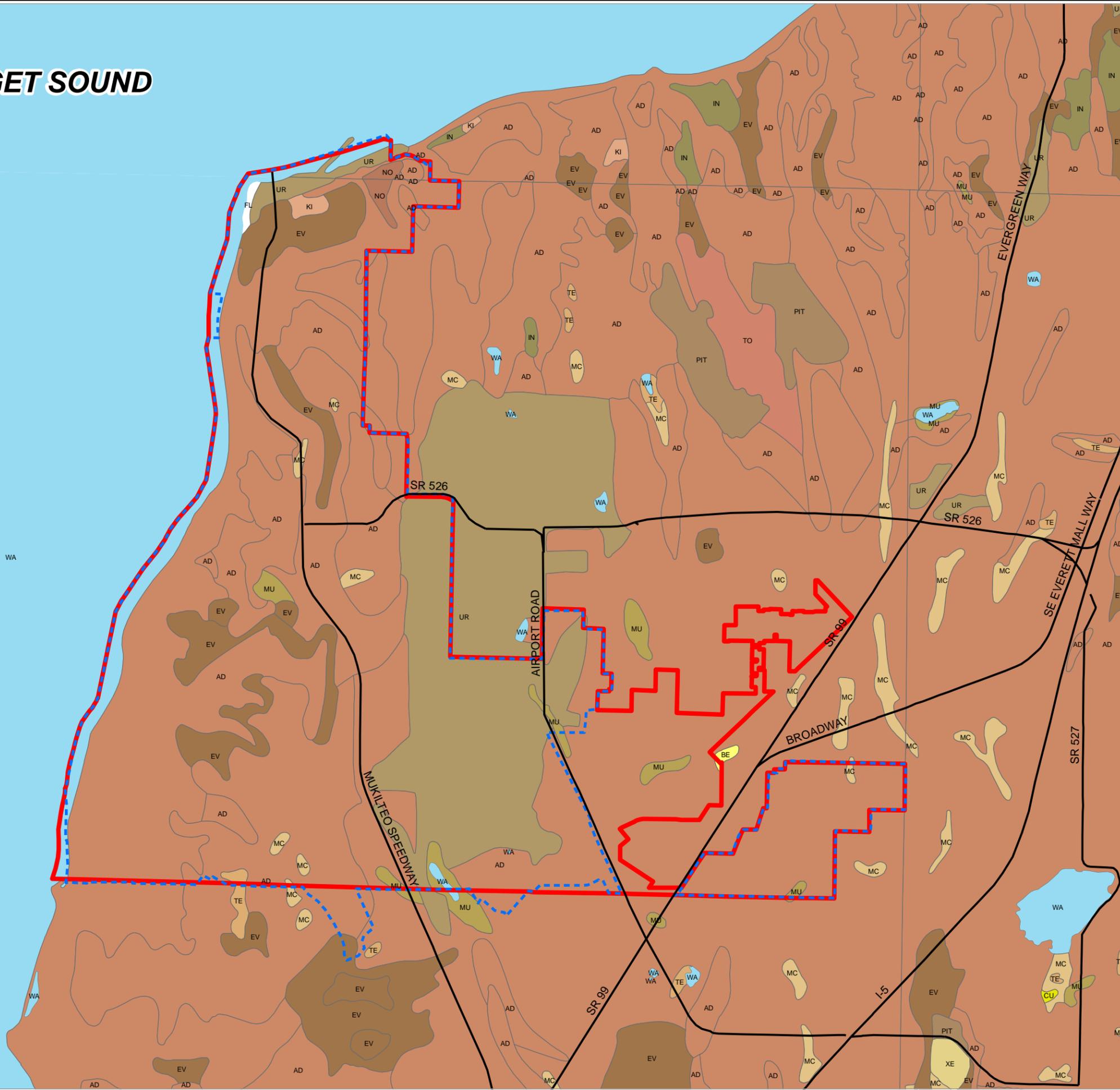
SOURCE: U.S. DEPARTMENT OF AGRICULTURE 2007

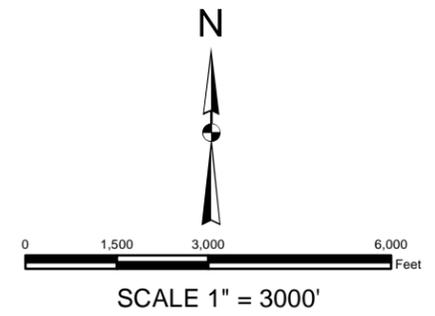
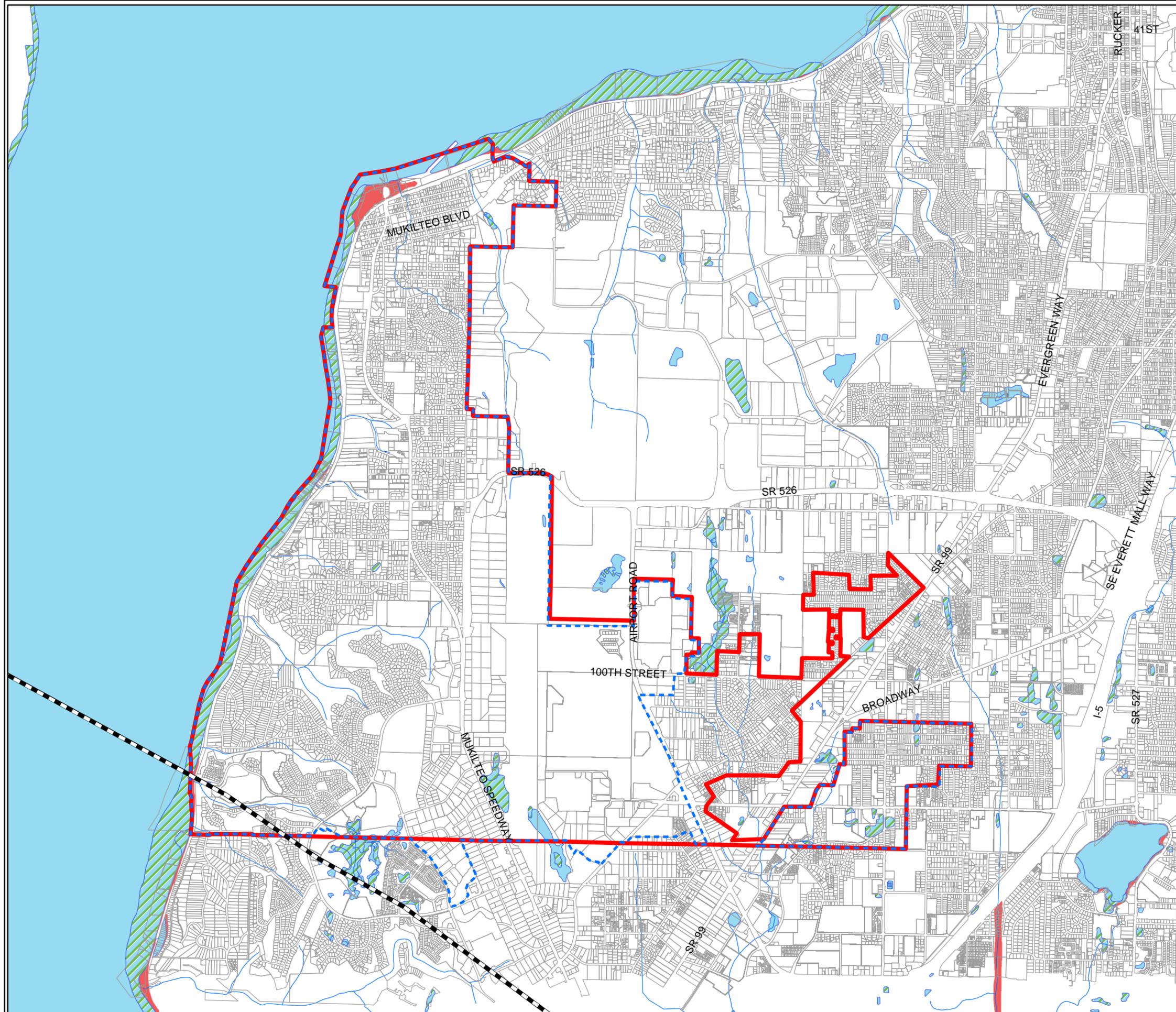
MUKILTEO WATER & WASTEWATER DISTRICT

WATER SYSTEM PLAN  
FIGURE 2-4  
SOILS

Gray & Osborne, Inc.  
CONSULTING ENGINEERS

UPDATED: 5/1/2015





**Legend**

- ESTIMATED LOCATION OF SOUTH WHIDBEY ISLAND FAULT
- RETAIL SERVICE AREA
- MUKILTEO WATER & WASTEWATER DISTRICT CORPORATE BOUNDARY
- WETLANDS
- LAKES
- STREAMS
- FEMA ZONE**
- 100-YEAR FLOODPLAIN

DATA SOURCES:  
 FEMA Q3 FLOOD DATA, WASHINGTON, 1998  
 US DEPT. OF FISH AND WILDLIFE, NWI, 2014

**MUKILTEO WATER & WASTEWATER DISTRICT**

**WATER SYSTEM PLAN**

**FIGURE 2-5**

**SITE SENSITIVE AREAS**

Gray & Osborne, Inc.  
CONSULTING ENGINEERS

UPDATED: 5/1/2015

## **Unincorporated Areas of Snohomish County**

The southeastern section of the District includes unincorporated and urbanized areas of southwest Snohomish County. Planning for this area is covered by the *Snohomish County Airport/Paine Field Master Plan Update* (Snohomish County, 2002), the *City of Everett Comprehensive Plan* (Everett, 2015), and the *Snohomish County GMA Comprehensive Plan* (Snohomish County, amended June 20, 2008).

## **City of Everett**

A portion of the 715 East Zone is within the urban growth area of the City of Everett. In recent years, the City of Everett has annexed sections of the 715 East Zone into their service area. The City of Everett is expected to continue to annex portions of this zone until their service area reaches their UGA boundary. Presently, the City of Everett provides water service to areas within the District's corporate limits. The District provides sewer service in these areas.

## **PLANNING PERIOD**

In the past, the District has adopted 6-year, 10-year, and 20-year planning periods to allow for the implementation of its Capital Improvement Program (CIP). The 10-year planning period for the District's CIP is to 2025 and the 20-year is to 2035.

## **POPULATION**

To evaluate the water system's existing facilities and determine requirements for future facilities, the District's existing and projected populations are estimated and used to project future water demand. Both residential and employee populations are presented. The residential population forecast is used to predict future residential water consumption for single- and multi-family customer classes. The employee population is used to predict future commercial water use for the commercial/industrial customer class.

## **Service Area Population Forecast**

The population of the District is estimated using data from Puget Sound Regional Council (PSRC) 2014 Land Use Targets. The forecast data is presented for regions known as Forecast Analysis Zones (FAZs). The District's retail service area overlaps four of the FAZs, as shown on Figure 2-6. The FAZ data provided by PSRC includes forecasts of populations for residents and employees inside each FAZ. Population forecasts within the FAZs are provided for 2010, 2025, 2030, 2031, and 2035.

Residential and employee populations for the District are based on GIS analysis of the four FAZs that contain the District's retail service area. Residential populations are estimated using the percentage of land within the District's retail service area (RSA) to

total land within the FAZ. The boundaries for FAZs 8000 and 7526 extend beyond the shoreline to include some of Puget Sound. These FAZ boundaries were trimmed to match the shoreline so that the percentage of land within the RSA could be compared to the total FAZ area over land. This assumes that no residential or employment growth will occur beyond the shoreline in the waters of Puget Sound. The percentages for land inside the RSA were also used to estimate employment. The residential population of the current RSA is estimated to have been 23,423 in 2010. The employee population within the current RSA is estimated to have been 19,820 in 2010. The PSRC provides population and employment projections for 2010, 2025, 2030, 2031, and 2035. These numbers are used as a baseline for the projections. Between these projected years, the appropriate growth rates were determined and used to project individual years in the District’s 20-year planning period.

Table 2-2 lists the FAZ identification number and the retail service area’s residential population within each FAZ. Table 2-3 lists the RSA’s employee population within each FAZ.

**TABLE 2-2**

**Residential Population Forecasts within the Retail Service Area<sup>(1)</sup>**

<b>FAZ<sup>(2)</sup></b>	<b>2010</b>	<b>2015</b>	<b>2021</b>	<b>2025</b>	<b>2035</b>
7526	8,001	8,165	8,361	8,492	8,837
7537	8,282	8,476	8,710	8,866	10,554
8000	3,252	3,384	3,541	3,646	4,183
8115	3,888	4,026	4,193	4,304	4,876
<b>Total</b>	<b>23,423</b>	<b>24,051</b>	<b>24,805</b>	<b>25,307</b>	<b>28,451</b>

(1) These population estimates are based on the current water retail service area.

(2) Data from PSRC 2014 Land Use Targets.

**TABLE 2-3**

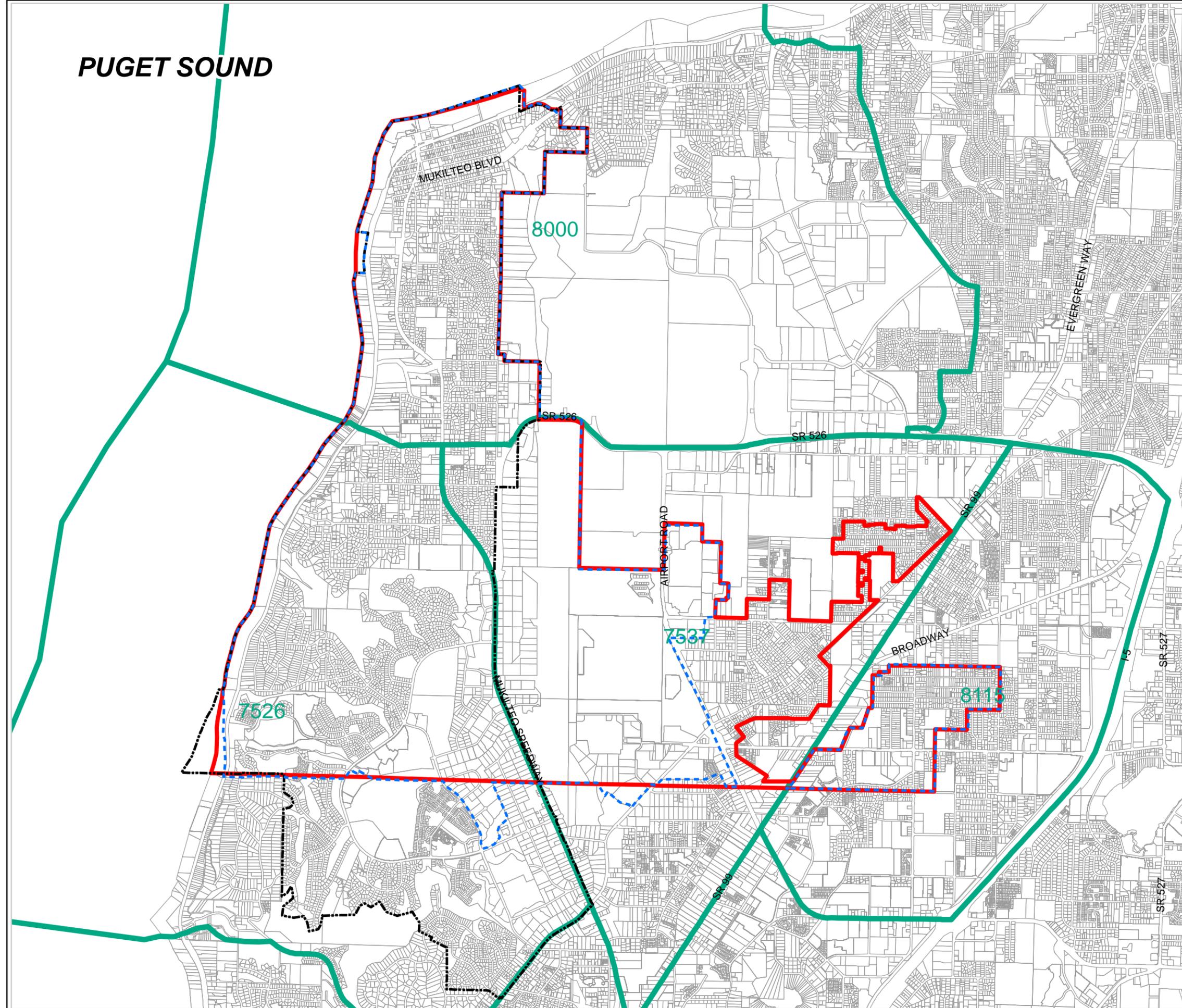
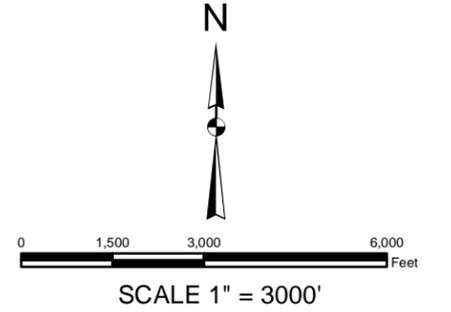
**Employee Population Forecasts within the Retail Service Area<sup>(1)</sup>**

<b>FAZ<sup>(2)</sup></b>	<b>2010</b>	<b>2015</b>	<b>2021</b>	<b>2025</b>	<b>2035</b>
7526	3,990	4,195	4,441	4,605	5,103
7537	5,019	5,620	6,340	6,821	8,472
8000	9,596	9,497	9,378	9,298	11,338
8115	1,215	1,369	1,553	1,677	2,033
<b>Total</b>	<b>19,820</b>	<b>20,680</b>	<b>21,712</b>	<b>22,401</b>	<b>26,945</b>

(1) These population estimates are based on the current retail service area.

(2) Data from PSRC 2014 Land Use Targets.

**PUGET SOUND**



**Legend**

- RETAIL SERVICE AREA
- MUKILTEO CITY LIMITS
- MUKILTEO WATER & WASTEWATER DISTRICT CORPORATE BOUNDARY
- FAZ BOUNDARIES

SOURCE: PSRC FAZ MAP 2010

MUKILTEO WATER & WASTEWATER DISTRICT

WATER SYSTEM PLAN  
FIGURE 2-6  
FAZ BOUNDARIES

Gray & Osborne, Inc.  
CONSULTING ENGINEERS

UPDATED: 5/1/2015

**Historical Population**

The historical population and employment is show in Table 2-4. PSRC data was used to estimate the population within the District during these years. Based on these estimates, linear interpolation was used to calculate population and employment in years between the PSRC estimates. In 2011, a portion of the District’s service area was annexed to Everett. From 2009 through 2011, this area was included in the historical population and employment estimates. After 2011, the estimates for this area are no longer included.

**TABLE 2-4**

**Historical Population and Employment**

Year	Population <sup>(2)</sup>	
	Residential	Employment
2009 <sup>(1)</sup>	25,290	20,638
2010 <sup>(1)</sup>	25,425	20,843
2011 <sup>(1)</sup>	25,559	21,049
2012	23,674	20,164
2013	23,800	20,336
2014	23,925	20,508

- (1) In 2011, a portion of the service area which included 1,188 connections was assumed by the City of Everett.
- (2) Estimated using PSRC FAZ population forecast data.

**Service Area Transfer to Everett**

The District and the City of Everett have an interlocal agreement governing annexations and service area transfers within the District’s retail service area. This agreement states that Everett will refrain from assuming District facilities within annexed areas for a period of 10 years from the date of annexation. There are currently no areas that were annexed by the City of Everett within the last 10 years so there are no planned transfers or assumptions during the next 10 years. In 2011, the District had a portion of their service area assumed to the City of Everett. The connections lost due to assumptions within the past 6 years are shown in Table 2-5 below.

**TABLE 2-5**

**Connections Lost Due to Assumptions**

Year	Single-Family	Multifamily	Commercial	Industrial	Total
2011	1,023	138	21	6	1,188

## Population Projection

The PSRC population and employment estimates are for 2010, 2025, 2030, 2031, and 2035. The estimated population and employment within the retail service area are shown in Tables 2-2 and 2-3. Based on these estimates, linear interpolation was used to calculate population and employment in years between the PSRC estimates. The projected District service area populations are given in Table 2-6.

**TABLE 2-6**

### Projected Population<sup>(1)</sup>

Year	Population	
	Residential	Employee
2015	24,051	20,680
2016	24,177	20,852
2017	24,302	21,024
2018	24,428	21,196
2019	24,553	21,368
2020	24,679	21,540
2021	24,805	21,712
2022	24,930	21,884
2023	25,056	22,057
2024	25,182	22,229
2025	25,307	22,401
2026	25,622	22,855
2027	25,936	23,309
2028	26,250	23,764
2029	26,564	24,218
2030	26,879	24,672
2031	27,192	25,126
2032	27,507	25,581
2033	27,821	26,036
2034	28,136	26,490
2035	28,451	26,945

(1) Based on PSRC forecast data.

## WATER USE

Knowledge and evaluation of past water use is important for the management of a water system. The historical records provided by the District are used to determine trends, past performance, identify areas for improvement, and forecast future use.

Historical water usage for the District is based on two primary sources of information: source production data and individual meter consumption data. The source production data is the amount of water purchased from the City of Everett and AWWD through the District’s master and flow control meters. Individual meter consumption data is the amount of water consumed by individual accounts. Production and consumption data are used to calculate estimates of annual per capita demand and distribution system leakage.

**EXISTING CONSUMPTION AND PRODUCTION DATA**

Annual water consumption information for the District from 2009 to 2014 is presented in Table 2-7. Annual water consumption for the District’s Single-Family Residential, Multifamily Residential, and Commercial/Industrial accounts and the District total are presented in millions of gallons. These values represent the yearly sum of the individual meter data for the entire District, as determined from billing records. The average day consumption value, in millions of gallons per day, is also presented for each year and customer class. In 2011, the City of Everett assumed 1,188 connections from the District. This caused a significant drop in water consumption from 2010 to 2011.

**TABLE 2-7**

**Annual Water Consumption by Customer Class<sup>(1)</sup>**

Year	Single-Family		Multifamily		Commercial/ Industrial		Hydrant Meters/Other		Total	
	mgd <sup>(2)</sup>	MG	mgd <sup>(2)</sup>	MG	mgd <sup>(2)</sup>	MG	mgd <sup>(2)</sup>	MG	mgd <sup>(2)</sup>	MG
2009	0.95	348	0.47	172	0.51	186	0.05	18	1.98	724
2010	1.00	365	0.45	163	0.47	170	0.03	10	1.95	709
2011 <sup>(3)</sup>	0.81	295	0.41	151	0.43	157	0.02	6	1.67	609
2012	0.80	293	0.41	148	0.46	167	0.01	3	1.68	612
2013	0.80	293	0.40	145	0.50	184	0.05	19	1.75	641
2014	0.81	296	0.41	150	0.48	175	0.02	9	1.72	631

(1) Water consumption data is obtained from District’s billing records.

(2) Average daily water consumption.

(3) Everett assumed 1,188 of the District’s connections in 2011.

Table 2-8 presents the District’s annual water consumption, excluding the 715 East Zone. This data is used for comparisons of consumption and production. Since the distribution system in the 715 East Zone is interconnected at numerous points with the City of Everett, water production data is not available for this area. The total annual water consumed by the District, excluding the 715 East Zone, ranged from a high of 513 MG in 2013 to a low of 488 MG in 2011 and 2012.

**TABLE 2-8**

**District Water Consumption**

<b>Year</b>	<b>Water Consumption (MG)</b>		
	<b>District Total<sup>(1)</sup></b>	<b>715E Zone<sup>(2)</sup></b>	<b>Without 715E Zone<sup>(3)</sup></b>
2009	724	215	509
2010	709	204	505
2011 <sup>(4)</sup>	609	122	488
2012	612	124	488
2013	641	128	513
2014	631	123	508

- (1) Sum of District service meter consumption (from Table 2-7).
- (2) Sum of service meter consumption located in 715 East Zone.
- (3) District water consumption minus water consumption in 715 East Zone.
- (4) Everett assumed 1,188 of the District's connections in 2011.

Table 2-9 presents the annual production data by source meter for the District for 2009 through 2014. These values represent the portion of the District serviced by the master and flow control meters and do not include the 715 East Zone. Water entering the District distribution system is measured at three master meter locations: Mukilteo Boulevard, Paine Field, and Harbour Pointe; and one flow control meter at 100<sup>th</sup> Street SW. As summarized in Table 2-9, the total production for the District ranged from a high of 543 MG in 2009 to a low of 500 MG in 2010.

**TABLE 2-9**

**Source Meter Production**

Year	Source Meter												Total Volume (MG)
	Mukilteo Blvd.		Casino Road		100 <sup>th</sup> Street		112 <sup>th</sup> Street <sup>(1)</sup>		Harbour Pointe <sup>(2)</sup>		Paine Field <sup>(3)</sup>		
	Volume (MG)	Percent	Volume (MG)	Percent	Volume (MG)	Percent	Volume (MG)	Percent	Volume (MG)	Percent	Volume (MG)	Percent	
2009	42.0	7.7%	347	63.9%	68.8	12.7%	85.4	15.7%	0	0.0%	0	0.0%	543
2010	44.3	8.9%	315	63.1%	67.4	13.5%	73.0	14.6%	0	0.0%	0	0.0%	500
2011	27.2	5.3%	210	40.9%	5.7	1.1%	122	23.8%	148	28.8%	0	0.0%	512
2012	12.9	2.5%	146	28.5%	5.2	1.0%	71.1	13.8%	191	37.1%	87.3	17.0%	514
2013	27.0	5.0%	73.8	13.6%	0.1	0.0%	3.8	0.7%	101	18.6%	335	62.0%	540
2014	25.3	4.9%	12.4	2.4%	0.5	0.1%	1.5	0.3%	112	21.6%	368	70.8%	521

(1) Decommissioned in 2014.

(2) Online in 2011.

(3) Online in 2012.

Table 2-10 presents total District water production for source meters and for the 715 East Zone. Water entering the 715 East Zone is not metered; therefore, production in the 715 East Zone is assumed equal to metered consumption.

**TABLE 2-10**

**District Water Production**

Year	MM <sup>(1)</sup> Production		FCM <sup>(2)</sup> Production		715E Zone Consumption <sup>(3)</sup>		Total	
	MG	mgd	MG	mgd	MG	mgd	MG	mgd
2009	389	1.07	154	0.42	215	0.59	758	2.08
2010	359	0.98	140	0.38	204	0.56	704	1.93
2011	384	1.05	128	0.35	122	0.33	634	1.74
2012	437	1.19	76	0.21	124	0.34	638	1.74
2013	536	1.47	4	0.01	128	0.35	669	1.83
2014	519	1.42	2	0.01	123	0.34	644	1.76

(1) Master Meter.

(2) Flow Control Meter.

(3) Production for the 715 East Zone is not metered so consumption is presented.

**SERVICE CONNECTIONS**

The number of connections in the District’s retail service area that are billed as Single-Family Residential, Multifamily Residential, and Commercial/Industrial are presented in Table 2-11. Residential connections, including both single-family and multifamily, represent the majority of connections within the District. In 2011, the District lost 1,188 connections when part of the District’s service area was assumed by the City of Everett. This included a loss of connections across all customer classes.

**TABLE 2-11**

**Number of Service Connections**

Year	Customer Class				Subtotal	Annual Growth
	Commercial/ Industrial	Irrigation	Single-Family Residential	Multifamily Residential		
2009	549	114	5,431	593	6,687	—
2010	553	114	5,461	594	6,722	0.52%
2011 <sup>(1)</sup>	534	108	4,463	457	5,562	-17.26%
2012	535	108	4,480	457	5,580	0.32%
2013	548	108	4,506	460	5,622	0.75%
2014	554	110	4,547	464	5,675	0.94%

(1) In 2011, 1,188 connections were assumed by the City of Everett.

## EQUIVALENT RESIDENTIAL UNITS

A useful way of assessing the impact of multifamily, commercial, and industrial water usage on a water utility is to calculate water usage in terms of Equivalent Residential Units (ERUs). The amount of water consumed by nonresidential connections can be compared to residential connections by calculating the equivalent number of single-family residences needed to consume the same volume of water as a nonresidential connection. The formula that defines an ERU is presented below.

$$ERU = \frac{\text{Single - Family Consumption (gallons)}}{(\text{Single - Family Connections}) * (365 \text{ days})}$$

The ERUs for 2009 through 2014 are presented in Table 2-12.

**TABLE 2-12**

### Historical Equivalent Residential Unit Values

Year	Single-Family Consumption (MG)	Single-Family Connections	ERU Value (gpd/connection)
2009	348	5,431	175
2010	365	5,461	183
2011 <sup>(1)</sup>	295	4,463	181
2012	293	4,480	179
2013	293	4,506	178
2014	296	4,547	179
<b>Average</b>			<b>179</b>

(1) In 2011, 1,188 connections were assumed by the City of Everett.

When calculating the number of ERUs for other customer classes, the average daily consumption for that customer class is divided by the ERU value. Results are shown in Table 2-13 for 2009 to 2014. Also shown in Table 2-13 are the total ERUs that are represented by the total metered consumption within the entire District Retail Service Area.

**TABLE 2-13**

**Historical District Consumption in ERUs**

Year	Single-Family			Multifamily			Commercial and Industrial			Total ERUs
	Connections	Volume (MG)	ERU (gpd/conn.)	Connections	Volume (MG)	ERUs	Connections	Volume (MG)	ERUs	
2009	5,431	348	175	593	172	2,694	549	186	2,901	11,027
2010	5,461	365	183	594	163	2,443	553	170	2,544	10,448
2011 <sup>(1)</sup>	4,463	295	181	457	151	2,288	534	157	2,378	9,129
2012	4,480	293	179	457	148	2,268	535	167	2,560	9,308
2013	4,506	293	178	460	145	2,221	548	184	2,827	9,554
2014	4,547	296	179	464	150	2,303	554	175	2,690	9,540

(1) In 2011, 1,188 connections were assumed by the City of Everett.

**PEAK WATER DEMAND**

Monthly and daily variations in water demand must be considered when planning water supply, storage, and transmission facilities. Hourly variations must be considered in designing water distribution systems. The degree of normal variations in demand experienced by water systems is generally a function of both system size and the time interval. The relationship is generally that the smaller the system and the shorter the time interval, the greater the variation from the average.

**Maximum Day Demand**

The calculated maximum day factors for 2009 through 2014, based on all four of the District’s source meters, are presented in Table 2-14. The average peaking factor is 1.97, but peaking factors have been as high as 2.27 in 2012. For the Plan, a value of 2.0 is used to estimate future maximum day. This is consistent with the value used in the 2010 *Water System Comprehensive Plan* and with the average peaking factor recorded in the past 6 years.

**TABLE 2-14**

**District Peaking Factors**

<b>Year</b>	<b>Average Day Production Excluding 715 East<sup>(1)</sup> (mgd)</b>	<b>Maximum Day Production Excluding 715 East<sup>(2)</sup> (mgd)</b>	<b>Peaking Factor<sup>(3)</sup></b>
2009	1.49	3.05	2.05
2010	1.37	2.30	1.68
2011	1.40	2.80	1.99
2012	1.41	3.19	2.27
2013	1.48	2.76	1.86
2014	1.43	2.65	1.97
<b>Average</b>	<b>1.43</b>	<b>2.79</b>	<b>1.97</b>

- (1) From District source meter records.
- (2) Taken from daily source meter telemetry.
- (3) Ratio of Maximum Day Production to Average Day Production.

**Peak Hour Demand**

The maximum quantity of water produced in a 1-hour period during a maximum day demand is the peak hour demand. If precise records of peak hour demand are not available, peak hour is often expressed in terms of a peaking factor. A peaking factor is defined as the ratio of peak hour to the maximum day demand. It is generally accepted that peak hour factors range from 1.5 to 2.5. The DOH *Water System Design Manual* (2009) provides a methodology for calculating peak hour demand (PHD). The generalized equation follows:

$$PHD = (MDD/1,440)[(C)(N) + F] + 18$$

Where:

- PHD* = Peak Hourly Demand, (gallons per minute, gpm)
- C* = Coefficient associated with ranges of ERUs
- N* = Number of service connections, ERUs
- F* = Factor associated with ranges of ERUs
- MDD* = Maximum Day Demand, (gpd/ERU)

The values for *C* and *F* of the peak hour demand formula are taken from the DOH *Water System Design Manual* (2009) Table 5-1. For the District, *C* is equal to 1.6 and *F* is equal to 225. Table 2-15 summarizes the historical peak hour factor calculation.

**TABLE 2-15**

**Peak Hour Factor**

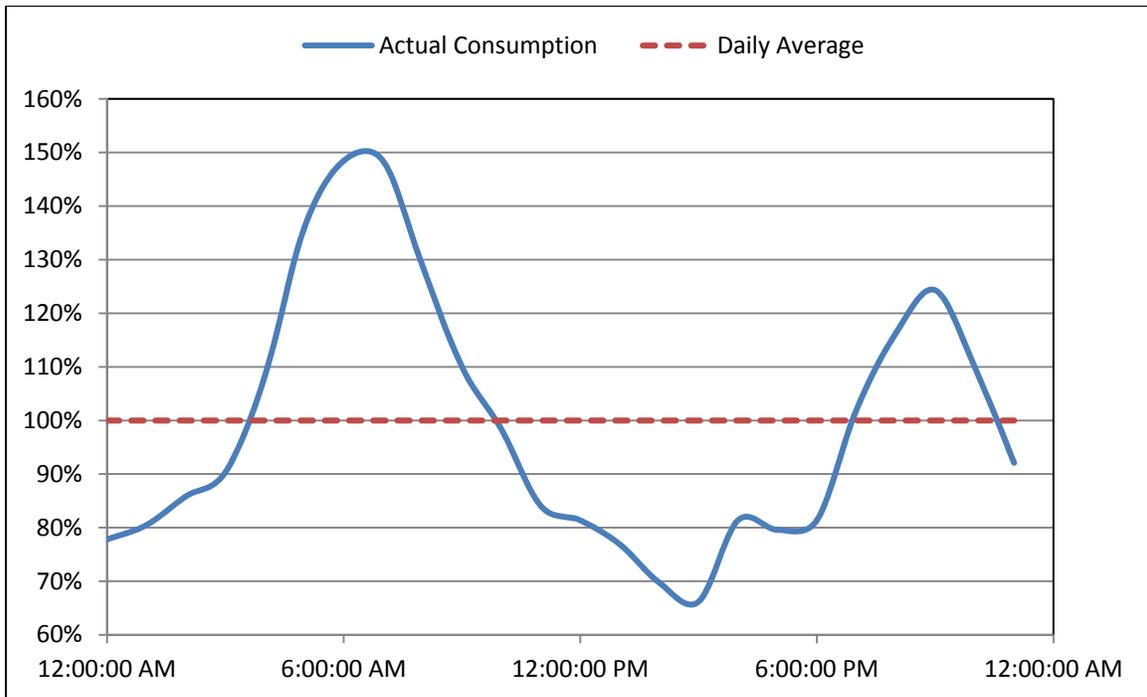
<b>Year</b>	<b>MDD<sup>(1)</sup> (mgd)</b>	<b>MDD (gpd/ERU)</b>	<b>MDD (gpm)</b>	<b>N<sup>(2)</sup> (ERUs)</b>	<b>C</b>	<b>F</b>	<b>PHD (gpm)</b>	<b>Peak Hour Factor</b>
2009	3.05	277	2,118	11,027	1.6	225	3,450	1.63
2010	2.30	220	1,594	10,448	1.6	225	2,603	1.63
2011	2.80	307	1,943	9,129	1.6	225	3,175	1.63
2012	3.19	343	2,217	9,308	1.6	225	3,618	1.63
2013	2.76	289	1,917	9,554	1.6	225	3,130	1.63
2014	2.65	278	1,843	9,540	<b>1.6</b>	<b>225</b>	3,010	<b>1.63</b>

(1) From Table 2-14.

(2) From Table 2-13.

The calculated peak hour factor has remained constant at 1.63.

For 2014, hourly consumption demands were determined based on reservoir levels and production data. Figure 2-7 below shows the hourly consumption normalized to the maximum day demand. The peak hour from 2014 was approximately 1.5 times the maximum day demand. Since only 1 year of peak hour data was available, a conservative rounded up peak hour factor of 1.7 (170 percent of maximum day demand) is used for projections in this Plan.



**FIGURE 2-7**

**2014 Maximum Day Demand**

**DISTRIBUTION SYSTEM LEAKAGE**

Distribution system leakage (DSL) is defined as all unauthorized uses, water system leakage, and any authorized uses the water system does not estimate or track (WAC 246-290-820(2)). The difference between source production and authorized consumption for the District during 2009 through 2014 is shown in Table 2-16. Authorized consumption includes metered usage by customers and other known or credibly estimated uses. These unmetered uses can include construction, firefighting, and flushing. The distribution system leakage analysis does not account for the 715 East Zone because production data is not available.

**TABLE 2-16**

**Distribution System Leakage**

Year	Production (gallon)	Consumption (gallon)	Distribution System Leakage		
			Gallons	Annual %	3-Year Rolling Average
2009	758,070,000	724,010,000	34,060,000	4.49%	1.6% <sup>(1)</sup>
2010	703,560,000	708,590,000	-5,030,000	-0.71%	1.2% <sup>(1)</sup>
2011	633,760,000	609,390,000	24,370,000	3.85%	2.5%
2012	637,550,000	612,000,000	25,550,000	4.01%	2.4%
2013	668,700,000	641,110,000	27,590,000	4.13%	4.0%
2014	643,610,000	630,740,000	12,870,000	2.00%	3.4%

(1) Data from the 2010 Water System Plan was used to calculate 3-year rolling average.

The municipal water law requires that water distribution systems have a leakage rate that is less than 10 percent of finished water production. For the District, distribution system leakage is calculated to be less than 10 percent in all years as shown in Table 2-16.

Although the District averages less than 10 percent DSL, the District conducts regular leak detection as a proactive conservation measure. A more detailed discussion of the District’s Water Use Efficiency Program is presented in Chapter 7.

**PER CAPITA WATER DEMANDS**

Per capita water demands were calculated for both residential and commercial uses. Residential water demands include both the single-family and multifamily classes. Residential per capita demands are presented in Table 2-17. Commercial/industrial per capita demands are presented in Table 2-18.

**TABLE 2-17**

**Residential Per Capita Demands**

Year	Residential Population	Residential Consumption (MG)	Residential Per Capita Consumption (gpcd)
2009	25,290	520	56.0
2010	25,425	529	57.0
2011	25,559	446	48.0
2012	23,674	441	51.0
2013	23,800	438	50.0
2014	23,925	446	51.0
<b>Average</b>			<b>52.2</b>

**TABLE 2-18**

**Commercial/Industrial Per Capita Demands**

<b>Year</b>	<b>Employee Population</b>	<b>Commercial/Industrial Consumption (MG)</b>	<b>Commercial Per Capita Consumption (gpcd)</b>
2009	20,638	204	27
2010	20,843	180	24
2011	21,049	163	21
2012	20,164	171	23
2013	20,336	203	27
2014	20,508	184	25
<b>Average</b>			<b>25</b>

**FUTURE WATER DEMAND**

Projections of overall water use for the District are calculated in order to evaluate source, storage, and distribution system needs for the 6-year, 10-year, and 20-year planning periods. Future water demands are calculated by multiplying the estimated population by the historical per capita water consumption. The populations are from Table 2-6 and are based on the Puget Sound Regional Council’s forecasts.

Since per capita demands are based on metered consumption, this does not take into account distribution system leakage. A leakage estimate, based on the current average leakage is used. The current 3-year rolling average DSL, as shown in Table 2-16, is 3.4 percent. For this analysis, a DSL value of 4.0 percent of estimated consumption is used to be conservative. The distribution system peaking factors are applied to the projected average day demand to calculate the projected maximum day and peak hour demands. A maximum day factor of 2.0 and a peak hour factor of 1.7 are used. The projected system demands are presented in Table 2-19.

**TABLE 2-19**

**Projected System Demands**

Year	Residential		Commercial		DSL <sup>(4)</sup> (mgd)	Average Day Demand (mgd)	Maximum Day Demand <sup>(5)</sup> (mgd)	Peak Hour Demand <sup>(6)</sup> (gpm)
	Population <sup>(1)</sup>	Consumption <sup>(2)</sup> (MGD)	Population <sup>(1)</sup>	Consumption <sup>(2)</sup> (mgd)				
2014 <sup>(7)</sup>	23,925	1.22	20,508	0.48	0.04	1.74	2.65	2,767
2015	24,051	1.25	20,680	0.51	0.07	1.83	3.66	4,330
2016	24,177	1.26	20,852	0.51	0.07	1.84	3.69	4,350
2017	24,302	1.27	21,024	0.52	0.07	1.85	3.71	4,380
2018	24,428	1.27	21,196	0.52	0.07	1.87	3.73	4,400
2019	24,553	1.28	21,368	0.52	0.07	1.88	3.75	4,430
2020	24,679	1.29	21,540	0.53	0.07	1.89	3.78	4,460
2021	24,805	1.29	21,712	0.53	0.07	1.90	3.80	4,480
2022	24,930	1.30	21,884	0.54	0.07	1.91	3.82	4,510
2023	25,056	1.31	22,057	0.54	0.07	1.92	3.84	4,540
2024	25,182	1.31	22,229	0.54	0.07	1.93	3.87	4,560
2025	25,307	1.32	22,401	0.55	0.07	1.94	3.89	4,590
2026	25,622	1.34	22,855	0.56	0.08	1.97	3.94	4,660
2027	25,936	1.35	23,309	0.57	0.08	2.00	4.00	4,720
2028	26,250	1.37	23,764	0.58	0.08	2.03	4.06	4,790
2029	26,564	1.39	24,218	0.59	0.08	2.06	4.12	4,860
2030	26,879	1.40	24,672	0.60	0.08	2.09	4.17	4,930
2031	27,192	1.42	25,126	0.62	0.08	2.12	4.23	4,990
2032	27,507	1.43	25,581	0.63	0.08	2.14	4.29	5,060
2033	27,821	1.45	26,036	0.64	0.08	2.17	4.35	5,130
2034	28,136	1.47	26,490	0.65	0.08	2.20	4.40	5,200
2035	28,451	1.48	26,945	0.66	0.09	2.23	4.46	5,270

- (1) From Table 2-6.
- (2) Calculated using average per capita consumption from Table 2-17.
- (3) Calculated using average per capita consumption from Table 2-18.
- (4) Assuming 4.0 percent distribution system leakage rate.
- (5) Based on a maximum day to average day peaking factor of 2.0.
- (6) Based on a peak hour to maximum day peaking factor of 1.7.
- (7) Based on actual data.

# CHAPTER 3

## WATER QUALITY

### INTRODUCTION

This chapter provides a description of federal and state water quality regulations and provides a discussion of the impacts that these regulations may have on the District. Many federal and state water quality requirements do not directly affect the operations of the District, since it purchases treated water from the City of Everett. The District relies on regulatory compliance by Everett at their filtration plant for many water quality parameters. Although these regulations do not directly affect the District, they affect the quality and cost of water purchased from Everett. A copy of the City of Everett's most recent water quality report is included in Appendix F.

Table 3-1 lists current drinking water regulations. The table also indicates whether or not the regulation requires the District to take action. Existing state law contains regulations concerning bacteriological contaminants, inorganic chemical and physical parameters (IOCs), volatile organic chemicals (VOCs), synthetic organic compounds (SOCs), radionuclides, and disinfection byproducts. The District is required to conduct distribution system monitoring for bacteriological contaminants, disinfection byproducts, residual disinfectant, and lead and copper.

**TABLE 3-1**

**Current Drinking Water Regulations<sup>(1)</sup>**

<b>Drinking Water Regulation</b>	<b>Contaminants Affected<sup>(2)</sup></b>	<b>District Action Required?</b>
Coliform Monitoring	Bacteriological	Yes
Stage 1 Disinfectants/Disinfection Byproducts Rule (D/DBPR)	TTHMs, HAA5, Chlorite, Bromate	Yes
Stage 2 Disinfectants/Disinfection Byproducts Rule (D/DBPR)	TTHMs, HAA5, Chlorite, Bromate	Yes
Residual Disinfectant	Total Free Chlorine	Yes
Lead and Copper Rule	Lead, Copper	Yes
Consumer Confidence Report	Reporting Only	Yes
Arsenic Rule	Arsenic	No <sup>(3)</sup>
Filter Backwash Recycling Rule	Bacteriological	No <sup>(3)</sup>
Ground Water Rule	Bacteriological	No <sup>(3)</sup>
Inorganic Chemicals and Physical Parameters	IOCs	No <sup>(3)</sup>

**TABLE 3-1 (continued)**

**Current Drinking Water Regulations<sup>(1)</sup>**

<b>Drinking Water Regulation</b>	<b>Contaminants Affected<sup>(2)</sup></b>	<b>District Action Required?</b>
Interim Enhanced Surface Water Treatment Rule	Bacteriological	No <sup>(3)</sup>
Long Term 1 Enhanced Surface Water Treatment Rule	Bacteriological	No <sup>(3)</sup>
Radionuclides Rule	Radionuclides	No <sup>(3)</sup>
Surface Water Treatment Rule (SWTR)	Microbial Contaminants	No <sup>(3)</sup>
Unregulated Contaminant Monitoring Rule	IOCs, VOCs, SOCs	No <sup>(3)</sup>
Volatile and Synthetic Organic Compounds	VOCs, SOCs	No <sup>(3)</sup>

(1) Drinking water regulations as of March 2015.

(2) TTHM = Total Trihalomethanes; HAA5 = Five Haloacetic Acids; IOCs = Inorganic Chemical and Physical Characteristics; VOCs = Volatile Organic Chemicals; SOCs = Synthetic Organic Compounds.

(3) Compliance for treatment and source water rules met by City of Everett.

**SAFE DRINKING WATER ACT**

The 1974 Safe Drinking Water Act (SDWA) and its 1986 and 1996 amendments established specific legislation for regulation of public water systems by federal and state governments. The federal government, specifically the U.S. Environmental Protection Agency (EPA), is authorized to develop national drinking water regulations and oversee the implementation of the act. Once the federal regulations become effective (i.e., promulgated), the states may adopt the federal law and accept the primary responsibility for implementation and enforcement of the law.

In Washington State, State Drinking Water Regulations are published in the Washington Administrative Code (WAC) 246-290. These regulations establish monitoring requirements, maximum contaminant levels, and requirements for follow-up actions.

Minimum standards for water quality are often specified in terms of Maximum Contaminant Levels (MCLs). Primary MCLs are based on chronic and/or acute human health effects. Secondary MCLs are based on factors other than health effects, such as the aesthetic quality of water (taste, odor, and color).

Public water suppliers have the responsibility of meeting the requirements of the regulations on a day-to-day basis. Monitoring requirements are often established for regulated contaminants to ensure that water systems demonstrate compliance with MCLs or treatment technique requirements. Public water suppliers are also required to retain certain operational records and submit annual reports to the Washington State Department of Health (DOH) as shown in Table 3-1.

## **DISTRICT MONITORED DRINKING WATER REGULATIONS**

### **COLIFORM MONITORING**

Many serious diseases are caused by bacteria, which are a classification of single-celled organisms. To test for contamination in drinking water, specific bacteria generally known as indicator organisms are measured. Indicator organisms are used because they can be easily and reliably detected and their presence is generally indicative of further biological contamination. Total coliform, fecal coliform, and *E. coli* are typical indicator organisms.

WAC 246-290 establishes bacteriological testing requirements for public water systems. Compliance with this rule is based on the presence/absence of total coliforms. The number of routine samples required depends on the system size.

Monitoring requirements and schedules for the District are found in the District's Coliform Monitoring Plan. A copy of the Coliform Monitoring Plan is provided in Appendix E.

The state bacteriological standards require a minimum number of 25 samples per month for a population of 21,501 to 25,000. The District's current population is 24,051 and is expected to exceed 25,000 within the 10-year planning period so the minimum number of samples will increase to 30 per month. The District currently collects 30 samples per month in order to cover each pressure zone, reservoir outlet, and source distribution area. A total of 45 sites are sampled. Each location is visited twice per quarter. A map showing the sampling locations is included in Appendix E with the District's Coliform Monitoring Plan.

The Coliform Monitoring Rule specifies two types of violations, "nonacute MCL" and "acute MCL." A purveyor is required to notify both the DOH and system consumers if either MCL violation occurs.

A violation of bacteriological MCLs occurs during routine sampling when:

- Coliform is detected in more than one sample in a single month (nonacute MCL);
- Coliform is present in a set of repeat samples collected as a follow-up to a sample with fecal coliform or *E. coli* presence (acute MCL); or
- Fecal coliform or *E. coli* is present in a repeat sample after coliform was detected in the routine sample (acute MCL).

The District is in compliance with monitoring requirements for coliform.

## **DISINFECTANTS/DISINFECTION BYPRODUCTS RULE**

The use of chemical disinfectants has been highly effective at controlling many waterborne diseases caused by pathogenic organisms. It has been found, however, that disinfectants can react with naturally occurring organic materials in source water and form what are known as disinfection byproducts or DBPs. A number of these DBPs have been shown in laboratory animal tests to be carcinogenic or cause adverse reproductive and developmental effects. According to the EPA, epidemiological studies have shown a weak association between certain cancers, reproductive and developmental effects and exposure to chlorinated surface water. To deal with this risk, the Disinfectants/Disinfection Byproduct Rule requires the monitoring of two groups of disinfection byproducts. These are trihalomethanes and haloacetic acids. Trihalomethanes are measured as the sum of four different compounds (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) known as total trihalomethanes or TTHMs. Haloacetic acids are measured as the sum of five different compounds (mono-, di- and tri-chloroacetic acids and mono- and di-bromoacetic acids) known as HAA5.

### **Stage 1**

WAC 246-290-300 mandates that purveyors of public water systems that provide water treated with chlorine or other halogenated disinfectant must monitor the system for disinfection byproducts. The Disinfectants/Disinfection Byproducts (D/DBP) Rule established residual disinfectant concentrations and maximum contaminant levels for disinfection byproducts. Under Stage 1 of the D/DBP Rule, the MCLs for TTHM and HAA5 are 80 µg/L and 60 µg/L, respectively, and are based on the running annual average of four quarterly samples taken at various locations throughout the system. The Stage 1 D/DBP Rule was in effect through April 1, 2012. All systems are now under Stage 2.

### **Stage 2**

Stage 2 of the D/DBP Rule was published in January 2006 and compliance with the new regulations began in 2012. Under Stage 2 of the D/DBP Rule, the MCLs for TTHM and HAA5 remain 80 µg/L and 60 µg/L, respectively; however, compliance with the MCL is based on the locational running annual average (LRAA) of each individual sample site instead of the running annual average of all sample sites combined. This means that the annual average at each site must be below the MCL. The number of samples taken is dependant on the population served. Systems serving between 500 and 9,999 people must collect two samples per year and systems serving between 10,000 and 99,999 people must collect four samples per quarter. The District's population falls within the range of 10,000 to 99,999 people so it needs to collect four samples per quarter.

The District's Stage 2 sampling locations were selected in the 2006 *Initial Distribution System Evaluation* (IDSE). The District chose to implement the Standard Monitoring Plan (SMP) approach developed by the EPA for the completion of their ISDE requirements. In this approach, eight new sampling locations are selected and DBPs are tested for 1 year at 2-month intervals. The new locations were chosen to cover the system entry point, points of average water residence time in the distribution system, high TTHM concentration, and high HAA5 concentration. New sample locations will be chosen as part of this Plan update using the water system base map, hydraulic model, master meter flow records, and Everett Water Filtration Plant temperature data. Samples are taken at these locations to determine which sites accurately represent high TTHM and HAA5 levels.

### **RESIDUAL DISINFECTANT**

WAC 246-290-300, -440, and -664 require residual disinfectant concentration monitoring on a daily basis. For filtered systems serving more than 3,300 people each month, WAC 246-290-664 requires continuous monitoring of the residual disinfectant concentration of water entering the distribution system, with the lowest value reported each day. Continuous monitoring occurs at the Everett Water Filtration Plant and is provided by the City. For distribution systems, residual disinfectant concentration at representative points is required to be measured on a daily basis or as otherwise approved by the DOH. At a minimum, residual disinfectant concentration within the distribution system must also be measured at the same time and location that routine coliform samples are collected. Water in the distribution system must contain a residual disinfectant concentration throughout the distribution system. The District tests for residual disinfectant at the same time routine distribution coliform samples are taken. Additionally, the District measures residual disinfectant continuously at the 620 Reservoirs inlet and outlet, the Reservoir 4 inlet and outlet, the Reservoir 1 outlet, and the Harbour Pointe Master Meter.

### **LEAD AND COPPER**

The Lead and Copper Rule (LCR) is intended to reduce tap water concentrations of lead and copper. The action levels are 0.015 mg/L for lead and 1.3 mg/L for copper. If the action levels are exceeded in more than 10 percent of the samples, the water system is required to take additional action to reduce lead and copper concentrations.

The District's compliance with the LCR is met as a part of Everett's Consecutive Systems Monitoring Program. Following a round of testing in 1992 that resulted in lead levels above the action limit, the City of Everett made several changes to their treatment process. Further testing and analysis demonstrated a reduction in lead levels at the tap. DOH has considered the Everett Water Filtration Plant's corrosion control process to be optimized since 1998. DOH approved reduced lead and copper monitoring for the City of Everett in March 1999. In 2000 and 2003, the total combined number of samples was 125 lead and copper tap samples, and 25 water quality parameter samples for the City of

Everett and the Consecutive Systems. Sampling parameters include pH, alkalinity, and temperature in the distribution system. The City of Everett also samples for pH every 4 hours at the point of entry. The average daily pH is reported to DOH. In 2006, a reduction in the number of required lead and copper samples from customer taps, from 125 to 100, was approved by DOH. This was done to establish a regional sample total based on the sample quantity requirements of the LCR. Additionally, water system eligibility to participate in the regional program was made Everett’s responsibility. The latest round of regional LCR tap sampling was conducted in 2012. Results from regional LCR testing are included in the District’s Consumer Confidence Report provided in Appendix F.

### CONSUMER CONFIDENCE REPORT

The Consumer Confidence Report Rule requires community water system purveyors to prepare and distribute an annual report of water quality analyses to their customers by the first of July annually. The District issues an updated Consumer Confidence Report to its customers each year prior to July 1. A copy of the District’s 2014 report is included in Appendix F.

### WATER QUALITY MONITORING SCHEDULE

Table 3-2 lists the District’s current water quality monitoring schedule.

**TABLE 3-2**

#### Water Quality Monitoring Schedule

Parameter	Monitoring Location	Frequency
Coliform	Distribution System <sup>(1)</sup>	25 per month
TTHM	Distribution System	4 samples each quarter
HAA5	Distribution System	4 samples each quarter
Chlorine Residual	Collect with Coliform Samples <sup>(2)</sup>	34 per month
Lead/Copper	Distribution System	As directed by City of Everett’s Consecutive System Monitoring Program

(1) See the Coliform Monitoring Plan in Appendix E.

(2) Water in the distribution system must contain a detectable chlorine residual throughout the distribution system.

## **CHAPTER 4**

### **SYSTEM ANALYSIS**

#### **INTRODUCTION**

Water system planning is based on a careful analysis of a water utility's ability to meet level of service standards for existing and future customers. The District has adopted design standards, which identify criteria and standards for the water system. These standards can be used to evaluate and analyze the existing water system facilities within the District's system by comparing the existing and projected system demands developed in Chapter 2 to the standards. Based on this comparison, water system deficiencies can be identified and recommendations for improvements to meet standards can be developed.

#### **SYSTEM DESIGN STANDARDS**

Performance and design criteria typically address the sizing and reliability requirements for source, storage, distribution, fire flow, and water quality. Construction standards set forth the actual materials and construction methods that contractors, developers, and the District must follow when constructing water system facility improvements.

Construction standards, including developer extension guidelines, have been developed for the District and are provided in Appendix G.

The DOH relies on various publications, agencies, and the utility itself to develop and establish design criteria. WAC 246-290-200, Design Standards, lists the various criteria allowed by DOH Table 4-1 provides a summary of the design standards.

## GENERAL FACILITY STANDARDS

**TABLE 4-1**

**Summary of DOH Design Standards**

Standard	DOH Design Manual (2009)
Source Development	The quantity of water at the source must: <ul style="list-style-type: none"> <li>• Have sufficient capacity and water rights to meet average day demand (ADD) and maximum day demand (MDD) on a reliable basis.</li> </ul>
Booster Pump Stations	<ul style="list-style-type: none"> <li>• Booster pumping facilities shall be designed to accommodate at least the next 10 years of system development.</li> <li>• All new closed-system booster pumps shall be equipped with standby power facilities to operate the booster pump under PHD at 30 psi, and PHD with a fire flow at 20 psi.</li> </ul>
Distribution	<ul style="list-style-type: none"> <li>• Minimum diameter of all distribution mains shall be 8 inches or greater. Smaller-diameter mains must be justified by hydraulic analysis.</li> <li>• New public system or additions shall provide the design quantity at 30 psi minimum under peak hourly demand at all points in the distribution system.</li> <li>• Required fire flow must be provided at a minimum of 20 psi.</li> </ul>
Storage	The sum of: <ul style="list-style-type: none"> <li>• Operational Storage</li> <li>• Equalizing Storage <math>V_{ES} = (Q_{PHD} - Q_S) * 150</math></li> <li>• Standby Storage<sup>(1)</sup> <math>V_{SB} = 2 * (ADD)</math></li> <li>• Fire Suppression Storage <math>V_{FSS} = FF * t_m</math></li> </ul> Where: <ul style="list-style-type: none"> <li><math>Q_{PHD}</math> = Peak Hour Demand</li> <li><math>Q_S</math> = Sum of all source capacities except emergency sources</li> <li><math>FF</math> = Fire Flow</li> <li><math>t_m</math> = Time (minutes)</li> </ul>

(1) For systems with one source.

Table 4-2 provides a comparison between the DOH Design Manual and the District standards with regard to general facility requirements. The District's standards meet or exceed all of the DOH standards.

**TABLE 4-2**

**General Facility Requirements**

<b>Standard</b>	<b>DOH Design Manual (2009)</b>	<b>District Standard</b>
Average Day and Maximum Day Demand	Average day demand (ADD) should be determined from previous actual water use data. Maximum day demand (MDD) is estimated at approximately 2.0 times the average day demand. MDD can be adjusted based on historical water use data.	Historical average day and maximum day demands are calculated from master meter data. Projected maximum day demand is estimated to be 2.0 times the average day demand.
Peak Hour Demand	Peak hour demand (PHD) is determined using the following equation: $PHD = (PDD/1,440)[(C)(N) + F] + 18$ $C = 1.6$ $N = \text{Number of ERUs}$ $F = 225$	Peak hour demand is calculated by applying a peaking factor of 1.7, which is more conservative than the DOH Manual.
Storage	The sum of: <ul style="list-style-type: none"> <li>Equalizing Storage  <math display="block">V_{ES} = (Q_{PHD} - Q_s) * 150</math> </li> <li>Standby Storage  <math display="block">V_{SB} = 2 * (ADD)</math> </li> <li>Fire Suppression Storage  <math display="block">V_{FSS} = FF * t_m</math> </li> </ul>	The sum of: <ul style="list-style-type: none"> <li>Equalizing Storage based on the DOH equation</li> <li>Standby Storage equal to 2 times ADD</li> <li>Fire Suppression Storage equal to the maximum required fire flow rate</li> </ul>
Fire Flow Rate and Duration	Fire flow rate and duration requirement will be as specified by the local fire authority and/or the Public Water System Coordination Act.	District fire flow requirements are detailed in Table 4-4.
Minimum System Pressure	The system should be designed to maintain a minimum of 30 psi in the distribution system under peak hour demand and 20 psi under fire flow conditions.	The system is designed to maintain a minimum of 30 psi in the system during peak hour demand and 20 psi during maximum day with a fire flow.
Minimum Pipe Sizes	The minimum size distribution system line shall not be less than 8 inches in diameter. Hydraulically justified smaller lines may be used on short line extensions.	The District's Developer Standards require distribution lines to be a minimum of 8 inches.

**TABLE 4-2 (continued)**

**General Facility Requirements**

<b>Standard</b>	<b>DOH Design Manual (2009)</b>	<b>District Standard</b>
Backup Power	On-site backup power equipment or gravity standby storage shall be provided unless the power grid meets the minimum reliability criteria.	The 620 Reservoirs Diesel Pumps, which serve the 715W Zone during times of peak demand, do not require electricity to operate. The Paine Field Booster Station, which serves the 715W Zone, also has an on-site generator.
Valve and Hydrant Spacing	Sufficient valving should be placed to keep a minimum of customers out of service when water is turned off for maintenance or repair. Fire hydrants on lateral should be provided with their own auxiliary gate valve.	Valves shall be installed at intervals not to exceed 1,000 feet and at each end of easements. Fire hydrants are placed as required by the governing jurisdiction per the appropriate adopted fire code.
Velocity	DOH recommends a maximum velocity of no more than 8 feet per second (fps) under PHD conditions, unless the pipe manufacturer specifies otherwise. Maximum velocities greater than 8 fps may occur under fire flow conditions, for short main sections, or piping in pump and valve station facilities.	The District's standard is to keep all velocities under 8 fps, even during fire flow events.

**SYSTEM ANALYSIS**

The following sections provide an analysis of the District's facilities based on the ability of the system to meet the existing and projected water demands. The District's source meters and supply system are discussed in Chapter 1 and shown on Figure 1-4.

**SOURCE OF SUPPLY**

**City of Everett**

One source of supply for the District is the City of Everett. With the exception of the 715 East Zone, all water entering the District from Everett is supplied by the two source meters. The District and Everett agreed upon a minimum flow of 45,000 gpd through the Casino Road Master Meter on August 21, 2014.

**Alderwood Water & Wastewater District**

Supply from AWWD is provided through the Paine Field and Harbour Pointe Master Meters. The District’s contract allows them to purchase up to 5 mgd through these two connections. This source of supply reduces retention time and improves water quality by bypassing a significant portion of Everett’s transmission, storage, and distribution systems. The District’s current goal is to use their AWWD connections to supply 75 percent of their needed flow.

The District is able to supply their maximum day demand, as show in Table 2-19, throughout the 20-year projection period using the available capacity of 5 mgd from their two AWWD connections or through their connections with the City of Everett. Table 4-3 shows the capacity of each master meter. These capacities can vary depending on the available head upstream.

**TABLE 4-3**

**Master Meter Capacities**

<b>Master Meter</b>	<b>Capacity (gpm)</b>	<b>Capacity (mgd)</b>
Paine Field	2,000	2.88
Harbour Pointe	1,500	2.16
Casino Road	3,000	4.32
Mukilteo Boulevard	2,500	3.60
<b>Total Source Capacity</b>	<b>9,000</b>	<b>12.96</b>

**STORAGE**

The District owns and operates four water storage reservoirs with a total capacity of 13.85 MG.

The storage analysis compares the capacity of the District’s storage facilities with the capacity required by District and DOH guidelines for the west side of the District. In order to determine whether or not the existing storage facilities owned by the District are adequate to meet existing and future demands on the system, the required volumes of the following five storage components need to be calculated.

1. Operational Storage
2. Equalizing Storage
3. Standby Storage
4. Fire Suppression Storage
5. Dead Storage

The formulas for calculating these components of the storage requirements are provided in the DOH Design Manual (2009). Discussion of the storage components follows.

### **Operational Storage (OS)**

Operational storage is typically defined as the volume of the reservoir devoted to supplying the water system while, under normal operation conditions, the sources of supply are in “off” status. The District does not operate its sources based on reservoir levels so the operational storage volume is defined as 10 percent of the reservoir capacity. This maintains the turnover of water in the reservoir which helps to improve water quality. Operational storage is in addition to other storage components, thus providing a factor of safety for equalizing, standby, and fire suppression storage.

### **Equalizing Storage (ES)**

Equalizing storage must be provided as part of the total storage for the system to provide water during periods of peak demand that cannot be met by the source production capacity. The District has adequate capacity from AWWD and the City of Everett to meet PHD. Equalizing storage is calculated based on the DOH guidelines. Source capacity for each master meter is displayed in the Table 4-3. Equalizing storage is calculated using the following equation:

$$ES = (PHD - Qs) * (150 \text{ minutes})$$

Where:

- $ES$  = Equalization Storage (gallons)
- $PHD$  = Peak Hour Demand (gpm)
- $Qs$  = Source capacity (gpm)

### **Standby Storage (SB)**

Standby storage provides reliability for the system should all sources fail or unusual conditions create higher-than-anticipated system demands. The amount of emergency storage required for the District is calculated using the following equation:

$$SB = (2 \text{ days}) * ADD$$

Where:

- $SB$  = Standby Storage (gallons)
- $ADD$  = Average Day Demand (gpd)

### **Fire Suppression Storage (FSS)**

Water systems must be capable of delivering fire flows in accordance with the adopted fire flow requirements. Fire flow requirements for the District vary with usage. The fire flow requirements are presented by pressure zone in Table 4-4. The required fire

suppression storage is the product of the fire flow rate and duration. Additionally, Reservoir 4 provides 810,000 gallons of dedicated fire flow storage purchased as detailed in the Tramco Agreement. This supply is pumped from the reservoir and can be taken from the dead storage volume.

**TABLE 4-4**  
**Fire Flow Requirements**

<b>Development Classification</b>	<b>Flow Rate (gpm)</b>	<b>Duration (hours)</b>	<b>Volume (gallons)</b>	<b>Pressure Zones</b>
Single-Family Residential	1,000	2	120,000	400
Multifamily Residential/ Small Commercial	3,000	3	540,000	270, 500, 620
Tramco Agreement <sup>(1)</sup>	18,000	0.75	810,000	715 West
Large Commercial/Industrial/ Institutional	4,000	4	960,000	715 West

(1) Dedicated fire flow storage.

**Dead Storage (DS)**

Dead storage is the volume of stored water not available at the minimum design pressure. For the analysis of dead storage, the minimum design pressure is 20 psi assuming the depletion of fire suppression storage. Dead storage for the District’s reservoirs is calculated using the elevation of the highest service in the pressure zone served by the reservoir as shown in Table 4-5.

**TABLE 4-5**  
**Highest Service Elevations**

<b>Reservoir</b>	<b>Base Elevation<sup>(1)</sup> (ft)</b>	<b>Highest Service (ft)</b>	<b>Dead Storage HGL (ft)</b>	<b>Dead Storage Water Level (ft)</b>	<b>Dead Storage (MG)</b>
Reservoir 1	250	190	236	0	0
Reservoir 2	580	530	576	0	0
Reservoir 4	595	601	647	52	1.96
Reservoir 5	578	530	576	0	0

(1) NAD 1983.

**Storage Analysis**

Storage requirements and analysis for the 6-year (2021), 10-year (2025), and the 20-year (2035) planning periods are shown in the tables below. Reservoir 1 was assigned

15 percent of total system-wide demand for calculating equalizing and standby storages. The remaining 85 percent of demand was shared by Reservoirs 2, 4, and 5.

Reservoir 1 shows a storage deficit throughout the 20-year planning period for the 270 Zone. Reservoirs 2, 4, and 5 combined show a storage surplus through the 20-year planning period. Water from Reservoirs 2, 4, and 5 can be provided to the 270 Zone by PRVs. Despite the deficit in Reservoir 1, there is sufficient storage in the other reservoirs to make up for the deficit. System wide, there is no projected storage deficit in the 20-year planning period.

**TABLE 4-6**

**2021 Storage Requirements and Analysis**

Reservoirs	Pressure Zones	Required Storage (MG)					Total Storage Available	Total Storage Required	Surplus or Deficit
		OS <sup>(1)</sup>	ES <sup>(2)</sup>	SB <sup>(3)</sup>	FSS <sup>(4)</sup>	DS			
1	270	0.075	0.00	0.52	0.54	0	0.75	1.14	-0.39
2, 4, and 5	400, 500, 620, 715W	1.31	0	2.95	0.96	1.96	13.1	7.18	5.92
<b>Total</b>		<b>1.39</b>	<b>0</b>	<b>3.47</b>	<b>1.5</b>	<b>1.96</b>	<b>13.85</b>	<b>8.31</b>	<b>5.54</b>

- (1) Operational storage is assumed to be 10 percent of storage capacity.
- (2) Equalizing storage is as defined by the DOH formula.
- (3) Standby storage is 2 days of average day demand.
- (4) Fire suppression storage is the maximum fire suppression storage requirement in any of the pressure zones.

**TABLE 4-7**

**2025 Storage Requirements and Analysis**

Reservoirs	Pressure Zones	Required Storage (MG)					Total Storage Available	Total Storage Required	Surplus or Deficit
		OS <sup>(1)</sup>	ES <sup>(2)</sup>	SB <sup>(3)</sup>	FSS <sup>(4)</sup>	DS			
1	270	0.075	0	0.58	0.54	0	0.75	1.20	-0.45
2, 4, and 5	400, 500, 620, 715W	1.31	0	3.30	0.96	1.96	13.1	7.53	5.57
<b>Total</b>		<b>1.39</b>	<b>0</b>	<b>3.89</b>	<b>1.5</b>	<b>1.96</b>	<b>13.85</b>	<b>8.73</b>	<b>5.12</b>

- (1) Operational storage is assumed to be 10 percent of storage capacity.
- (2) Equalizing storage is as defined by the DOH formula.
- (3) Standby storage is 2 days of average day demand.
- (4) Fire suppression storage is the maximum fire suppression storage requirement in any of the pressure zones.

**TABLE 4-8**

**2035 Storage Requirements and Analysis**

Reservoirs	Pressure Zones	Required Storage (MG)					Total Storage Available	Total Storage Required	Surplus or Deficit
		OS <sup>(1)</sup>	ES <sup>(2)</sup>	SB <sup>(3)</sup>	FSS <sup>(4)</sup>	DS			
1	270	0.075	0	0.67	0.54	0	0.75	1.28	-0.53
2, 4, and 5	400, 500, 620, 715W	1.31	0	3.79	0.96	1.96	13.1	8.02	5.08
<b>Total</b>		<b>1.39</b>	<b>0</b>	<b>4.46</b>	<b>1.5</b>	<b>1.96</b>	<b>13.85</b>	<b>9.30</b>	<b>4.55</b>

- (1) Operational storage is assumed to be 10 percent of storage capacity.
- (2) Equalizing storage is as defined by the DOH formula.
- (3) Standby storage is 2 days of average day demand.
- (4) Fire suppression storage is the maximum fire suppression storage requirement in any of the pressure zones.

## **PUMPING ANALYSIS**

During normal operations, most of the District's distribution system is supplied by gravity from the reservoirs or directly from source meters. The Paine Field Booster Station is used to pump a portion of the supply from AWWD's 30-inch main into the District's Reservoir 4 in the 715 West Zone. During high demands, the District's other booster stations can be used to provide extra supply to certain zones. The Lamar Hill Booster Station supplies the Lamar Hill area of the 400 Zone in the event of a source of supply failure, the Diesel Pumps supply the 715 West Zone and the Reservoir 1 Pump supplies the 500 Zone. Table 1-5 in Chapter 1 provides a summary of each of the District's five booster stations.

The District's system is primarily supplied through master meters or by storage. As shown in Tables 4-6 through 4-8, the District has sufficient equalizing storage to meet peak hour needs, so the District's booster stations serve to provide redundancy of supply for reliability and operational flexibility, and in the case of the Diesel Pumps, to meet localized fire flow requirements. Therefore, the District has sufficient pumping facilities to meet its current needs.

## **SYSTEM DEFICIENCIES**

Based on the analyses presented in Chapters 3 and 4, the District's facilities do not show any source, storage, pumping, or water quality deficiencies for the 20-year planning period.

## **CHAPTER 5**

### **HYDRAULIC MODELING**

#### **INTRODUCTION**

This chapter presents the hydraulic model of the District's water system and the results of hydraulic analyses, which are conducted to evaluate the existing and future capabilities of the water system.

The operation of a municipal water system involves dynamic interactions between various water system components, including source, storage, transmission, and distribution system facilities. These interactions and their effect on the level of service provided to District customers are dependent on the distribution and magnitude of water demands within the system and the performance characteristics of the water system facilities. In addition to normal diurnal demands, infrequent and unanticipated demand events, such as fires and other emergencies, can significantly stress a municipal water system and its components. Such factors must be considered in analyzing the ability of a water system to provide for future demands, while maintaining an adequate level of water service to customers.

The development of a computer hydraulic model, which can accurately and realistically simulate the response of a water system under a variety of conditions and scenarios, has become an increasingly important element in the planning, design, and analysis of municipal water systems. The Washington State Department of Health's WAC 246-290 requires hydraulic modeling as a component of Water System Plans.

#### **HYDRAULIC MODELING SOFTWARE**

The District's water system is analyzed using Innovyze's H2ONet hydraulic modeling software, which operates in an AutoCAD computer aided design and drafting environment.

The H2ONet model is configured with a graphical user interface. Each water system element, including pipes, valves, and reservoirs, is assigned a unique graphical representation within the model. Each element is assigned a number of attributes specific to its function in the actual water system. Typical element attributes include spatial coordinates, elevation, water demand, pipe lengths and diameters, and critical water levels for reservoirs. With attributes of each system element as the model input, the H2ONet software produces the model output in the form of flows and pressures throughout the simulated water system.

## **MODEL ASSUMPTIONS**

Prior to the calibration of the hydraulic model, the basic layout of the water system is recreated within the model. The lengths, diameters, and connection points of system piping are assigned using an updated base map of the water system. The locations of normally closed valves, check valves, and pressure reducing valves (PRVs) are also found on water system base maps, while the set-points of the District's facilities are taken from the District's SCADA system settings. The assumptions regarding the modeling of the District's water source, the City of Everett and AWWD, system demands, and the settings of PRVs are included in the following sections.

### **SOURCE**

Water is currently delivered at three metered locations (Mukilteo Boulevard, Paine Field, Harbour Pointe Boulevard) and at several points where the District's and the City of Everett's service areas are connected in the 715 East Zone. Since Everett and the District are connected at several locations, portions of the Everett water system are incorporated into the model of the District's water system.

Water is delivered to the District's downtown Mukilteo area (the 270 Zone) at the Mukilteo Boulevard Master Meter from Everett's distribution system. A PRV located on Mukilteo Boulevard lowers the hydraulic grade line of the delivered water from approximately 400 feet to 270 feet. The District can receive supply at the Casino Road master meter and 100<sup>th</sup> Street flow control meter, but these are used sparingly to maintain water quality and to provide emergency supply.

AWWD provides the majority of the District's supply through the Paine Field booster station and master meter, and Harbour Pointe master meter. Everett's Casino Road Elevated Tank supplies water to the remainder of the District at multiple connection points in the 715 East Zone. To realistically simulate the interactions between the water systems of Everett and the District, the Casino Road Elevated Tank and portions of Everett's distribution system are included in the District's hydraulic model.

The District operates the Everett Casino Road master meter daily to maintain water quality, but this is primarily an emergency source of supply. Similarly, the 100<sup>th</sup> Street flow control meter will open if there is a drop in pressure, but is primarily an emergency supply source.

Supply is also provided from AWWD through the Paine Field and Harbour Pointe Master Meters. The Paine Field connection pumps water from the AWWD 30-inch transmission main on Beverly Park Road through a 16-inch main to Reservoir 4. The flow is metered near the connection in a vault on Commando Road and in the pump station. The Harbour Pointe connection is located along Harbour Pointe Boulevard near St. Andrews Drive. There are two vaults, one contains AWWD's revenue meter and the other contains the

District's flow control valve. The water flows by gravity from the AWWD 635 Zone to the District's 620 Zone.

## **SYSTEM DEMANDS**

A key element in the hydraulic modeling process is the distribution of demands throughout the water system. Demands are distributed within the model based on the projected demands from Chapter 2. The 270 Zone and 715W Zone nodes have been assigned a portion of the total demand based on historical data from the Mukilteo Boulevard master meter, Paine Field master meter, and Westgate meters. The rest of the demand has been equally distributed among the remaining nodes.

Three demand types are used in the hydraulic analysis.

- Average Day Demands: These demands were used to verify typical operation of the system, such as calibration conditions.
- Peak Hour Demands: These demands were used to verify the system is able to meet the DOH standards to supply domestic water at a minimum system wide pressure of 30 psi.
- Maximum Day Demands: These demands were used to evaluate the system's ability to meet the required fire flows at DOH's requirement of 20 psi.

In order to evaluate the system under different demand conditions, several demand scenarios are included in the model. These demand scenarios account for demands of the existing system and the projected demands of the 6-year and 20-year planning periods.

## **PRESSURE REDUCING VALVES (PRVS)**

In the District's water system, the delivery of water from the reservoirs to various pressure zones is dependent on numerous PRV stations distributed throughout the system. The District conducted field tests of all PRVs to determine their correct settings that are presented in Chapter 1. All model PRV settings have been updated to these settings.

## **MODEL CALIBRATION**

The calibration of a hydraulic model provides a measure of assurance that the model is an accurate and realistic representation of the actual system. For the District's model, field measurements from July 2015 are used for the calibration process.

**FIRE HYDRANT TESTS**

The H2ONet hydraulic model of the District’s water system is calibrated using data obtained from fire hydrant tests at various locations throughout the water system. Seven fire hydrant tests were conducted with the assistance of District personnel in July 2015. During these tests, static and residual pressures were recorded as District staff opened hydrants and recorded the flow. Field results were used to calibrate the hydraulic model through adjustment of model elevations and verification of pipe type, sizes, and roughness coefficients.

The testing locations include points within each pressure zone. A description of each testing location is presented in Table 5-1. Testing locations are shown in Figure 5-1.

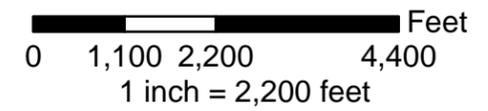
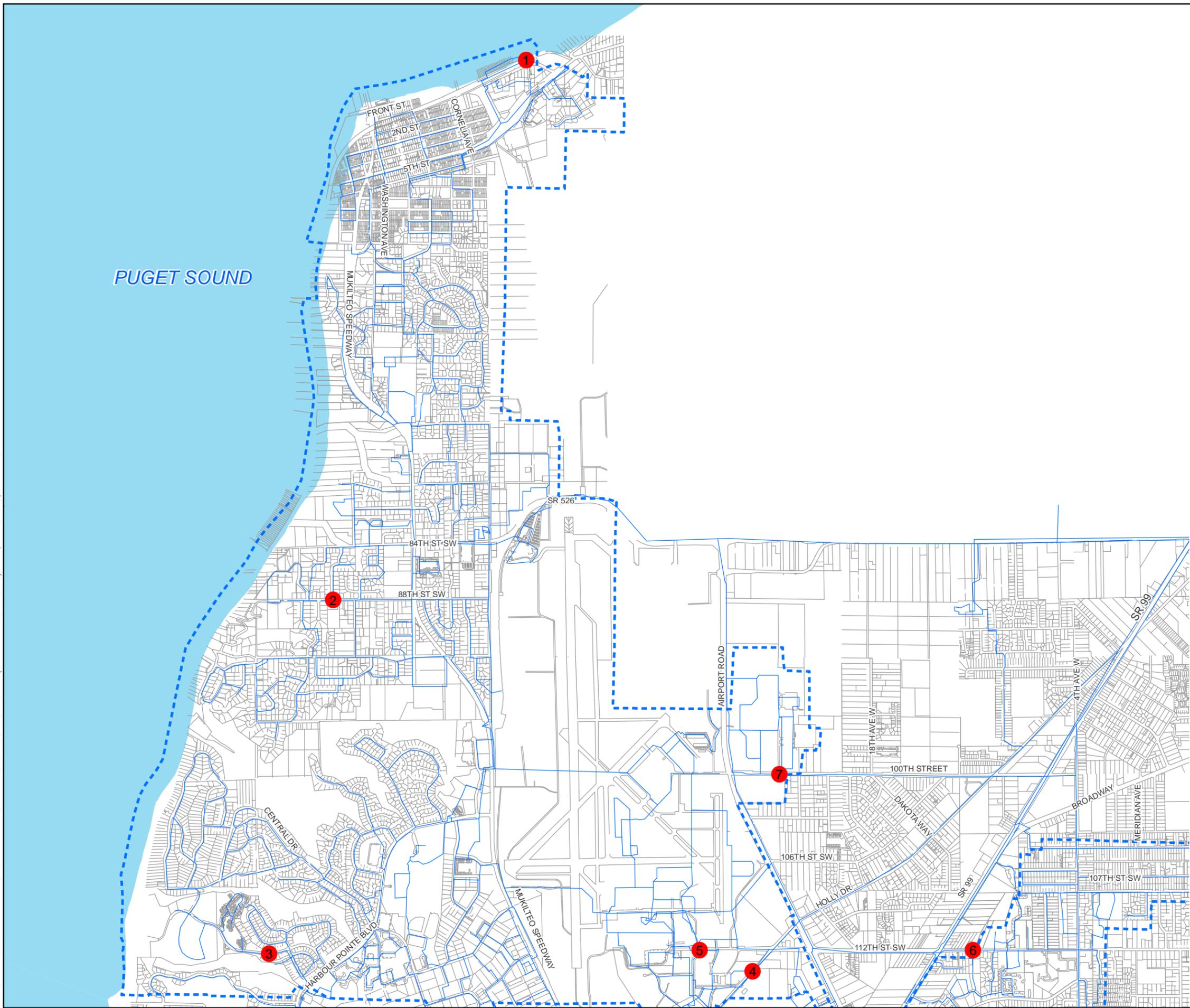
**TABLE 5-1**

**Hydrant Testing Locations**

<b>Test No.</b>	<b>Pressure Zone</b>	<b>Testing Location</b>	<b>Description</b>
1	270	1 <sup>st</sup> Street	Boeing Rail Barge
2	620	54 <sup>th</sup> Place West and 88 <sup>th</sup> Street SW	Residential Neighborhood
3	500	6113 Harbour Heights Parkway, Mukilteo	Residential Neighborhood
4	715 W	11333 Beverly Park Road	Fairmont Elementary School
5	715 W	112 <sup>th</sup> Street SW and Commando Road	Industrial district
6	715 E	9 <sup>th</sup> Place West and 112 <sup>th</sup> Street SW	Multi-Family Complex
7	715 W	24 <sup>th</sup> Place West and 100 <sup>th</sup> Street SW	Commercial Buildings

The system conditions at the time of each test, to be replicated in the model calibration process, were recorded for each hydrant test. Additionally, water levels of District reservoirs and readings from source meters were recorded during the testing time period. A summary of the recorded reservoir levels and master meter flow rates is presented in Table 5-2. The system conditions at the time of testing are simulated in the hydraulic model during the calibration process.

M:\MUKILTEO\15424 WATER SYSTEM PLAN UPDATE\GIS\FIGURES\MODEL (SAMPLE LOCATIONS).MXD, 11/10/2015, JPALAPUZ



- LEGEND:**
- HYDRANT TESTING LOCATION
  - PIPES
  - RETAIL SERVICE AREA

**MUKILTEO WATER & WASTEWATER DISTRICT**  
**WATER SYSTEM PLAN**

**FIGURE 5-1**  
**HYDRANT TESTING LOCATIONS**



**Gray & Osborne, Inc.**  
 CONSULTING ENGINEERS

**TABLE 5-2**

**System Conditions During Hydrant Testing**

<b>Reservoir</b>	<b>Overflow Elevation</b>	<b>Water Level Elevation</b>
Reservoir No. 1	271 feet	262.3 feet
Reservoir No. 2	620 feet	613.0 feet
Reservoir No. 4	715 feet	708.0 feet
Reservoir No. 5	620 feet	615.0 feet
Casino Rd. Elevated Tank	715 feet	715.0 feet <sup>(1)</sup>
<b>Meter</b>	<b>Flow</b>	
Casino Road	0 gpm	
Mukilteo Boulevard	0 gpm	
100 <sup>th</sup> Street	0 gpm	
Paine Field	1,148 gpm	
Harbour Pointe	523 gpm	

(1) Modeled assumption based on static pressure tests.

**CALIBRATION PROCEDURES**

Using the system conditions for each hydrant test, the hydraulic model is used to generate static pressure and residual pressure during the measured hydrant flow. The total system demand at the time of the hydrant tests is assumed to be the average day demand for 2015. Model output is generated at points in the model equivalent to the locations of the hydrant tests.

Model output for static pressure is generated by running the model at average system demands. Model output for residual pressure is generated at each model hydrant test point by placing an added demand equal to the measured hydrant flow and recording the resulting pressure. Model output for available fire flow for each hydrant test is generated by setting the model to produce the maximum amount of flow at a hydrant test location while maintaining a pressure of 20 psi in the system.

**CALIBRATION RESULTS**

The friction factors for the pipes in the modeled system are adjusted throughout the calibration process until the model output best approximated the measured values. Hazen-Williams C-factors between 100 and 130 are used throughout the system. These friction factors are typical values for most pipe and are generally conservative. However, the friction factors for the pipe also compensates for system losses through valves and pipe intersections.

The model output is produced for two data comparisons, static pressure and residual pressure. The values measured in the hydrant flow tests are compared to the model output values in Table 5-3.

**TABLE 5-3**  
**Calibration Results**

Test No.	Flow (gpm)	Static Pressure (psi)			Residual Pressure (psi)			Change (psi)
		Field	Model	Difference	Field	Model	Difference	
1	1,592	110	109	1	100	95	5	4
2	1,300	96	96	0	90	91	-1	-1
3	919	64	67	-3	58	63	-5	-2
4	1,126	58	58	0	56	56	0	0
5	1,126	52	55	-3	52	55	-3	0
6	1,404	80	85	-5	80	82	-2	-3
7	1,061	62	64	-2	62	62	0	-2

Calibration of the hydraulic model produced results that are within 5 psi of static pressure and 5 psi of residual pressure. This meets DOH Water System Design Manual (Table 8-1) requirements for the use of hydraulic modeling in long-range planning.

## SYSTEM ANALYSIS

### MODEL CONDITIONS

Model input assumptions have significant impacts on peak hour and fire flow results. According to WAC 246-290, a water system must maintain a minimum pressure of 30 psi in the distribution system under peak hour demand conditions. Peak hour reservoir levels include draw down due to operational storage and equalization storage.

The DOH Water System Design Manual (2009) states that a water system should be designed to provide adequate fire flow under peak day demand conditions, while maintaining a minimum system pressure of 20 psi and velocities under 10 ft/s. Fire flow reservoir levels include draw down due to operational storage, equalization storage, and fire suppression storage based upon the largest fire flow requirement. See Chapter 4 for a discussion of the storage components for each zone. Since Reservoirs 2, 4, and 5 can share storage, the volume of operating storage is distributed between the three based on each reservoir's capacity. To be conservative, the largest fire flow storage requirement in the 715 West Zone is completely taken out of Reservoir 4 and the largest fire flow storage requirement in the 620 Zone is split between Reservoir 2 and 5. Table 5-4 shows reservoir levels as they are modeled for each scenario.

**TABLE 5-4**

**Model Reservoir Levels**

Reservoir No.	Capacity (gallons)	Overflow Level (ft)	2021		2035	
			Peak Hour Level (ft)	Fire Flow Level (ft)	Peak Hour Level (ft)	Fire Flow Level (ft)
1	750,000	21	19.0	4.64	19.0	4.6
2	2,300,000	40	35.9	33.31	35.9	33.3
4	4,500,000	120	108.0	82.50	108.0	82.5
5	6,300,000	42	37.9	35.31	37.9	35.3

Source meter settings for each future modeling scenario are shown in Table 5-5. The District is in the process of phasing out their use of the Everett master meters and supplying all demands from the AWWD master meters at Paine Field and Harbour Pointe. Consequently, the Mukilteo Boulevard master meter is limited to 40 gpm during non-fire flow scenarios. The Everett master meters can be used under emergency connections. For the 2021 and 2035 scenarios, all master meters are closed except for Mukilteo Boulevard, Harbour Pointe, and Paine Field. In the 2035 scenario, an 8-inch PRV that is parallel to the Mukilteo Boulevard Master Meter is open to provide fire flow to Lamar Hill.

**TABLE 5-5**

**Model Meter Settings**

Meter	2021 PHD Scenarios (gpm)	2035 PHD Scenarios (gpm)	Fire Flow Scenarios (gpm)
Casino Road	0	0	0
Mukilteo Boulevard	40	40	2,500
Harbour Pointe	1,500	1,500	1,500
100 <sup>th</sup> Street	0	0	0
Paine Field	2,000	2,000	2,000

**PEAK HOUR ANALYSIS**

The District’s existing distribution system has been modeled under 2021 and 2035 peak hour demand conditions. Peak hour reservoir levels include draw down due to operational storage and equalization storage.

Peak hour analyses for 2021 and 2035 reveal no system deficiencies. Results indicate minimum system pressure in both 2021 and 2035 is 32 psi at the intersection of Beverly

Park Road and Commando Road West. The results for peak hour demand modeling are presented in Appendix I.

Table 5-6 provides the system conditions used during peak hour analyses.

**TABLE 5-6**  
**System Conditions During Peak Hour Analyses**

Condition	2021	2035
Model Demand Set Name	2021 PHD	2035 PHD
Peak Hour Demands	4,480 gpm	5,270 gpm
Model Tank Set Name	2021 PHD	2035 PHD
Source Conditions	Normal operation <sup>(1)</sup>	Normal operation <sup>(1)</sup>
Booster Station Status	Normal operation <sup>(2)</sup>	Normal operation <sup>(2)</sup>
270 Zone Reservoir	268 ft HGL	268 ft HGL
620 Zone Reservoirs	615.9 ft HGL	615.9 ft HGL
715 Zone Reservoir	703 ft HGL	703 ft HGL

- (1) See Table 5-5 for master meter settings.  
 (2) One 620 Reservoirs Diesel Pump operating.

## AVAILABLE FIRE FLOW ANALYSIS

The District’s existing distribution system has been modeled under 2021 and 2035 maximum day demand conditions. A system wide available fire flow map, located in the back sleeve of the Plan, illustrates the District’s available fire flow under 2035 maximum day conditions. The results of fire flow modeling are presented in Appendix J.

Fire flow reservoir levels include draw down due to operational storage, equalization storage, and fire suppression storage based upon the largest fire flow requirement. See Chapter 4 for a discussion of the storage components for each zone. The water level in Reservoir 4 at the beginning of a fire, with operating and equalizing storage depleted, must be at least 90 feet in order to ensure proper sprinkler operation in the industrial area in Paine Field. Based on the storage components presented in Chapter 4, this requirement is met for the 20-year projection period.

The District’s distribution system has been modeled with the fire flow conditions provided in Table 5-7. Table 5-8 lists model fire flow results for critical locations that have fire flow requirements greater than the District’s minimum standards. For this analysis, both diesel pumps at the 620 Reservoirs are active. It is assumed for this analysis that the Harbour Point Master Meter and Paine Field Booster Station are at their capacity described in Chapter 1. Also, an 8-inch PRV in the same vault as the Mukilteo Boulevard Master Meter can open to provide fire flow to the 270 Zone. The results of fire flow modeling are presented in Appendix J.

**TABLE 5-7**

**System Conditions During Fire Flow Analyses**

<b>Condition</b>	<b>2021</b>	<b>2035</b>
Model Demand Set Name	2021 MDD	2035 MDD
Maximum Day Demands	2,696 gpm	2,888 gpm
Model Tank Set Name	2021 MDD	2035 MDD
Source Conditions	Normal operation <sup>(1)</sup>	Normal operation <sup>(1)</sup>
Booster Station Status	Normal operation <sup>(2)</sup>	Normal operation <sup>(2)</sup>
270 Zone Reservoir	253.6 ft HGL	253.6 ft HGL
620 Zone Reservoirs	613.3 ft HGL	613.3 ft HGL
715 Zone Reservoir	677.5 ft HGL	677.5 ft HGL

- (1) See Table 5-5 for master meter settings.  
 (2) Both 620 Reservoirs Diesel Pumps operating.

**TABLE 5-8**

**Available Fire Flow Results in 2035 for Critical Locations<sup>(1)</sup>**

<b>Location</b>	<b>Address</b>	<b>Model Node</b>	<b>Pressure Zone</b>	<b>Available Fire Flow (gpm)</b>	<b>Required Fire Flow (gpm)</b>
Hydrant	Park Avenue and 1 <sup>st</sup> Street	J-235	270	6,275	3,000
Rose Hill Community Center	Lincoln Avenue and 4 <sup>th</sup> Street	J-413	270	6,274	3,000
Hidden Forest Apartments	4722 94 <sup>th</sup> Street SW	J-516	620	4,791	3,000
Olympic View Jr. High School	SR 525 and 76 <sup>th</sup> Street SW	J-634	620	3,870	3,000
Mukilteo Elementary School	Washington Avenue at 72 <sup>nd</sup> Street SW	J-640	620	3,000	3,000
Giddon Industries	11410 Beverly Park Drive	J-223	715	5,114	3,500
Hydrant	SR 526 and 44 <sup>th</sup> Avenue	J-300	715	4,138 <sup>(2)</sup>	3,000
Quadrant Business Park	44 <sup>th</sup> Avenue at 82 <sup>nd</sup> Street	J-322	715	4,067 <sup>(2)</sup>	3,000
Hers Complex	Russell Road and Cyrus Road	J-617	715	5,571 <sup>(2)</sup>	5,500
ATS/Boeing	3121 109 <sup>th</sup> Street SW	J-726	715	18,000	18,000

- (1) At end of fire with reservoir levels as shown in Table 5-4 and master meters set in Table 5-5.  
 (2) Available fire flow with both 620 Reservoirs Diesel Pumps operating. The 1,750 gpm pumps activate when the pressure in the 715 Zone adjacent to the 620 Reservoirs falls below 30 psi.

Table 5-9 shows the identified 2021 and 2035 fire flow deficiencies. Fire flow deficiencies are identical for 2021 and 2035 model runs.

**TABLE 5-9**

**Available Fire Flow Results in 2035 for Deficient Locations<sup>(1)</sup>**

<b>Location</b>	<b>Nodes</b>	<b>Pressure Zone</b>	<b>Available Fire Flow (gpm)</b>	<b>Required Fire Flow (gpm)</b>	<b>Reason for Deficiency</b>
Lamar Hill	Many	400	800	1,000	Dead end 6-inch causing low pressure, inadequate supply to 400 Zone

(1) At end of fire with reservoir levels as shown in Table 5-4 and master meters set in Table 5-5.

Table 5-10 shows the improved results for locations with fire flow deficiencies with the improvements given in Chapter 8. Individual projects that address fire flow deficiencies are identified as part of the District’s Capital Improvement Program, discussed in detail in Chapter 8.

**TABLE 5-10**

**Available Fire Flow Results for Deficient Locations with Improvements<sup>(1)</sup>**

<b>Location</b>	<b>Nodes</b>	<b>Pressure Zone</b>	<b>Available Fire Flow (gpm)</b>	<b>Required Fire Flow (gpm)</b>	<b>Projects Resolving Deficiency<sup>(1)</sup></b>
Lamar Drive	J-431	400	1,665	1,000	D-4, D-11

(1) At end of fire with reservoir levels as shown in Table 5-4 and master meters set in Table 5-5.

(2) See Chapter 8 for a full description of the District’s Capital Improvement Program projects.

**SUMMARY**

Based on hydraulic modeling results for the District’s water system, the hydraulic capacity of the District’s distribution system is currently sufficient to meet both average day, peak hour, and fire flow demands with the exception of the Lamar Hill area. With improvements discussed in Chapter 8 for the Lamar Hill area, the District’s distribution system capacity is sufficient to meet average day, peak hour, and fire flow demand conditions for the 20-year projection period.

## **CHAPTER 6**

### **OPERATION AND MAINTENANCE PROGRAM**

#### **INTRODUCTION**

This Chapter summarizes the operation and maintenance programs maintained by the District. The complete operations and maintenance policies and procedures are detailed in the District's Emergency Response Plan/O&M Manual.

#### **WATER SYSTEM ORGANIZATION**

The District is divided into two branches; Operations and Maintenance Department, and Administrative Services Department. Both branches are overseen by Jim Voetberg, the General Manager. A complete organizational chart for the District is presented in Figure 6-1. This chart illustrates the specific personnel positions and corresponding responsibility for the District's water system.

The Operations and Maintenance Department is divided into two groups; one focused on operation of the wastewater treatment plant, and one focused on operation of the water distribution and wastewater collection systems. Routine water utility work assignments include water service replacement and repair; water main inspections and repair; control valve service and repair; system valve maintenance and repair; booster station maintenance and repair; reservoir inspection and maintenance; fire hydrant maintenance, testing and repair; meter reading, water main flushing, water quality sampling developer installation inspection, and cross connection inspection.

#### **CERTIFICATION REQUIREMENTS**

Water Works Operator Certification, required under WAC 246-292-060, mandates large Washington State public water systems retain in their employment individuals who are certified by examination as competent in water supply operation and management. The Washington State Department of Health (DOH) determines the required level and number of certified positions based on the population and complexity of the water system. The District is classified as a Group 3 Water System, which requires that at least one employee be certified as a Level 3 Water Distribution Manager (WDM-3). The District meets all DOH certification requirements and the current certification status of District personnel is shown in Table 6-1.

**TABLE 6-1**

**District Personnel Certification**

<b>Waterworks Operator</b>	<b>WDM Cert. Level</b>	<b>CCS Cert. Level</b>	<b>BAT Cert. Level</b>	<b>PIO Cert. Level</b>	<b>GISP</b>
Jim Voetberg	3			1	
Rick Matthews	3	1		1	
Brian Munson	1	1			
Jared Alexander	3	1	1		
Brandon Henson	3	1	1		1
Matt Wright	1	1			
Eric Overton	1	1			
Roger Darling	1	1			
Briley Olson	1				
Gil Bridges	IT	1			

**PROFESSIONAL GROWTH REQUIREMENTS**

In order to promote and maintain expertise for the various grades of operator certification, Washington State requires that all certified operators complete not less than three Continuing Education Units (CEU) within each 3-year period. Programs sponsored by both Washington Environmental Training Resources Center (WETRC) and the American Waterworks Association (AWWA) Pacific Northwest Subsection are the most popular source of CEUs for certified operators in Washington State. All operators have acquired or will acquire the proper number of CEUs for recertification.

Besides providing CEUs, operator training is an important component in maintaining a safe and reliable water system. At a minimum, all personnel performing water system related duties receive training in the following areas:

- Confined space
- Trenching and shoring
- Traffic flagging
- Cross connection control
- First Aid/CPR

**SYSTEM OPERATION AND CONTROL**

The locations of the major system components are shown on Figure 1-5. A description of the normal operation of each facility is given in Chapter 1.

**BOARD OF COMMISSIONERS**

GENERAL MANAGER  
(Jim Voetberg)

ADMINISTRATIVE ASSIST.  
(Kendra Chapman)

**WASTEWATER TREATMENT FACILITY**

TREATMENT PLANT MANAGER  
(Gil Bridges)

WWTF LEAD  
(Darin Janda)

OPERATOR I  
(Mark Buntich, Colson Crim)

LAB ANALYST  
(Brianna Sheppard)

PRETREATMENT TECH  
(Greg Bradley)

**ADMINISTRATIVE SERVICES DEPARTMENT**

FINANCE MANAGER  
(Sue Parks)

FINANCIAL ACCOUNTING SUPERVISOR  
(Bev Templin)

ACCOUNTING ASSISTANT  
(Jodi Kerslake)  
(Sara Normoyle)

ADMIN ASSISTANT/RECEPTIONIST  
(Liz Greene)

**OPERATIONS & ENGINEERING DEPARTMENT**

OPERATIONS/ENGINEERING MANAGER  
(Rick Matthews)

OPER FIELD SUPERVSR  
(Brian Munson)

UTILITY SVCS TECH III  
(Roger Darling)  
(Eric Overton)  
(Matt Wright)

UTILITY SVCS TECH II  
(Briley Olson)

UTILITY SVCS TECH I

WATER QUALITY/  
ENGIN TECH  
(Jared Alexander)

GIS ANALYST/  
UTIL SVCS TECH III  
(Brandon Henson)

**MUKILTEO WATER & WASTEWATER DISTRICT  
WATER SYSTEM PLAN**

FIGURE 6-1  
DISTRICT STAFF ORGANIZATION CHART



## **SCADA SYSTEM**

The District's SCADA system master control is located at the District Office, but can also be accessed remotely by District staff. The system currently uses Siemens programmable logic controllers (PLCs), communicating with S&B's DirectSoft and TiSoft communications software, integrated with a S&B's WINCC control software.

The WINCC software offers a graphical user interface that provides operators with the ability to interpret and interact with data presented in user-friendly display screens. Display screens have been modified and created to suit the needs of the District's operators.

The system displays enable the District operators to monitor and report system conditions from data collected from 23 RTU sites (nine water, 14 sewer).

The SCADA system enables the operator to implement and modify control strategies, which manage source, storage, and pumping facilities within the District's water and wastewater systems. Modifications to control strategies are continuously performed by staff. Staff's goal is to further automate systems focusing on improving system flows, maximizing water quality, while minimizing energy and operational costs.

The District meets its operational goals primarily through adjustment of the Paine Field booster station, and Harbour Pointe master meter. The adjustment of the flow rate of the District's source meters allows the District to fill or draw from reservoirs to meet system demands and manage water quality. Although the District sets the master meter flow rates on a daily basis, the District has seasonal operational schemes for winter and summer time demand conditions.

## **DISTRIBUTION SYSTEM**

The District maintains approximately 91.6 miles of water mains, which interconnect the source meters, emergency interties, reservoirs, and customer service connections. There are no special daily tasks associated with the distribution grid, but there are several preventive maintenance activities that are necessary to maintain the reliability and extend the useful life of the system.

## **PREVENTIVE MAINTENANCE PROGRAM**

Planning for present and future maintenance of the water system facilities is an important task, as important as planning water main extensions and other physical improvements. The maintenance effort must be continuous in order for the District to continue to fulfill its role as a water purveyor in the future.

The role of maintenance is to preserve the value of the District's physical infrastructure and ensure that the District can continue to provide a safe and reliable water supply. The

most cost effective method for maintaining a water system is to provide a planned preventative maintenance (PM) program. Through a planned PM program, the optimum level of maintenance activities can be provided for the least total maintenance cost.

The District's PM program involves defining the tasks to be performed, scheduling the frequency of each task, and then providing necessary staff to perform the task. For large and complex water systems, the administration, scheduling, and record keeping generated by the PM program may be the greatest challenge.

## **SCADA SYSTEM**

The District's system is controlled by a central SCADA system, located at the District's main office. The SCADA system continually monitors all reservoirs, master meters, flow control meters, and booster stations to ensure they are working properly. Source meter flow rates and booster station status are controlled by the SCADA system. The SCADA system is monitored continuously and is equipped with alarms that alert District staff to problems with the system. Historical data from the SCADA system is stored in the DMS system located at the District Office. The SCADA allows anomalies in system pressure, reservoir levels, and flow rates to be identified immediately, triggering additional investigation or remedial action as necessary.

## **SOURCE METERS**

All source meters are visited and inspected a minimum of once per month. Total flow readings are taken and checked against values obtained through the telemetry system. City of Everett and AWWD master meter readings are compared to the District's readings to check for consistency.

## **STORAGE FACILITIES**

Each reservoir is visited and inspected at least once per month to check for security breaches and ensure sanitary conditions. All gutters are cleaned of debris and the roof is swept once per year. During the summer months, the surrounding landscaping is maintained, including mowing the grass. The exterior walls of the steel reservoirs are washed as needed to maintain appearance. Paint is applied as needed. All reservoir interiors are cleaned and inspected at least once every 5 years either by draining and entering the reservoir or by submersible robots in a full reservoir. Reservoir 4 is inspected while still in service. During the interior inspection, sediment is removed from the floor and the structure is checked for abnormalities.

## **BOOSTER STATIONS**

The Lamar Hill Booster Station is visited a minimum of twice per year. During this visit, the pump is flushed and exercised to ensure proper operation. This pump can only be operated by starting and stopping by hand.

Reservoir 1 Booster Station is visited and exercised monthly.

The 620 Reservoirs Transfer Pump and Diesel Pumps are visited weekly. The Diesel Pumps are exercised weekly to ensure proper operation. The Transfer Pump runs under peak demand periods to transfer water from Reservoir 5 to Reservoir 2 and is exercised to empty Reservoir 2 or Reservoir 5 for cleaning.

## **DISTRIBUTION SYSTEM FACILITIES**

The District flushes its water mains every 2 years. Each year, approximately 45 miles of water main are flushed to remove any sediment accumulation and to ensure hydrants are functioning properly.

The District is committed to minimizing the amount of lost water in its distribution system. Each year the District contracts out and conducts a leak survey of approximately 15 miles of its distribution system. Water mains that contain leaks are repaired and considered for complete replacement.

## **EMERGENCY RESPONSE PROGRAM**

Water utilities have the responsibility to provide an adequate quantity and quality of water in a reliable manner at all times. To do this, utilities must reduce or eliminate the effects of natural disasters, accidents, and intentional acts. The District has developed a stand alone Emergency Response Plan that details their responses to different possible emergencies. This document is included in the District's Emergency Response Plan/O&M Manual.

## **SAFETY PROCEDURES**

Work place hazards for this system are primarily limited to traffic control, confined space entry, asbestos-cement pipe handling, electrical equipment safety and access for elevated structures. As water mains are frequently located in the road, traffic is controlled using flaggers, cones and warning signs when needed. Staff is trained as to proper entry into confined spaces such as below grade equipment vaults. Inspection of storage is made using the proper harness and restraining devices to prevent accidental falls. Staff is trained how to safely work on electrical equipment, including lock-out/tag-out procedures. The District conducts regular safety meetings to discuss proper safety procedures for work place hazards.

## **CROSS-CONNECTION CONTROL PROGRAM**

The District's Cross-Connection Control Program was updated in 2005 and adopted by the Board of Commissioners by Resolution A-1548. A copy of the resolution and the District's Cross-Connection Control Program are located in Appendix L. The District

requires premise isolation on all new service connections, with the exception of single family connections. Current commercial and industrial customers were sent a letter explaining the importance of cross-connection prevention and were asked to return a questionnaire about their on-site waterlines. Commercial and industrial sites are visited to determine if additional cross-connection control devices are necessary.

## **NEW CROSS-CONNECTION DEVICES**

Backflow prevention devices are required on all new, existing, and potential cross-connections. Cross-connection prevention devices are catalogued and inspected by District staff. It is the responsibility of the customer to ensure initial and regular testing of the devices. A condition for new service includes an evaluation by the District's certified cross-connection control specialist to determine what type of backflow device is needed.

## **CROSS-CONNECTION CONTROL PROGRAM RECORD KEEPING**

A critical program element is the maintenance of accurate records in support of an aggressive cross-connection control program. The District records cross-connection devices at each service using XC2 software. Testing results for each device recorded in the respective database file. The database information on each assembly includes:

- Location of each water service connection
- Initial inspection information
- Installation information
- Assembly information
- Testing history

## **PERSONNEL REQUIREMENTS**

The District maintains an inventory of approved cross-connection control devices. A person certified as a cross-connection control specialist will handle the inspections. The District currently has eight staff members who are certified as Cross-Connection Control Specialists and two staff members certified as a Backflow Assembly Tester.

## **CUSTOMER COMPLAINT RESPONSE**

The District maintains a log of public complaints with respect to the water supply system. Depending on the nature of the complaint, a staff member may be contacted by portable radio or mobile phone to respond immediately if a public health issue is apparent. If not of immediate urgency, a customer inquiry is completed and staff responds in a timely manner.

## CHAPTER 7

### WATER USE EFFICIENCY PROGRAM

#### OBJECTIVE

The objectives of this Chapter are to identify the conservation and water use efficiency requirements pertaining to the District, evaluate past conservation efforts, and describe the District's water use efficiency program for the next 10 years.

#### WATER USE EFFICIENCY RULE BACKGROUND

The Washington Legislature passed the Water Use Efficiency Act of 1989 (43.20.230 RCW), which directs Department of Health (DOH) to develop procedures and guidelines relating to water use efficiency. In response to this mandate, Department of Ecology (Ecology), the Washington Water Utilities Council, and DOH jointly published a document titled *Conservation Planning Requirements* (1994). In 2003, the Municipal Water Supply - Efficiency Requirements Act (Municipal Water Law) was passed and amended RCW 90.46 to require additional conservation measures. The Municipal Water Law, among other things, directed DOH to develop the Water Use Efficiency (WUE) Rule, which is outlined in the *Water Use Efficiency Guidebook* and became effective January 22, 2007. These documents provide guidelines and requirements regarding the development and implementation of conservation and efficiency programs for public water systems. Conservation and efficiency programs developed in compliance with these documents are required by DOH and by Ecology as part of a public water system water right application. Conservation must be evaluated and implemented as an alternate source of supply before state agencies approve applications for new or expanded water rights. The third and most recent edition of the WUE Guidebook was released in January 2011.

The WUE Rule is an extension to the Conservation Planning Requirements and sets more stringent requirements for public water purveyors. The WUE Rule is comprised of four sections:

1. Planning requirements.
2. Distribution system leakage standard.
3. Customer goal setting.
4. Annual WUE reporting.

This rule requires additional conservation measures related to data collection and reporting, distribution leakage, metering, goal setting, and performance reporting.

## PLANNING REQUIREMENTS

Under the WUE Rule, water systems are required to implement planning methods to forecast future demands and determine necessary measures to reduce usage and demand. Elements of the planning requirements include:

1. Data collection;
2. Demand forecasts; and
3. Selection and evaluation of WUE measures.

## WATER USE EFFICIENCY REQUIREMENTS

The *Water Use Efficiency Guidebook* establishes varying implementation and evaluation requirements for municipal water suppliers (MWS). The new requirements focus on the importance of measuring water usage and evaluating the effectiveness of the WUE program. There are three fundamental elements to the Rule, including planning, distribution leakage standards, and goal setting and performance reporting.

Table 7-1 provides a summary of the WUE Rule deadlines applicable to the District.

**TABLE 7-1**

**Summary of WUE Rule Deadlines**

<b>Requirement</b>	<b>Deadline for MWS with 1,000 or more connections</b>
Meet distribution leakage standard (based on 3-year rolling average)	July 1, 2010, or 3 years after installing all service meters
Complete installation of all service meters	January 22, 2017

## WATER METERS

Metering all water production and consumption is critical for determining system wide and individual water use efficiency. The WUE Rule sets deadlines for meter installation and data collection. As Table 7-1 indicates, the WUE Rule requires production meters on all existing and new water sources, and requires consumption meters on all customer connections by 2017. The District meters all existing customer connections and will meter all new connections, and therefore is in full compliance with consumption metering requirements.

Currently, the District's supply is provided by Alderwood Water and Wastewater District (AWWD) and the City of Everett (Everett). Supply is provided by the City of Everett through two master meters and one flow control meter. The District's 715 East Zone receives all its water from Everett through numerous interties, none of which are metered.

Due to periodic service area transfers in the 715 East Zone and the number of interties, there are no plans to install master meters within that zone. Production and consumption in the 715 East Zone are totaled from customer service meter readings.

Supply from AWWD is provided through two master meters. The Paine Field connection pumps water from the AWWD 30-inch transmission main on Beverly Park Road through a 16-inch main to Reservoir 4. The Harbour Pointe connection is located along Harbour Pointe Boulevard near St. Andrews Drive and feeds directly into the 620 Zone by gravity. Both connections are monitored by AWWD and the District.

The District also has three emergency interties with the Alderwood Water & Wastewater District (AWWD). As described in WAC 246-290-132(4), emergency interties are exempt from metering requirements. A detailed description of the water system is provided in Chapter 1.

## **DATA COLLECTION**

The WUE Rule requires regular collection of production and consumption data. Data must be reported in the District's planning documents and annual performance report to DOH. Water use data will be used for the following:

- Calculating distribution system leakage.
- Forecasting demand for future water needs.
- Identifying areas for more efficient water use.
- Evaluating the success of your WUE program.
- Describing water supply characteristics.
- Aiding in decision-making about water management.

The WUE Rule set requirements for collecting source and service data. Source meters must be read monthly and reported as monthly and annual totals. Service meter totals only have to be reported in annual amounts, although it is recommended to read all service meters every 1 to 2 months. The District reports monthly and annual water produced, annual water consumed, annual totals for each customer class, and customer class seasonal variations.

The District has established five customer classes: single-family residential, multi-family residential, commercial/industrial/institutions, schools, and irrigation. By separating customers into different categories, the District tracks the effects of their WUE program and conservation more accurately.

## **DISTRIBUTION SYSTEM LEAKAGE**

The WUE Rule requires that water distribution systems have a leakage rate of less than 10 percent of finished water production. Distribution system leakage (DSL) is defined as all unaccounted for water that entered the distribution system, including reservoirs.

Known or credibly estimated losses can be excluded from the leakage calculation and may include uses such as construction, firefighting, and flushing.

Distribution system leakage for the District equals the difference between the volumes measured at the District’s master meters and flow control meter, and the volume measured at customer meters. Production and consumption volumes for the 715 East Zone are taken as the volume measured by customer meters and added to the totals for the rest of the distribution system.

Table 7-2 provides annual data from 2009 to 2014 for distribution system leakage, excluding the 715 East Zone since production data is not available.

**TABLE 7-2**

**Distribution System Leakage**

Year	Production (gallon)	Consumption (gallon)	Distribution System Leakage		
			Gallons	Annual %	3-yr Rolling Average
2009	758,070,000	724,010,000	34,060,000	4.49%	1.6% <sup>(1)</sup>
2010	703,560,000	700,070,000	3,490,000	0.50%	1.6%
2011 <sup>(2)</sup>	633,760,000	609,390,000	24,370,000	3.85%	3.0%
2012	637,550,000	612,000,000	25,550,000	4.01%	2.8%
2013	668,700,000	641,110,000	27,590,000	4.13%	4.0%
2014	643,610,000	630,740,000	12,870,000	2.00%	3.4%

(1) Data from the 2010 Water System Plan was used to calculate 3-year rolling average.

(2) Everett Assumed 1,188 of the District’s connections in 2011.

As shown in Table 7-2, the District has historically been well below the 10 percent distribution system leakage requirement. This is primarily due to monitoring customer accounts for unusual usage, which may indicate leaks, and conducting annual leak detection surveys throughout the distribution system. With a current three-year rolling average of 3.4 percent, the District is in full compliance with DOH requirements. The significant decreases in production and consumption values for 2011 were the result of the assumption of 1,188 connections by the City of Everett.

**WATER USE EFFICIENCY PROGRAM**

The following sections describe the District’s water use efficiency goals, a description of the conservation measures, and the resulting water use projections.

**REGIONAL CONSERVATION PROGRAM**

As a purveyor to over 30 water systems, both large and small, the City of Everett has established the Everett Water Utilities Committee (EWUC) to help advise the City

Council regarding the planning, financing and implementation for future major capital improvements to the Everett’s water system, which affects water service to regional customers outside the City including, but not limited to, determination of service areas, location, sizing, and other technical input regarding filtration facilities.

EWUC strives to coordinate the interests and efforts of the wholesale customers and Everett. One way of doing so is by developing and implementing a conservation program that wholesale customers can participate in.

As a member of the EWUC, the District has historically participated in the Regional Conservation Program (RCP) developed by Everett in order to cooperate with regional conservation efforts.

**PAST AND PRESENT PROGRAMS**

The District chose to adopt Everett’s RCP in the District’s *Water System Comprehensive Plan (2003)* and recently approved Resolution 368-15 to continue participation in the RCP. The plan included several goals, which are summarized in Table 7-3.

**TABLE 7-3**

**EWUC Conservation Plan Goals**

<b>Goal</b>	<b>Objective</b>
Minimizing the Cost of Water	<ul style="list-style-type: none"> <li>• Reduce peak day demand</li> <li>• Defer capital costs</li> <li>• Capture low-cost savings</li> </ul>
Meeting Regulatory Requirements	<ul style="list-style-type: none"> <li>• Address current regulations</li> <li>• Anticipate future regulations</li> <li>• Demonstrate good management</li> </ul>
Reduce Stream Impacts	<ul style="list-style-type: none"> <li>• Promote efficiency</li> <li>• Increase water for fish</li> <li>• Benefit ESA and other issues</li> </ul>
Preserving Water Rights	<ul style="list-style-type: none"> <li>• Promote efficiency</li> <li>• Benefit the environment</li> <li>• Demonstrate good stewardship</li> </ul>

The District utilizes resources provided by Everett to help meet these goals. Several are additional measures that the District implements on their own, and several of the measures implemented by the District are supported by Everett through the RCP program. The following sections detail these measures.

## DISTRICT MEASURES

### CUSTOMER LEAK SURVEYS

The District monitors customer accounts in an effort to identify leaks. There are several methods used for identifying potential leaks:

- If the District staff observes a high read during meter readings, they check if the meter is running at the time, which indicates a possible leak.
- Meter reading software flags accounts using variance percentages compared to the previous year's bill.
- District staff reviews accounts flagged by the software and has suspect accounts rechecked.

If a potential leak is identified, a letter from the District is sent to the customer in an effort to alert the customer to the condition and repair the leak. In the 2013, the District monitored 212 accounts with high consumption and 23 leaks were repaired. The resulting savings of leak repair were 2.7 MG per year, based on the average savings per leak from the leaks found between 1998 and 2002. Table 7-4 summarizes results of customer account leak detection.

**TABLE 7-4**

#### **Customer Leak Detection Results**

<b>Year</b>	<b>Accounts Monitored</b>	<b>Leaks Detected</b>	<b>Leaks Repaired</b>	<b>Savings (MG)</b>
2009	147	66	22	2.6
2010	247	89	9	1.1
2011	255	110	24	2.8
2012	191	125	19	2.2
2013	212	152	23	2.7
2014	354	308	9	1.1

### DISTRIBUTION SYSTEM LEAK SURVEYS

The District has contracted with a leak detection firm to perform leak detection surveys on over 230 miles of water mains since 1997. The Contractor provides estimates of the magnitude of leaks. Water loss estimated by leak detection contractors is typically 25 to 50 percent greater than what the District finds leaks to be during repair. Twenty two leaks have been detected to date, resulting in a savings of over 28 MG per year by District estimates. Table 7-5 summarizes results of these surveys.

**TABLE 7-5**

**Distribution System Leak Detection Survey Results**

Year	Miles surveyed	Leaks repaired	Savings	
			gpm	MG/yr
1997-2009	148.3	19	52.8	27.8
2010	10.5	2	1.25	0.66
2011	10	0	0	0
2012	20.5	0	0	0
2013	14	0	0	0
2014	20	1	0.25	0.13
2015	13	0	0	0
<b>Total</b>	<b>236.3</b>	<b>22</b>	<b>54.3</b>	<b>28.54</b>

**BLOWOFF REPLACEMENT PROGRAM**

From 2006 to 2008, the District worked to replace over 25 blowoff assemblies identified as leaking. The District estimates that replacement stopped 17 gpm in leaks per blowoff, or a total of 8.9 MG per year. The District will continue to identify and replace leaking blowoffs as part of its normal maintenance program.

**BILLS SHOWING CONSUMPTION HISTORY**

Water utility bills for each customer class include information on consumption history for the past 12 months. This allows the customer to track their water use and compare usage to previous billing periods.

**DISTRICT MEASURES SUPPORTED BY EWUC**

**CONSERVATION KITS**

In cooperation with EWUC, the District makes indoor and outdoor water conservation kits available to customers free of charge. Indoor water kits include a toilet tank displacement bag, low-flow showerhead, faucet aerators, and toilet leak detection dye. Outdoor water kits include a water-saving garden hose nozzle, automatic timer, sprinkler rain gauge, and soil moisture meter. Table 7-6 shows the number of indoor and outdoor conservation kits allocated to the District by EWUC over the past 6 years. The District does not keep track of how many kits are distributed per month, but they typically distribute their full allocation per year.

**TABLE 7-6**

**Water Conservation Kits Allocated by EWUC**

<b>Year</b>	<b>Indoor Kits</b>	<b>Outdoor Kits</b>
2009	100	210
2010	100	210
2011	100	300
2012	100	300
2013	100	300
2014	200	300

**CUSTOMER EDUCATION**

The District provides information and tips for efficient water use for customers in their semi-annual newsletter. Information on efficient use is also available for customers at the District office.

**PROGRAM PROMOTION**

The District also provides a number of water conservation brochures to customers at the customer service desk at the District office. Brochure subjects have included summer lawn and watering calendars and guides, home water conservation guides, leaky faucet repair and landscaping tips.

**IRRIGATION MANAGEMENT**

In conjunction with EWUC, the District has adopted a water calendar for summer months to discourage frequent and over watering. The calendar allows for outdoor watering every third day. Watering days are assigned based on the last two digits of house numbers. In the event of a water shortage, irrigation management would be mandated.

**EWUC MEASURES IMPLEMENTED WITHIN DISTRICT SERVICE AREA**

**School Programs**

Since 2009, the City of Everett's Regional Conservation Plan has conducted over 3,800 conservation workshops in classrooms around Snohomish County, reaching more than 99,000 students.

## EFFECTS OF PAST MEASURES

Since the District adopted their current conservation plan in June 2003 with their previous *Water System Comprehensive Plan*, there has been significant reduction in customer water use, as illustrated in Table 7-7.

**TABLE 7-7**

### District Water Savings

	2009	2010	2011	2012	2013	2014
Authorized Consumption <sup>(1)</sup> (MG)	724	709	609	612	641	631
Estimated Service Area Residential Population	25,290	25,425	25,559	23,674	23,800	23,925
Per capita use (gpcd)	78	76	65	71	74	72
Annual savings	-2.6%	2.5%	14.4%	-9.2%	-4.2%	2.7%
Average annual savings	0.6%					

The current conservation plan has resulted in average annual savings of 0.6 percent of per capita demand since 2009 and an average annual savings of 2.2 percent of per capita demand since the plan was adopted in 2003. This corresponds to a total savings of approximately 75 million gallons of water compared with 2003 per capita use. Since their current plan has proven to be quite effective, the District will continue implementing all of these measures.

## NEW WATER USE EFFICIENCY PROGRAM

Under the WUE Rule, the District must set water use efficiency goals and measure progress each year toward meeting these goals. Goals must include a measurable outcome, address water supply or demand characteristics, and include an implementation schedule. The District must also evaluate or implement conservation measures to help meet these goals.

### Goals

The District plans to reduce its water use in several ways. First, the District will continue to participate in the RCP presented by EWUC to promote conservation by its customers and reduce overall water demand.

The City of Everett's current goal is to save approximately 0.24 mgd per year through the year 2019, with a total savings of approximately 1.44 mgd at the end of the 6-year planning period. The City has developed a conservation program through EWUC that includes education, conservation kits, leak repair, rebates, and audits, with expected savings from each measure.

Nearly \$7 million has been invested in regional water conservation activities since 2001 including school education, indoor and outdoor water conservation kits, rebates for water efficient clothes washers and toilets, leak detection, business water audits, and school irrigation audits. The City of Everett's Regional Conservation Plan has saved about 3.7 mgd, far exceeding the original goal of 1.96 mgd by the end of 2012.

The District's second goal is to continue to maintain a distribution leakage rate of significantly less than 10 percent per the WUE Rule requirements. As Table 7-2 shows, the District currently has a 3-year rolling average of 3.4 percent distribution system leakage. The District will continue to monitor customer accounts for leaks and conduct annual leak detection surveys.

Since the District began distribution system leak detection surveys, they have repaired 22 leaks, saving a total of over 28 MG per year. The majority of those savings are from leaks found between 1997 and 2009. The average savings since 2009 is 0.13 MG per year.

The District also monitors customer accounts for high usage that may indicate leaks. Based on past savings, the District anticipates saving 1 to 2 MG per year. Compounded with savings from system leak detection surveys, the District expects to save approximately 2 MG annually through 2021. Although the District expects to continue to see savings from the leak detection programs, the District does not anticipate these savings to change their average DSL rate significantly. These program goals will be re-evaluated annually.

### **Water Use Efficiency Measures**

The WUE Rule states several measures that must be implemented or evaluated and provides a list of measures that are counted as additional measures in the WUE Program. WAC 246-290-810 identifies the minimum number of water use efficiency measures that must be evaluated based on system size. The District serves the 2,500 and 9,999 connections category and therefore must evaluate or implement six supplementary water use efficiency measures in addition to the mandatory measures. The following sections describe both the mandatory and supplementary water use efficiency measures evaluated and indicate which have been or will be implemented by the District.

#### **Mandatory Implementation – Source and Service Metering and Meter Calibration**

The District currently meters all customers and has five master or flow control meters that account for water entering the District from Everett and AWWD. The District will continue to meter all new customers and sources. Source meters are calibrated periodically. The District's service meter replacement program replaces old customer water meters with electronic meters, which help decrease read errors.

Mandatory Implementation – Leak Detection and Water Accounting

Although the District has low historical distribution system leakage, the District will continue to pursue leak detection and repair for its distribution systems.

The District will continue to monitor customer accounts in an effort to identify leaks and will conduct additional leak detection surveys throughout the system. Additionally, the District plans to investigate the installation of meters on hydrants used for firefighting training as another means of accounting for lost water. The District has purchased a meter to use when flushing pipes.

Mandatory Implementation – Customer Education

The District will continue to provide customer education by including efficient water use tips in their semi-annual newsletter and by making information available at the District office.

Mandatory Evaluation – Rates that Encourage Efficiency

The District currently has a uniform rate structure with a volume charge. Customers are charged a monthly base rate, which is based on customer class and meter size. There is also an additional charge for each thousand gallons of water used. Table 7-8 summarizes the water rates.

**TABLE 7-8**

**District Water Rate Summary<sup>(1)</sup>**

<b>Customer Category</b>	<b>Bimonthly Basic Charge</b>	<b>Volume charge \$/1,000 gallons</b>	<b>Extra Unit \$/Unit</b>
Single-Family, Size Range from 5/8" x 3/4" to 2"	\$24.48 – \$186.80	\$3.41	NA
Multi-Family, Size Range from 5/8" x 3/4" to 10"	\$16.80 – \$1,507.16	\$3.07	\$10.08
Commercial/Industrial, Size Range from 5/8" x 3/4" to 24"	\$26.92 – \$5,931.40	\$3.96	\$16.14
Irrigation, Size Range from 5/8" x 3/4" to 2"	\$25.62 – \$195.52	\$3.77	NA

(1) As of January 1, 2015.

The District’s position is that the uniform volume charge it has in place is sufficient to encourage conservation across all rate classes and provide the financial stability to operate and maintain the water system at a high level of service to its customers. The District will re-evaluate inclined block and seasonal rate structures as part of its next rate study.

Mandatory Evaluation – Reclaimed Water Opportunities

Prior to November 2007, the District did not own or operate a wastewater treatment facility. The District operated a small collection system that conveyed all of its wastewater to the City of Everett for treatment. In November 2007, the District merged with the Olympus Terrace Sewer District which operates a wastewater treatment facility. The District’s wastewater treatment facility does not currently have the capability to treat wastewater to reclaimed water standards.

At the present time, the City of Everett has not discussed plans for reclaimed water with the District, but the District will work with Everett in identifying reclaimed water opportunities if Everett approaches the District. Potential uses of reclaimed water are discussed later on in this Chapter.

Supplementary Measures

The District will continue implementing all of their current measures described above as part of their new Water Use Efficiency Program. Table 7-9 summarizes these measures.

**TABLE 7-9**

**District WUE Program Measures**

<b>Implemented Measures</b>	<b>Comment</b>	<b>Applicable Customer Classes</b>
Program Promotion	District measure supported by EWUC	5
School Outreach	District measure supported by EWUC	1
Bills Showing Consumption History	District measure	5
Conservation Kits	District measure supported by EWUC	2
Irrigation Management	District measure supported by EWUC	1
Washer Rebates	EWUC measure	2
Toilet Rebates	EWUC measure	2
Water Audits	EWUC measure	2
<b>Total Measures Counted</b>		<b>20</b>

**Evaluation of Measures**

As a purveyor of the City, the District’s membership in EWUC is paid out of the wholesale water rate. As a result, the District can take advantage of the programs and resources provided by EWUC at no additional cost. Since many of the District’s measures are supported by EWUC, the primary evaluation method of measures will be tracking reductions in water use instead of cost-effectiveness.

**PUBLIC FORUM**

The District will engage customers and other interested members of the public in a public forum when establishing WUE goals. The public forum not only allows the public to provide input on the decisions to be made by the governing body, but it also helps them understand the purpose of establishing goals. The District’s WUE goals were last publically set at the September 2, 2015 Commissioner Meeting, as required by WAC 246-290.

**TARGET WATER SAVINGS PROJECTIONS**

If the District’s water use efficiency goals are realized, the District will see significant savings in water use. Table 7-10 shows projected savings from the presented goals.

**TABLE 7-10**

**Projected Water Use Efficiency Savings**

Measure	Expected Savings (MG per year)					
	2016	2017	2018	2019	2020	2021
Leak Detection and Water Accounting <sup>(1)</sup>	2	2	2	2	2	2
Education <sup>(2)</sup>	5.8	5.8	5.9	5.9	5.9	6.0
Conservation Kits <sup>(4)</sup>	1	1	1	1	1	1
Leak Repair <sup>(5)</sup>	0.1	0.1	0.1	0.1	0.1	0.1
Toilet Rebates <sup>(5)</sup>	0.16	0.16	0.16	0.16	0.16	0.16
Washer Rebates <sup>(5)</sup>	0.22	0.22	0.22	0.22	0.22	0.22
Audits (ICI) <sup>(5)</sup>	0.9	0.9	0.9	0.9	0.9	0.9
Audits (Schools) <sup>(5)</sup>	0.03	0.03	0.03	0.03	0.03	0.03
<b>Total Savings</b>	<b>10.2</b>	<b>10.2</b>	<b>10.3</b>	<b>10.3</b>	<b>10.3</b>	<b>10.4</b>

- (1) District program.
- (2) Education includes customer education, program promotion, bills showing consumption history, school outreach and irrigation management. Most of these are supported by EWUC.
- (3) Education savings are not compounded annually due to the need to re-educate customers each year to maintain constant savings.
- (4) District measure supported by EWUC.
- (5) EWUC measure. Leak Repair is an EWUC measure that should not be confused with the District’s separate leak program.

**DEMAND FORECASTING**

The WUE Rule has added new criteria to consider when preparing demand forecasts. It is now required to project demands both with and without anticipated savings from the water use efficiency program. This additional forecast can help determine whether capital improvements can be delayed or eliminated, and how much additional growth may be permitted. It also provides a basis to measure actual water use data against to monitor conservation success.

A demand forecast with and without anticipated savings from both goals is shown in Table 7-11.

**TABLE 7-11**

**Demand Forecast With and Without Conservation Savings**

Year	Projected Population	Without Conservation		With Conservation	
		Average Day Demand (mgd)	Peak Day Demand (mgd)	Average Day Demand (mgd)	Peak Day Demand (mgd)
2016	24,177	1.84	3.69	1.81	3.63
2017	24,302	1.85	3.71	1.82	3.66
2018	24,428	1.87	3.73	1.84	3.67
2019	24,553	1.88	3.75	1.85	3.69
2020	24,679	1.89	3.78	1.86	3.73
2021	24,805	1.90	3.80	1.87	3.74

**ANNUAL PERFORMANCE REPORTING**

The District is required to submit a performance report to the Department of Health annually. This report must include:

- Total source production and system wide consumption.
- Distribution system leakage in percentage and volume.
- Goal description, schedule, and progress toward meeting goals.

DOH has developed a report form that must be submitted for annual reporting. The District has also developed a spreadsheet to track monthly production and consumption volumes and calculated DSL volume and percentage. These reports are available to the public.

**POTENTIAL FOR WATER REUSE**

This section presents a brief analysis of the potential for water reuse within the District service area. Use of reclaimed water is an alternative to wastewater treatment plant effluent disposal. The production and beneficial use of reclaimed water is the development of a new usable water supply. In addition to minimizing the environmental impacts of wastewater disposal, water reuse can address problems associated with diminishing potable water supplies and acquiring new water rights. In the state of Washington, any type of direct beneficial reuse of municipal wastewater is defined as water reuse or reclamation. *Water Reuse and Reclamation Standards* have been issued jointly by the Departments of Health and Ecology.

## PERMITTED USES OF RECLAIMED MUNICIPAL WASTEWATER

Allowable water reuse methods of Class A reclaimed water include:

- Irrigation of Non-Food Crops
- Spray Irrigation of Food Crops
- Surface Irrigation
  - Food crops where there is no reclaimed water contact with edible portion of crop
  - Root crops
  - Orchards and vineyards
  - Food crops that undergo physical or chemical processing sufficient to destroy all pathogenic agents
- Landscape Irrigation
  - Restricted access areas (e.g., cemeteries, freeway landscaping)
  - Open access areas (e.g., golf courses, parks, playgrounds, etc.)
- Impoundments
  - Landscape impoundments
  - Restricted recreational impoundments
  - Non-restricted recreational impoundments
- Fish Hatchery Basins
- Decorative Fountains
- Flushing of Sanitary Sewers
- Street Cleaning
  - Street sweeping, brush dampening
  - Street washing, spray
  - Washing of corporation yards, lots, and sidewalks
- Dust Control (Dampening Unpaved Roads, Other Surfaces)
- Dampening of Soil for Compaction (Construction, Landfills, etc.)
- Water Jetting for Consolidation of Backfill Around Pipelines
- Fire Fighting and Protection
  - Dumping from aircraft
  - Hydrants or sprinkler systems in buildings
- Toilet and Urinal Flushing
- Washing Aggregate and Making Concrete
- Industrial Boiler Feed
- Industrial Cooling
- Industrial Process

Most of these methods provide limited potential for use in the District due to the relatively small quantities and seasonal nature of the reuse method. Two reuse methods that offer the potential for 100 percent reuse on a year-round basis are groundwater

recharge and stream flow augmentation. A more detailed discussion of groundwater recharge and stream flow augmentation is provided.

### **Groundwater Recharge**

Groundwater recharge using reclaimed water is permitted under the water reuse standards. Three categories of groundwater recharge are covered in the water reuse standards:

- Direct injection to a drinking water aquifer
- Direct injection to a non-drinking water aquifer
- Surface percolation

Since the District does not rely on groundwater as a source of supply, direct injection of reclaimed water to a drinking water aquifer is not discussed in detail. Direct injection of reclaimed water to a non-drinking water aquifer must be Class A reclaimed water treatment standards as well as the following additional criteria:

$$\text{BOD}_5 \leq 5 \text{ mg/L}$$

$$\text{TSS} \leq 5 \text{ mg/L}$$

Any additional criteria deemed necessary by DOH or Ecology

Groundwater recharge using surface percolation must be at least Class A reclaimed water. In addition to secondary treatment to provide oxidized wastewater, the process must include a “step to reduce nitrogen prior to final discharge to groundwater.”

### **Streamflow Augmentation**

For small streams where fish habitat has been degraded due to low instream flows, stream flow augmentation is an alternative that is allowed under the water reuse regulations and standards. This reuse method still requires a National Pollutant Discharge Elimination System (NPDES) permit and adherence to the surface water quality standards (WAC 173-201A). However, the key difference between stream flow augmentation and surface water disposal is that a determination of beneficial use has been established based on a need to increase flows to the stream. To make this determination requires concurrence from the Washington Department of Fish and Wildlife (WDFW) that the need exists for additional instream flows.

Instream flow augmentation can be used to mitigate for future surface water supply or ground water withdrawal. However, since the District purchases its supply and does not anticipate any long-term development of its own supply, streamflow augmentation is not an appropriate application for the District.

**Other Uses**

The water reuse standards allow for a number of other uses that are not discussed in detail here. However, the general basis for the reuse criteria is that when unlimited public access to the reclaimed water is involved, the criteria requires Class A reclaimed water. The use of reclaimed water for agricultural purposes is allowed under the water reuse standards, including food crops, as proper setback distances are employed.

**SOURCES**

There are no current sources of Class A reclaimed water to the District. The District owns and operates a wastewater treatment plant that provides secondary treatment and discharges to a marine outfall in Puget Sound. There is currently no provision for treatment of water to Class A reclaimed water standards at this facility. Additionally, there is no infrastructure for the distribution of reclaimed water. The City of Everett previously provided some reclaimed water in the form of treated secondary effluent to the Kimberly-Clark paper mill for cooling use but stopped after December 2006. The City of Everett’s 2014 Addendum to the 2007 Water Comprehensive Plan states that there are no plans to provide reclaimed water to other customers in the near future. Any development of reclaimed water will require expensive upgrades to the wastewater treatment facilities and significant infrastructure improvements for either the District or Everett.

**REUSE AREA REQUIREMENTS**

The water reuse standards establish criteria for siting and identifying water reclamation projects and their facilities. Water reclamation storage facilities, valves, and piping must be clearly labeled, and no cross-connections between potable water and reclaimed water lines are allowed. A key area requirement for a water reclamation project is setback distance. Table 7-12 summarizes setback requirements for water reclamation facilities.

**TABLE 7-12**

**Setback Distances for Class A Reclaimed Water in the State of Washington**

<b>Reclaimed Water Use/Facility</b>	<b>Distance (Feet)</b>
<b>Minimum Distances to Potable Water Well:</b>	
Spray or Surface Irrigation	50
Unlined Storage Pond or Impoundment	500
Lined Storage Pond or Impoundment	100
Pipeline	50
Minimum Distance between Irrigation Area and Public Areas	0

## **POTENTIAL FOR IRRIGATION WATER REUSE**

Reclaimed water can be used for irrigation and landscape purposes. The District has an annual average rainfall of approximately 36 inches. Due to the significant amount of rainfall during winter months, reclaimed water could be used for irrigation only during the summer. Many of the parks within the District are heavily treed and are not irrigated; however, there are several schools with athletic and play fields which are large irrigation water users. The peak day reclaimed water usage rates for irrigation demands are presented in Table 7-13. The peak day reclaimed water usage rate for irrigation purposes assumes a typical irrigation rate of 14 inches per year, and irrigation for four months per year.

## **POTENTIAL FOR INDUSTRIAL WATER REUSE**

In addition to irrigation, industries within the District might have a use for reclaimed water. The majority of industrial activity within the District takes place on Paine Field. If reclaimed water was used in the Paine Field area it would need to be pumped up from the District's wastewater treatment plant, which is located near sea level. Paine Field does not currently have the type of industrial activities that would benefit from large quantities of reclaimed water, and the District is unaware of any plans for this type of industrial activity. Industrial reuse is currently not cost effective due to the difficulty of transmission main construction, the energy required for the pumps, and the current lack of end-users.

## **JETTING OF SANITARY SEWER LINES**

One possible application of reclaimed water by the District could be to jet (clean) the sanitary sewer lines. The District currently has approximately 114 miles, 602,000 lineal feet, of gravity sewers. To completely flush the system every 5 years would require flushing 120,400 lineal feet of mains each year. At a typical flushing rate of 4,000 gallons per 1,000 lineal feet of sewers, a total of 0.48 million gallons of water per year is required for sanitary sewer flushing. This represents approximately 0.08 percent of the District's yearly water consumption. Without a reclaimed water distribution system in place throughout the District the significant costs required to develop such a distribution system for sewer flushing alone are not justifiable. The development of reclaimed water for this for sewer flushing does not appear cost-effective at this time.

**TABLE 7-13**

**Potential Uses for Reclaimed Water**

<b>Irrigation/Landscaping Use<sup>(1)</sup></b>	<b>Area (acre)</b>	<b>Annual Usage (MG/year)</b>	<b>Peak Day (gpd)</b>
Public Parks	43	16.35	272,429
Public Schools	149	56.6	943,998
<b>Maintenance Activity</b>	<b>Length (lf)</b>	<b>Annual Usage (MG/year)</b>	<b>Peak Day (gpd)</b>
Jetting of Sewer Lines	120,400	.48 <sup>(2)</sup>	4,000 <sup>(3)</sup>
<b>Total Potential Reclaimed Water Usage</b>		<b>73.5</b>	<b>1,220,427</b>

- (1) Assuming a typical irrigation rate of 14 inches per year over the period of 4 months (from mid May to mid September).
- (2) Assumes flushing interval of 5 years and a rate of 4,000 gallons of water used per 1,000 lineal feet of sewer flushed.
- (3) Assumes 125 lineal feet per hour are flushed for 8 hours a day using 4,000 gallons of reclaimed water per 1,000 lineal feet of sanitary sewer.

**FEASIBILITY OF RECLAIMED WATER**

Within the District service area are several potential applications for reclaimed water. Of these the only significant application appears to be for irrigation of school playfields and landscaping. However, the District would need to undertake numerous costly improvement projects in order to serve this demand. There is currently no source of the required Class A reclaimed water to the District. At this time, development of water reuse within the District does not appear to be cost-effective.

**SUMMARY**

To comply with the new requirements set forth in the Water Use Efficiency Rule and to reduce overall water use, the District has set a goal to continue participation in the City of Everett’s RCP, and to maintain a distribution system leakage rate of less than 10 percent.

The District will employ several measures to accomplish these goals, which are as follows:

- Leak detection surveys
- Monitoring customer accounts for leaks
- Customer education
- Program promotion
- Bills showing consumption history
- School outreach

- Water conservation kits
- Irrigation management
- Cooperation with the Regional Program established by EWUC

If the goals are realized, the District anticipates annual savings of approximately 7.56 MG per year.

## **CHAPTER 8**

### **CAPITAL IMPROVEMENT PLAN**

#### **INTRODUCTION**

This chapter presents a 10-year Capital Improvement Plan (CIP) in accordance with the requirements of WAC 246-290. Water system capital improvements have been scheduled and prioritized on the basis of water quality concerns, component reliability, regulatory requirements, growth, system benefit, and financial priority. For the proposed projects identified in this chapter, individual project descriptions and preliminary project cost estimates are presented in Appendix K. A District water system base map illustrating the locations of the proposed improvement projects is included in the back sleeve.

In the future, other projects may arise that are not identified as part of the District's CIP presented in this chapter. Such projects may be deemed necessary for ensuring water quality, preserving emergency water supply, meeting unforeseen regulatory requirements, accommodating transportation improvements proposed by other agencies, or addressing unforeseen problems with the District's water system. Due to budgetary constraints, the completion of these projects may require that the proposed completion date for projects in the CIP be rescheduled. The District retains the right to reschedule proposed projects and to expand or reduce the scope of proposed projects, as best determined by the District's Commissioners when new information becomes available for evaluation. Additionally, future planning efforts by Snohomish County, the City of Everett, and the City of Mukilteo may affect land use zoning and demand distributions within the District. Each capital improvement project will be reevaluated to consider the most recent planning efforts as the proposed completion date for the project approaches.

The transportation improvements proposed by other agencies, including the Washington State Department of Transportation, Snohomish County, the City of Mukilteo, the City of Everett, and Snohomish County Airport may force the District to relocate water mains or construct new water mains. Budget and required staff effort to complete such projects may force the District to re-prioritize projects. The District retains the right to be flexible in scheduling its capital improvement projects to accommodate other unforeseen projects.

#### **COMPLETED CAPITAL IMPROVEMENT PROJECTS**

The capital improvement plan in the District's 2009 *Water System Comprehensive Plan* recommended various improvements to the storage, transmission, and distribution systems for the District. Table 8-1 list projects completed by the District since 2009.

**TABLE 8-1**

**Completed Capital Improvement Projects**

<b>Year Completed</b>	<b>Project Description</b>	<b>Pipe Size (inches)</b>	<b>Pipe Length (linear feet)</b>
2009	AWWD Supply Agreement	N/A	N/A
2009	Paine Field Water and Sewer Improvements	12	800
2009 – 2015	Annual Telemetry Updates	N/A	N/A
2010	AMR Study	N/A	N/A
2010	Harbour Pointe Boulevard Master Meter	12	700
2010	Reservoir No. 2 Interior Recoating	N/A	N/A
2010	Lamar Drive Feasibility Study	N/A	N/A
2010	West Gate Flow Meter Telemetry and Flow Control	N/A	N/A
2010	Telemetry Master Plan	N/A	N/A
2010	620 Reservoirs Transfer Pump Meter	N/A	N/A
2012	Headquarters Site Lighting and Security Improvements	N/A	N/A
2012	Paine Field Booster Station and Transmission Main	16	3,100
2012 – 2015	Service Meter Replacement Program	N/A	N/A
2012	Security Improvements	N/A	N/A
2012 – 2015	GIS System (ongoing)	N/A	N/A
2014	48 <sup>th</sup> Place Main	8	570
2014	Airport Road Isolation/ Marino Loop	8	330
2015	3 <sup>rd</sup> Street Water Main	8	1,000
2015	Goat Trail Road Crossing	8	450
2016	Water System Plan	N/A	N/A

N/A – Not Applicable

## **PROPOSED CAPITAL IMPROVEMENTS**

The District proposes system improvements based on DOH requirements and H<sub>2</sub>O<sub>Net</sub> hydraulic analysis, adopted District standards, and ongoing maintenance. Proposed projects are organized by storage improvements, transmission and distribution system improvements, meter improvements, general system improvements, and capital improvements to booster stations. Project costs listed are 2015 costs (ENR CCI, Seattle = 10398.24, June 2015) and have not been adjusted for inflation.

### **PROPOSED STORAGE IMPROVEMENTS**

The District has identified the following storage improvements in the 20-year planning period.

#### **S-1 Reservoir No. 4 Interior and Exterior Recoating (2016)**

The District plans to recoat the interior and exterior of Reservoir No. 4. The reservoir's original coating is anticipated to reach the end of its useful life and will be removed and replaced. The exterior coating will include a top coat of the existing system.

**Estimated Project Cost: \$1,525,000**

#### **S-2 Reservoir No. 1 Interior Recoating (2023)**

The District plans to repaint the interior of Reservoir No. 1. The Reservoir's current coating is anticipated to reach the end of its useful life and need to be recoated.

**Estimated Project Cost: \$354,000**

#### **S-3 Reservoir No. 2 Exterior Recoating (2026)**

The District plans to repaint the exterior of Reservoir No. 2. The Reservoir's current coating is anticipated to reach the end of its useful life and will need to be recoated.

**Estimated Project Cost: \$545,000**

#### **S-4 Reservoir No. 4 Site Piping (2016)**

The District plans to install new site piping to allow the District to pump out of Reservoir No. 4.

**Estimated Project Cost: \$75,000**

#### **S-5 Reservoir No. 5 Interior Recoating (2016)**

The District began recoating the interior of Reservoir No. 5 in 2015 with completion anticipated in the spring of 2016.

**Estimated Project Cost: \$700,000**

### **PROPOSED TRANSMISSION AND DISTRIBUTION SYSTEM IMPROVEMENTS**

Transmission and distribution system improvements and priorities are based upon results of the H<sub>2</sub>O<sub>N</sub>et hydraulic analysis (Chapter 5), planned system expansion, level of service, looping projects, and the age and material of existing lines.

#### **PROPOSED TRANSMISSION SYSTEM IMPROVEMENTS**

The two primary District goals pertaining to the transmission system are to provide redundant transmission facilities for each pressure zone and to size transmission lines so as to minimize head losses during high demand periods.

#### **T-1 Paine Field Transmission Main (2021 to 2022)**

The District plans to construct a transmission main that will cross Paine Field at approximately 100<sup>th</sup> Street SW. The 16-inch transmission main will consist of approximately 2,400 linear feet of waterline. This includes 1,500 feet of HDPE waterline directional drilled underneath the Paine Field runway and taxiway. This project will tie with project DE-1 and will strengthen the District's transmission between Reservoir No. 4 and Reservoirs No. 2 and No. 5.

**Estimated Project Cost: \$3,436,000**

### **PROPOSED DISTRIBUTION SYSTEM IMPROVEMENTS**

#### **D-1 5<sup>th</sup> Street Water Main (2016)**

The District plans to construct a 12-inch transmission main from the 500 Zone to the Lamar Hill area of the 400 Zone. This project includes approximately 2,750 linear feet of 12-inch DI water main, a PRV station, and replacement of 300 linear feet of 8-inch water main on Cornelia Avenue. This project includes a crossing of the BNSF Railway that will require approximately 100 linear feet of 30-inch steel casing installed by jacking and boring. This project will allow the District to provide supply to Lamar Hill with the Mukilteo Boulevard Master Meter out of service and allow the District to decommission the Lamar Drive Booster Station.

**Estimated Project Cost: \$1,050,000**

**D-2 Lamar Drive and Debreton Lane Water Main (2016 to 2017)**

The District plans to replace approximately 1,850 linear feet of 6-inch cast iron water main with 8-inch ductile iron water main. This project is located along Lamar Drive between Mukilteo Boulevard and Debreton Lane. This project will increase available fire flow, replace aging main, and upgrade the system to current District standards.

**Estimated Project Cost: \$891,000**

**D-3 62<sup>nd</sup> Place Water Main (2017 to 2018)**

The District plans to replace approximately 1,050 linear feet of 4-inch cast iron water main with an 8-inch ductile iron water main. The project is located along 92<sup>nd</sup> Place SW and 62<sup>nd</sup> Place between 92<sup>nd</sup> Street SW and 95<sup>th</sup> Place SW. This project will replace aging main, increase available fire flow, and upgrade the system to current District standards.

**Estimated Project Cost: \$514,000**

**D-4 Washington Avenue Water Main (2018 to 2019)**

The District plans to replace approximately 1,600 linear feet of 6-inch cast iron water main with an 8-inch ductile iron water main. The project is located along Washington Avenue, 6<sup>th</sup> Street and Lincoln Avenue in downtown Mukilteo. This project will replace aging main, improve available fire flow, and upgrade the system to current District standards.

**Estimated Project Cost: \$768,000**

**D-5 Possession View Place Water Main (2019 to 2020)**

The District plans to replace approximately 1,050 linear feet of 6-inch cast iron water main with 8-inch ductile iron water main. The project is located along Possession View Place, between Washington Avenue and Goat Trail Road. This project will replace aging water main, increase available fire flow to this area, and upgrade the system to current District standards.

**Estimated Project Cost: \$508,000**

**D-6 8<sup>th</sup> Street Water Main (2020 to 2021)**

The District plans to replace approximately 300 linear feet of 4-inch cast iron water main with 8-inch ductile iron water main. The project is located along 8<sup>th</sup> Street, east of Campbell Avenue. This project will replace an aging water

main, increase available fire flow to the area, and upgrade the system to current District standards.

**Estimated Project Cost: \$185,000**

**D-7 10<sup>th</sup> Street Water Main (2020 to 2021)**

The District plans to replace approximately 970 linear feet of 4-inch cast iron water main with an 8-inch ductile iron water main. The project is located along 10<sup>th</sup> Street from Park Avenue to Campbell Avenue. This project will replace an aging water main, increase available fire flow to the area, and upgrade the system to current District standards.

**Estimated Project Cost: \$506,000**

**D-8 Pressure Relief Valve Installation (2025)**

The District plans to install two pressure relief valves to prevent over-pressurization of closed zones in the event of a pressure reducing valve failure. The recommended locations are:

- 400 Zone – 6<sup>th</sup> Street and Washington Avenue
- 500 Zone – 19<sup>th</sup> Drive and Mukilteo Speedway

The 500 Zone pressure relief valve will be installed as part of the Webster Street Water Main Developer Extension.

**Estimated Project Cost: \$75,000**

**D-9 102<sup>nd</sup> Place Water Main (20-Year Planning Period)**

The District plans to construct approximately 200 linear feet of new 8-inch ductile iron water main. The project is located along 102<sup>nd</sup> Place SW, extending the current waterline to Central Drive. This improvement will improve water quality and increase available fire flow to the area by providing looping.

**Estimated Project Cost: \$147,000**

**D-10 Paine Field Upsizing (20-Year Planning Period)**

The District plans to replace approximately 900 linear feet of 6-inch cast iron water main with 12-inch ductile iron water main. This project will replace an aging main, increase available fire flow, and upgrade the system to current District standards.

**Estimated Project Cost: \$615,000**

## **PROPOSED METER IMPROVEMENTS**

### **M-1 Annual Service Meter Replacement Program (2016 to 2017)**

The District replaces service meters on a 20-year cycle.

**Estimated Annual Cost: \$130,000**

## **CAPITAL IMPROVEMENTS TO THE GENERAL SYSTEM**

### **G-1 Water System Plan (2025)**

The update of the District's Water System Plan is required every 6 to 10 years by WAC 246-290-100. The District plans to fund the next update of the Plan in 2025.

**Estimated Project Cost: \$70,000**

### **G-2 Annual Telemetry Upgrades (2016 to 2026)**

The District plans to budget approximately \$20,000 annually for various telemetry/SCADA upgrades each year.

**Estimated Annual Cost: \$20,000**

### **G-3 Reservoir No. 2 Chlorine Booster (2016)**

The District Plans to install a chlorine booster at Reservoir No. 2 following the completion of the 5<sup>th</sup> Street water main and PRV No. 270-03 installation. The installation of a chlorine booster will allow the District to supply the 270 Zone with water from AWWD.

**Estimated Project Cost: \$35,000**

### **G-4 Reservoir No. 2 Storage Building (2016)**

The District plans to construct a covered storage building at the Reservoir No. 2 site to provide material storage for District operations. This project will be funded by both the water and sewer utilities.

**Estimated Project Cost: \$250,000**

**G-5 Water Rate Study (2016)**

The District plans to conduct a water rate study. A 5-year water service rate schedule will be developed, as well as an update of the GFC rates.

**Estimated Project Cost: \$40,000**

**CAPITAL IMPROVEMENTS TO BOOSTER STATIONS**

**P-1 Paine Field Booster Station Third Pump (2018)**

The District plans to install a jockey pump and variable frequency drive at the Paine Field Booster Station in order to adequately provide lower flows when required and to improve station redundancy.

**Estimated Project Cost: \$130,000**

**P-2 Conversion of 620 Reservoir Diesel Pump to Electric Power (2024 to 2025)**

The District plans to convert one of the 620 Reservoir diesel pumps to electric power in order to allow more frequent usage and better operational control to move storage from the 620 Zone to the 715 West Zone. One diesel-powered pump will be retained for emergency use during power outages.

**Estimated Project Cost: \$116,000**

**DEVELOPER EXTENSION PROJECTS**

The District is currently aware of several projects that will be designed, constructed, and financed by developers. Table 8-2 details each project with currently proposed line sizes and alignments. Changes to each project may occur in the future.

**TABLE 8-2**

**Developer Extension Projects Summary**

<b>Project No.</b>	<b>Project Location</b>	<b>Pipe Size (inches)</b>	<b>Pipe Length (feet)</b>
DE-1	Paine Field Future Terminal	12	2,600
DE-2	101 <sup>st</sup> Street SW	8	1,300
DE-3	54 <sup>th</sup> Avenue West	8	700
DE-4	50 <sup>th</sup> Avenue West	8	1,750
DE-5	State Route 525 Transmission Main	12	4,650
DE-6	Paine Field Boulevard Water Main	12	3,550
DE-7	Front Street Water Main	12	2,230
DE-8	Harbour Heights Water Main	8	2,000
DE-9	77 <sup>th</sup> Street SW	8	1,250
DE-10	80 <sup>th</sup> Street SW	12	1,300
DE-11	53 <sup>rd</sup> Place West	8	325
DE-12	10 <sup>th</sup> Street and Mukilteo Speedway	8	700
DE-13	Chennault Beach Road Water Main	8	2,100
DE-14	Webster Street Water Main	8	500
DE-15	Boys and Girls Club, 109 <sup>th</sup> Street SW	12	2,300
DE-16	Electro Impact, 47 <sup>th</sup> Avenue West	8	750
DE-17	36 <sup>th</sup> Place West	8	600
DE-18	Debreton Lane Water Main Loop	8	750

**CAPITAL IMPROVEMENTS PLAN SCHEDULE**

Table 8-3 provides a summary of each capital improvement project and the proposed schedule. Table 8-4 provides a schedule showing the amount each project will be financed each year. Several large projects span multiple years.

**TABLE 8-3**

**Capital Improvement Project Summary**

Project No.	Pressure Zone	Project Description	Pipe Size (inches)	Pipe Length (feet)	Year to be Completed	Total Estimated Cost
S-1	715	Reservoir No. 4 Interior and Exterior Recoating	N/A	N/A	2016	\$1,525,000
S-2	270	Reservoir No. 1 Interior Recoating	N/A	N/A	2023	\$354,000
S-3	715	Reservoir No. 2 Exterior Recoating	N/A	N/A	2026	\$545,000
S-4	715	Reservoir No. 4 Site Piping	12	100	2016	\$75,000
S-5	715	Reservoir No. 5 Interior Recoating	N/A	N/A	2016	\$700,000
T-1	715	Paine Field Transmission Main	16	2,400	2021–2022	\$3,436,000
D-1	400	5 <sup>th</sup> Street Water Main	8	2,750	2016	\$1,050,000
D-2	400	Lamar Drive and Debreton Lane Water Main	8	1,850	2016–2017	\$891,000
D-3	400	62 <sup>nd</sup> Place Water Main	8	1,050	2017–2018	\$514,000
D-4	400	Washington Avenue Water Main	8	1,600	2018–2019	\$768,000
D-5	500	Possession View Place Water Main	8	1,050	2019–2020	\$508,000
D-6	500	8 <sup>th</sup> Street Water Main	8	300	2020–2021	\$185,000
D-7	500	10 <sup>th</sup> Street Water Main	8	970	2020–2021	\$506,000
D-8	400/500	Pressure Relief Valve Installation	N/A	N/A	2025	\$75,000
D-9	500	102 <sup>nd</sup> Place Water Main	8	200	20-Year Planning Period	\$147,000
D-10	715	Paine Field Upsizing	12	2,400	20-Year Planning Period	\$615,000
M-1	715	Annual Service Meter Replacement Program	N/A	N/A	2016–2017	\$260,000
G-1	-	Water System Plan	N/A	N/A	2025	\$70,000
G-2	-	Annual Telemetry Upgrades	N/A	N/A	2016–2026	\$220,000
G-3	715	Reservoir No. 2 Chlorine Booster	N/A	N/A	2016	\$35,000
G-4	715	Reservoir No. 2 Storage Building	N/A	N/A	2016	\$250,000
G-5	-	Water Rate Study	N/A	N/A	2016	\$40,000
P-1	715	Paine Field Booster Station 3 <sup>rd</sup> Pump	N/A	N/A	2018	\$130,000
P-2	620	Conversion of 620 Reservoir Diesel Pump to Electric Power	N/A	N/A	2024–2025	\$116,000

**TABLE 8-4**

**Capital Improvement Project Schedules**

<b>Project No.</b>	<b>Total Project Cost</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026–2037</b>
S-1	\$1,525,000	\$1,525,000										
S-2	\$354,000								\$354,000			
S-3	\$545,000											\$545,000
S-4	\$75,000	\$75,000										
S-5	\$700,000	\$700,000										
T-1	\$3,436,000						\$1,718,000	\$1,718,000				
D-1	\$1,050,000	\$1,050,000										
D-2	\$891,000	\$445,500	\$445,500									
D-3	\$514,000		\$257,000	\$257,000								
D-4	\$768,000			\$384,000	\$384,000							
D-5	\$508,000				\$254,000	\$254,000						
D-6	\$185,000					\$92,500	\$92,500					
D-7	\$506,000					\$253,000	\$253,000					
D-8	\$75,000										\$75,000	
D-9	\$147,000											\$147,000
D-10	\$615,000											\$615,000
M-1	\$260,000	\$130,000	\$130,000									
G-1	\$70,000										\$70,000	
G-2	\$220,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000
G-3	\$35,000	\$35,000										
G-4	\$250,000	\$250,000										
G-5	\$40,000	\$40,000										
P-1	\$130,000			\$130,000								
P-2	\$116,000									\$58,000	\$58,000	
<b>Total</b>	<b>\$13,015,000</b>	<b>\$4,270,500</b>	<b>\$852,500</b>	<b>\$791,000</b>	<b>\$658,000</b>	<b>\$619,500</b>	<b>\$2,083,500</b>	<b>\$1,738,000</b>	<b>\$374,000</b>	<b>\$78,000</b>	<b>\$223,000</b>	<b>\$1,327,000</b>

## **CHAPTER 9**

### **FINANCIAL PROGRAM**

#### **INTRODUCTION**

This chapter presents the financial program for the District's water utility. Financial planning is one of the most important aspects of a water system plan. In order to implement the plan, a basic financial program must be established. Through the financial program the District's Board of Commissioners and District Manager are assured that the capital improvement schedule can be implemented, because the financing of each CIP project has been addressed. Thus, a financial program makes the difference between a "wish list" and the implementation of the CIP. Additionally, the financial program plays a key role in establishing water rates and other charges that reflect the actual costs of providing water to the District. Rate studies are an important tool used to maintain rates at a level needed to fund maintenance, operation, and capital improvement projects.

#### **EXISTING SERVICE RATES AND CHARGES**

The 2015 and 2016 service rates and charges were established by District resolutions. The resolutions specify meter charge, volume charge, general facilities charge, and service installation charge. The District resolutions are provided in Appendix D.

#### **BASE CHARGE**

The 2015 and 2016 monthly base charges were established by District Resolution No. 336-14, passed in December 2014. Table 9-1 summarizes the monthly base charge, which increases as meter size increases. The base charge does not include any water use.

In the case of multifamily, whenever more than one unit is served by a single meter, an additional unit charge of \$5.04 per month is imposed on each additional unit. An additional unit charge of \$8.07 per month is imposed for each additional unit for customers classified as commercial/ industrial.

**TABLE 9-1**

**Existing Water Base Charge**

<b>Meter Size (inches)</b>	<b>Monthly Base Rate<sup>(1)</sup></b>
<b>Single-Family Residential</b>	
5/8 x 3/4	\$12.24
1	\$30.67
1-1/2	\$59.51
2	\$93.40
<b>Multifamily</b>	
5/8 x 3/4	\$8.40
1	\$21.06
1-1/2	\$40.86
2	\$64.12
3	\$128.98
4	\$198.19
6	\$300.44
8	\$480.77
10	\$753.58
<b>Commercial/Industrial</b>	
5/8 x 3/4	\$13.46
1	\$33.72
1-1/2	\$65.43
2	\$102.68
3	\$206.54
4	\$317.37
6	\$481.11
8	\$769.89
10	\$1,206.76
24	\$2,965.70
<b>Irrigation</b>	
5/8 x 3/4	\$12.81
1	\$32.11
1-1/2	\$62.29
2	\$97.76

(1) As defined by Resolution No. 336-14, effective January 1, 2016.

**VOLUME CHARGE**

Volume charges were established by District Resolution No. 336-14, effective January 1, 2016. The volume charge for a customer classification is based upon

consumption in thousands of gallons per month, as measured by a District service meter. Table 9-2 shows the volume charge for each of the District’s customer classifications.

**TABLE 9-2**

**Existing Volume Charge**

<b>Customer Classification</b>	<b>Volume Charge (per 1,000 gallons)<sup>(1)</sup></b>
Single-Family Residential	\$3.41
Multifamily Residential	\$3.07
Commercial/Industrial	\$3.96
Irrigation	\$3.77

(1) As defined by Resolution No. 336-14, effective January 1, 2016.

The current monthly rate for gravity fire protection is \$53.17 for private fire service with backflow detector assembly or by other means. The current monthly fire protection rate for structures served by private pump is \$60.10. There is a volume charge of \$22.37 per month for each 1,000 gpm required by the customer in excess of the standard. For storage in excess of the District’s fire flow standard, an additional \$212.88 is charged per month for each additional 100,000 gallons.

Other service charges were established by District Resolution No. 336-14 in December 2014. The labor and material cost for services provided by the District are also incurred by the customer.

**GENERAL FACILITIES CHARGE**

General facilities charges were revised by District Resolution No. 340-15, passed in February, 2015. The charge amount is based upon the use of the property for which the water service is applied, according to the schedule in Table 9-3. The charge is imposed on new customers requesting water service.

**TABLE 9-3**

**Existing General Facilities Charge**

<b>Customer Classification</b>	<b>Charge<sup>(1)</sup></b>
<b>Single-Family Residential</b>	
Per Dwelling Unit	\$5,089
<b>Multifamily Residential</b>	
First Dwelling Unit	\$5,089
Each Additional Dwelling Unit	\$2,545
<b>Commercial/Industrial/Schools</b>	
Meter Charge:	
5/8" x 3/4"	\$5,241
1"	\$13,104
1-1/2"	\$26,206
2"	\$41,930
3"	\$83,859
4"	\$131,032
6"	\$262,063
8"	\$419,300
10"	\$602,745
12"	\$817,636
16"	\$1,320,798
20"	\$1,918,302
24"	\$2,594,425

(1) As defined by Resolution No. 340-15, effective February 19, 2015.

**METER INSTALLATION CHARGES**

The existing water service installation charges were established by District Resolution No. 340-15, effective February 19, 2015. The charge amount for 3/4-inch and 1-inch meter installations depends on whether the District or a developer installs the meter. The charge amounts are presented in Table 9-4.

**TABLE 9-4**

**Existing Meter Installation Charge<sup>(1)</sup>**

<b>District-Installed Water Services</b>	
3/4-inch service	\$3,534
1-inch service	\$3,734
<b>Developer-Installed Water Services</b>	
3/4-inch service	\$483
1-inch service	\$520
1-1/2-inch service	\$649
2-inch service	\$796

(1) As defined by Resolution No. 340-15, effective February 19, 2015.

**FINANCIAL STATUS OF EXISTING WATER UTILITY**

**REVENUES AND EXPENSES**

Revenue sources for the District’s existing water utility include all service charges, interest on investment and assessments, and miscellaneous revenues. District expenditures include operation, maintenance, administrative costs, depreciation, and debt service. The water utility revenues and expenses for 2009 through 2014 are summarized in Table 9-5.

**TABLE 9-5**

**Historical Revenues and Expenses: 2009 to 2014<sup>(1)</sup>**

	2009	2010	2011	2012	2013	2014
<b>Operating Revenue</b>						
Service Charges						
Residential	\$1,612,779	\$1,556,455	\$1,357,413	\$1,475,467	\$1,638,375	\$1,674,505
Commercial	\$1,622,621	\$1,580,589	\$1,564,528	\$1,713,663	\$1,822,043	\$1,908,544
Permits, Fees and Charges	\$17,690	\$18,574	\$23,750	\$21,789	\$19,070	\$38,089
Miscellaneous	\$449,504	\$308,368	\$297,689	\$268,417	\$193,273	\$242,247
<b>Subtotal Operating Revenue</b>	<b>\$3,702,594</b>	<b>\$3,463,986</b>	<b>\$3,243,380</b>	<b>\$3,479,336</b>	<b>\$3,672,761</b>	<b>\$3,863,385</b>
<b>Operating Expenses</b>						
Operation & Maintenance Expenses	\$1,768,883	\$1,735,913	\$1,501,484	\$1,497,272	\$1,440,207	\$1,447,249
General and Administrative	\$1,094,822	\$928,538	\$894,682	\$948,159	\$918,166	\$1,096,241
Depreciation	\$581,017	\$577,777	\$567,623	\$587,819	\$675,888	\$687,720
<b>Subtotal Operating Expense</b>	<b>\$3,444,722</b>	<b>\$3,242,228</b>	<b>\$2,963,789</b>	<b>\$3,033,250</b>	<b>\$3,034,261</b>	<b>\$3,231,209</b>
<b>Net Operating Income</b>	<b>\$257,872</b>	<b>\$221,758</b>	<b>\$279,591</b>	<b>\$446,086</b>	<b>\$638,500</b>	<b>\$632,176</b>
<b>Other Revenue</b>						
Investment Interest	\$29,679	\$13,439	\$10,180	\$6,721	\$5,959	\$5,429
Other Interest	-	-	\$1,201	\$1,623	\$1,456	\$1,305
<b>Subtotal of Other Revenue</b>	<b>\$29,679</b>	<b>\$13,439</b>	<b>\$11,381</b>	<b>\$8,344</b>	<b>\$7,424</b>	<b>\$6,734</b>
<b>Other Expense</b>						
Interest on Long-Term Debt	-	-	-	-	\$6,454	\$3,296
Net Loss on Disposal of Assets	-	\$1,161,411	\$117,699	\$283,963	(\$9,994)	(\$7,730)
<b>Subtotal Other Expense</b>	<b>-</b>	<b>\$1,161,411</b>	<b>\$117,699</b>	<b>\$283,963</b>	<b>(\$3,540)</b>	<b>(\$4,434)</b>
Capital Contributions	\$1,009,222	\$591,297	\$263,907	\$118,701	\$446,716	\$947,472
<b>Net Income</b>	<b>\$1,296,773</b>	<b>(\$334,917)</b>	<b>\$437,180</b>	<b>\$289,168</b>	<b>\$1,096,180</b>	<b>\$1,590,816</b>

(1) Information taken from the District's Financial Statements.

## **FINANCIAL ANALYSIS**

From 2009 to 2014, the General and Administrative costs represented between \$895,000 and \$1,097,000 per year. The major costs for General and Administrative expenses are employee salaries, employee benefits, payroll tax, and state excise tax.

Historically, the District has experienced a stable or positive net operating income during most years from 2009 to 2014. During this time the District has been able to increase its annual depreciation payment from approximately \$581,000 to \$687,000 to the District capital replacement fund (747).

The District's Capital Improvement Program presented in Chapter 8 includes improvements of approximately \$11,688,000 during the 10-year planning period. These improvements will be funded through the capital improvement fund (745), capital replacement fund (747), and possibly loans. The District capital improvement fund (745) currently contains a balance of \$347,000 and the capital replacement fund contains a balance of \$5,830,000.

The District performs regular rate studies to assess the expenses and revenues of its water system. Each rate study evaluates the need to adjust rates to fund the District's current and future capital improvement plan.

**APPENDIX A**

**WATER FACILITY INVENTORY (WFI)  
DOH PROJECT CHECKLIST**



# WATER FACILITIES INVENTORY (WFI) FORM - Continued

<b>1. SYSTEM ID</b> 57550 J	<b>2. SYSTEM NAME</b> MUKILTEO WATER & WASTEWATER	<b>3. COUNTY</b> SNOHOMISH	<b>4. GROUP</b> A	<b>5. TYPE</b> Comm
--------------------------------	--	-------------------------------	----------------------	------------------------

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
<b>25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)</b>	0	7663	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or more per year)	4661		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	0		
<b>26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)</b>			
A. Apartment Buildings, condos, duplexes, barracks, dorms	444		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	3002		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	0		
<b>27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)</b>			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	662	662	
<b>28. TOTAL SERVICE CONNECTIONS</b>		<b>8325</b>	

<b>29. FULL-TIME RESIDENTIAL POPULATION</b>	
A. How many residents are served by this system 180 or more days per	24575

<b>30. PART-TIME RESIDENTIAL POPULATION</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

<b>31. TEMPORARY &amp; TRANSIENT USERS</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?												
B. How many days per month is water accessible to the public?												

<b>32. REGULAR NON-RESIDENTIAL USERS</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?												
B. How many days per month are they present?												

<b>33. ROUTINE COLIFORM SCHEDULE</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	25	25	25	25	25	25	25	25	25	25	25	25

**35. Reason for Submitting WFI:**

Update - Change  
  Update - No Change  
  Inactivate  
  Re-Activate  
  Name Change  
  New System  
  Other \_\_\_\_\_

**36. I certify that the information stated on this WFI form is correct to the best of my knowledge.**

SIGNATURE: \_\_\_\_\_

DATE: \_\_\_\_\_

PRINT NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

**WS ID**   **WS Name**

57550   Mukilteo Water & Wastewater Distr

**Total WFI Printed: 1**



filtration pilot study

construction documents:

- filtration or other complex treatment
- chemical addition only
- complete new water system
- new source only
- system modification
- system modification; design standards used; PE prepared

existing system approval

- non-expanding; not detailed evaluation
- non-expanding, detailed evaluation
- expanding, not detailed evaluation
- expanding, detailed evaluation

waivers:

- inorganic chemical (initial)
- organic chemical (initial)
- use
  
- inorganic chemical (renewal)
- organic chemical (renewal)
- use (renewal)
- coliform (w/departmental inspection)
- coliform (w/ third-party inspection)

other

- well-site evaluation and approval
- regulatory monitoring plan
- unfiltered system annual report
- water system compliance report (loan letter)
- water right self-assessment (if applicable)

other projects (describe) \_\_\_\_\_

---

For department use only below this line:

Log-in # \_\_\_\_\_; Initial fee \_\_\_\_\_; Invoice mailed \_\_\_\_\_;

Invoice # \_\_\_\_\_; Fee received \_\_\_\_\_; # review letters \_\_\_\_\_

Approval Date: \_\_\_\_\_ Date construction report received: \_\_\_\_\_ #approved connections \_\_\_\_\_

Area served: \_\_\_\_\_

Provisions: \_\_\_\_\_

## WSP Checklist

Content Description	*Must Be Submitted ( ✓ )	(Page #) in WSP
<b>Chapter 1</b>		
<b>Description of Water System</b>		
• Ownership and Management	( ✓ )	1-1
• System History and Background	( ✓ )	1-3
• Inventory of Existing Facilities	( ✓ )	Chpt. 1
• Related Plans (e.g., CWSP, local land use plans)	( ✓ )	1-16 thru 1-18
• Service Area and Characteristics	( ✓ )	2-2
• Agreement (signed in accordance with CWSP)	( )	
• Map	( ✓ )	2-2
• Service Area Policies (Including SMA policy and conditions of service)	( ✓ )	2-3
<b>Chapter 2</b>		
<b>Basic Planning Data</b>		
• Current Population, Number of Service Connections, and ERUs	( ✓ )	2-18
• Current Water Use and Data Reporting	( ✓ )	2-20
• Current and Future Land Use	( ✓ )	2-1
• Future Population and Number of Service Connections and ERUs (6 and 20 years)	( ✓ )	2-12
• Future Water Use (Demand forecast for 6 and 20 years)	( ✓ )	2-24
<b>Chapter 3</b>		
<b>System Analysis</b>		
• System Design Standards	( ✓ )	4-1
• Water Quality Analysis	( ✓ )	Chpt. 3
• System Inventory, Description and Analysis	( ✓ )	
• Source	( ✓ )	4-4
• Treatment	( )	
• Storage	( ✓ )	4-5
• Distribution System/Hydraulics	( ✓ )	Chpt. 5
• Summary of System Deficiencies	( ✓ )	4-11
• Analysis of Possible Improvement Projects	( ✓ )	4-7
<b>Chapter 4</b>		
<b>Conservation Program and Source of Supply Analysis</b>		
• Conservation Program	( ✓ )	Chpt. 7
• Water Right Assessment	( ✓ )	1-6
• Source of Supply Analysis and evaluation of supply alternatives	( )	
• Water Supply Reliability Analysis With Water Shortage Response Plan	( ✓ )	N/A
• Interries	( )	
<b>Chapter 5</b>		
<b>Source Water Protection (Check One or Both)</b>		
• Wellhead Protection Program	( )	
• Watershed Control Program	( )	
<b>Chapter 6</b>		
<b>Operation and Maintenance Program</b>		
• Water System Management and Personnel	( ✓ )	6-1
• Operator Certification	( ✓ )	6-2
• Routine Operating Procedures, Preventive Maintenance and Record Keeping	( ✓ )	6-2
• Water Quality Sampling Procedures (Comprehensive Monitoring Plan)	( ✓ )	3-3
• Coliform Monitoring Plan	( ✓ )	3-3
• Emergency Response Program	( ✓ )	6-5
• Safety Procedures	( ✓ )	6-5
• Cross-Connection Control Program	( ✓ )	6-5
• Service Reliability in accordance with WAC 246-290-420	( )	
<b>Chapter 7</b>		
<b>Distribution Facilities Design and Construction Standards</b>		
• Standard Construction Specification for Distribution Mains	( )	
• Design and Construction Standards for distribution Related Projects	( )	
<b>Chapter 8</b>		
<b>Improvement Program</b>		
• Capital Improvement Schedule (6 and 20 years)	( ✓ )	8-14
<b>Chapter 9</b>		
<b>Financial Program</b>		
• Summary of past income and expenses	( ✓ )	9-4
• Balanced Operating Budget (1 year if >1,000 connections / 6 year if < 1,000 connections)	( ✓ )	
• Demonstration of revenue and cash flow stability to fund CIP and emergency improvements	( ✓ )	
• Rate Structure that considers affordability of rates and water conservation	( ✓ )	9-1
• Systems < 1,000 connections may do DOH Financial Viability Test to complete above reqs.	( )	
• UTC Financial Viability and Feasibility Test (for UTC regulated systems)	( )	
<b>Chapter 10</b>		
<b>Miscellaneous Documents</b>		
• For Community Systems, Meeting of the Consumers (date and description)	( )	
• County/Adjacent Utility Correspondence	( ✓ )	App. O
• Documentation of State Environmental Policy Act (SEPA) Compliance	( )	
• Agreements	( )	
• Satellite Management Program	( )	

\* Requirement will be determined at the pre-plan conference.



# Water System Plan Submittal Form

This form must be completed and submitted along with the Water System Plan (WSP). It will expedite review and approval of your WSP. **All water systems should contact their regional planner before developing any planning document for submittal.**

Mukilteo Water & Wastewater District	57550 J	James E. Voetberg	
1. Water System Name	PWS ID# or Owner ID#	Water Systems Owner's Name	
James E. Voetberg	(425) 355-3355	General Manager	
Contact Name for Utility	Phone Number	Title	
7824 Mukilteo Speedway	Mukilteo	WA	98275
Contact Address	City	State	Zip
Eric Delfel, P.E.	(206) 284-0860	Project Manager	
2. Project Engineer	Phone Number	Title	
701 Dexter Avenue North	Seattle	WA	98109
Project Engineer Address	City	State	Zip
3. Billing Contact Name (required if not the same as #1)	Billing Phone Number	Billing Fax Number	
Billing Address	City	State	Zip

4. How many services are presently connected to your system? 5,675 in 2014
5. Is your system expanding (seeking to extend service area or increase number of approved connections)?  Yes  No
6. If the number of services is expected to increase, how many *new* connections are proposed in the next six years? \_\_\_\_\_
7. If your system is private-for-profit, is it regulated by the State Utilities and Transportation Commission?  Yes  No
8. Is the system located in a Critical Water Supply Service Area (i.e., have a Coordinated Water System Plan)?  Yes  No
9. Is your system a customer of a wholesale water system?  Yes  No
10. Will your system be pursuing additional water rights from the Department of Ecology in the next 20 years?  Yes  No
11. Is your system proposing a new intertie?  Yes  No
12. Do you have projects currently under review by us?  Yes  No
13. Are you requesting distribution main project report and construction document submittal exception and if so, does the WSP contain standard construction specifications for distribution mains?  Yes  No
14. The water system is responsible for sending a copy of the WSP to adjacent utilities for review or a letter notifying them that a copy of the WSP is available for their review and where the review copy is located. Has this been completed?  Yes  No
15. The purveyor is responsible for sending a copy of the WSP to all local governments within the service area (county and city planning departments, etc.). Has this been completed?  Yes  No
16. Are you proposing a change in the place of use of your water right?  Yes  No

If answer to questions 7,8, 11, 14 and/or 15 is "yes," list who you sent the WSP to: \_\_\_\_\_

- City of Everett, Public Works**
- City of Everett, Planning**
- City of Everett, City Clerk**
- Alderwood Water and Wastewater District**
- Snohomish County Public Health**
- Snohomish County, Public Works**
- Snohomish County, Planning**
- Snohomish County Council**
- City of Mukilteo, Planning**
- City of Mukilteo, Public Works**
- Snohomish County Airport**
- Mukilteo Library**

Is this plan:  an Initial Submittal  a Revised Submittal

Please enclose the following number of copies of the WSP:

3 copies for Northwest and Southwest Regional Offices **OR** 2 copies for Eastern Regional Office (We will send one copy to Ecology)  
1 additional copy if you answered "yes" to question 7. \_\_\_\_\_ Total copies attached

*Please return completed form to the Office of Drinking Water regional office checked below.*

Northwest Drinking Water Operations  
Department of Health  
20425 72<sup>nd</sup> Avenue South, Suite 310  
Kent, WA 98032-2358  
253-395-6750

Southwest Drinking Water Operations  
Department of Health  
PO Box 47823  
Olympia, WA 98504-7823  
360-236-3030

Eastern Drinking Water Operations  
Department of Health  
16201 East Indiana Avenue Suite 1500  
Spokane Valley, WA 99216  
509-329-2100

For people with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TDD/TTY call 711).

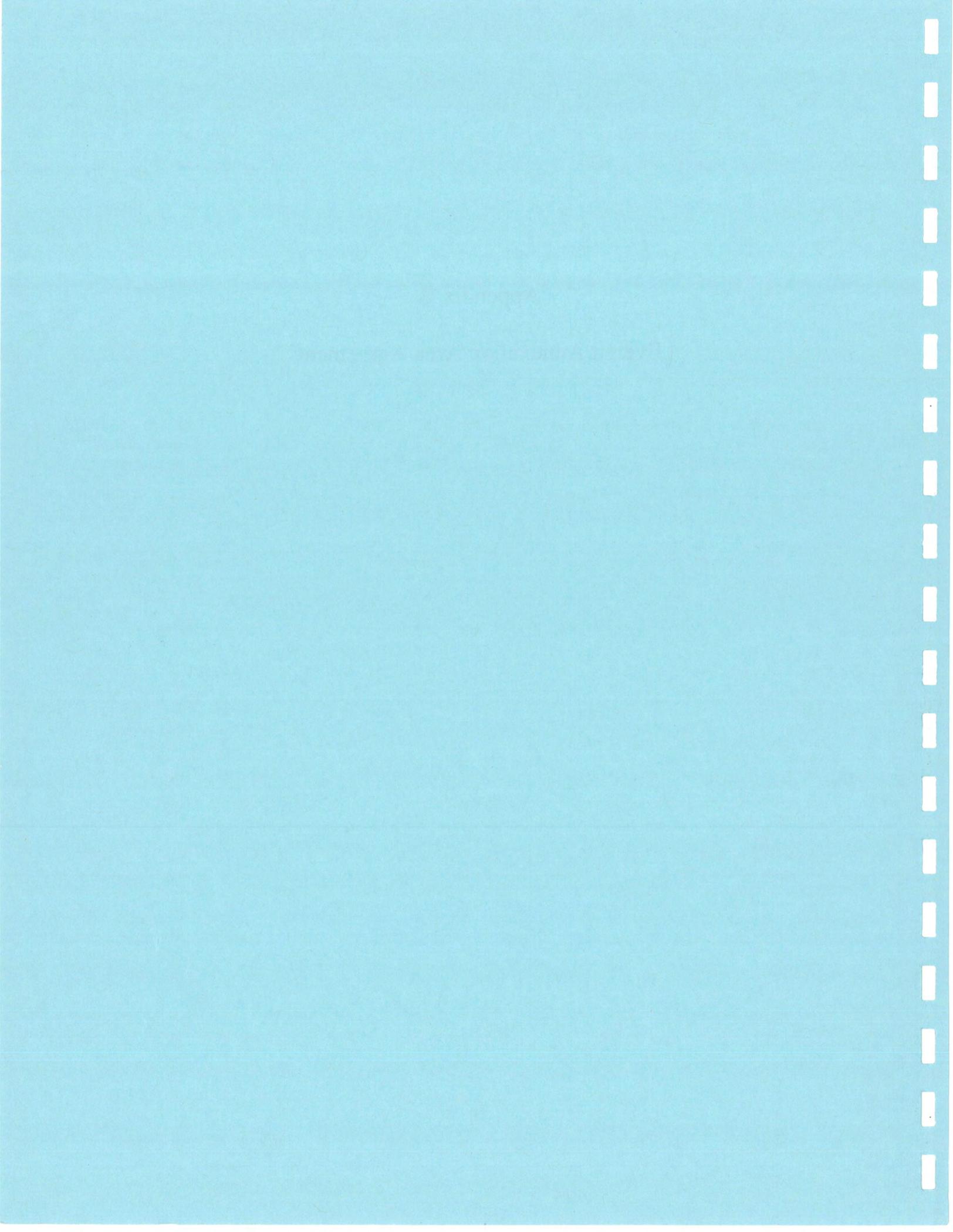
DOH Form 331-397-F (Updated 01/15)

**APPENDIX B**

**EVERETT ANNEXATION AREA AGREEMENT**

Appendix B

Everett Annexation Area Agreement



13.00

NO EXCISE TAX  
REQUIRED

OCT 24 1984

AGREEMENT BETWEEN THE CITY OF EVERETT AND THE  
MUKILTEO WATER DISTRICT CONCERNING ANNEXATIONS OF  
PORTIONS OF THE DISTRICT TO THE CITY

KIRKE SIEVERS, Sp. J. Clk. Wash. Co. Treas.  
By *[Signature]* Deputy

8410240174

IT IS HEREBY AGREED by and between the City of Everett,  
Washington hereinafter called the "City" and the Mukilteo  
Water District, hereinafter called the "District," that,

WHEREAS, in 1964 the District and City did enter into  
an agreement concerning annexations to the City from January  
1, 1958 to October 24, 1962, encompassing areas which at the  
time of said annexations were located within the District  
and which areas were receiving water service from the  
District; and

WHEREAS, under said prior agreement the City assumed  
full management and control of all water facilities and  
service then within the City's boundaries; and

WHEREAS, the City and the District now desire to update  
and supplement said agreement and provide for assumption of  
water services by the City in areas annexed since 1962;  
and

WHEREAS, the City and the District wish to establish an  
agreement regarding certain areas of the District not  
now annexed to the City but adjacent thereto;

NOW, THEREFORE, it is hereby agreed between the parties  
as follows:

1. Definitions.

(a) "Assume," "assumed," or "assumption" mean  
that process authorized by RCW 35.13A or other applicable  
statute whereby facilities and equipment of the District  
become the property of the City (except as otherwise  
specified) subject to the City's power to manage, control,  
maintain and operate such property, facilities and equipment  
and to fix and collect service and other charges from owners  
and occupants of property so served.

MUKILTEO WATER DISTRICT  
806 - 5th St., P. O. Box 217  
Mukilteo, WA 98275  
355-3355

8410240174

(b) "Indebtedness" refers to the District's water-related indebtedness and includes general obligation bonds, revenue bond, and temporary, emergency and interim loans. The term shall exclude that portion of ULID or LID bonds payable from property assessments which shall be collected and paid by the District.

(c) "Annexed Areas I" means the following described annexations to the City which were the subject of the 1964 agreement and which the parties hereby acknowledge:

<u>Date</u>	<u>Ordinance</u>
1/01/58	3646
1/01/59	3699
12/31/59	3747
1/01/60	3762
3/29/61	3818
12/01/61	3841
8/01/62	3888
10/24/62	3917

(d) "Annexed Areas II" means the following described annexations to the City which the parties hereby acknowledge:

<u>Date</u>	<u>Ordinance</u>
6/14/66	4153
7/05/66	4156
9/04/68	4315
10/08/68	4323
5/06/70	76-70
2/10/71	118-71
11/05/80	739-80
8/11/82	879-82
10/13/82	892-82
5/11/83	943-83
12/28/83	992-83

and as shown on Exhibit A which is attached hereto and incorporated by reference herein.

(e) "Newly annexed area" means any annexations to the City of Everett of territory within the boundary of the District occurring subsequent to the effective date of this Agreement.

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MUKILTEO WATER DISTRICT  
 806 - 5th St., P. O. Box 217  
 Mukilteo, WA 98275  
 355-3355

(e) "Bomarc Site" means that property located within the boundaries of the District which is owned by Snohomish County and is located east of Airport Road and north of 100th Street.

2. Agreement.

(A) On July 1, 1984, that portion of the District's water system located within Annexed Area II shall be assumed by the City.

All property and water facilities, with the exception of the 16-inch line on the north side of SR 526 from 40th Avenue West proceeding in an easterly direction approximately 1,000 feet, formerly belonging to the District shall become the property of the City with the attendant responsibility for maintenance and operation thereof and payment of costs associated therewith.

(B) Compensation to the District for facilities and loss of revenue occasioned by the assumption of facilities within Annexed Areas II shall be based on payment by the City of the annexed area's prorated share of District indebtedness as of January 1, 1984, calculated on the percentage of water revenues generated from the annexed areas in 1983 to total 1983 District water revenue. Said percentage amount shall be due in such amounts and at such times as the District's payments are due. Accordingly, said percentage shall be applied to the interest and principal amortization schedule of the District's indebtedness existing as of July 1, 1984, to determine the payment amounts. Payments from the City to the District of the City's percentage share of the District's indebtedness payment shall be due thirty (30) days prior to the due date for the District's debt payments, said first payment to be due on or about December 1, 1984. In the event of refunding of District's indebtedness, the amount and due dates of City payments shall be adjusted to share in the benefits thereof.

MUKILTEO WATER DISTRICT  
806 - 5th St., P. O. Box 217  
Mukilteo, WA 98275  
355-3355

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(C) It is expressly understood and agreed by both parties hereto that all portions of the Mukilteo Water District which have been annexed to the City shall as of the effective date of such annexation cease to be a part of the District and shall be considered outside the District for any and all purposes, except as specifically considered for redemption of property secured indebtedness as set forth under paragraph B herein. It is specifically agreed that residents in Annexed Areas I and II shall not be allowed to vote in District elections and Annexed Areas I and II shall not be computed as part of the 60% assessed valuation to entitle the City to assume jurisdiction of the District under RCW 35.13A. or other applicable statutes. The City shall join with the District in obtaining the necessary court directive to the appropriate election officials.

(D) Upon the effective date hereof, all real and personal property formerly belonging to the District, except those items listed in paragraph A, located within Annexed Area II shall become the property of the City. Such property shall include, but not be limited to, pipelines, reservoirs, valves, hydrants, services, meters, equipment, buildings, easements, rights, permits, facilities and any and all related appurtenances, except as heretofore noted, located within the annexed areas. Title to such property shall be vested in the City pursuant to all applicable provisions in this agreement.

The City shall, upon acquisition of said property, become completely and solely responsible for the continued maintenance and operation of said property and facilities and further, the City shall bear all expenses of maintenance and operation associated therewith.

(E) The District agrees that, if it makes the improvements set out in the District's latest revision of its Comprehensive Plan (1981), any non-developer funded

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improvement(s) will be financed by revenue bond issues and/or the District's general facilities charge.

The District agrees that it will construct and pay for that portion of the 12-inch diameter pipe on 100th Street Southwest from Airport Road to Holly Drive.

(F) The City agrees that it will refrain from assuming District facilities in newly annexed areas for a period of ten (10) years from the date of annexation. Thereafter, if the City assumes District facilities within the annexed area(s), the City agrees to pay the annexed area's share of the existing outstanding indebtedness of the District in accordance with the provisions of paragraph B herein.

(G) The District agrees that it will not as a matter of general principle oppose annexations by the City. The District reserves the right to object to an annexation for District Management reasons pertinent to the specific annexation.

(H) The District reserves the right to challenge by all legal means any attempt by any municipality to assume jurisdiction over all of the District. In the event that the City of Mukilteo acts and attempts to assume jurisdiction of all of the district, the District recognizes and concurs in the intent of the City to assume District facilities east of Paine Field. Accordingly, it is agreed that the City of Mukilteo shall not be the beneficiary of any conditions of this Agreement, particularly the ten (10) year limitation set forth in paragraph (F). If the District is unable to prevent the City of Mukilteo from proceeding with its assumption of the District, the District will, if requested by the City, recommend to the Boundary Review Board that the City should assume District facilities east of Paine Field.

(I) The question of water service to the "Japanese Gulch" area which is located within the City is left open for future negotiation.

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(J) The parties agree that the District will provide sewer service to that portion of the Bomarc Site that can be served by the District with a gravity sewer system.

(K) The City and the District agree that in the future whenever an annexation is followed by an assumption of District facilities, the area annexed and no longer served by the District is to be considered removed from the District for purposes of voting.

(L) It is expressly understood and agreed that payment by the City of any and all monetary considerations contemplated herein shall not become an obligation of the City's general fund and that no portion of said monetary considerations is to be considered payable or satisfied from said general fund to the City.

(M) All indebtedness in the District existing at the time of annexation of any area herein considered, which indebtedness is secured by real and personal property such as general obligation bonds, and local improvement district bonds, shall remain an obligation of the District. Payment of such indebtedness shall continue by and/or through the District in accordance with the terms and conditions established at the time such indebtedness was contracted.

(N) The City and District hereby agree that with respect to property, facilities and equipment located within the several annexed areas, or in newly annexed areas, which on the dates of annexation were serving portions of the District not annexed to the City, the City shall, for the economic life of such property, facilities and equipment, provide for continuity of service to the unannexed portion of the District served by such property, facilities and equipment on the date of annexation.

(O) The following subsections provide for general operational rules and procedures which have been observed by the City and the District in connection with providing water

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RECEIVED WATER DISTRICT  
607-20-50... P.O. No. 17  
... 3000 30

service to the annexed and immediately adjacent areas. It is the intent of both parties to set forth these general rules and procedures and be guided by them in the continued future operation of both the City's and the District's water system. It is not the intent of the parties hereto that the following outline should cover every eventuality but rather that such rules and procedures shall be adhered to when applicable and that instances not included below be administered in a manner generally in keeping with the policies of both parties and settled in a manner which is fair and reasonable.

(1) The City shall make the necessary revisions required to, as completely as practicable, place or relocate the "master meters" through which the District will continue to purchase its entire water supply from the City. The ownership, maintenance and operation of such new or relocated meters shall be the City's responsibility together with the costs thereby incurred. If it is determined by the City to be impractical to provide for "master metering" of the total water supply provided to the District (particularly with reference to customers along the common boundary line between the City and the District) then the City shall periodically read the meters necessary to completely account for all water supplied to the District and add or subtract, as the case may be, such readings to (or from) the appropriate "master meter" to arrive at the correct total water consumption of the District. As a matter of convenience, such individual customer meter readings taken by the District for purposes of billing its customers, which meter readings are necessary to supplement the "master meter" consumptions, shall be provided by the District upon the City's request for this purpose.

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(2) Watermains located in street or road rights-of-way and on easements contiguous to the common boundary line separating the annexed areas from the District, and which watermains can be used as a common main to serve customers both within the City and within the District shall be treated as follows:

Responsibility for maintenance and operation of such watermains and appurtenances and payment of all costs incident thereto shall be borne by the party to this Agreement in whose areas said watermain and appurtenances are located. The boundary limits alone determine this responsibility.

In the event a new water service shall be installed to serve a customer of one party (called the "first party") and the watermain from which such service is to be supplied is located in the area of the other party (called the "second party"), then the second party shall provide the required labor and materials to complete the service installation in accordance with the first party's requirements. The actual cost of such service installation shall then be paid to the second party by the first party. All customer relations and contacts shall be done by the first party, including the application for service, turn-ons, shut-offs, and subsequent billings for water service. Ownership shall be vested in the first party after the initial turn-on, along with the responsibility for the maintenance thereof and payment therefor. The reverse of this procedure described above would obtain if the situations of the parties were reversed with respect to ownership of the common watermain and location of the customer to be served.

The above paragraph is applicable to individual, residential and nominal sized commercial services. In the event a service is requested which is two inches (2") in diameter or larger, or a service which is intended to serve more than one residence or commercial structure, it will then be necessary for both parties

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hereto to mutually agree that the supply of water available at the point of connection is sufficient to provide adequate water service for the proposed connection before the installation of said connection may be undertaken. The responsibilities for customer relations and contacts, including the application for service, turn-ons, shut-offs, subsequent billings for water, ownership, maintenance and operation of the service shall be as set forth in the paragraph above.

(3) Fire hydrants located on watermains common to areas served by both the City and the District as described in subsection (C) above, may be used for fire fighting purposes only by both the City and the fire protection agency serving customers of the District without charge to either party for water so used. Water from fire hydrants used for any other purpose than that set forth above shall be measured through a meter with the express consent of the party in whose area said fire hydrant is located.

(4) It is anticipated that by reason of additional water consumption requirements by both the City and the District, it is probable that the present method of supplying water to certain areas common to both the City and the District will become inadequate. It is hereby agreed that at such time deemed necessary and proper by both parties, a survey and investigation of this problem will be jointly undertaken by the City and the District and further, that a reasonable solution to the problem shall be agreed upon and instituted. Plans for the necessary improvement and payment therefor shall be mutually agreed upon by both parties hereto prior to commencement of work on the improvement.

(5) In the event certain operational or other problems of mutual concern occur which cannot be

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- 9 -

MUXILED WATER DISTRICT  
806 - 5th St., P. O. Box 217  
Mukilteo, WA 98275  
355/3355

VOL 1868 PAGE 2388

remedied by reference to this Agreement, then the parties hereto agree to resolve such problems in a manner which will be neither detrimental nor harmful to either party from an operational or financial viewpoint.

(P) The District retains the right to collect all bills outstanding as of July 1, 1984 from those customers who will be served by the City after that date. If the District does not receive payment on said outstanding bills by September 30, 1984, then those accounts will be transferred to the City for collection. The City agrees to make good faith efforts to collect said bills and to reimburse the District any moneys the City receives.

(Q) The effective date of this agreement shall be the 1st day of July, 1984.

(R) The parties agree to dismiss their respective lawsuits, claims or counterclaims in Snohomish County Cause numbers 83-2-01880-1; 83-2-03201-4, and the City agrees to dismiss its proceeding before the Boundary Review Board to assume the Mukilteo Water District.

(S) If any paragraph or provision of this contract is held to be invalid, the remainder of the contract shall not be affected.

DATED this 23 day of May, 1984.

APPROVED AS TO FORM

[Signature]  
City Attorney

CITY OF EVERETT

By [Signature]  
Mayor

Attest:

[Signature]  
City Clerk

MUKILTEO WATER DISTRICT

By [Signature]  
President

Attest:

[Signature] [Signature]  
Secretary

8410240174

DEAN W. WILLIAMS, AUDITOR  
SNOHOMISH COUNTY, WASH.  
DEPUTY  
1984 OCT 24 PM 1:00

RECORDED

306-5th St., P. O. Box 217  
Mukilteo, WA 98275  
355-3355

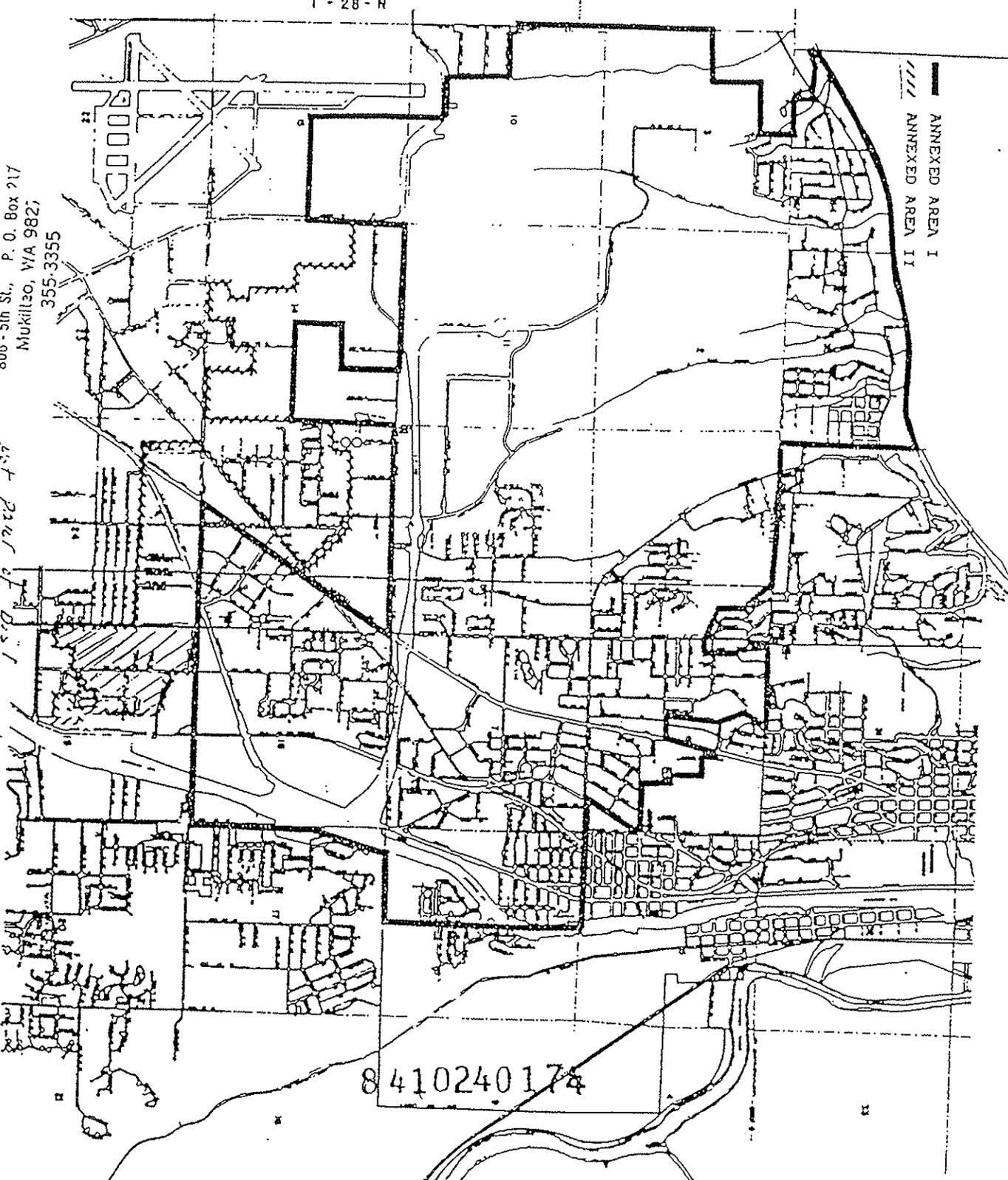
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UNION DISTRICT  
806 - 5th St., P. O. Box 217  
Mukilteo, WA 98271  
355-3355

Part of Dist 1  
Dist Service Area 5/10/62

ANNEXED AREA I  
ANNEXED AREA II

841024017a





**APPENDIX C**

**DISTRICT INTERLOCAL AGREEMENTS**

Lots 28+29  
Blk 2  
Fairmount / Metco

MWD4-17

TEMPORARY SERVICE AGREEMENT

BETWEEN

MUKILTEO WATER DISTRICT AND ALDERWOOD WATER DISTRICT

THIS AGREEMENT, made this \_\_\_\_ day of \_\_\_\_\_, 1989, between MUKILTEO WATER DISTRICT (hereinafter "Mukilteo"), a municipal corporation, and ALDERWOOD WATER DISTRICT (hereinafter "Alderwood"), a municipal corporation, W I T N E S S E T H

WHEREAS, Mukilteo and Alderwood share a common boundary; and

WHEREAS, Mukilteo has formed Sewer ULID S-7 and is proceeding with engineering and installation of the sewer; and

WHEREAS, Metco is developing property located within the boundaries of ULID S-7, and adjacent to said common boundary; and

WHEREAS, Metco has entered into a developer's extension agreement with Mukilteo, and has also requested a temporary connection to Alderwood's system pending installation and operation of ULID S-7;

NOW, THEREFORE, IT IS HEREBY AGREED that:

1. The extension shall be built according to the standards and specifications of the Mukilteo water system and pursuant to Mukilteo's developer's extension agreement. Upon completion of the extension, title thereto shall be conveyed to Mukilteo by Metco.

2. Alderwood will allow the sewer extension constructed to serve property, legally described in Ex. A, to be connected to Alderwood's sewer system pending installation and operation of ULID S-7; provided, that Alderwood will be given two weeks prior to construction to review the plans for the extension.

3. Mukilteo shall collect all fees and charges required by its resolutions, the developer extension agreement, or imposed by Alderwood as a condition of connecting to its system. Alderwood's connection charge shall be paid to Alderwood when collected. Mukilteo shall bill the property owner(s) for monthly sewer service in accordance with resolutions of the Mukilteo Water District. In addition, Mukilteo shall collect any monthly surcharge imposed by Alderwood. All billings and surcharges collected by Mukilteo shall be paid to Alderwood on a quarterly basis, so long as this Agreement remains in force.

4. Upon completion of the extension and its acceptance by Mukilteo, operation, maintenance and repair shall be the primary responsibility of Mukilteo; provided, that Alderwood shall have the right to maintain or repair said extension, if necessary to preserve and protect its system.

5. Alderwood shall terminate service to Metco's property upon notification from Mukilteo that ULID S-7 has been installed and

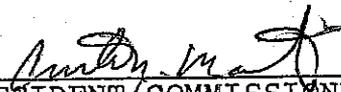
is in operation and available to serve Metco's property and payment of any money owed to Alderwood pursuant to this Agreement; thereafter, all rights and obligations hereunder shall terminate.

6. Mukilteo will notify Alderwood if for any reason ULID S-7 should not be installed or placed in operation; at which time this Agreement shall be renegotiated, or Mukilteo will provide permanent service to Metco's property.

7. Mukilteo and Alderwood will enter into any agreements with Metco necessary to implement this agreement.

8. Each party hereto will indemnify and hold harmless the other party from any and all suits, claims, demands, judgments, awards or liabilities, including reasonable attorneys' fees, arising out of that party's negligence related to the temporary service provided to Metco.

BOARD OF COMMISSIONERS FOR  
ALDERWOOD WATER DISTRICT, a  
municipal corporation

  
\_\_\_\_\_  
PRESIDENT/COMMISSIONER

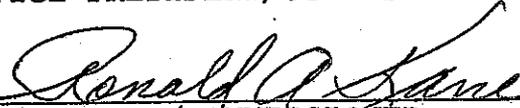
  
\_\_\_\_\_  
VICE-PRESIDENT/COMMISSIONER

  
\_\_\_\_\_  
SECRETARY/COMMISSIONER

BOARD OF COMMISSIONERS FOR  
MUKILTEO WATER DISTRICT, a  
municipal corporation

  
\_\_\_\_\_  
PRESIDENT/COMMISSIONER

  
\_\_\_\_\_  
VICE-PRESIDENT/COMMISSIONER

  
\_\_\_\_\_  
SECRETARY/COMMISSIONER

MWD4-17.0

LEGAL DESCRIPTION

LOTS 28 AND 29, BLOCK 2, FAIRMOUNT, ACCORDING TO THE PLAT THEREOF RECORDED IN VOLUME 10 OF PLATS, ON PAGE 91, RECORDS OF SNOHOMISH COUNTY, WASHINGTON;

EXCEPT THAT PORTION OF SAID LOT 29, LYING WITHIN LOT 1 OF SNOHOMISH COUNTY SHORT PLAT ZA8705229SP, RECORDED UNDER AUDITOR'S FILE NO. 8801060084, RECORDS OF SNOHOMISH COUNTY, WASHINGTON.

TOGETHER WITH A NON-EXCLUSIVE PERMANENT EASEMENT FOR INGRESS AND EGRESS AND FOR THE INSTALLATION, OPERATION, AND MAINTENANCE OF UTILITIES, OVER, UNDER, ACROSS, THROUGH, AND UPON THE FOLLOWING DESCRIBED PROPERTY, SITUATED IN THE COUNTY OF SNOHOMISH, STATE OF WASHINGTON, TO WIT:

THAT PORTION OF LOT 27, BLOCK 2, FAIRMOUNT, ACCORDING TO THE PLAT THEREOF RECORDED IN VOLUME 10 OF PLATS, ON PAGE 91, RECORDS OF SNOHOMISH COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS: BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 27; THENCE N 32°55'00" E, ALONG THE WESTERLY LINE OF SAID LOT 27, A DISTANCE OF 40.00 FEET; THENCE S 57°05'00" E, A DISTANCE OF 61.79 FEET TO AN INTERSECTION WITH THE SOUTH LINE OF SAID LOT 27; THENCE WEST, ALONG SAID SOUTH LINE, A DISTANCE OF 73.61 FEET TO THE POINT OF BEGINNING.

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RECEIVED

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TEMPORARY SERVICE AGREEMENT  
BETWEEN  
MUKILTEO WATER DISTRICT  
AND  
ALDERWOOD WATER DISTRICT

MUKILTEO WATER DIST.

9007260227

THIS AGREEMENT, made this 17<sup>th</sup> day of July, 1990,  
between MUKILTEO WATER DISTRICT ("Mukilteo"), a municipal  
corporation, and ALDERWOOD WATER DISTRICT ("Alderwood"), a  
municipal corporation,

W I T N E S S E T H:

WHEREAS, Mukilteo is a municipal corporation engaged in  
providing water and sewer service to residents within its  
boundaries; and

WHEREAS, Alderwood is a municipal corporation engaged in  
providing water and sewer service to residents within its  
boundaries; and

WHEREAS, Mukilteo and Alderwood share a common boundary; and

WHEREAS, property situated in Mukilteo adjacent to the  
aforementioned common boundary is by virtue of topography  
better served by Alderwood; and

WHEREAS, pursuant to the provisions of RCW 56.08.060 and  
57.08.045, Alderwood is willing to provide temporary water and  
sewer service to said property and Mukilteo is willing to  
authorize such temporary service; NOW, THEREFORE,

NO EXCISE TAX  
REQUIRED

JUL 26 1990

9007260227

KIRKE SIEVERS, Snohomish County Treasurer  
By Nancy Salo  
Deputy

IT IS HEREBY AGREED THAT:

1. **Temporary Service.** Alderwood may provide temporary water and sewer service to that property legally described on Exhibit "A", which description is incorporated by reference herein, which property is located within the boundaries of Mukilteo. No other property within Mukilteo will be allowed to connect to the system serving the property without the prior approval of both Districts. Service by Alderwood will terminate when Mukilteo notifies Alderwood that it is prepared to provide service. Service charges will be prorated to the date Alderwood terminates service.

2. **Fees and Charges.** Alderwood shall collect all fees and charges required by its resolution, its Developer Extension Agreement, and imposed by Alderwood as a condition of connecting to its system.

3. **Service/Billing Procedure.** Water and sewer service shall be provided to the property at Alderwood's service rates as established, or as hereafter amended, by resolution, which shall be collected by Alderwood pursuant to Alderwood's normal billing and collection procedures.

4. **Construction/Installation.** Construction and installation of the system serving the property will be in accord with Alderwood's Developer Extension Agreement and Alderwood's standards and specifications.

5. **Operation.** The extension to the property shall be operated pursuant and subject to Alderwood's resolutions, rules, and regulations.

6. **Nondiscrimination.** Alderwood agrees that it will not discriminate against customers it serves pursuant to this Agreement in respect to rates and charges, conditions of service, or imposition of emergency measures.

7. **Other Agreements.** Mukilteo and Alderwood will enter into any agreements with property owners necessary to implement this Agreement.

8. **Hold Harmless.** Mukilteo herewith agrees to release and shall hold Alderwood harmless from any and all suits, claims, demands, judgments, awards, or liability, including reasonable attorney's fees, arising out of this Agreement.

9. **Attorney's Fees and Costs.** In the event that either district commences any legal action relating to the provisions of this Agreement, the prevailing party shall be entitled to all costs of litigation, including but not limited to the cost of investigation, witness, expert, and reasonable attorney's fees, including all such costs and fees incurred in appeal.

10. **Entire Agreement.** This Agreement constitutes the entire agreement between the parties with respect to the rights and responsibilities of both parties in regard to the temporary service provided for herein. This Agreement may be changed in

writing, only upon mutual agreement of the commissioners of both districts.

11. Recording of Agreement. This Agreement shall be filed for record at the Office of the Snohomish County Auditor at the expense of Mukilteo.

DATED that date and year first above written.

ALDERWOOD WATER DISTRICT  
a municipal corporation

By *Ray Colly*  
Its President/Commissioner

MUKILTEO WATER DISTRICT,  
a municipal corporation

By *Frank Brennan*  
Its President/Commissioner

RECORDED

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DEAN V. WILLIAMS, AUDITOR  
SNOHOMISH COUNTY, WASH.

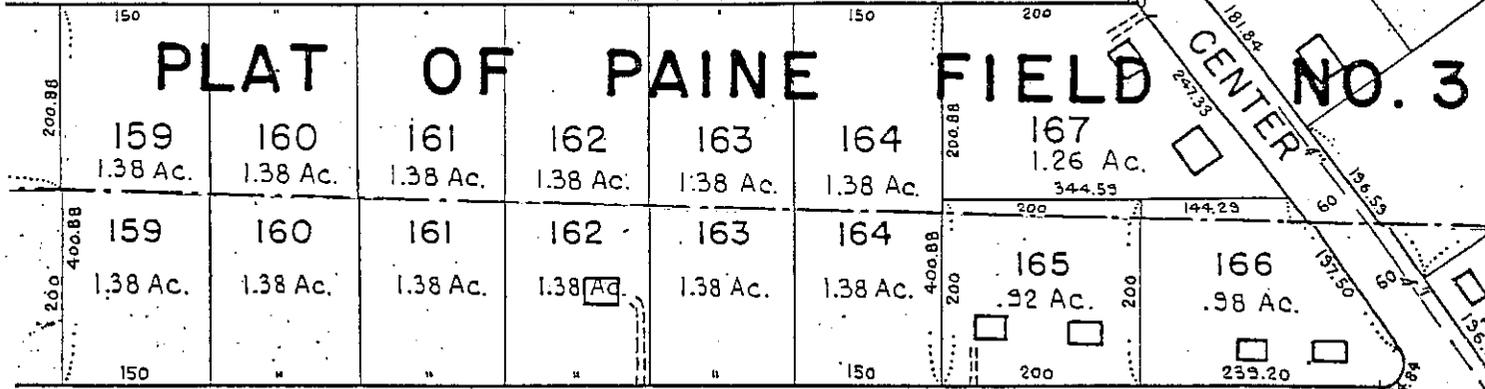
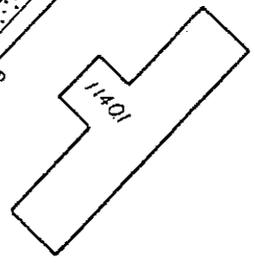
DEPUTY

*Linda Russ*

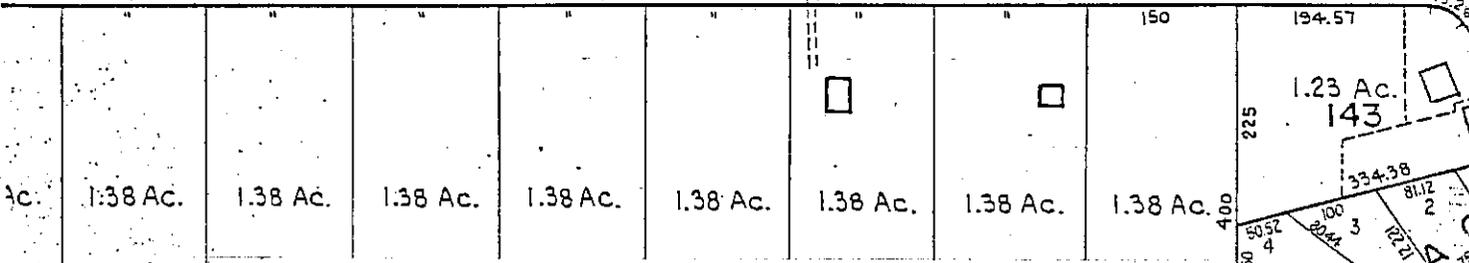
"FAIRMOUNT SCHOOL"

School District No. 6

PAINE FIELD BC



117TH ST. S.W.



LEGAL DESCRIPTION

That portion of Lots 162, 163 and 164, Plat of Paine Field No. 3, as recorded in Volume 14 of Plats, Page 31, records of Snohomish County, Washington, lying in Section 23, Township 28 North, Range 4 East, W.M.

9007260227

119TH ST. S.W.

1989

Sector 15, Harbour Heights

RECORDED

10<sup>00</sup>

NO EXCISE TAX  
REQUIRED

NOV 9 1989

**WATER SERVICE AGREEMENT  
BETWEEN  
MUKILTEO WATER DISTRICT  
AND  
ALDERWOOD WATER DISTRICT**

KIRKE SIEVERS, Snohomish County Treasurer.  
By [Signature] Deputy

89 NOV -9 PM 1:12

DEAN V. WILLIAMS, AUDITOR  
SNOHOMISH COUNTY, WASH.

[Signature]

THIS AGREEMENT, made as of this 8<sup>th</sup> day of November, 1989, between the MUKILTEO WATER DISTRICT, a municipal corporation of the State of Washington, hereinafter referred to as "Mukilteo", and the ALDERWOOD WATER DISTRICT, a municipal corporation of the State of Washington, hereinafter referred to as "Alderwood".

**W I T N E S S E T H:**

WHEREAS, Mukilteo and Alderwood share a joint boundary; and

WHEREAS, Sector 15 of Harbour Heights is being developed by Harbour Pointe Limited Partnership and that said sector is partly located in each District; and

WHEREAS, Alderwood has been requested to provide water service to that portion of Sector 15, located within Alderwood but on the boundary shared with Mukilteo; and

WHEREAS, the topography and the location of Sector 15 is such that fire protection and domestic service from Mukilteo is more practicable pending construction of additional facilities by Alderwood; and

WHEREAS, Mukilteo is willing to provide temporary service to that portion of Sector 15 within Alderwood's boundaries and Alderwood is willing to allow Mukilteo to provide said service; and

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MUKILTEO WATER DISTRICT  
P. O. Box 217  
Mukilteo, WA 98275

8911090263

VOL. 2281 PAGE 0708

WHEREAS, RCW 57.08.045 authorizes service agreements between districts, now, therefore,

IT IS AGREED AS FOLLOWS:

1. Mukilteo will provide interim water service to that portion of Sector 15 located within the boundaries of Alderwood, and identified on the drawing attached as Exhibit "A" which is incorporated by reference herein.

2. Extensions to be connected to Mukilteo's system will be constructed pursuant to Mukilteo's Developer Extension Agreement in accordance with Mukilteo's standards and specifications; and that ownership of extensions will be transferred to Mukilteo by bill of sale, which, during the term of this Agreement, will own, maintain, repair and operate said extensions in accordance with Mukilteo's rules and regulations.

3. Charges for connecting to Mukilteo's system will be assessed and collected by Mukilteo, and Mukilteo will be responsible for billing those customers receiving its water service.

4. Mukilteo's customers residing within Alderwood will be treated by Mukilteo in a like manner as similar customers situated within Mukilteo and/or served by Mukilteo.

5. This Agreement will be effective upon Harbour Pointe Limited Partnership reimbursing Alderwood for its legal fees and costs incurred in conjunction with drafting this Agreement.

MUKILTEO WATER DISTRICT  
P. O. Box 217  
Mukilteo, WA 98275

6. This Agreement will be filed for record in the Snohomish County Auditor's Office by Alderwood.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

**BOARD OF COMMISSIONERS FOR  
ALDERWOOD WATER DISTRICT:**

*Carole M. ...*

\_\_\_\_\_  
President/Commissioner

*Shirley ...*

\_\_\_\_\_  
Vice President/Commissioner

*Shirley ...*

\_\_\_\_\_  
Secretary/Commissioner

ATTEST:

*Shirley ...*

\_\_\_\_\_  
Secretary

**BOARD OF COMMISSIONERS FOR  
MUKILTEO WATER DISTRICT:**

*Michael G. Baker*

\_\_\_\_\_  
President/Commissioner

*Frank J. Brewster*

\_\_\_\_\_  
Vice President/Commissioner

*Ronald A. Kane*

\_\_\_\_\_  
Secretary/Commissioner

ATTEST:

*Ronald A. Kane*

\_\_\_\_\_  
Secretary

MUKILTEO WATER DISTRICT  
P. O. Box 217  
Mukilteo, WA 98275



**TEMPORARY SERVICE AGREEMENT  
BETWEEN  
MUKILTEO WATER DISTRICT  
AND  
ALDERWOOD WATER DISTRICT**

THIS AGREEMENT, made this 9<sup>TH</sup> day of February, 1994,  
between MUKILTEO WATER DISTRICT ("Mukilteo"), a municipal  
corporation, and ALDERWOOD WATER DISTRICT ("Alderwood"), a  
municipal corporation,

W I T N E S S E T H:

WHEREAS, Mukilteo provides water and sewer service to resi-  
dents within its boundaries; and

WHEREAS, Alderwood provides water and sewer service to resi-  
dents within its boundaries; and

WHEREAS, Mukilteo and Alderwood share a common boundary; and

WHEREAS, property situated in Mukilteo adjacent to the common  
boundary cannot be presently served by Mukilteo; and

WHEREAS, pursuant to the provisions of 57.08.045, Alderwood is  
willing to provide temporary water service to said property and  
Mukilteo is willing to authorize such temporary service;

NOW, THEREFORE, IT IS HEREBY AGREED THAT:

1. Temporary Service. Alderwood may provide temporary water  
service to that property legally described on Exhibit "A", which is  
incorporated by reference herein, which property is located within  
the boundaries of Mukilteo. No other property within Mukilteo will  
be allowed to connect to the system serving the property without

the prior approval of both Districts. Service by Alderwood will terminate when Mukilteo notifies Alderwood that it is prepared to provide service. All costs associated with termination of service and transfer of service to Mukilteo shall be the responsibility of Mukilteo. Service charges will be prorated to the date Alderwood terminates service.

2. Fees and Charges. Alderwood shall collect all fees and charges required by its resolution, its Developer Extension Agreement, and imposed by Alderwood as a condition of connecting to its system.

3. Service/Billing Procedure. Water service shall be provided to the property at Alderwood's service rates as established, or as hereafter amended, by resolution, which shall be collected by Alderwood pursuant to Alderwood's normal billing and collection procedures.

4. Construction/Installation. Construction and installation of the system serving the property will be in accord with Alderwood's Developer Extension Agreement and Alderwood's standards and specifications.

5. Operation. The extension to the property shall be operated pursuant and subject to Alderwood's resolutions, rules and regulations.

6. Nondiscrimination. Alderwood agrees not to discriminate against customers served pursuant to this Agreement with respect to rates and charges, conditions of service, or imposition of emergency measures.

7. Other Agreements. Alderwood will enter into any agreements with property owners necessary to implement this Agreement.

8. Hold Harmless. Alderwood herewith agrees to release and shall hold Mukilteo harmless from any and all suits, claims, demands, judgments, awards or liability, including reasonable attorney's fees, arising out of this Agreement.

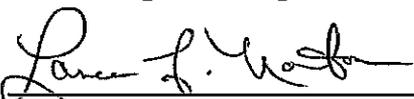
9. Attorney's Fees and Costs. Should either district commence legal action relating to the provisions of this Agreement, the prevailing party shall be entitled to all costs of litigation, including but not limited to, the cost of investigation, witness, expert and reasonable attorney's fees, including all such costs and fees incurred in appeal.

10. Entire Agreement. This Agreement constitutes the entire Agreement between the parties with respect to the rights and responsibilities of both parties in regard to the temporary service provided for herein. This Agreement may be changed, in writing, only upon mutual agreement of the commissioners of both districts.

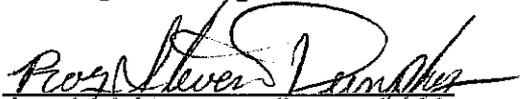
11. Recording of Agreement. This Agreement shall be filed for record at the Office of the Snohomish County Auditor at the expense of Alderwood.

DATED that date and year first above written.

ALDERWOOD WATER DISTRICT  
a municipal corporation

By   
Its President/Commissioner

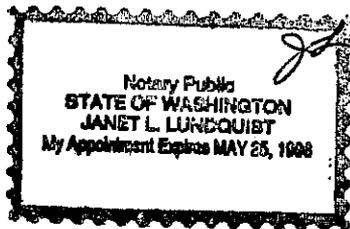
MUKILTEO WATER DISTRICT  
a municipal corporation

By   
Its President/Commissioner

STATE OF WASHINGTON )  
 ) ss.  
COUNTY OF SNOHOMISH )

I certify that I know or have satisfactory evidence that LANCE F. NORTON is the person who appeared before me, and said person acknowledged that HE signed this instrument, on oath stated that HE was authorized to execute the instrument and acknowledged it as the President/Commissioner of ALDERWOOD WATER DISTRICT, a municipal corporation, to be the free and voluntary act of such municipal corporation for the uses and purposes mentioned in the instrument.

Dated JAN. 17, 1994



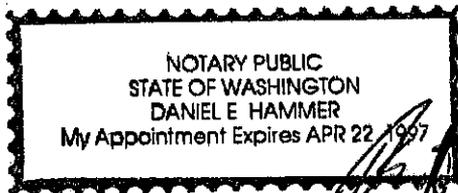
Janet L. Lundquist  
NAME: JANET L. LUNDQUIST  
(Print Name)

Notary Public in and for the  
State of Washington.  
Commission Expires: 5/25/96

STATE OF WASHINGTON )  
 ) ss.  
COUNTY OF SNOHOMISH )

I certify that I know or have satisfactory evidence that Ray Steven Dunphy is the person who appeared before me, and said person acknowledged that He signed this instrument, on oath stated that He was authorized to execute the instrument and acknowledged it as the President/Commissioner of MUKILTEO WATER DISTRICT, a municipal corporation, to be the free and voluntary act of such municipal corporation for the uses and purposes mentioned in the instrument.

Dated 2/9/99



DANIEL E. HAMMER  
NAME: [Signature]  
(Print Name)

Notary Public in and for the  
State of Washington.  
Commission Expires: 4/22/97

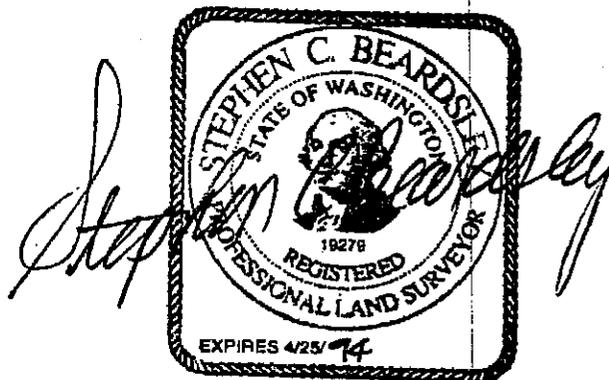
EXHIBIT "A"

LEGAL DESCRIPTION  
HARBOUR POINTE TOWNHOMES  
(That portion located in Mukilteo Water District)

That portion of Lot 5, Harbour Pointe Central Square, a Binding Site Plan - Plat of Survey, record in Volume 1 of Binding Site Plans, pages 242 and 243, under Auditor's File No. 9110175003, and modified by Boundary Line Adjustment recorded in Volume 40 of Surveys, page 167, under Auditor's File No. 9306165003, all of the records of Snohomish County, Washington, lying within Section 21, Township 28 North, Range 4 East, W.M., more particularly described as follows:

Beginning at the intersection of the westerly boundary of said Lot 5 with the south line of Section 21, which point is also on the easterly right-of-way margin of Harbour Pointe Boulevard; thence northeasterly along the margin of Harbour Pointe Boulevard, being a curve to the left having a radius of 1142.00 feet, through a central angle of  $11^{\circ}53'42''$ , an arc distance of 237.09 feet, to an angle point in the north line of Lot 5, thence along the north line of Lot 5,  $S 60^{\circ}40'01'' E$ , 266.00 feet; thence  $N 31^{\circ}39'20'' E$ , 105.11 feet; thence  $S 60^{\circ}40'01'' E$ , 370.98 feet to the south line of Section 21; thence  $N 88^{\circ}00'03'' W$ , along the south line of Section 21, a distance of 742.57 feet to the point of beginning.

Containing 81,164 square feet (1.863 acres).



1-14-94





201008180466 27 PGS  
08/18/2010 2:43pm \$88.00  
SNOHOMISH COUNTY, WASHINGTON

NO EXCISE TAX  
REQUIRED

AUG 18 2010

KIRKE SIEVERS, Snohomish County Treasurer

By KIRKE SIEVERS

AFTER RECORDING RETURN TO:  
Mukilteo Water and Wastewater District  
P.O. Box 260  
Mukilteo, WA 98275-0260

**RECORDING COVER SHEET**

Document Title: Wholesale Water Supply Agreement between Alderwood Water & Wastewater District and Mukilteo Water & Wastewater District

Reference Number(s): N/A

Grantor(s): Alderwood Water & Wastewater District

Grantee(s): Mukilteo Water and Wastewater District

Legal Description: N/A – Document Being Recorded Is An Agreement

Assessor's Property Tax Parcel/Account Number(s): N/A

**WHOLESALE WATER SUPPLY AGREEMENT  
Between Alderwood Water & Wastewater District  
and Mukilteo Water & Wastewater District**

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**AGREEMENT BETWEEN  
ALDERWOOD WATER & WASTEWATER DISTRICT  
AND MUKILTEO WATER & WASTEWATER DISTRICT  
FOR WATER SUPPLY**

This Wholesale Water Supply Agreement ("Agreement") between the Alderwood Water & Wastewater District, a special purpose municipal corporation (the "District,") and Mukilteo Water & Wastewater District, a special purpose municipal corporation (the "Customer") (individually a "Party" and collectively the "Parties") for the purposes set forth herein.

WHEREAS, the District and the Customer are each authorized under the law of the State of Washington to supply potable water to their retail customers and to enter into wholesale contracts for the purchase and sale of wholesale water supply; and

WHEREAS, the District and the Customer desire to enter into an agreement wherein the District sells wholesale water to the Customer at a wholesale water rate that will adequately compensate the District for those current and future costs attributable to supplying wholesale water to the Customer;

NOW, THEREFORE, The District and the Customer agree as follows:

**SECTION I. - WATER SUPPLY**

The District agrees to sell to the Customer and the Customer agrees to purchase from the District up to the daily quantity of water shown on Exhibit "A" according to the terms and conditions of this Agreement. The water shall be delivered to Master Meters at a point in or immediately adjacent to a site as depicted on Exhibit B and E. The District shall be the Customer's primary source of water; provided that the Customer may use any existing alternate source connections and re-use water as sources of water supply.

## SECTION II. - DEFINITIONS

As used in this Agreement, unless the context clearly indicates otherwise, the following words and phrases shall mean:

"Administrative Time" means the District's administrative costs incurred to maintain, operate and repair the Wholesale Facilities.

"Cubic Foot" means a unit of measurement of water equal to 7.48 gallons. The term "CCF" shall mean 100 cubic feet of water.

"Distribution Main" means any water main owned and operated by either the District or by the Customer as part of its Retail Water System.

"District Peak Day Water" means the 24-hour maximum usage day measured in million gallons pumped from the Everett System through the three pump stations operated by the District.

"Everett Supply Contract" means the current agreement between the City of Everett and the District for water supply, dated January 28, 2005, and any future amendments thereof.

"Master Meter" means the measuring device installed to measure the volume of water supplied to the Customer by the District.

"Peak Day Water" means the 24-hour maximum usage day measured in million gallons during a calendar year.

"Regional Facilities" means District assets as identified on Exhibit C that are necessary to provide service to all District retail and wholesale customers.

"Retail Water System" means that system owned and operated by the District or by the Customer composed of Distribution Mains and appurtenances used for receiving a supply of water and distributing it directly to the District's or the Customer's retail customers.

"Service Connections" means those separate connections between a Retail Water System and a retail customer.

"Service Meters" means the meter or measuring device installed on a service line or Service Connection for the purpose of measuring the volume of water supplied to a retail customer.

"Terminal Storage Reservoir" means a storage reservoir used primarily to provide reserves against transmission failure from the supply, supply or pumping failure, pump control

storage to balance and economically operate the supply pumps and which permits a reduced sizing in the supply transmission and pumping system to the terminal storage reservoirs.

"Transmission Main" means a pipe owned and operated by the District primarily used for carrying water from a source (currently the Everett Water System) to a Retail Water System that normally has limited or no Service Connections.

"Wholesale Customer" means a customer who purchases water from the District according to the terms and conditions of this Agreement or an agreement with substantially similar terms and conditions, delivered through the Wholesale Facilities.

"Wholesale Facilities" means current assets, identified on Exhibit B, and future assets hereafter added to an amended Exhibit B, owned and operated by the District that are necessary to supply water to the Wholesale Customers in this Agreement. These Wholesale Facilities may also be part of the Regional Facilities.

"Wholesale Water Cost" means all of the costs incurred by the District to supply water to Wholesale Customers, including

- (1) The cost of purchased water, which is the annual amount (U.S dollars) paid by the District for water supplied to the Wholesale Customers under either the Everett Supply Contract or any other agreement for the purchase of water to supply the Wholesale Customers.
- (2) Maintenance and operation costs ("Wholesale M&O costs"), which are costs incurred by the District to maintain, operate and repair the Wholesale Facilities, including Administrative Time, cost of materials and supplies, and the full cost of labor attributable to serving the Wholesale Customers.
- (3) "Power Costs," which are the electrical and other fuel charges associated with operating the Wholesale Facilities.
- (4) "Existing Wholesale Debt," (Principal + Interest) which is the existing bonded debt service and debt obligations of the District attributable to serving the Wholesale Customers, including principal and interest payments.
- (5) "Future Wholesale Debt Service," (Principal + Interest) which is future debt issued by the District to finance capital improvements and infrastructure, attributable to serving the Wholesale Customers, including principal and interest

payments.

- (6) "Cash (Rate) Funded Wholesale Facility Improvements," ("CFI") which is that revenue component of the Wholesale Water Rate used, in whole or in part, to cash fund Wholesale Facilities.
- (7) "Other Program Funding," which includes costs incurred by the District that benefit Wholesale Customers but are not otherwise included in the Wholesale Water Rate.
- (8) "Quantity of Water Supplied," which is the prior year's total of water supplied to the Wholesale Customers (CCF) as measured by all Master Meters, plus or minus any adjustments for individual services of the Customer or District connected upstream or downstream, respectively, of the Master Meters.
- (9) "District Finance Option," which is a revenue component of the Wholesale Water Rate used in whole or in part to fund capital improvements where bonds or CFI are impractical or are not available.

"Wholesale Water Rate" means the cost of water to the Wholesale Customer in dollars per hundred cubic feet (CCF).

"Wholesale Water System" includes the Wholesale Facilities and the Retail Water System of any Wholesale Customer and of the District.

### **SECTION III. - FUTURE FACILITY ACQUISITIONS**

(THIS SECTION INTENTIONALLY LEFT BLANK)

### **SECTION IV. - CONTINUITY OF SERVICE**

Except as otherwise provided, the District's supply of water to the Customer shall be continuous. In the event of a general emergency or water shortage affecting the District, the District and the Customer shall implement necessary water conservation measures. Because the District and the Customer have critical customers, the District shall consult with the Customer regarding water allocations. General restrictions placed upon deliveries to the

Customer shall be made according to the District's most recent Emergency/Drought Response Plan. In the event of localized emergency problems, temporary service interruptions may result.

The District may have to implement emergency Wholesale Water System conservation measures to meet an emergency condition. The Customer shall assist and support such emergency conservation measures.

If the District determines that interruptions and reductions are necessary or reasonable in case of system emergencies, the District shall provide oral notice to the Customer and may temporarily interrupt or reduce deliveries of water to the Customer. Except in cases of emergency, and to avoid unreasonable interference with the Customer's operations, the District shall give the Customer at least fourteen (14) calendar days notice of any proposed interruptions or reduction in service, the reason therefore, and the probable duration thereof, including any interruptions or reduction in services that will be caused by the installation of equipment, repairs, replacements, investigations, inspections or other maintenance performed by the District on its water system or those parts of the system supplying the Customer.

The City of Everett currently holds water rights regulated by the State Department of Ecology and an approved Water System Plan regulated by the State Department of Health that enables the City of Everett to perform the Everett Supply Contract. Said water rights and plan currently authorize the District to supply City of Everett water to Customer under this Agreement and consistent with the terms of the Everett Supply Contract. Customer acknowledges and agrees that any interruption or restriction of said authorization could result in the curtailment, interruption or reduction in the District's service to Customer, the declaration of an emergency, or other measures reasonable under the circumstances.

In the event of any of the foregoing or otherwise, the District shall have no obligation whatsoever to obtain and furnish a substitute supply of water and Customer may obtain and use any alternate lawful source of water supply including re-use water as substitute water supply. The District shall cooperate with the Customer and use its best efforts to assist Customer in obtaining an alternative source(s) of water supply. Nothing herein shall be interpreted to waive any right or obligation under Washington law as the

same exists or shall hereinafter be created.

## **SECTION V. - OPERATIONAL EFFICIENCY**

The Everett Supply Contract includes a rate component of peak to average day flow that affects the District and the Customer. Therefore, as a material element of this Agreement, the Customer shall track during the high water demand period June through August the operational control components of its Retail Water System, including, at a minimum, reservoir storage capacity and flow controls, and provide the data collected to the District in accordance with procedures and on a schedule as established by the Wholesale Committee.

## **SECTION VI. - WHOLESALE COMMITTEE**

The District shall establish and staff, and the Customer shall participate in, a wholesale committee (“Wholesale Committee”) composed of the District and each Wholesale Customer. Each Wholesale Customer shall designate in writing a representative to serve on the Wholesale Committee. A representative may be replaced by a written designation of the committee member. The Wholesale Committee shall have the powers and authority as set forth below:

1. Advisory Powers and Authority. The Wholesale Committee shall review and advise the District on the following topics or issues:

- a. Proposed wholesale rate changes, including Administrative Time;
- b. Proposed multi-year wholesale capital improvement plans;
- c. Coordination with the District on day-to-day operations relating to high water demand;
- d. Proposed bond issues for wholesale system capital improvements;
- e. Changes in District standards that would apply to wholesale improvements;
- f. Proposed modifications to the Everett Supply Contract;
- g. Proposed regulatory changes that could potentially impact wholesale customers;
- h. Day-to-day operational issues and coordination efforts; and

i. District Finance Option.

2. Approval Powers and Authority. The Wholesale Committee shall review and approve of the following topics:

- a. The District's Emergency/Drought Response Plan;
- b. Limits on cash funded wholesale system capital improvements; and
- c. "Other Program Funding" as defined and used in this Agreement.

Approval will require a majority vote of the Wholesale Customers plus District.

The Wholesale Committee shall meet annually by the 15<sup>th</sup> of March to review the proposed wholesale rates and, as necessary, to address the other topics as outlined above. A meeting may be called by any member of the Wholesale Committee. The Wholesale Committee shall evaluate each Wholesale Customer's operational efficiency by the end of each year and provide a report and recommendation to the District's Board of Commissioners on the summarized data of the Wholesale Customers' tracking of high water demand to identify potential efficiency measures to be implemented under the state-mandated Water Use Efficiency Rule. Each Wholesale Customer shall receive a copy of the report.

## **SECTION VII. - MASTER METER**

All water delivered by the District to Customer shall be measured by a Master Meter. All Master Meters, including vaults and appurtenances, will be owned, maintained, repaired, replaced and upgraded by the District and the cost thereof included in the Wholesale Water Cost. The District shall own all facilities from the connection to the District pipeline to the upstream flange of the valve downstream of the Master Meter. The cost of a new Master Meter requested by the Customer, including appurtenances and installation, shall be paid by the Customer. Relocation of a Master Meter necessitated by the Customer shall be paid by the Customer.

The District shall establish standards for Master Meters, including appurtenances and access to flow data. Access to the Master Meter and the flow records shall be made available to the Customer upon request. The Master Meter shall be checked by the District

on a schedule and for accuracy per the manufacturer's recommendation and the cost thereof included in the Wholesale Water Cost. Either the District or the Customer may request additional tests. The costs of additional tests shall borne equally, if both Parties agree to the test; otherwise, by the Party requesting the test, unless the meter is not performing within the manufacturer's specification, whereupon the benefited Party shall pay for the test. Any adjustment to charges for water supplied shall be determined by the average water use of the three prior years for the same period, unless some other method is agreed upon. Either a credit or an additional billing calculated at the applicable Wholesale Water Rate shall accrue to the appropriate party. If review of the meter records does not establish when the change in accuracy occurred, the period of adjustment shall be one-half of the period since the last meter calibration, not to exceed 12 months.

#### **SECTION VIII. - AREA OF USE**

The Customer shall not furnish service under any terms to services or systems other than those within its approved service area as defined within its Water Comprehensive Plan without first receiving written approval of the District. The Customer currently serves other water suppliers or the service area of such suppliers by agreement. Those agreements are identified on Exhibit D and continued service to those suppliers is hereby approved by District.

#### **SECTION IX. - WATER QUALITY**

The water delivered by the District to the Master Meter shall comply with state and federal standards for drinking water and be of the same standard and quality normally delivered to the District's other customers. The District shall not be liable for any degradation of water quality and resulting damages that may occur beyond the Master Meter, including liability for acts of sabotage. Customer shall operate its system in conformance with law and in a manner which does not impair the water quality of the "Wholesale Water System."

**SECTION X. - SUPPLY TO DISTRICT-OWNED SERVICES TRANSMITTED  
THROUGH CUSTOMER MAINS**

The District shall have the right to continue to serve its Retail Water System with water transmitted through the Customer's Master Meter and Retail Water System. Every two months, the District shall read meters in that portion of the District's Retail Water System supplied through Customer's Master Meter and Retail Water System. The volume of water shown by meter reading shall be deducted from the total Master Meter reading for the month in which these meters are read, plus 25% added for meter losses, flushing, leakage and other authorized unmetered usage.

**SECTION XI. - WHOLESALE WATER RATE**

Wholesale Customers shall pay a Wholesale Water Rate that shall be adjusted annually on April 1 and shall be effective on that date. The Wholesale Water Rate shall recover the District's Wholesale Water Cost computed by the following formula:

$$R = E + \frac{M + P + (ED + FD) + CFI + DFO + O}{Q}$$

*Where:*

- R = Wholesale Water Rate (\$/CCF) computed to the nearest ten-thousandth of a dollar
- E = The District's cost of Purchased Water (\$/CCF)
- M = Wholesale M&O Costs for the prior calendar year, excluding Power Costs
- P = Power Costs for the prior calendar year [Wholesale-Related Portion Only]
- ED = Existing Wholesale Debt including Principal + Interest
- FD = Future Wholesale Debt Service including Principal + Interest
- CFI = Cash (Rate) Funded Wholesale Facility Improvements
- O = Other Program Funding as may be deemed appropriate by the Wholesale Committee

DFO = District Finance Option

Q = Quantity of Water Supplied (CCF) in the prior calendar year measured by the Wholesale Customers' Master Meters

In determining the Wholesale Water Rate, the District shall be governed by the following principles:

1. Revenue recovery for debt service shall be based upon the debt service (payment) schedule associated with each debt issue. Whenever the District issues refunding debt, it shall analyze the refunding issue to determine an equitable allocation of principal and interest to the Wholesale Water Rate. The Wholesale Committee shall be convened to review the allocation for either a new debt issue or a refunding issue.

2. In the year in which the District proposes to issue a new long-term debt instrument to finance, in whole or in part, the construction of or improvements to Wholesale Facilities, the cost attributable to Wholesale Facilities, including projected principal, interest, reserve payments, and debt service, incurred by the District for that year shall be included in the Wholesale Water Rate. The cost of such debt shall be allocated to the Wholesale Customers, over the life of the debt issue, according to the specific use of proceeds from that debt issuance. At the end of the year, and after the debt has been issued, the debt issue is considered "Existing Wholesale Debt" for purposes of establishing wholesale water rates in subsequent years.

3. Whenever financially feasible, debt service coverage shall be met by the District's overall financial operations (retail and wholesale). If debt service coverage cannot be met by the District's overall financial operations, then the Wholesale Water Rate shall be adjusted to include a component sufficient to meet the specific debt service coverage covenants.

4. Every fifth (5) year commencing in the year 2015, the District shall re-

determine Wholesale M&O Costs for the purpose of setting the Wholesale Water Rate for that year. In each of the subsequent four years, the Wholesale M&O Cost (M) shall be escalated by the consumer price index for all Urban Consumers (CPI-U) (Seattle/Tacoma/Bremerton metropolitan area) December to December or a comparable index, if that index is unavailable; provided that in any year, the District may, at its discretion, forego escalation of cost according to the index and determine the actual Wholesale M&O Costs that year.

5. Power Costs attributable to the Wholesale Customers shall be determined when the Wholesale Water Rate is re-calculated and shall be equal to the following:

$$P = (\text{District's prior calendar year cost of power at Wholesale Facilities identified on Exhibit B, and as Exhibit B may be amended}) \times (\text{the Wholesale Customers' combined prior calendar year volumetric use of water as recorded on Master Meters identified on Exhibit B, and as Exhibit B may be amended}) \div (\text{the District's prior calendar year volumetric use of water as recorded at the District's Master Meters at the Evergreen Way Pump Stations.})$$

6. The CFI component of the Wholesale Water Rate shall be determined by the District after a review of the District's 5-year capital improvement plan by the Wholesale Committee. The Wholesale Committee shall approve CFI funding for each year of the five (5) year capital improvement plan, after considering the different financial and rate impacts of funding wholesale projects with cash or by debt and such other factors deemed relevant by the Committee.

7. Annually, before the Wholesale Water rate is developed, the Wholesale Committee shall review and approve what, if any, Other Program Funding, including costs incurred by the District that are not otherwise included in the Wholesale Water Cost, should be allocated to Wholesale Customers and included in the Wholesale Water Rate. Approval will require a majority vote of the Wholesale Customers plus District.

8. The District shall establish a separate wholesale capital improvement sinking fund (reserve) to segregate and account for certain revenues received from the Wholesale Customers as identified in this Agreement. The sinking fund shall contain the balance in the bond reserve fund as identified in the current wholesale contract. The District shall deposit into the wholesale capital improvement sinking fund all revenues received from:

- A. The Cash (Rate) Funded Improvements (CFI) component of the Wholesale Water Rate; and
- B. Wholesale Water Rates to meet the minimum debt service coverage ratio requirements (rate covenant).

Interest earned on the balance of the Wholesale Capital Improvement Sinking Fund shall be retained in the sinking fund and credited to the Sinking Fund on a monthly basis in a manner consistent with the methodology the District uses to allocate interest to its funds.

Except as otherwise provided, all funds deposited into the wholesale capital improvement sinking fund shall be applied to the cost of wholesale capital improvement projects undertaken by the District. On the recommendation of the Wholesale Committee the District may use these funds to pay the cost of any other wholesale-related activity (e.g. early buy-down of debt, buy down a rate adjustment, rate transition, etc.).

9. Whenever a component of the Wholesale Water Cost is determined by meter readings and some condition (e.g. meter failure, emergency conditions [e.g. earthquake]) would make the use of those readings unreasonable or inequitable to the District or to the Wholesale Customers, the District shall use its best and reasonable judgment to “normalize” the volumetric usage data for purposes of establishing the affected component of the Wholesale Water Rate.

10. The District may utilize District funds to finance Wholesale Facility improvements, the funding size of which is not practical for issuance of bonds, and the Cash (Rate) Funded Wholesale Facility Improvement option has not been approved by the Wholesale Committee. The capital funds necessary for the improvement would be provided by the District subject to reimbursement through wholesale water rates for a term not to exceed ten (10) years. The rate would be determined based upon the average rate of investments for District funds for the prior year. The rate may be adjusted annually utilizing the District's annual investment rate for the prior year. The District also reserves the right to terminate this funding option at any time during the term by adding the remaining funds yet to be paid to a larger bond issue. If so elected, the wholesale portion would be the pro rata share of the bond issue at the terms of the bond issue.

## **SECTION XII. - BILLING & PAYMENT**

The District shall bill the Customer for water supplied under this Agreement on regular monthly intervals.

The Master Meters shall be read and recorded on or about the last normal work day of the month in which the service was furnished. Billing to the Customer shall be made by the 10th day of the month following, and payment to the District is due by the 30th day of the month in which the statement is received. If any payment or portion thereof due the District shall remain unpaid for 25 days following its due date, the Customer shall be charged with and pay to the District interest on the amount unpaid from its due date until paid at the rate of eight (8) % per annum.

If any or all of a bill is in dispute, the Customer shall pay the amount as billed and both the District and the Customer shall agree to the time line to resolve the disputed amount. If any material error, an amount greater than \$1,000 per month is discovered in the rate calculation, billing, payment, interest allocation, or any other calculation or assumption, the District shall correct the error retroactively from the date of receipt of notice of the error backwards for a period of up to three (3) years or as mutually agreed. The \$1,000 amount shall be adjusted for inflation every five (5) years with CPI-U as described in Section XI of this agreement.

### **SECTION XIII. - TERM & EXPIRATION**

(1) The term of this Agreement shall be from its effective date until January 1, 2055. The Parties may renew this Agreement by mutual written agreement upon such terms and conditions as the Parties may later agree.

(2) If the Customer shall cease to take water from the District without the District's consent, the Customer shall remain liable for its proportionate share of the then existing wholesale bonded indebtedness issued before January 1, 2055 as may at that time be determined including credits for certain payments and recognition given to the growth experienced in the Customer, the District, and all other Wholesale Customers. This liability shall continue only until such time as all or part of the water supply no longer taken by the Customer from the District is sold by the District to another party. In that event, liability shall be reallocated, in whole or in part, to the new customer.

(3) If the District shall cease to supply water to the Customer without the Customer's consent, the Customer shall cease to be liable for its proportionate share of the wholesale bonded indebtedness as described in Subsection 2 above.

### **SECTION XIV. - NOTICE OF NEGOTIATION**

The Customer shall receive timely written notice of negotiation with City of Everett for a rate change or additional water and the Customer shall have the right to be present at such meetings.

### **SECTION XV. - FORCE MAJEURE AND CHANGES IN LAW**

Neither Party hereto shall be considered to be in default in respect to any obligations hereunder if prevented from fulfilling such obligations due to conditions beyond their reasonable control or due to changes in state or federal law. If a Party is unable to perform in whole or in part because of such condition or change in the law, the Party shall diligently and promptly take reasonable steps to allow it to perform. The Parties expressly acknowledge and agree that the inability or preclusion of the City of Everett to perform, in whole or material part, the Everett

Supply Agreement caused by an order or directive of governmental authority or a court with jurisdiction shall constitute a force majeure or change in law event hereunder.

## **SECTION XVI. - LEGAL RELATIONS**

Each Party shall defend, hold harmless, and indemnify the other from any and all claims, demands, suits, and judgments arising out of its conduct. If, and to the extent, the Parties are both liable to a third party claimant, each Party shall be responsible to the extent of its fault, and shall defend, hold harmless, and indemnify the other for its fault. The foregoing indemnity is specifically and expressly intended to constitute a waiver of each Party's immunity under Washington's Industrial Insurance Act, RCW Title 51, but only with respect to the other Party only, and only to the extent necessary to provide each Party with a full and complete indemnity of claims made by the other Party's employees. The Parties acknowledge that these provisions were specifically negotiated and agreed upon by them.

## **SECTION XVII. - DISPUTE RESOLUTION**

The Parties are committed to working cooperatively in resolving all matters related to this Agreement and achieving its intent and purpose. If a dispute should arise, the Parties agree to meet on an informal basis within fourteen (14) calendar days after receipt of written notice of the dispute submitted by a Party to attempt to resolve the dispute.

If the Parties are unable to resolve the dispute on an informal basis within thirty (30) days, the Parties agree they shall utilize mediation. Each Party shall be responsible for the costs of their own legal representation and pro rata cost of mediator.

Any dispute arising under this Agreement that is not resolved pursuant to the mediation process may, upon mutual agreement of the Parties, if such agreement occurs within twenty (20) calendar days of the failure of the Parties to reach resolution through mediation, be resolved by binding arbitration by a single arbitrator. Within seven (7) calendar days of the date the Parties agree to arbitration, each Party shall provide the other Party with the names of three (3) neutral arbitrators having experience in the subject matter of the dispute and in arbitrating disputes. The

Parties will thereafter attempt in good faith to select an arbitrator from this panel of six (6) potential arbitrators.

If the Parties are unable to agree upon a single arbitrator within twenty (20) calendar days from the date the Parties agree to binding arbitration, then each Party shall designate one (1) arbitrator from its panel of three (3) arbitrators. The two (2) designated arbitrators shall then select a third arbitrator from the remaining arbitrator panel members, and this third arbitrator shall act and serve as the single arbitrator for the dispute. The Parties shall equally split the arbitrator's fee and all arbitration expenses. The prevailing party at arbitration shall be entitled to an award by the arbitrator of its attorneys' fees and costs at the arbitrator's discretion.

The Parties agree that this dispute resolution process shall precede any action in a judicial or quasi-judicial tribunal.

The Parties also agree that at all times pending resolution of the dispute, the Parties shall continue to perform their respective duties and obligations in accordance with the terms and conditions of this Agreement. The intent of the Parties is to preserve the status quo under the Agreement. By way of illustration and not limitation, the Parties wish to assure uninterrupted water service and compliance with the payment provisions of Section XII.

#### **SECTION XVIII. - GOVERNING LAW AND VENUE**

This Agreement shall be governed by and construed in accordance with the laws of the state of Washington. Any lawsuit or judicial action or proceeding arising out of or relating to this Agreement that could not be resolved through Dispute Resolution, shall be heard in the Superior Court of the State of Washington in and for Snohomish County.

#### **SECTION XIX. - NO THIRD PARTY BENEFICIARIES**

Except as expressly set forth in this Agreement, nothing in this Agreement is intended to confer upon any person or entity, other than the Parties hereto, any rights, benefits, or obligations. No such third-party shall have any right to enforce any of the provisions of this Agreement unless expressly stated otherwise herein.

## **SECTION XX. - LIMITATION ON DAMAGES**

Notwithstanding any other provision of this Agreement, neither the District nor the Customer shall be liable to the other under or pursuant to this Agreement for indirect, incidental, special, exemplary, punitive, or consequential damages, including but not limited to damages for lost profits, revenues or benefits, loss of property use, the cost of capital, or the cost of purchased or replacement water.

## **SECTION XXI. - GENERAL PROVISIONS**

(1) **Waiver:** A waiver by either Party of any terms or conditions of this Agreement shall not be deemed or construed to be a waiver of any other term or condition, nor shall the waiver of any breach be deemed or construed to constitute a waiver of any subsequent breach, whether of the same or any other term or condition of this Agreement.

(2) **Assignment:** Except where one of the Parties merges, consolidates or combines with another entity neither this Agreement nor any of the rights, interests or obligations created hereunder may be assigned by either Party without the written consent of the other Party. This Agreement shall be binding upon and inure to the benefit of the successors and assigns of the respective Parties.

(3) **Notices:** Any notices required or permitted to be given hereunder shall be given in writing and shall be delivered (a) in person, (b) by certified mail, postage prepaid, return receipt requested, (c) by electronic transmission in the form of email or facsimile, or (d) by a commercial overnight courier that guarantees next day delivery and provides a receipt, and such notices shall be addressed as follows:

To the Customer:

General Manager  
Mukilteo Water & Wastewater District  
P.O. Box 260  
Mukilteo, WA 98275  
Fax: 425-348-0645

To the District:

General Manager  
Alderwood Water & Wastewater District  
3626 156th Street SW  
Lynnwood, Washington 98087  
Fax: 425-742-4562

or to such other address designated in writing by the addressee.

(4) Entirety: All prior negotiations and agreements between the parties hereto relating to the subject matter hereof are merged into and superseded by this Agreement, which shall constitute the entire agreement between the Customer and the District concerning the sale of water to the Customer.

(5) Authority: Each Party represents and warrants that it has the power and legal authority to enter into this Agreement. The individual(s) executing this Agreement on behalf of the respective Party represents and warrants that such individual has the power and authority to do so.

(6) Effective Date: This Agreement shall be effective upon the date by which each Party has approved and signed this Agreement ("Effective Date").

(7) Attorneys' Fees and Costs: In the event that either Party commences any legal action or proceeding relating to the provisions or enforcement of this Agreement, the prevailing party shall be entitled to receive, and the non-prevailing party shall pay, its reasonable attorneys' fees and costs, including those incurred in any appeal.

(8) Exhibits Incorporated by Reference: Any exhibits attached to this Agreement are fully incorporated herein by this reference.

(9) Titles to sections and subsections in this Agreement are for reference purposes only and shall have no substantive effect.

(10) In the event of a material breach or default of this Agreement by either of the Parties, the Parties acknowledge that it may be difficult to measure the resulting damages and that monetary damages may not provide a complete or adequate remedy. Accordingly, the non-defaulting Party, in addition to damages and any other relief sought or recovered, shall

be entitled to seek injunctive relief and the specific performance of the terms and conditions of this Agreement.

(11) If any term, condition or provision of this Agreement is determined to be void, unenforceable or limited in its application or effect in a legal proceeding, such determination shall not affect any other provisions in this Agreement and all other provisions shall remain in full force and effect.

(12) Any new water Wholesale Customer Agreement utilizing the same Wholesale Water Facilities as included in the Agreement, shall have the same terms and conditions as this Agreement, with the exclusion of Exhibits A, D and E.

MUKILTEO WATER & WASTEWATER DISTRICT  
A Municipal Corporation

By: Thomas H. Rainville

President of the Board

Date: 7-30-2010

ATTEST:

TD McGrath  
Secretary

APPROVED AS TO FORM:

W M  
Attorney

ALDERWOOD WATER & WASTEWATER DISTRICT  
A Municipal Corporation

By: Paul D. McDietye  
President of the Board

Date: 16 Aug 2010

**ALDERWOOD WATER & WASTEWATER DISTRICT  
AND MUKILTEO WATER & WASTEWATER DISTRICT  
WHOLESALE WATER SUPPLY AGREEMENT**

**EXHIBIT A – QUANTITY OF WATER TO BE PURCHASED**

All quantities in Million Gallons per Day (MGD)

YEAR	Average Daily Demand	Peak Day Demand
2010	1.5	2.8
2018		3.1
2033-2038	2.7	5.0
2050		5.0

**ALDERWOOD WATER & WASTEWATER DISTRICT  
AND MUKILTEO WATER & WASTEWATER DISTRICT  
WHOLESALE WATER SUPPLY AGREEMENT**

**EXHIBIT B - WHOLESALE FACILITIES**

The water lines including transmission facilities are shown on a separate map exhibit.

The following is a list of the wholesale facilities referenced in the Agreement, in addition to the water lines shown on the separate map.

Evergreen Way Pump Station Site (6003 Evergreen Way, Everett)

- Pump Station No. 1
- Pump Station No. 2

Maintenance and Operation Site (15204 35<sup>th</sup> Avenue W, Lynnwood)

- Reservoir No. 1
- Chlorination Facility
- Ancillary valves and piping associated with the above assets

Administration Site (3626 156<sup>th</sup> Street SW, Lynnwood)

- Reservoir No. 2
- Reservoir No. 3
- Chlorination Facility
- Ancillary valves and piping associated with the above assets

Edmonds Master Meter Site (168<sup>th</sup> Street SW and 62<sup>nd</sup> Avenue W, Edmonds)

- Master Meter
- Vault and ancillary assets

Lynnwood Master Meter Site (Spruce Way and 164<sup>th</sup> Street SW, Lynnwood)

- Master Meter
- Vault and ancillary assets

Mountlake Terrace Master Meter Site (212<sup>th</sup> Street SW and 44<sup>th</sup> Avenue W)

- Master Meter
- Vault and ancillary assets
- (Emergency supply at 38<sup>th</sup> Avenue W and 228<sup>th</sup> Street SW)

Mukilteo Water & Wastewater District Meter Site (Harbour Point Boulevard and St. Andrews Drive; and Beverly Park Road and Center Road, Mukilteo)

- Master Meter
- Vault and ancillary assets

**ALDERWOOD WATER & WASTEWATER DISTRICT  
AND MUKILTEO WATER & WASTEWATER DISTRICT  
WHOLESALE WATER SUPPLY AGREEMENT**

**EXHIBIT C - REGIONAL FACILITIES**

The regional water lines and larger water transmission facilities are shown on a separate map exhibit.

The following list contains additional regional facilities as referenced in the Agreement.

Evergreen Way Pump Station Site (6003 Evergreen Way, Everett)

- Leased Site
- Pump Station No. 1
- Pump Station No. 2

Maintenance and Operation Site (15204 35<sup>th</sup> Avenue W, Lynnwood)

- Site
- Reservoir No. 1
- High Tank No. 1
- High Tank No. 2
- Booster Pump Station
- Chlorination Facility
- Ancillary valves and piping associated with the above assets
- Maintenance and Operation Administration Building
- Shop Facility
- Warehouse Facilities
- Material Storage Facilities

Administration Site (3626 156<sup>th</sup> Street SW, Lynnwood)

- Site
- District Administration Building
- Reservoir No. 2
- Reservoir No. 3
- Chlorination Facility
- Ancillary valves and piping associated with the above assets

**ALDERWOOD WATER & WASTEWATER DISTRICT  
AND MUKILTEO WATER & WASTEWATER DISTRICT  
WHOLESALE WATER SUPPLY AGREEMENT**

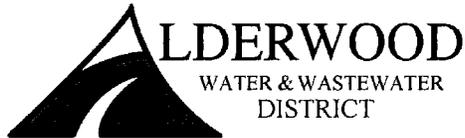
**EXHIBIT D – CUSTOMERS WATER SERVICE AGREEMENT TO OTHER  
SUPPLIERS**

NONE IDENTIFIED.

**ALDERWOOD WATER & WASTEWATER DISTRICT  
AND MUKILTEO WATER & WASTEWATER DISTRICT  
WHOLESALE WATER SUPPLY AGREEMENT**

**EXHIBIT E – MASTER METER LOCATION**

Harbour Point Boulevard and St. Andrews Drive; and Beverly Park Road and Center Road



RECEIVED

JUL 14 2014

3626 - 156<sup>th</sup> Street SW • Lynnwood, WA 98087-5021 • 425-743-4605 • 425-742-4562 Fax • [www.awwd.com](http://www.awwd.com)

July 9, 2014

Mr. Jim Voetberg, General Manager  
Mukilteo Water & Wastewater District  
7827 Mukilteo Speedway, PO Box 260  
Mukilteo, WA 98275

RE: Amendment to *Exhibit B: Wholesale Facilities* and map exhibit of the Wholesale Water Supply Agreement

Dear Mr. Voetberg:

After the discussion at the Wholesale Committee Meeting on March 25, 2013, we added Silver Lake Water & Sewer District as a wholesale customer in May 2013. With the addition of Silver Lake, we have also added to the list of wholesale facilities, found in Exhibit B in your Water Supply Agreement. Please find enclosed an amended Exhibit B that reflects these added facilities.

Please also find the map exhibit of wholesale facilities, which has been updated to include facilities related to supplying water to Silver Lake. Please replace the Exhibit B and map exhibit in your Water Supply Agreement with the enclosed items.

If you should have any questions regarding the added facilities and the impact on wholesale water rates, please feel free to contact me at (425) 743-4605 or by email at [skrishnan@awwd.com](mailto:skrishnan@awwd.com).

Sincerely,

Sridhar Krishnan  
Finance Director

Enclosure

CC: Awwd Board of Commissioners  
Jeff Clarke, Awwd General Manager

**ALDERWOOD WATER & WASTEWATER DISTRICT  
AND MUKILTEO WATER & WASTEWATER DISTRICT  
WHOLESALE WATER SUPPLY AGREEMENT**

**EXHIBIT B – WHOLESALE FACILITIES (Amended 7/1/2014)**

The water lines including transmission facilities are shown on a separate map exhibit.

The following is a list of the wholesale facilities referenced in the Agreement, in addition to the water lines shown on the separate map.

Evergreen Way Pump Station Site (6003 Evergreen Way, Everett)

Pump Station No.1  
Pump Station No.2

Maintenance and Operation Site (15204 35<sup>th</sup> Avenue W, Lynnwood)

Reservoir No.1  
Chlorination Facility  
Ancillary valves and piping associated with the above assets

Administration Site (3626 156<sup>th</sup> Street SW, Lynnwood)

Reservoir No.2  
Reservoir No.3  
Chlorination Facility  
Ancillary valves and piping associated with the above assets

Edmonds Master Meter Site (168<sup>th</sup> Street SW and 62<sup>nd</sup> Avenue W, Edmonds)

Master Meter  
Vault and ancillary assets

Lynnwood Master Meter Site (Spruce Way and 164<sup>th</sup> Street SW, Lynnwood)

Master Meter  
Vault and ancillary assets

Mountlake Terrace Master Meter Site (212<sup>th</sup> Street SW and 44<sup>th</sup> Avenue W, Mountlake Terrace)

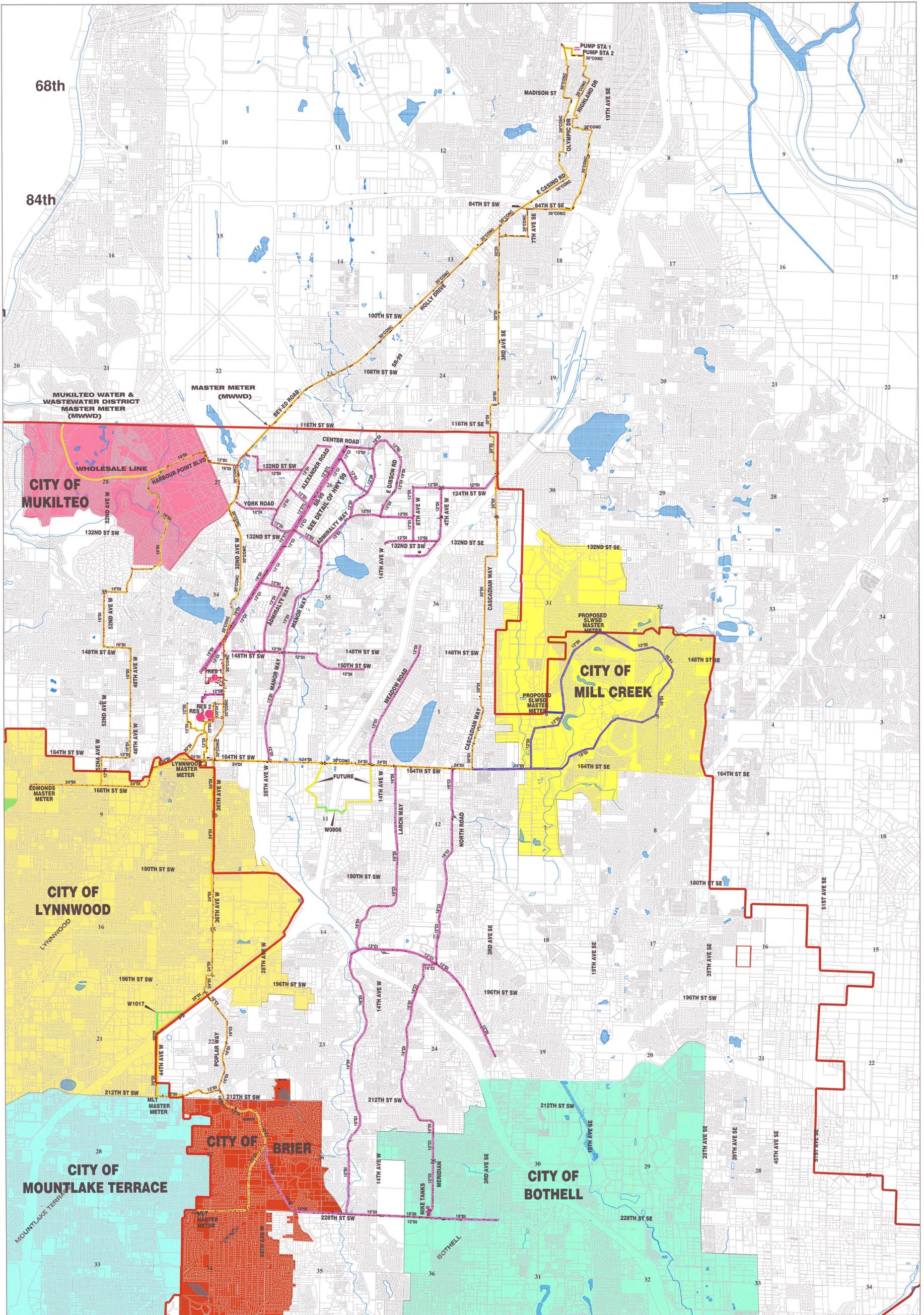
Master Meter  
Vault and ancillary assets  
(Emergency supply at 38<sup>th</sup> Avenue W and 228<sup>th</sup> Street SW)

Mukilteo Water & Wastewater District Meter Site (Harbour Point Boulevard and St. Andrews Drive; and Beverly Park Road and Center Road, Mukilteo)

Master Meter  
Vault and ancillary assets

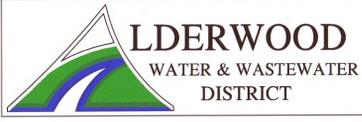
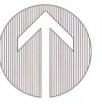
Silver Lake Water & Sewer District Meter Site (State Route 527 and Mill Creek Boulevard; and Mill Creek Boulevard and Trillium Boulevard, Mill Creek)

Master Meter  
Vault and ancillary assets



WHOLESALE WATER LINES

LEGEND  
 WHOLESALE LINES: —  
 REGIONAL LINES: —  
 PROPOSED WHOLESALE LINES: —



WHOLESALE WATER EXHIBIT

Scale: NTS

**APPENDIX D**

**WATER RATE RESOLUTION  
GFC RESOLUTION  
SERVICE CONNECTION CHARGE RESOLUTION**

## EXHIBIT A WATER GFCs

**SECTION 1. Definitions.** Terms used herein are defined for the purpose of this Exhibit as follows:

- a) *New Customer.* Any customer requesting new water service or adding to the number of dwelling units served by an existing water service within the District's water service area; or an existing customer who has not paid a GFC who changed the use of their property so as to increase the property's demand upon the District's system.
- b) *Charge for General Facilities and Connection to Existing System.* A connection charge payable to the District pursuant to RCW 57.08-005(11) for the purposes of providing the District with funds for capital improvements to construct storage tanks, sources of supply, pipelines, booster stations, and other facilities, including real property, to accommodate anticipated, continued growth created by demand for water service to new customers.

**SECTION 2. GFC Imposed.** The amount of the charge shall be based upon the size of the meter serving the property for which water service is applied. Effective February 19, 2015, the District's water GFC rates shall be:

Meter Size	Factor	GFC
5/8" x 3/4"	1	5,241
1"	2.5	13,104
1 1/2"	5	26,206
2"	8	41,930
3"	16	83,859
4"	25	131,032
6"	50	262,063
8"	80	419,300
10"	115	602,745
12"	156	817,636
16"	352	1,320,798
20"	366	1,918,302
24"	495	2,594,425

**SECTION 3. Increase for Inflation.** The charges herein imposed shall be adjusted annually to reflect the prior year's inflation as reflected by the Engineering News Record Construction Cost Index for the Seattle area; provided, however, that the increase shall not exceed 5%.

**SECTION 4. Change in Classification.** Where a deviation from the land use classification established by governing authority for the area described herein, as of the date of this Resolution, results in the need for increased capacity not included in the District Comprehensive Water Plan, as currently existing, the new customer shall be responsible for providing all improvements to the District water system necessary to meet all applicable standards and reasonable design criteria, as determined and approved by the District.

**SECTION 5. *Additional Charges.***

Fees for installation of new water service connections shall be:

<u>District-installed water services</u>	
5/8 x 3/4 inch service	\$3,534
1 inch service	\$3,734
1 1/2 inch service and larger	installed through the DE process
 <u>Developer-installed water service</u>	
5/8 x 3/4 inch service	\$483
1 inch service	\$520
1 1/2 inch service	\$649
2 inch service	\$796
3 inch service and larger, materials and meter provided by Developer	

The water GFC is made in addition to all other charges for new service connections. This is not a charge or payment in lieu of any Utility Local Improvement District's assessment, latecomer's fee, or main extension cost.

**SECTION 6. *Use of Funds.*** The funds received pursuant to the Water GFC shall be used only for projects identified in the Comprehensive Water Plan for land acquisition, reservoir construction, transmission mains, pump stations or projects built in whole or in part to accommodate growth within the District. Said funds shall be deposited to the Water Capital Improvement Fund of the District by transfer to Snohomish County. All returns from the investment of such funds shall be reinvested after deducting the charges of the County Treasurer for such service until expended by the District.

**SECTION 7. *Time of Payment.*** The GFC shall be due and payable at the time of application for water service.

**SECTION 8. *Fire System Meters Exempt.*** Privately owned meters associated with fire suppression systems are not subject to water GFCs.

## **EXHIBIT A WATER RATES AND CHARGES**

### **Section 1 – Rate Structure.**

1.1 **Customer Classes.** Classes of customers for water service are hereafter established as follows:

- a) *Single Family Residential* shall mean a residential unit served by a separate water meter;
- b) *Multi-Family Residential* shall mean a duplex, apartments, condominium, townhouses, and mobile home parks served by a single water meter;
- c) *Commercial* shall mean transient residential facilities (hotels, motels, RV parks), schools, parks, and other commercial uses;
- d) *Irrigation* shall mean water used for landscaping and other non-consumptive uses served by a single water meter;
- e) *Fire* shall mean private fire service served by a backflow detector assembly or other means;

1.2 **Rates and Charges.** The District shall collect the following water service rates and charges:

a) *Service rates and charges.* A monthly charge shall be imposed upon all customer classes for water supplied. The charge shall be comprised of a base rate according to meter size, and a volume charge based upon consumption in thousand gallons per month as measured by the District's water meter. In the case of multi-family and multi-commercial, whenever more than one unit is served by a single meter, an additional unit charge shall be imposed upon each additional unit. As of January 28, 1992, each single family residence, each multi-family building and each commercial building or complex shall be served by a single meter. Whenever more than one building is presently served by a single meter, each building shall be billed the base rate for the meter size serving the property.

b) *Gravity fire service availability charge.* A monthly charge shall be imposed upon all sizes of fire lines. Consumption in excess of one hundred (100) gallons per billing period shall be subject to the commercial base rate equivalent to the fire line size and a volume charge based on usage.

c) *Pumped fire service availability charge.* A monthly charge imposed upon all sizes of fire lines utilizing a private pump. Consumption in excess of one thousand (1000) gallons, per billing period shall be subject to the commercial base rate equivalent to the fire line size and a volume charge based on usage.

d) *Excess fire protection flow charge.* A monthly charge shall be imposed in addition to either of the fire service availability charges for each building served in excess of the District's standard as defined in Table 4-4 of the District's Comprehensive Plan, plus a charge for each 1,000 gallons per minute or part thereof.

Table 4-4  
Fire Flow Requirements

Development Classification	Flow rate (gpm)	Duration (hours)	Volume (gallons)	Pressure Zones
Single Family Residential	1,000	2	120,000	400
Multi-Family Residential /Small Commercial	3,000	3	540,000	270,500,620
Large Commercial /Industrial/Institutional	4,000	4	960,000	715 West

e) *Excess fire protection storage charges.* A monthly charge imposed upon each additional 100,000 gallons or part thereof in excess of the District standard for storage, as defined in Table 4-4 of the District Comprehensive Plan.

f) *Exceptions* to the fire service charges are as follows:

1. Consumption for fire suppression purposes if confirmed by an appropriate fire official.
2. Consumption for maintenance and testing of the service shall not be subject to the commercial base rate provided the District receives adequate prior notice so that it can observe the test.

g) *Excess fire protection charge and excess fire protection storage charge.* Applied to customers whose requirements for fire flow or fire storage exceeds adopted District standards after any mitigation that might have been carried out as part of the developer review or construction process.

**Section 2 - Rates and Charges.**

See Table 1 below.

**2.1 Automatic Rate Adjustment.**

When an increase occurs in wholesale charges for water, water filtration or the multiplier from the City of Everett or Alderwood Water and Wastewater District in excess of planned increases identified in the FCS Group Rate Study dated February 1, 2012, the General Manager is authorized and directed to implement an updated rate schedule, revised to add the necessary increment to the volume charges or fixed charges, to pass-through the increases to each class of customer of the District as an increase in District rates.

Table 1  
Schedule of Water Rates

Customer Classifications	per Resolution No. 336-14			
	Effective 01/01/15		Effective 01/01/16	
	Monthly Base Rate	Volume Charge (\$/k gal)	Monthly Base Rate	Volume Charge (\$/k gal)
<b>Single family:</b>				
5/8 x 3/4 inch meter	\$ 11.70	\$ 3.26	\$ 12.24	\$ 3.41
1 inch meter	\$ 29.33	\$ 3.26	\$ 30.67	\$ 3.41
1-1/2 inch meter	\$ 56.90	\$ 3.26	\$ 59.51	\$ 3.41
2 inch meter	\$ 89.29	\$ 3.26	\$ 93.40	\$ 3.41
<b>Multi-family:</b>				
5/8 x 3/4 inch meter	\$ 8.40	\$ 3.07	\$ 8.40	\$ 3.07
1 inch meter	\$ 21.06	\$ 3.07	\$ 21.06	\$ 3.07
1-1/2 inch meter	\$ 40.86	\$ 3.07	\$ 40.86	\$ 3.07
2 inch meter	\$ 64.12	\$ 3.07	\$ 64.12	\$ 3.07
3 inch meter	\$ 128.98	\$ 3.07	\$ 128.98	\$ 3.07
4 inch meter	\$ 198.19	\$ 3.07	\$ 198.19	\$ 3.07
6 inch meter	\$ 300.44	\$ 3.07	\$ 300.44	\$ 3.07
8 inch meter	\$ 480.77	\$ 3.07	\$ 480.77	\$ 3.07
10 inch meter	\$ 753.58	\$ 3.07	\$ 753.58	\$ 3.07
Extra Unit	\$ 5.04		\$ 5.04	
<b>Commercial/Industrial:</b>				
5/8 x 3/4 inch meter	\$ 12.68	\$ 3.73	\$ 13.46	\$ 3.96
1 inch meter	\$ 31.77	\$ 3.73	\$ 33.72	\$ 3.96
1-1/2 inch meter	\$ 61.64	\$ 3.73	\$ 65.43	\$ 3.96
2 inch meter	\$ 96.75	\$ 3.73	\$ 102.68	\$ 3.96
3 inch meter	\$ 194.60	\$ 3.73	\$ 206.54	\$ 3.96
4 inch meter	\$ 299.03	\$ 3.73	\$ 317.37	\$ 3.96
6 inch meter	\$ 453.30	\$ 3.73	\$ 481.11	\$ 3.96
8 inch meter	\$ 725.40	\$ 3.73	\$ 769.89	\$ 3.96
10 inch meter	\$ 1,137.02	\$ 3.73	\$ 1,206.76	\$ 3.96
24 inch meter	\$ 2,794.31	\$ 3.73	\$ 2,965.70	\$ 3.96
Extra Unit	\$ 7.61		\$ 8.07	
<b>Irrigation:</b>				
5/8 x 3/4 inch meter	\$ 12.07	\$ 3.55	\$ 12.81	\$ 3.77
1 inch meter	\$ 30.25	\$ 3.55	\$ 32.11	\$ 3.77
1-1/2 inch meter	\$ 58.69	\$ 3.55	\$ 62.29	\$ 3.77
2 inch meter	\$ 92.11	\$ 3.55	\$ 97.76	\$ 3.77
3 inch meter	\$ 185.28	\$ 3.55	\$ 196.65	\$ 3.77
<b>Fire:</b>				
Gravity	\$ 44.31		\$ 53.17	
Pump	\$ 50.08		\$ 60.10	
<b>Excess Fire:</b>				
<b>Availability</b>	\$ 22.08		\$ 22.37	
Per 1000 gpm excess				
Fire Flow Requirements				
<b>Storage:</b>	\$ 204.30		\$ 212.88	
Per 100,000 gallons excess storage				

Note: Excess Fire class also pays fire gravity fixed monthly charge.

**EXHIBIT D  
MISCELLANEOUS FEES AND CHARGES**

**SECTION 1. Customer Service Charges:**

<b>1.</b>	<b>Administrative Charge:</b> Added to the cost of all District supplies, merchandise or services, including labor, consultant services, etc.	15%
<b>2.</b>	<b>Closing Bills:</b> Charges for closing bills, made at other than regular billing time, shall be calculated at a per diem rate using the following formula: The number of days being billed, divided by 60 (number of days in a regular billing cycle), multiplied by the two-month base rate, plus the volume charge.	
<b>3.</b>	<b>Convenience Fee:</b> A convenience fee will be charged for each transaction through the online and telephone bill pay portal:	
	E-check payments (per transaction)	\$1.00
	Credit card payments (per transaction)	\$1.00 + 3%
<b>4.</b>	<b>Copy Fee:</b> Copies of public records:	
	4 or fewer pages	No charge
	5 or more pages	\$0.15/page
<b>5.</b>	<b>Deduct Meter Application Fee:</b> An application fee will be charged for the purchase of a deduct meter.	\$30.00
<b>6.</b>	<b>Deduct Meter Read Charge:</b> Bimonthly charge for all District-read deduct meters.	\$10.00
<b>7.</b>	<b>Delinquent Notice:</b> Issued to water and sewer service accounts that are 30 days past due/delinquent.	10% of the delinquent amount
<b>8.</b>	<b>Developer Extension Agreement Manual, Comprehensive Plan, etc. Fee</b>	Cost + 15%
<b>9.</b>	<b>Duplicate Billing Fee:</b> Bimonthly charge for duplicate billings sent to tenants.	\$2.00
<b>10.</b>	<p><b>Fire Hydrant Meter Rental:</b> A hydrant meter permit will be issued for temporary connections to fire hydrants for building construction or related purposes. Water from the hydrant will only be provided through hydrants owned by the District. Maximum meter rental period shall be twenty (20) business days, unless arrangements have been made for a longer period and approved by the General Manager. Water used through the hydrant meter shall be billed in accordance with the current commercial rate resolution.</p> <p>Whenever, in the judgment of the General Manager, the best interests of the District require termination/revocation of the rental meter, the District shall demand the return of the meter and pick up the meter if not returned immediately.</p> <p>The General Manager, or his/her designee, has the authority to waive the deposit fee for customers with a prior history of compliance with the District rental meter policies:</p>	
	Deposit for 1" meter	\$200.00
	Deposit for 3" meter	\$750.00
	Rental fee, first day	\$25.00
	Rental fee, each additional business day	\$5.00

<b>11. Lien and Lien Release Filing Fees:</b> Equal to the Snohomish County fee for filing and releasing liens, staff time and administrative charge. The charge on past due/delinquent balances shall be the prime rate of the District bank plus 4%.	
<b>12. Meter Pricing:</b> Charged for all non-developer related meter sales (excluding sales tax and Administrative Charge):	
¾" meter	\$164.04
1" meter	\$223.39
1 ½" meter	\$385.96
2" meter	\$513.40
<b>13. Meter Testing:</b> A customer may request in writing that his/her District-furnished meter be tested for accuracy:	
Deposit (based on two hours labor-field personnel) to be returned if tested to be more than 3% defective or incorrect	Hourly rate plus Actual Cost and Admin Charge
Test expense to be paid by the customer if the meter is found to be correct within the limits prescribed (deposit would be applied to the actual cost of inspecting and testing the meter)	
<b>14. New Customer Fee:</b> Change the billing name and/or address to a new owner:	
Water and/or sewer account	\$25.00
Storm water only	\$10.00
Change name or address due to District error, marriage, divorce or death	No charge
Change mailing address for current owner	No charge
<b>15. Obstructed Meter Penalty:</b> Assessed for restricting or blocking access to the water meter at the time of scheduled termination, as defined in the most current lien and foreclosure resolution.	\$500.00
<b>16. Permit Application Fee:</b> An application fee will be charged for the purchase of each water or sewer permit.	\$150.00
<b>17. Professional Engineering Services</b>	Cost + 15%
<b>18. Public Records/Engineering Information Requests:</b>	
Fax transmission (long distance) 8 1/2" x 11" and 8 ½" x 14" (per page)	\$.15
CD-ROM (per disc)	\$1.00
24" x 36" drawing sheet (per sheet)	\$5.00
Aerial mapped sheet (per sheet)	\$10.00
Overlay (per sheet)	\$5.00
Computer-generated printouts (per hour)	\$50.00
<b>19. Public Utility Tax:</b> Washington State Public Utility Tax as codified in RCW 82.16.020 and any other utility tax, franchise fee, or other tax authorized for a City, Town, County or Washington State to be assessed on the revenues of the District as hereafter amended, and shall be added onto and in addition to charges assessed by the District.	
<b>20. Returned Payment Fee (NSF):</b> The owner will be notified of the returned payment. The amount of the returned payment and returned payment fee must be paid in cash or by certified check. If not paid within 3 business days from date of notification, water service will be turned off if account is otherwise past due/delinquent. If the returned payment was used to avoid turn-off, water service will be turned off immediately, without prior notice to the owner.	\$35.00

<b>21. Service After Hours – Labor Rates:</b> All service provided after regular working hours, on weekends and holidays shall be at the after hours rate (3 hours minimum at time and a half).	Based on labor service charges schedule	
<b>22. Service Termination Notice Charge:</b> Prior to termination of utility service, District staff will send a Service Termination Notice by mail to the owner of the delinquent property account and, where applicable, to the owner's designated representative and the "resident" tenant.	\$20.00 per account	
<b>23. Sewer Stub Inspection Fee:</b> New connections or disconnects.	\$125.00/stub	
<b>24. Temporary Reactivation Fee:</b> Assessed for temporary reactivation of a service with a delinquent account balance, to facilitate the sale of the property.	\$70.00	
<b>25. Turn Off Meter Fee</b> (excluding maintenance during business hours or seasonal use):	During business hours (8:00 a.m. until 4:30 p.m.)	\$50.00
	After business hours, weekends and holidays	\$229.50
<b>26. Unauthorized Use of Water:</b> Unauthorized taking of water, tampering with equipment, unauthorized connection or operation of the District's system by any person, firm or corporation without prior written District's consent or without first obtaining a permit. Fee due and payable immediately upon unauthorized use.	\$200.00	

**SECTION 2. Equipment Service Charges:**

<u>Large Equipment</u>	<u>Per hour</u>
Backhoe	\$40.00
Dump Truck	\$62.00
Truck	\$20.00
Vac-Con (Vactor)	\$165.00
TV Van	\$65.00/hour + \$0.10/ linear foot
Compressor, Hole Hog, Backhoe Hydraulic Compactor, Trench Boxes Hydraulic Power Unit, etc.	\$22.50
<u>Small Equipment</u>	<u>Per hour</u>
Jackhammer, Whacker, Generator, Pumps, Tapping Machines, Pressure Washer, Chainsaw, Threader Power Head, Hydraulic Tools, etc.	\$9.00

**SECTION 3. Labor Service Charges:**

<u>Labor</u>	<u>Labor Rates per hour</u>	
	<u>during work hours</u>	<u>after hours (3 hours minimum)</u>
Developer Extension Plan Review and Field Services	\$68.00	\$102.00
District Field Personnel	\$51.00	\$76.50
District Office Personnel	\$46.00	\$69.00

**APPENDIX E**

**COLIFORM MONITORING PLAN  
COLIFORM SAMPLING LOCATION MAP**

# MUKILTEO WATER AND WASTEWATER DISTRICT

## **COLIFORM MONITORING PLAN**

SAMPLES GROUPS AND MAPS INCLUDED

# MUKILTEO WATER AND WASTEWATER DISTRICT

## COLIFORM MONITORING PLAN

### **INTRODUCTION**

The total coliform rule requires each public water system to collect coliform bacteria samples at sites which are representative of water throughout the distribution system. The locations where the samples are taken must be on a written sample site plan in accordance with WAC 246-290-300 3 (b) (I).

This amendment to the Department of Health's Drinking Water Regulations includes:

The purveyor of Group A systems shall prepare and adhere to a written coliform monitoring plan. The plan shall include but is not limited to:

- A. A system map or diagram showing the location of:
  - 1. Water sources;
  - 2. System facilities;
  - 3. Distribution Systems;
  - 4. Pressure Zones;
  - 5. Interconnections; and
  - 6. Coliform sample collection sites.
  
- B. A narrative describing sample site information to include:
  - 1. Populations served and service connections;
  - 2. Water sources;
  - 3. System facilities and processes for storage, treatment, and pressure regulation;
  - 4. Coliform sampling sites; and
  - 5. Sampling Schedule
  
- C. The purveyor shall:
  - 1. Keep the coliform monitoring plan on file with the system and make the plan available to the department for review;
  - 2. Revise the plan as directed by the department; and
  - 3. Base routine monitoring upon the coliform monitoring plan."

# MUKILTEO WATER AND WASTEWATER DISTRICT

## COLIFORM MONITORING PLAN

### A. SYSTEM INFORMATION

Mukilteo Water and Wastewater District  
PWS ID # 57550 J

**Source:** City of Everett

#### **Reservoir Storage:**

- #1 - 750,000 gallon reservoir at 807 Park Ave, Mukilteo
- #2 - 2.3 MG reservoir at 8300 44th Ave W, Mukilteo
- #4 - 4.5 MG reservoir stand pipe at 3300 109th ST SW, Paine Field
- #5 - 6.3 million gallon reservoir at 8300 44th Ave W Mukilteo

#### **TREATMENT:**

100% of the water is filtered and chlorinated at the City of Everett's water filtration plant prior to our purchase.

#### **PUMP STATIONS:**

Four pump stations and one transfer pump are operated as part of the District's water distribution system.

One of these stations provides additional pressure, when required to maintain adequate service to the Lamar Drive area of the Reservoir No. 1 Service Area. Normally, Everett's Reservoir No. 5 provides adequate pressure to the area. Improvements to the transmission line on Mukilteo Boulevard have reduced pressure fluctuations and this pump station is now used only during emergencies.

The second pump station is located at the District's Reservoir No. 2 site at 84th ST SW and 44th Ave W. This pump station contains two 99 HP, diesel-powered pumps capable of 1,750 GPM Each when operating at 150 feet of head. The primary function of this pump station is to provide additional supply to the 715 Pressure Zone within the West District Service Area during low pressure conditions. Low pressures may result from fire demands within this area or from problems with Everett's supply system.

Water supply to the pump station is provided by direct connection to the District's 2.3 MG Reservoir No. 2 and the 6.3 MG Reservoir No. 5 that serves the 620 Pressure Zone.

The third pump station is located at the District's Reservoir Number 1 site at 807 Park Ave. This station contains one 30 HP, electric powered pump capable of 300 gpm operating at 270 feet of head. The primary function of this pump is to supplement the 500-pressure zone within the west district service area with pressure and flow if needed. Normally, the two reservoirs at 8300 44<sup>th</sup> Ave W provide sufficient pressure and flow to this zone.

The fourth pump station is at Reservoir 4 to provide water from the Alderwood Water and Wastewater District (AWWD) to be used for system supply in the 715' zone. The pump station will lift water from AWWD's 635' HGL zone using up to two 40hp pumps. Two pumps are installed at this station to provide redundancy for a pump failure. The Pumps are operated using variable frequency drive units to allow for energy efficient use of the motors while operating at fractional speeds. The District operates this pump station as the preferred source for the 715' HGL.

#### **TRANSFER PUMP:**

There is one transfer pump located between the District's Reservoir No. 2 and No. 5 at 84th ST SW and 44th Ave W. It is housed in the site's pump house.

The primary purpose of the transfer pump is to limit the gravity draw down of either reservoir to approximately one-half full. The second purpose of the transfer pump is to de-water either reservoir during maintenance.

The transfer pump is a Byron Jackson pump with a capacity of approximately 2,200 gpm. The piping, pump can and electrical equipment are sized such that a 3200 gpm pump can be installed in the future.

#### **PRESSURE ZONES:**

Topographically, the District lies on a high plateau cut at several points by deep ravines. This geography contributes to four district service areas within the Mukilteo Water and Wastewater District: The Reservoir No. 1 Service Area, The West District Service Area, The Airport Service Area and the East District Service Area. The District's four service areas contain various pressure zones as shown in Table "A" and illustrated in Exhibit "A". The zones are inter-tied, where possible, to allow loop feeds to each zone through pressure reducing stations. Exhibit "A" (map included with the written plan) also shows inter-ties with Everett, Alderwood and Silver Lake Water Districts.

**Table A**

PRESSURE ZONES

Service Area	715	620	500	400	270
Reservoir No. 1					X
West District	X	X	X	X	
Airport District	X				
East District	X				

# MUKILTEO WATER AND WASTEWATER DISTRICT

## COLIFORM MONITORING PLAN

TOTAL POPULATION SERVED: 23,271

TOTAL NUMBER OF SERVICE CONNECTIONS: 5,689

POPULATION EXTRAPOLATED FROM 2010 COMPREHENSIVE PLAN

### **B. SAMPLING INFORMATION**

ROUTINE SAMPLING REQUIRED BY REGULATION: 25 samples per month

However, 30 routine samples are taken each month to adequately cover each pressure zone, reservoir, and source distribution.

Repeat sample sites are available upstream and downstream of all repeat sample sites. If for some reason a routine sampling site is unable to be used, move to the upstream or downstream repeat site and make note it was used that month for routine site. If a routine site is removed permanently, move to the closest available service, set up new sampling group and update sampling plan.

All water storage tanks can be sampled as necessary.

All sources can be sampled directly as necessary.

Repeat samples will be taken to confirm the original sample results and to determine the cause of the Coliform presence. One set of repeat samples shall be collected and submitted for analysis for every sample in which the presence of Coliform is detected. A set of repeat Coliform samples consist of:

- ◆ Site of previous sample with a coliform presence.
- ◆ The upstream repeat site. (Within 5 active services upstream of site of sample with a Coliform presence).
- ◆ The downstream repeat site. (Within 5 active services downstream of site of sample with a Coliform presence).

All samples in a set of repeat samples shall be collected on the same day and submitted for analysis within twenty four hours after notification by the laboratory of a Coliform presence.

## **Mukilteo Water and Wastewater District's procedure for taking bacterial samples**

Step 1: Samples are to be taken Monday or Tuesday of each month. Samples will not be taken the last week of the month or on the 13<sup>th</sup>!

Step 2: Choose set of locations to be done at that time in accordance with MWWD Monitoring Plan.

Step 3: Inspect sample bottles for cracks, missing seal, ect.

Step 4: Fill out all paper work for samples. Address stickers for bottles, sample sheets and CL2 recording sheet.

Step 5: Fill chlorine squirt bottle with 1/3 bleach to 2/3 water for disinfection.

Step 6: Once at sample station, inspect for damage, vandalism, ect. If station is covered with brush, grass, ect., remove all before beginning. You must take samples after 9:00am that day or they will be rejected by the lab.

Step 7: Disinfect sample station with bleach mixture at point of sample draw.

Step 8: Run water through sample station at full flow for at least 10 minutes.

Step 9: Check CL2 residual, if residual is normal for that area, continue with taking sample. If it is too low or too high, continue to flow water until optimal residual is reached. Once optimal residual is reached, turn flow down to a thin stream (about the width of a pencil) then let the water run for about a minute.

Step 10: Disinfect hands or use medical type gloves. Remove seal from bottle, remove cap using your finger tips and turning bottle instead of cap. Do not rinse sample bottle before filling. There is a powder in the sample bottle to neutralize any chlorine that may be present. Fill bottle to desired level and replace cap using same technique. DO NOT set the cap down, touch any part of the cap that touches the bottle, or let anything touch the rim of the bottle or inside of the cap!

Step 11: Inspect sample for discoloration or sediment. If sample is not satisfactory, throw bottle away and use new one.

Step 12: Fill out all required paper work for that sample. Make sure to fill out the lab form completely. The lab may reject the sample if it is not filled out completely and legibly.

Step 13: Secure the lab slip to the bottle with a rubber band. Repeat steps 6 – 13 until all samples are taken for the day.

Step 14: Once all samples are taken, take samples and all completed paper work to the Snohomish County Health District @ 3020 Rucker Ave, Everett, WA by 9:00am the next morning. Edge Analytical has a courier who picks up the samples and delivers them to the lab.

Repeat sample sets will be taken to:

Edge Analytical  
805 W. Orchard Dr Ste 4.  
Bellingham, WA 98225  
(800) 755-9295  
Fax (360) 757-1402

Or

AM-Test  
14603 NE 87th ST  
Redmond, WA 98052  
(425) 885-1664

Include with sample, the test number of original sample from  
Udder Health Systems.

### PUBLIC NOTICE INFORMATION

Herald Newspaper	Mailing Address: P.O. Box 930 Everett, WA 98206  Street Address: 1800 41 <sup>st</sup> St #S-300 Everett, WA 98203	Sharon Alyer (425) 339-3486 salyer@heraldnet.com  News Tips (425) 339-3428 newstips@heraldnet.com
KOMO 4 Television	140 4 <sup>th</sup> Ave N. Seattle, WA 98109	Newsroom (206) 404-4145 tips@komonews.com  Assignment Desk newsadx@komotv.com  Breaking News 1-TV-TIPS-KOMO 1-888-477-5666
KING 5 Television	333 Dexter Ave N. Seattle, WA 98109	Assignment Desk (206) 448-3850 newstips@king5.com
KIRO 7 Television	2807 Third Ave Seattle, WA 98121	Assignment Desk (206) 728-8308 newstips@kirotv.com

# MUKILTEO WATER AND WASTEWATER DISTRICT

## Coliform Monitoring Plan

	JAN	FEB	MAR	APR	MAY	JUN
	MONTH 1	MONTH 2	MONTH 3	MONTH 4	MONTH 5	MONTH 6
WEEK 2	1 thru 15	31 thru 45	16 thru 30	1 thru 15	31 thru 45	16 thru 30
WEEK 3	16 thru 30	1 thru 15	31 thru 45	16 thru 30	1 thru 15	31 thru 45

	JUL	AUG	SEPT	OCT	NOV	DEC
	MONTH 7	MONTH 8	MONTH 9	MONTH 10	MONTH 11	MONTH 12
WEEK 2	1 thru 15	31 thru 45	16 thru 30	1 thru 15	31 thru 45	16 thru 30
WEEK 3	16 thru 30	1 thru 15	31 thru 45	16 thru 30	1 thru 15	31 thru 45

Each DOT on the enclosed Coliform Monitoring Map corresponds to the above sample number.

Thirty (30) water samples will be taken on a rotating basis. Samples will be taken at a minimum of 45 different locations.

# MUKILTEO WATER AND WASTEWATER DISTRICT

## SAMPLE GROUPS

Sample # 1	Address	E/W/PF Area	PSI Zone
Routine	11121 6 <sup>TH</sup> Ave W (S.S.)	E	715
Repeat Upstream	11113 6 <sup>TH</sup> Ave W	E	715
Repeat Downstream	11126 6 <sup>TH</sup> Ave W	E	715

Sample # 2	Address	E/W/PF Area	PSI Zone
Routine	1 <sup>st</sup> Dr/107 <sup>th</sup> St SE (S.S)	E	715
Repeat Upstream	21 107 <sup>th</sup> St SE	E	715
Repeat Downstream	102 107 <sup>th</sup> St SE	E	715

Sample # 3	Address	E/W/PF Area	PSI Zone
Routine	106 <sup>th</sup> and 4 <sup>th</sup> Ave (S.S)	E	715
Repeat Upstream	10517 4 <sup>th</sup> Ave W	E	715
Repeat Downstream	10609 4 <sup>th</sup> Ave W	E	715

Sample # 4	Address	E/W/PF Area	PSI Zone
Routine	650 105 <sup>TH</sup> St SW (S.S)	E	715
Repeat Upstream	611 105 <sup>TH</sup> St SW #A	E	715
Repeat Downstream	701 105 <sup>TH</sup> St SW	E	715

Sample # 5	Address	E/W/PF Area	PSI Zone
Routine	44 <sup>th</sup> Ave W / Woodcrest (S.S)	W	715
Repeat Upstream	Woodcrest Garage	W	715
Repeat Downstream	8440 44 <sup>TH</sup> Ave W	W	715

# MUKILTEO WATER AND WASTEWATER DISTRICT

## SAMPLE GROUPS

Sample # 6	Address	E/W/PF Area	PSI Zone
Routine	88 <sup>th</sup> and 46 <sup>th</sup> (S.S)	W	620
Repeat Upstream	8788 46 <sup>th</sup> PL W	W	620
Repeat Downstream	4631 88 <sup>th</sup> St SW	W	620

Sample # 7	Address	E/W/PF Area	PSI Zone
Routine	8962 48 <sup>th</sup> PL W	W	620
Repeat Upstream	8978 48 <sup>th</sup> PL W	W	620
Repeat Downstream	8946 48 <sup>th</sup> PL W	W	620

Sample # 8	Address	E/W/PF Area	PSI Zone
Routine	8025 53 <sup>rd</sup> Ave W (S.S.)	W	715
Repeat Upstream	8019 53 <sup>rd</sup> Ave W	W	715
Repeat Downstream	8035 53 <sup>rd</sup> Ave W #A	W	715

Sample # 9	Address	E/W/PF Area	PSI Zone
Routine	7092 44 <sup>TH</sup> PL W (S.S)	W	715
Repeat Upstream	7096 44 <sup>TH</sup> PL W	W	715
Repeat Downstream	7086 44 <sup>TH</sup> PL W	W	715

Sample # 10	Address	E/W/PF Area	PSI Zone
Routine	2310 Washington Ave (S.S.)	W	500
Repeat Upstream	2311 Washington Ave	W	500
Repeat Downstream	2331 Washington Ave	W	500

# MUKILTEO WATER AND WASTEWATER DISTRICT

## SAMPLE GROUPS

Sample # 11	Address	E/W/PF Area	PSI Zone
Routine	1826 19 <sup>th</sup> Dr (S.S.)	W	500
Repeat Upstream	1809 19 <sup>TH</sup> Dr	W	500
Repeat Downstream	1802 19 <sup>TH</sup> Dr	W	500

Sample # 12	Address	E/W/PF Area	PSI Zone
Routine	1317 Goat Trail Ct. (S.S.)	W	620
Repeat Upstream	1323 Goat Trail Ct	W	620
Repeat Downstream	1311 Goat Trail Ct	W	620

Sample # 13	Address	E/W/PF Area	PSI Zone
Routine	703 Washington Ave (S.S)	W	400
Repeat Upstream	905 Washington Ave	W	400
Repeat Downstream	811 Washington Ave	W	400

Sample # 14	Address	E/W/PF Area	PSI Zone
Routine	944 4 <sup>TH</sup> St (S.S)	W	270
Repeat Upstream	945 4 <sup>TH</sup> St	W	270
Repeat Downstream	931 4 <sup>TH</sup> St	W	270

Sample # 15	Address	E/W/PF Area	PSI Zone
Routine	PRV VAULT Lamar Dr (S.S)	W	400
Repeat Upstream	204 Lamar Dr	W	400
Repeat Downstream	1503 Mukilteo Blvd	W	400

# MUKILTEO WATER AND WASTEWATER DISTRICT

## SAMPLE GROUPS

Sample # 16	Address	E/W/PF Area	PSI Zone
Routine	304 Mukilteo Speedway (S.S.)	W	270
Repeat Upstream	308 Washington	W	270
Repeat Downstream	305 Washington	W	270

Sample # 17	Address	E/W/PF Area	PSI Zone
Routine	1347 Hill St (S.S.)	W	620
Repeat Upstream	1358 Hill St	W	620
Repeat Downstream	1345 Hill St	W	620

Sample # 18	Address	E/W/PF Area	PSI Zone
Routine	9 <sup>th</sup> and Park (S.S.)	W	500
Repeat Upstream	902 Park	W	500
Repeat Downstream	907 Park	W	500

Sample # 19	Address	E/W/PF Area	PSI Zone
Routine	Ent. Caymus Townhomes (S.S.)	W	620
Repeat Upstream	4806 Caymus Lane	W	620
Repeat Downstream	Towneplace Suites Maint Office	W	620

Sample # 20	Address	E/W/PF Area	PSI Zone
Routine	53 <sup>RD</sup> Ave W / 88 <sup>TH</sup> St (S.S.)	W	620
Repeat Upstream	5234 88 <sup>TH</sup> St SW	W	620
Repeat Downstream	8803 53 <sup>RD</sup> PL W	W	620

# MUKILTEO WATER AND WASTEWATER DISTRICT

## SAMPLE GROUPS

Sample # 21	Address	E/W/PF Area	PSI Zone
Routine	9450 55 <sup>TH</sup> Ave W	W	620
Repeat Upstream	5612 94 <sup>TH</sup> PL SW	W	620
Repeat Downstream	9471 55 <sup>TH</sup> Ave W	W	620

Sample # 22	Address	E/W/PF Area	PSI Zone
Routine	9212 60 <sup>TH</sup> Ave W (S.S)	W	400
Repeat Upstream	9215 60 <sup>TH</sup> Ave W	W	400
Repeat Downstream	9225 60 <sup>TH</sup> Ave W	W	400

Sample # 23	Address	E/W/PF Area	PSI Zone
Routine	9331 61 <sup>ST</sup> Ave W (S.S)	W	500
Repeat Upstream	9321 61 <sup>ST</sup> Ave W	W	500
Repeat Downstream	9403 61 <sup>ST</sup> Ave W	W	500

Sample # 24	Address	E/W/PF Area	PSI Zone
Routine	10703 Marine View Dr (S.S)	W	400
Repeat Upstream	10709 Marine View Dr	W	400
Repeat Downstream	10625 Marine View Dr	W	400

Sample # 25	Address	E/W/PF Area	PSI Zone
Routine	5733 Central Dr (S.S.)	W	500
Repeat Upstream	5717 Central Dr	W	500
Repeat Downstream	5809 Central Dr	W	500

# MUKILTEO WATER AND WASTEWATER DISTRICT

## SAMPLE GROUPS

Sample # 26	Address	E/W/PF Area	PSI Zone
Routine	5525 107 <sup>TH</sup> St SW (S.S)	W	620
Repeat Upstream	5530 107 <sup>TH</sup> St SW	W	620
Repeat Downstream	5531 107 <sup>TH</sup> St SW	W	620

Sample # 27	Address	E/W/PF Area	PSI Zone
Routine	11324 Mukilteo Speedway	W	715
Repeat Upstream	11110 Mukilteo Speedway	W	715
Repeat Downstream	11524 Mukilteo Speedway	W	715

Sample # 28	Address	E/W/PF Area	PSI Zone
Routine	112 <sup>th</sup> St and Hwy 99 (S.S.)	E	715
Repeat Upstream	1126 112 <sup>th</sup> St SW	E	715
Repeat Downstream	11311 Hwy 99	E	715

Sample # 29	Address	E/W/PF Area	PSI Zone
Routine	3101 111 <sup>th</sup> St SW	P/F	715
Repeat Upstream	3101 111 <sup>th</sup> St SW #E	P/F	715
Repeat Downstream	3101 111 <sup>th</sup> St SW #M	P/F	715

Sample # 30	Address	E/W/PF Area	PSI Zone
Routine	9724 32 <sup>ND</sup> PL	E	715
Repeat Upstream	Snohomish Co. Airport (OFFICE)	E	715
Repeat Downstream	10203 31 <sup>ST</sup> Ave W #C-57	E	715

# MUKILTEO WATER AND WASTEWATER DISTRICT

## SAMPLE GROUPS

Sample # 31	Address	E/W/PF Area	PSI Zone
Routine	RES #1 Outlet Vault (S.S.)	W	270
Repeat Upstream	RES #1 Inlet Vault	W	270
Repeat Downstream	612 Park St	W	270

Sample # 32	Address	E/W/PF Area	PSI Zone
Routine	Highland Terr Ct/Goat Trl Rd (S.S.)	W	500
Repeat Upstream	1604 Highland Terrace Ct	W	500
Repeat Downstream	1602 Goat Trail Rd	W	500

Sample # 33	Address	E/W/PF Area	PSI Zone
Routine	4810 72 <sup>nd</sup> Pl. SW (S.S.)	W	620
Repeat Upstream	4806 72 <sup>nd</sup> Pl. SW	W	620
Repeat Downstream	4814 72 <sup>nd</sup> Pl. SW	W	620

Sample # 34	Address	E/W/PF Area	PSI Zone
Routine	44 <sup>th</sup> and 76 <sup>th</sup> (S.S.)	W	715
Repeat Upstream	7704 44 <sup>th</sup> Ave W	W	715
Repeat Downstream	4414 76 <sup>th</sup> St SW	W	715

Sample # 35	Address	E/W/PF Area	PSI Zone
Routine	RES #2 OUTLET (CL2 ANALYZER)	W	620
Repeat Upstream	Res #5 Inlet Vault	W	620
Repeat Downstream	8522 Mukilteo Speedway	W	620

# MUKILTEO WATER AND WASTEWATER DISTRICT

## SAMPLE GROUPS

Sample # 36	Address	E/W/PF Area	PSI Zone
Routine	88 <sup>th</sup> and 45 <sup>th</sup> PL (S.S.)	W	620
Repeat Upstream	4519 88 <sup>th</sup> St SW	W	620
Repeat Downstream	4605 88 <sup>th</sup> St SW	W	620

Sample # 37	Address	E/W/PF Area	PSI Zone
Routine	10115 50 <sup>TH</sup> PL W	W	620
Repeat Upstream	10131 50 <sup>TH</sup> PL W	W	620
Repeat Downstream	10107 50 <sup>TH</sup> PL W	W	620

Sample # 38	Address	E/W/PF Area	PSI Zone
Routine	9788 Marine View Dr (S.S.)	W	400
Repeat Upstream	9784 Marine View Dr	W	400
Repeat Downstream	9800 Marine View Dr	W	400

Sample # 39	Address	E/W/PF Area	PSI Zone
Routine	11123 55 <sup>TH</sup> Ave W (S.S.)	W	500
Repeat Upstream	5432 111 <sup>TH</sup> PL SW	W	500
Repeat Downstream	11122 55 <sup>TH</sup> Ave W	W	500

Sample # 40	Address	E/W/PF Area	PSI Zone
Routine	6533 ST Andrews Dr (S.S.)	W	620
Repeat Upstream	6526 ST Andrews Dr	W	620
Repeat Downstream	6535 ST Andrews Dr	W	620

# MUKILTEO WATER AND WASTEWATER DISTRICT

## SAMPLE GROUPS

Sample # 41	Address	E/W/PF Area	PSI Zone
Routine	10823 53 <sup>rd</sup> Ave. W	W	620
Repeat Upstream	10829 53 <sup>rd</sup> Ave. W	W	620
Repeat Downstream	10815 53 <sup>rd</sup> Ave. W	W	620

Sample # 42	Address	E/W/PF Area	PSI Zone
Routine	BLD #7 Baycourt APTS (S.S.)	W	620
Repeat Upstream	BLD #6 Baycourt APTS	W	620
Repeat Downstream	BLD #26 Baycourt APTS	W	620

Sample # 43	Address	E/W/PF Area	PSI Zone
Routine	47 <sup>th</sup> and 109th (S.S.)	W	620
Repeat Upstream	10733 47 <sup>th</sup> PL W	W	620
Repeat Downstream	10802 47 <sup>th</sup> Ave W	W	620

Sample # 44	Address	E/W/PF Area	PSI Zone
Routine	112 <sup>th</sup> and 7 <sup>th</sup> PL (S.S.)	E	715
Repeat Upstream	11118 6 <sup>th</sup> Ave W	E	715
Repeat Downstream	805 112 <sup>th</sup> St SW	E	715

Sample # 45	Address	E/W/PF Area	PSI Zone
Routine	11426 3 <sup>RD</sup> PL W	E	715
Repeat Upstream	11502 3 <sup>RD</sup> PL W	E	715
Repeat Downstream	11423 3 <sup>RD</sup> PL W	E	715

# MUKILTEO WATER AND WASTEWATER DISTRICT

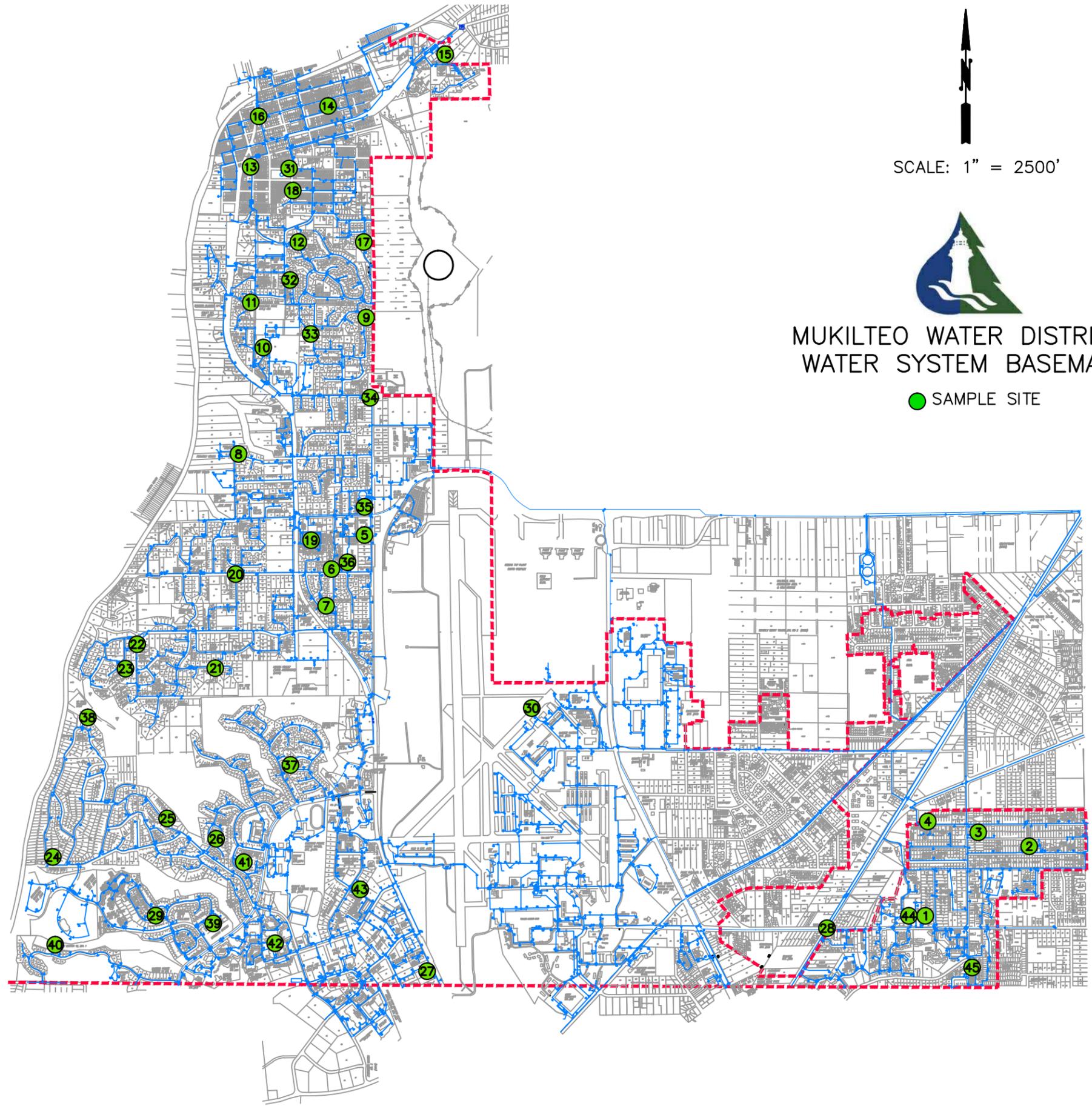
## COLIFORM MONITORING PLAN

### C. PLAN PREPARATION INFORMATION

PREPARED BY KEVIN ENGLISH, (FORMER) OPERATIONS SUPERVISOR,  
RICK MATTHEWS, OPERATIONS SUPERVISOR AND JARED ALEXANDER,  
WATER QUALITY TECH, MUKILTEO WATER AND WASTEWATER  
DISTRICT.

PREPARED APRIL 1991  
UPDATED AUGUST 1992  
UPDATED APRIL 1998  
UPDATED NOV 2000  
UPDATED APRIL 2003  
UPDATED JANUARY 2004  
UPDATED OCTOBER 2004  
UPDATED JANUARY 2005  
UPDATED JULY 2006  
UPDATED August 19, 2010  
REVISED January 10, 2011  
UPDATED November 2014  
UPDATED March 2015





SCALE: 1" = 2500'



# MUKILTEO WATER DISTRICT WATER SYSTEM BASEMAP

● SAMPLE SITE

**APPENDIX F**

**CONSUMER CONFIDENCE REPORT**

# Drinking Water Quality Report 2014

Mukilteo Water and Wastewater District

# Mountain Fresh!



## Clean, Safe Drinking Water Delivered to Your Tap

Your drinking water comes from Spada Lake Reservoir, located about 30 miles east of Everett at the headwaters of the Sultan River. This 50-billion-gallon storage facility serves as a collection point for rain and snowmelt from the Cascade Mountains. It was created in 1964 through a partnership between the City of Everett and the Snohomish County PUD as part of the Jackson Hydroelectric Project.

Spada Lake Reservoir is located in the Upper Sultan River Watershed, an area encompassing more than 80 square miles. This is one of the wettest watersheds in the continental United States. The average annual rainfall is about 165 inches—five times the rainfall in Everett.

Water quality in the Sultan Basin is carefully monitored. To protect the naturally pristine water in Spada Lake Reservoir, the watershed is patrolled and human activities are limited to minimize the impact on water quality. We continue to evaluate and adjust our security measures on an ongoing basis.

## Taste, Quality and Value

Water is a life-essential resource. Yet, at about a penny a gallon, it costs very little compared to its value.

Your water rates pay for everything it takes to operate our water system, from storage and treatment, to delivering the water to your tap. Your water rates also help pay for water system improvements that ensure that we will provide high-quality drinking water for generations to come.

As this year's Drinking Water Quality Report shows, this is an exceptional value for the clean, safe, great-tasting drinking water you receive.



## The Drinking Water Treatment Process

From Spada Reservoir, water travels through a pipeline to Chaplain Reservoir which holds about 4.5 billion gallons of water. This is where the Everett Drinking Water Treatment Plant is located. At the plant, the water is treated with advanced filtration and disinfection.

First, a coagulant is added to the water to cause particles to clump together. Next, the water passes through large filters that remove the particles. These particles can include sediment and natural materials as well as viruses, bacteria and other disease-causing organisms. Finally, sodium hypochlorite

solution is added to the water to kill any organisms that were not removed by the filtration process.

During the treatment process, polymers are added as part of the filtration process, fluoride is added for dental health purposes and soda ash is added to adjust the pH level of water so it is less corrosive on pipes and plumbing fixtures. These additives are carefully monitored and the water is continually tested to make sure it is safe to drink.

1.

Precipitation and snowmelt from the mountains are collected in Spada Lake Reservoir.



1

2

2.

The water treatment process begins at Lake Chaplain Reservoir, where the City's water treatment plant is located.



3

3. The Everett Drinking Water Treatment Plant treats water using coagulation, flocculation, filtration and disinfection.



4

4. Water transmission pipelines carry drinking water to Everett.



5

5. Treated water is delivered to about 570,000 people or 80 percent of the businesses and households in Snohomish County.



# Your Drinking Water Facts and Figures

All water sources (both tap water and bottled water) contain impurities. As water flows over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

- Microbial contaminants such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban surface water, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban surface water and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and may also come from gas stations, urban stormwater runoff and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.



In order to ensure that tap water is safe to drink, US Environmental Protection Agency (EPA) prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA Safe Drinking Water Hotline at 1-800-426-4791.

Some people may be more vulnerable to contaminants in drinking water than the general population.

Immuno-compromised people, such as people with cancer undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA and US Center for Disease Control (CDC) guidelines on appropriate means to lessen risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.

## Important Terms:

**Maximum Contaminant Level Goal (MCLG)** – The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**Maximum Contaminant Level (MCL)** – The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available water treatment technology.

**Maximum Residual Disinfectant Level (MRDL)** – The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

**Maximum Residual Disinfectant Level Goal (MRDLG)** – The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

**Treatment Technique (TT)** – A required process and performance criteria intended to reduce the level of a contaminant in drinking water.

**Action Level (AL)** – The concentration of a contaminant, which, if exceeded, triggers a treatment or other requirements which a water system must follow.

**Parts per Million (ppm)/ Parts per Billion (ppb)/Parts per Trillion (ppt)** – A part per million means that one part of a particular contaminant is present for every million parts of water. Similarly, parts per billion and parts per trillion indicate that one part of a contaminant is present for those quantities of water.

**Not Applicable (N/A)** – Means the EPA has not established MCLGs for these substances.

## DETECTED REGULATED CONTAMINANTS

Parameter	Major Source	Units	EPA Regulations		MWWD Results		
			Ideal Level/Goal (MCLG)	Maximum Allowable (MCL)	Range or Other	Average Value or Highest Result	Comply?
Nitrate	Erosion of natural deposits, animal waste	ppm	10	10	0.011–0.086	0.046	Yes
Total Coliform Bacteria <sup>1</sup>	Naturally present in the environment	% Positive	0	5% Positive per Month	0	0	Yes
Fluoride <sup>2</sup>	Dental health additive	ppm	2	4	0.2–0.9	0.8	Yes
Residual Disinfectant Level (free chlorine)	Added as a drinking water disinfectant	ppm	4.0 (MRDLG)	4.0 (MRDL)	0.06–1.0	0.48	Yes
Haloacetic Acids (5) (HAA5)	By-product of drinking water chlorination	ppb	N/A	60	23.8–36.9	29.5	Yes
Total Trihalomethanes (TTHM)	By-product of drinking water chlorination	ppb	N/A	80	26.6–58.2	39.4	Yes
Turbidity <sup>3</sup>	Soil erosion	NTU	N/A	TT	100%	0.11	Yes

<sup>1</sup>One routine total coliform sample collected in November 2014 was positive. The location was retested and the results were negative.

<sup>2</sup>0.8 ppm is the lowest level allowed under current State regulations. The 0.2 value in the range is due to the fact that the fluoride system was shut down for 24 hours in November 2014 for repairs.

<sup>3</sup>In 2014, no filtered water turbidity results were above the EPA 0.3 NTU limit so 100% met the requirement.

## DETECTED UNREGULATED CONTAMINANTS

Parameter	Units	Ideal Level/Goal (MCLG)	MWWD Results	
			Range Detected	Average Value
Bromodichloromethane	ppb	0	1.4–2.8	1.9
Chloroform (trichloromethane)	ppb	300	25.2–55.4	37.6
Dichloroacetic Acid	ppb	0	2.9–16.0	10.3
Monochloroacetic Acid	ppb	None	2.4–2.6	N/A
Trichloroacetic Acid	ppb	300	14.2–23.3	18.9

These substances are individual disinfection by-products for which no MCL standard has been set, but which must be monitored.

## UNREGULATED CONTAMINANT MONITORING RULE 3 (UCMR3) SAMPLING

Parameter	Major Source	Units	Everett Water Results*		MWWD Results**	
			Range Detected	Average Value or Highest Result	Range Detected	Average Value or Highest Result
Chlorate	By-product of drinking water chlorination	ppb	26–80	53	38.6–61.7	50.7
Chromium	Naturally present in the environment	ppb	0.22–0.32	0.29	0.30–0.31	0.31
Chromium-6	Naturally present in the environment	ppb	0.20–0.29	0.25	0.31–0.35	0.33
Strontium	Naturally present in the environment	ppb	14–16	15	15.6–16.7	16.2
Vanadium	Erosion of natural deposits	ppb	<0.2–0.20	<0.2	0.15–0.19	0.17
4-androstene-3, 17-dione	Naturally present in the environment	ppt	<0.3–0.38	<0.3		

\*Samples taken at treatment plant effluent. \*\*Samples taken a maximum site in the distribution system.

## LEAD, COPPER AND pH

Parameter	Major Source	Units	EPA Regulations		MWWD Results		
			Ideal Level/Goal (MCLG)	Action Level (AL)	90th % Level	Homes Exceeding the AL	Comply?
Lead <sup>1</sup>	Plumbing, erosion of natural deposits	ppb	0	15	0.0014	None	Yes
Copper <sup>1</sup>	Plumbing, erosion of natural deposits	ppm	0.02	1.3	0.0495	None	Yes
pH <sup>2</sup>	Soda ash is used to reduce water corrosivity by increasing pH and alkalinity	s.u.	Daily Avg 7.6	Min Daily Avg 7.4	Average 7.6	Minimum* 7.4	Yes

<sup>1</sup>This data was collected in 2012. The next round of sampling will be conducted in 2015.

<sup>2</sup>The average daily pH cannot be below 7.4 for more than nine days every six months. In 2014, the average daily pH never dropped below 7.4.

### USEPA required lead statement. The USEPA drinking water regulations require this statement be included with the lead and copper sampling results regardless of the levels observed:

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Mukilteo Water and Wastewater District is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to two minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at <http://www.epa.gov/safewater/lead>.

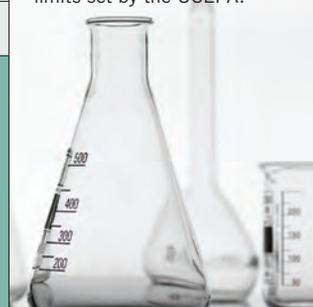
## Definitions & Required Statements

### CRYPTOSPORIDIUM:

Cryptosporidium is a one-celled intestinal parasite that if ingested may cause diarrhea, fever, and other gastrointestinal distress. It can be found in all of Washington's rivers, streams, and lakes and comes from animal or human waste in the watershed. Cryptosporidium is resistant to chlorine, but is removed by effective filtration and sedimentation treatment such as that used by Everett. It can also be inactivated by certain types of alternate disinfection processes such as ozonation and UV light contactors. Past monitoring results suggest that Cryptosporidium is present in Everett's source only occasionally and at very low concentrations. In 2014, Everett collected monthly Cryptosporidium oocysts samples from the source water at the plant intakes. No oocysts were detected.

### TREATMENT POLYMERS:

During water treatment, organic polymer coagulants are added to improve the coagulation and filtration processes that remove particulates from water. The particulates that are removed can include viruses, bacteria and other disease causing organisms. The USEPA sets limits on the type and amount of polymer that a water system can add to the water. In addition to the EPA limits, the State of Washington requires that all polymers used be certified safe for potable water use by an independent testing organization (NSF International). During treatment, Everett adds only NSF approved polymers and the levels used are far below the safe limits set by the USEPA.



# Ensuring an Adequate Supply

2014 Mukilteo Water and Wastewater District • Annual Water Use Efficiency Performance Report (WUER)

Water is a precious resource. Conservation helps fill the needs of people, industries, businesses and farms, while also keeping fish and other aquatic life alive and well.

The District has set conservation goals in accordance with the WUER and is required to report our progress and accomplishments annually.

One of our conservation goals is met by our continued participation in the City of Everett's Regional Water Conservation Program. This program is planned and developed with the water systems that are served with treated water from the City of Everett and is funded from water system revenues.

Nearly \$7 million has been invested in regional water conservation activities since 2001. This includes such things as school education, indoor and outdoor water conservation kits, rebates for water efficient clothes washers and toilets, leak detection, business water audits and school irrigation audits. In 2014, 630 water conservation workshops were conducted in classrooms throughout Snohomish County, reaching more than 16,200 students. Participating water

systems also distributed more than 2,500 indoor conservation kits and 4,000 outdoor conservation kits. These 2014 activities are estimated to have saved about .065 million gallons per day (MGD) regionally. Through these efforts, the program has saved about 3.7 MGD, enough water to fill more than 87,000 bathtubs a day.

A second conservation goal is to maintain a distribution leakage rate significantly less than the 10% requirement of the WUER. All the water MWWDD distributed to our customers in 2014 was treated by the City of Everett. In 2014, the District purchased over 643 million gallons of water. The difference between purchases and sales in 2014 indicates a distribution system leakage rate of less than 1.7%, well under the WUER requirement.

Mukilteo Water and Wastewater District pursued an aggressive conservation approach prior to the WUER requirement. Annual customer leak surveys, distribution leak surveys, blow-off replacements, customer consumption databases and irrigation management were and still are utilized to help us and our customers achieve our conservation goals. The District estimates it has received substantial water savings. The average savings for the last 8 years is estimated at 1.2%. This would calculate to 20,719 gallons per day or 7.56 million gallons per year, utilizing 2014 production data. The District is on track to meet its stated goals.



## CONSERVATION TIPS:

- Install water-efficient showerheads and take shorter showers.
- Fix leaky faucets and toilets. Leaks waste a lot of water.
- Install low-flow toilets. This can reduce indoor water use by as much as 20 percent.
- Only run full loads in your dishwasher and clothes washer.
- Use a soaker hose on steep slopes to prevent wasteful runoff.
- Water small areas by hand to avoid watering the sidewalk and driveway.
- Replace grass in seldom-used areas of your yard with groundcovers and plants that use less water.
- Adjust your mower to a higher setting. A taller lawn retains moisture and requires less water.
- Put a layer of mulch around plants and trees. Mulch holds moisture and discourages weed growth.

For more information about our water conservation programs, go to [www.everettwa.gov/conservation](http://www.everettwa.gov/conservation).

## Partnership for Safe Water

The Partnership for Safe Water is a voluntary effort supported by more than 200 water utilities, the US Environmental Protection Agency (EPA), the American Water Works Association and other prominent drinking water organizations in the United States. The goal of the program is for participating utilities to use a continuous improvement process developed by the Partnership members.

The program is designed to help drinking water utilities optimize their treatment plants to produce drinking water of a higher quality than is required by regulations. To participate, each treatment plant must demonstrate that it can consistently meet the Partnership's high water-quality standards.

Since the City of Everett began participating in the program more than a decade ago, it has met the performance standards set by the Partnership. Recently, Everett renewed its commitment to continuously improve performance at its water treatment plant and is implementing some of the Partnership's tools to optimize performance at the plant.

The City of Everett will continue to participate in this cooperative effort to strive for excellence. We believe this is the best way to ensure our customers will always receive the highest quality drinking water possible.





**Mukilteo Water and  
Wastewater District**

7824 Mukilteo Speedway  
Mukilteo, WA 98275-0260

PRSRT STD  
U.S. POSTAGE  
**PAID**  
PERMIT NO. 71  
EVERETT, WA

## **INSIDE:** Your Drinking Water Quality Report

In 2014, your water was tested for more than 100 possible contaminants. What does all the information in this report mean? Simply put, the data confirms that your drinking water meets or exceeds all government standards and is safe to drink.

### ***Your Opinion Matters***

Let us know how we're doing and what you think about your water. Call 425-355-3355 or email us at [info@mukilteowwd.org](mailto:info@mukilteowwd.org).

## **What You Can Do:** **CONSERVE** **BE INFORMED** **GET INVOLVED**

### **Mukilteo Water and Wastewater District**

Phone: 425-355-3355  
Website: [www.mukilteowwd.org](http://www.mukilteowwd.org)

### **State Department of Health (DOH)**

Phone: 1-800-521-0323  
Website: [www.doh.wa.gov/ehp/dw/](http://www.doh.wa.gov/ehp/dw/)

### **US Environmental Protection Agency (EPA)**

Phone: 1-800-426-4791  
Website: [www.epa.gov/safewater](http://www.epa.gov/safewater)

**To get involved** in decisions affecting your drinking water, attend and comment at MWWD Board of Commissioners meetings the first and third Wednesdays of each month at 7:00 p.m.

### **MWWD Board of Commissioners:**

Mike Johnson, Thomas McGrath, Thomas Rainville

**Learn more about your water  
at [www.mukilteowwd.org](http://www.mukilteowwd.org).**

**PUBLISHED BY MUKILTEO WATER AND WASTEWATER DISTRICT**  
Editors: Greg Moore, Jodi Kerslake  
Water Quality Specialist: Jared Alexander

*This report is required and costs about 40 cents to produce and mail to you.*

## DETECTED REGULATED CONTAMINANTS

Parameter	Major Source	Units	EPA Regulations		MWWD Results		
			Ideal Level/Goal (MCLG)	Maximum Allowable (MCL)	Range or Other	Average Value or Highest Result	Comply?
Nitrate	Erosion of natural deposits, animal waste	ppm	10	10	0.011–0.086	0.046	Yes
Total Coliform Bacteria <sup>1</sup>	Naturally present in the environment	% Positive	0	5% Positive per Month	0	0	Yes
Fluoride <sup>2</sup>	Dental health additive	ppm	2	4	0.2–0.9	0.8	Yes
Residual Disinfectant Level (free chlorine)	Added as a drinking water disinfectant	ppm	4.0 (MRDLG)	4.0 (MRDL)	0.06–1.0	0.48	Yes
Haloacetic Acids (5) (HAA5)	By-product of drinking water chlorination	ppb	N/A	60	23.8–36.9	29.5	Yes
Total Trihalomethanes (TTHM)	By-product of drinking water chlorination	ppb	N/A	80	26.6–58.2	39.4	Yes
Turbidity <sup>3</sup>	Soil erosion	NTU	N/A	TT	100%	0.11	Yes

<sup>1</sup>One routine total coliform sample collected in November 2014 was positive. The location was retested and the results were negative.

<sup>2</sup>0.8 ppm is the lowest level allowed under current State regulations. The 0.2 value in the range is due to the fact that the fluoride system was shut down for 24 hours in November 2014 for repairs.

<sup>3</sup>In 2014, no filtered water turbidity results were above the EPA 0.3 NTU limit so 100% met the requirement.

## DETECTED UNREGULATED CONTAMINANTS

Parameter	Units	Ideal Level/Goal (MCLG)	MWWD Results	
			Range Detected	Average Value
Bromodichloromethane	ppb	0	1.4–2.8	1.9
Chloroform (trichloromethane)	ppb	300	25.2–55.4	37.6
Dichloroacetic Acid	ppb	0	2.9–16.0	10.3
Monochloroacetic Acid	ppb	None	2.4–2.6	N/A
Trichloroacetic Acid	ppb	300	14.2–23.3	18.9

These substances are individual disinfection by-products for which no MCL standard has been set, but which must be monitored.

## UNREGULATED CONTAMINANT MONITORING RULE 3 (UCMR3) SAMPLING

Parameter	Major Source	Units	Everett Water Results*		MWWD Results**	
			Range Detected	Average Value or Highest Result	Range Detected	Average Value or Highest Result
Chlorate	By-product of drinking water chlorination	ppb	26–80	53	38.6–61.7	50.7
Chromium	Naturally present in the environment	ppb	0.22–0.32	0.29	0.30–0.31	0.31
Chromium-6	Naturally present in the environment	ppb	0.20–0.29	0.25	0.31–0.35	0.33
Strontium	Naturally present in the environment	ppb	14–16	15	15.6–16.7	16.2
Vanadium	Erosion of natural deposits	ppb	<0.2–0.20	<0.2	0.15–0.19	0.17
4-androstene-3, 17-dione	Naturally present in the environment	ppt	<0.3–0.38	<0.3		

\*Samples taken at treatment plant effluent. \*\*Samples taken a maximum site in the distribution system.

## LEAD, COPPER AND pH

Parameter	Major Source	Units	EPA Regulations		MWWD Results		
			Ideal Level/Goal (MCLG)	Action Level (AL)	90th % Level	Homes Exceeding the AL	Comply?
Lead <sup>1</sup>	Plumbing, erosion of natural deposits	ppb	0	15	0.0014	None	Yes
Copper <sup>1</sup>	Plumbing, erosion of natural deposits	ppm	0.02	1.3	0.0495	None	Yes
pH <sup>2</sup>	Soda ash is used to reduce water corrosivity by increasing pH and alkalinity	s.u.	Daily Avg 7.6	Min Daily Avg 7.4	Average 7.6	Minimum* 7.4	Yes

<sup>1</sup>This data was collected in 2012. The next round of sampling will be conducted in 2015.

<sup>2</sup>The average daily pH cannot be below 7.4 for more than nine days every six months. In 2014, the average daily pH never dropped below 7.4.

### USEPA required lead statement. The USEPA drinking water regulations require this statement be included with the lead and copper sampling results regardless of the levels observed:

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The Mukilteo Water and Wastewater District is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to two minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at <http://www.epa.gov/safewater/lead>.

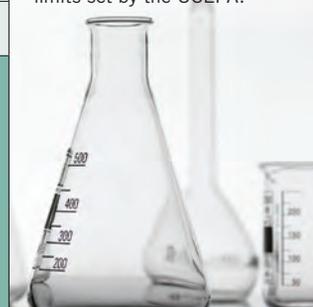
## Definitions & Required Statements

### CRYPTOSPORIDIUM:

Cryptosporidium is a one-celled intestinal parasite that if ingested may cause diarrhea, fever, and other gastrointestinal distress. It can be found in all of Washington's rivers, streams, and lakes and comes from animal or human waste in the watershed. Cryptosporidium is resistant to chlorine, but is removed by effective filtration and sedimentation treatment such as that used by Everett. It can also be inactivated by certain types of alternate disinfection processes such as ozonation and UV light contactors. Past monitoring results suggest that Cryptosporidium is present in Everett's source only occasionally and at very low concentrations. In 2014, Everett collected monthly Cryptosporidium oocysts samples from the source water at the plant intakes. No oocysts were detected.

### TREATMENT POLYMERS:

During water treatment, organic polymer coagulants are added to improve the coagulation and filtration processes that remove particulates from water. The particulates that are removed can include viruses, bacteria and other disease causing organisms. The USEPA sets limits on the type and amount of polymer that a water system can add to the water. In addition to the EPA limits, the State of Washington requires that all polymers used be certified safe for potable water use by an independent testing organization (NSF International). During treatment, Everett adds only NSF approved polymers and the levels used are far below the safe limits set by the USEPA.



## **APPENDIX G**

# **MUKILTEO WATER & WASTEWATER DISTRICT WATER SYSTEM DESIGN STANDARDS**



**MUKILTEO WATER &  
WASTEWATER DISTRICT**

**DEVELOPER STANDARDS  
FOR  
WATER AND SEWER SYSTEMS**

**2009**



**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS

# **ADOPTION**

The Developer Standards for the construction and acceptance of water and sewerage facilities in the Mukilteo Water & Wastewater District were adopted by the District's Board of Commissioners on September 14, 2009, under Resolution No. 118-09.

# **NOTICE**

The standards herein are presented to inform the Developer/Contractor of the general minimum requirements for construction and acceptance of Water and Sewer facilities within the Mukilteo Water &Wastewater District (the “District”).

Mukilteo Water &Wastewater District does not assume responsibility for keeping this material current. The District should be consulted in case of doubt regarding the applicability of any standards or item(s) presented herein. Some of the information presented herein is based on governmental codes and ordinances, and industry standards, and is subject to change in the event that the governing codes, ordinances or standards are changed. The District is not responsible for notifying developers, contractors, or other individuals of such changes as they may be adopted.

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# MWWD DEVELOPER EXTENSION CHECKLIST

NAME OF DEVELOPMENT \_\_\_\_\_ EXT. # \_\_\_\_\_

DATE \_\_\_\_\_ OWNER'S NAME \_\_\_\_\_

PHONE \_\_\_\_\_ EMAIL \_\_\_\_\_

ADDRESS \_\_\_\_\_

ENGINEER \_\_\_\_\_ PHONE \_\_\_\_\_

CONTRACTOR \_\_\_\_\_ PHONE \_\_\_\_\_

<u>Date</u>	<u>Pre-Construction</u>
_____	Sign Preapplication Declaration
_____	Provide Fire Flow Requirement for Commercial, Industrial & MF Projects
_____	Fill out and return Industrial Pretreatment Program Survey
_____	If Reimbursement Requested, Comply with the Resolution A945
_____	Deposit Received by District \$ _____
_____	Sign Developer Extension Agreement by Commissioners
_____	Pre-Design Meeting
_____	Preliminary Plan Review by District
_____	Commissioners Authorized Water/Sewer Plan Approval
_____	Department of Ecology Approval (Sewer Plans Only)
_____	Snohomish County/City/State Right-of-Way Use Permit
_____	Other Permits, Specify _____
_____	Pre-Construction Meeting
_____	Certificate of Insurance (Provided by Contractor Prior to Pre-Con)
_____	Received all Required Recorded Offsite Easements
_____	Copy of Contractor's State License Prior to Pre-Con
_____	Copy of Preliminary Plat as prepared for submittal

<u>Water</u>	
_____	Approval of Materials to be Used
_____	System Pressure Tested
_____	Purification Tested

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Water Turned On

Punch List Sent to Owner

Sewer

\_\_\_\_\_

Approval of Materials to be Used

\_\_\_\_\_

System Pressure Tested

\_\_\_\_\_

Flushed

\_\_\_\_\_

T.V.'d, Mandrell Pulled, Line Plugs Pulled

\_\_\_\_\_

Punch List Sent to Owner

Post Construction

\_\_\_\_\_

As-Builts Reviewed and Red-Lines Sent to Developer's Engineer

\_\_\_\_\_

Red Lines Returned to District - As-Builts OK

\_\_\_\_\_

Mylar, Electronic Copy and 3 Sets of Prints of Plans to District Office

\_\_\_\_\_

Itemized List of Costs Water/Sewer

\_\_\_\_\_

Bill of Sale Water/Sewer

\_\_\_\_\_

Copy of Recorded Plat Received

\_\_\_\_\_

All Fees Paid

\_\_\_\_\_

Final Punch List

\_\_\_\_\_

2-Year Maintenance Bond Received

\_\_\_\_\_

Project Accepted as Complete by District

\_\_\_\_\_

Declaration of Construction Sent to Department of Ecology (Sewer Only)

\_\_\_\_\_

Recorded Onsite - Easements, including Easement Map

\_\_\_\_\_

Recorded Offsite - Easements, including Easement Map

\_\_\_\_\_

Resolution # \_\_\_\_\_ Accepting Project For O & M

\_\_\_\_\_

Water Service and Sewer Service Available to Project

# DESIGN CRITERIA & PLAN SUBMITTAL SUMMARY

(Adjustments may be made by the District on site specific projects)

## The following must be provided:

### 1. GENERAL

1. Cover sheet showing entire property and location of improvements.
2. Location of streets, rights-of-ways, easements (easements to be labeled, on the plans, "to Mukilteo Water & Wastewater District"), property lines, existing and proposed utilities and improvements (Design plans for water and sewer system must be on separate sheets).
3. Stationing or pipe lengths for the site area and on all improvements to be constructed. Stationing, from the nearest downstream manhole, for all proposed sewer facilities.
4. Existing and proposed grades of streets, easements and areas of improvements.
5. Match lines and title blocks for each sheet.
6. North arrow and engineering scale on each sheet.
7. Maximum horizontal scale of 1"=30' Vertical Scale: 1"=5' ;(or as otherwise approved by District). Vertical Datum shall be NGVD 29.
8. Sewers to be located below potable water lines, with 18-inches vertical separation and with a minimum 10-foot horizontal separation from parallel water lines. Crossing angles shall be 45 deg. or greater. Unusual or special conditions are addressed in accordance with the Department of Ecology and the Department of Health criteria.
9. Permanent access for District service vehicles shall be provided at all manholes. Adequate separation shall be provided between sewers and parallel utilities to allow for future access for repair. Vertical separation of 12 inches shall be provided between all crossing utilities.
10. Water system plans are to be separate from other utility plans, but all other utilities are to be shown with the water system portions highlighted.
11. Sanitary sewer plans are to be separate from other utility plans, but all other utilities are to be shown with the sewer system portions highlighted.
12. Construction plans shall be signed & dated by a Washington State licensed engineer.
13. Standard notes for water and sewer system construction shall be included with construction plans.

14. Approval block for District signature shall be included on all sheets of the construction plans.
15. Standard details for water and sewer system construction shall be included in with construction plans.
16. A Fire Flow Analysis shall be performed on all commercial, multi-family, industrial or any project identified by the District to determine available water flow and pressure. The Developer shall deposit funds prior to the analysis being performed. The District's consulting engineer shall perform all Fire Flow Analysis.

## **2. WATER**

1. Water mains to be located 10 feet northerly or easterly of street centerline (or as otherwise approved by District).
2. Operational system pressure range to be between 35 and 135 psi.
3. Minimum system pressures to be 30 psi under maximum hour demand conditions and 20 psi under maximum day demands plus fire flow demands.
4. Water main to be 8-inch minimum pipe diameter (or as otherwise approved by the District). Pipe diameters may be larger as required to deliver water needed to comply with Item 3 above.
5. Maximum design velocities in mainline to be 8 feet per second (8 fps) under maximum day demand plus fire flow demand.
6. Water mains to be designed with the following minimum cover:
  - 8 inch diameter - 3'-6"
  - 12 inch and larger - 4'-0"
  - Water mains in Easements - 5'-0" (Unless otherwise approved by the District.)
7. Whenever possible, loop water mains to minimize occurrence of dead end lines. Provide fire hydrant or blow-off assembly at dead end mains for flushing purposes.
8. Pipes connecting fire hydrants to be at least 6 inches in diameter. The maximum length of 6-inch pipe between the main and fire hydrant to be 50 feet and shall be installed with restraint joints.
9. Only one fire hydrant to be installed on any dead end 8-inch main.
10. Fire hydrant spacing in single-family residential areas are not to exceed 500 feet. Hydrant spacing in commercial, industrial, and multi-family residential areas are not to exceed 300 feet.

11. Maintain a maximum distance between hydrants and the building portion of any lot for residential buildings of 300 feet measured along an access roadway or driveway.
12. For all other occupancy type buildings, maintain a maximum distance between hydrants and the buildable portion of any lot of 150 feet measured along an access roadway or driveway.
13. For commercial buildings, the minimum number of hydrants required is determined by dividing the required fire flow in gpm by 1,200. The hydrant must be located no closer than 50 feet to any served building and at no greater distance than 300 feet from any portion thereof. In addition, a hydrant must be located within 150 feet of a sprinkler standpipe or fire department connection. District shall determine if hydrants located across streets from construction site can be included for fire protection.
14. Fire line services shall have a State approved Double Check Detector Backflow Prevention Assembly, at a minimum, installed in a utility vault at the ROW/Property line with 6-inch PVC gravity drain to storm.
15. Valves are to be installed on each leg of all tees and crosses and at intervals of 500 feet or less in commercial or multi-family areas and 800 feet or less in single-family areas (or as otherwise approved by the District).
16. Valves to be installed on each side of the hydrant tee at fire hydrants designated by the District.
17. Valves to be installed on the water main at each end of mains located in easements.
18. Combination air and vacuum valve assemblies to be located at all high points in the system (or as otherwise approved by the District).
19. All dead end mains to be terminated with line size tees by 6-inch flanged tee, thrust blocks, and blow-off assembly.
20. All pipeline deflections to be designed in accordance with pipe manufacturer's recommendations.
21. Thrust blocks and/or anchor blocks to be provided for all fittings and bends.
22. Provide polyethylene encased restrained joint pipe and fittings within all easements and in site sensitive areas identified by Developer or District.
23. All residential lots to be served with a minimum of a single 1-inch copper service line between the main and meter. No connections to the main or meter boxes are to be located on easements.
24. Individual structures connected to the water system, including multiple structures on the same lot, shall have a minimum of one water service each.
25. Provide a pressure reducing valve station at each crossing of District's pressure zone lines, consisting of two PRV valves and a pressure relief valve.

26. All commercial, multi-family, industrial, fire and irrigation services shall include a DOH approved backflow preventor located immediately behind and on the property side of the water service box.

### **3. SEWER**

1. Sewer mains to be located 5 feet southerly or westerly of street centerline (or as otherwise approved by the District). Pipe material, length, diameter and slope are designated on each run in plan and profile views. (Pipe information may be omitted on the plan view when the plan and profile are located on the same sheet).
2. Sewer mains to be designed with no less than the following minimum grade:
  - 8-inch gravity main - 0.75%
  - 6-inch side sewer - 2.0%
  - 8-inch gravity dead end - 1.0%

Slopes of less than 0.75% but greater than 0.5% may be considered, at the discretion of the District, in certain situations/areas. Steeper slopes may be required depending on topography and tributary flows (at the discretion of the District).

3. All sewer mains to have a minimum cover of 3 feet. (Side sewer laterals in public rights-of-way to have a minimum 5 feet of cover at right-of-way line).
4. Sewer mains to be of material noted below:

Gravity Sewer and Laterals:

  - PVC Pipe: 5'-18' cover
  - Polyethylene or Epoxy Lined DI Pipe or Equal: 3 feet to 5 feet cover
  - Polyethylene or Epoxy Lined DI Pipe or Equal: 18-feet deep and over, and/or slopes of 18% or greater
  - Polyethylene or Epoxy Lined DI Pipe: for force mains
5. Sewer mains on 18% slope or greater to be anchored securely with concrete anchors or equal.
  - 18 to 35% - 36 feet center to center
  - 35 to 50% - 24 feet center to center
  - 50 and over - 16 feet center to center
6. Side sewer laterals to be located 5 feet to 10 feet from the lot corner on the lower side of the lot (or as otherwise approved by District). Manhole required 10 feet into property on all side sewers not serving single family lots. Stationing shall be provided from the nearest downstream manhole.
7. Side sewer lateral invert elevations and minimum house floor elevations to be shown on the construction plans for all critical lots.
8. Manhole spacing not to exceed 400 feet (or as approved by the District).

9. Manholes (6-foot minimum depth) are to be located at all changes in grade, pipe alignment, pipe intersections, termination points and 10 feet into property on all side sewers other than single family. Clean-outs are not acceptable as a substitute.
10. Manholes in excess of 20 feet in depth to be 54-inch diameter.
11. Manholes are not to be located in low points of vertical curves or curb flow lines (gutter sections).
12. Manholes shall have minimum of 0.10-foot drop across channel.
13. Match crowns of differing sizes of pipes in manholes.
14. Drop connections are not allowed except as approved by the District. If allowed, drop connections are to be outside drops and are not to exceed 10 feet.
15. All manholes to have locking covers with District service vehicle access provided.
16. Invert and rim elevations to be shown on plan and profile for all manholes.
17. Correct invert elevation of the manholes to be shown at point of connection (field verified).
18. When specified by the District, grease interceptors shall be provided for all Commercial, Industrial, and School food establishments, or when specified by the District (Interceptor shall be installed as close as possible to source of grease/fat). When specified, by the District, Sample Chamber to be installed immediately downstream of the Grease Interceptor.
19. Sewer Grinder Pumps are not allowed. Where standard conforming gravity service cannot be achieved and denial of service is the only remaining option, private ownership of grinder pumps may be considered by the District. The Developers Engineer shall provide the District with information utilized in determining gravity service unavailability showing that all means of achieving gravity service, regardless of cost, have been reviewed and eliminated. If it is proven that gravity service is unavailable, only then will the District accept the Developers Engineer's proposal identifying pump design and the areas to be served for District review and approval.
20. The need of sewage lift stations shall be presented by the Developer and evaluated by the District. If the District determines the need for a lift station, the Developer and Developer's Engineer shall present areas of service, total developed flow projection, pump capacities and operating head conditions. Design must comply with the District requirements for the site-specific project.
21. Sewer force mains shall be ductile iron and a minimum of 6-inches diameter and shall be designed for a minimum of 2-1/2 feet per second (fps) velocity.
22. Construction work shall not commence until approval is received from the State Department of Ecology.

23. Where applicable, sewer construction work shall not commence until District personnel have witnessed the installation of a plug to protect the downstream system.

**These checklists are a partial lists prepared to assist in plan review. See full text of standards and details. Additional District requirements may be mandated, on a case by case basis, due to site specific conditions.**

## **WATER SYSTEM INSTALLATION NOTES**

1. Prior to any construction activity, the Developer shall arrange a pre-construction conference with the Mukilteo Water and Wastewater District. The Developer, Contractor and proposed on-site supervisors shall attend.
2. All work and materials shall be in accordance with the latest revision, including addenda and updates, of the Mukilteo Water and Wastewater District Developer Standards. Contractor to have Mukilteo Water and Wastewater District Standards on job site.
3. No District inspections will take place and the Job will be shut down unless an approved and District signed copy of these Plans are on the job site at all times construction is in progress.
4. All water system improvements shall be constructed in accordance with these approved Plans. Any deviation from the Plans will require approval from the owner, engineer, District and appropriate public agencies.
5. Notify the District 72 hours (3 working days) prior to beginning construction and for any restarts of work.
6. The District shall be notified three working days prior to the time the Developer would like to connect to existing mains or for installation of tapping tees. The connection shall be done in accordance with District requirements. Connections to take place Tuesdays through Thursdays only. Developer shall not operate any District valves; these will be operated by Water District personnel only.
7. For aid in utility location, call 1-800-424-5555, a minimum of 48 hours (2 working days) prior to beginning of construction. Existing utilities, whether shown or not, shall be located prior to construction, so as to avoid damage or disturbance, and the Developer shall assume all responsibility and costs connected therewith to protect, maintain and repair, where necessary.
8. Water line construction within the proposed development shall not commence until the street has been brought to sub-grade, meeting Mukilteo Water District approval.
9. Water main shall be field staked prior to construction, with 25-foot stakes on curves. Lot corner stakes shall also be in place prior to construction.
10. Pipe shall be ductile iron, AWWA Class 52 thickness, with rubber gaskets, push-on type, or mechanical joint, meeting AWWA Specifications. Fittings shall be AWWA, cement lined, ductile iron, and either mechanical joint or flanged, as indicated herein. All pipe to be purchased and installed as a part of the developers water system shall be delivered to the job site with water tight wrapping or pipe plugs. Plugs and/or wrapping shall remain in place until the pipe is installed in the trench.
11. Unless otherwise specified valves 12 inch and smaller shall be ductile iron resilient seated gate valves: Acceptable valves are Mueller, Clow, M&H, U.S. Pipe and American Flow Control, Series 2500. Valves larger than 12 inches

shall be ductile iron butterfly valves; Acceptable valves are Pratt Groundhog and Dresser 450.

12. All bolts on water works fittings shall be coated with Armitite Anti-Seize Compound No. 609, or equal, prior to installation. All water works fittings and bolted assemblies shall be completely covered with visqueen plastic, 4 mil. The end of the plastic shall be taped to secure them to the pipe.
13. Hydrants shall be Mueller Centurion A-423, Clow Medallion, or Dresser Reliant 929 meeting AWWA Specifications. Hydrants shall be furnished with threaded outlets, meeting fire district/department standards. Both thrust blocking and mega lugs restraints are required on each hydrant installation.
  - Hydrants within the City of Mukilteo fire service area and Fire District #1 shall be equipped with 4-inch Storz adapters; all other hydrants shall utilize a 5-inch Storz adapter. All hydrants shall have a 4-½-inch NST threads on pumper port.
14. Provide thrust blocking and/or restrained joints at all fittings and bends and up-thrust fittings, in accordance with District standards, conditions and specifications.
15. All new connections to the existing water system shall be in strict conformance with the appropriate subsections of the specifications of the District. No connection shall be made between the new main and the existing mains until the new piping has been flushed, disinfected, tested and received satisfactory bacteriological test results.
16. Individual water services to the property line shall be 1" diameter minimum size and be installed with 36-inch minimum cover.
17. Residential fire sprinkler systems shall have a minimum 1-inch meter/service. Backflow prevention assemblies shall be installed on all residential fire sprinkler systems and located immediately behind the water meter/service on the property side.
18. Fire line services shall have a Double Check Detector Backflow Prevention Assembly installed in a utility vault at the ROW/Property line with a 6-inch PVC gravity drain to storm. Fire line service shall terminate, in the structure to be served, with the District's Riser Detail.
19. All commercial, multi-family, industrial and irrigation services shall include a DOH approved backflow prevention assembly located immediately behind and on the property side of the water meter. Alternate locations may be acceptable upon approval by the District. Structures requiring fire sprinkler system shall have at least one backflow prevention assembly per each structure, protecting the potable water system from the fire system. The backflow prevention assembly shall be located in a flood proof vault or service box, depending on size, outside the structure in a location approved by the District.
20. Where road grades are established, provide a minimum of 48-inch cover over 12 inch or larger water mains, and provide a minimum of 42-inch cover over 8-inch mains; or additional depth as required to miss other utilities.
21. Water mains constructed within easements or private roads shall be installed with polyethylene encasement, restrained joints and with a 5'-0" minimum cover.

During backfill operations, furnish and install 3-inch-wide metallic marker tape with 3 feet of cover over water main.

22. Minimum radius for 12 inch and smaller pipelines constructed on curves (4 degree deflection per joint) is 258 feet.
23. Compaction: All trench backfill and roadway embankment shall be compacted to 95% of modified proctor dry maximum density in accordance with ASTM D1557, except the top 6 inches in paved areas, which shall be 100%.
24. Construction inspection will be done by Mukilteo Water and Wastewater District and/or their designated engineer. No utility facilities will be accepted by the District if proper inspections have not been completed.
25. The water main construction phase will not be considered complete until the installation is acceptable to the District including a satisfactory hydrostatic pressure test, a satisfactory disinfection test, satisfactory flow of service lines, and completion of all items on the inspector's punch list.
26. Water service is available only after transfer of ownership to the District and after payment of all current applicable fees.

## SEWER SYSTEM INSTALLATION NOTES

1. Prior to any construction activity, the Developer shall arrange a pre-construction conference with the Mukilteo Water and Wastewater District. The Developer, Contractor and proposed on-site supervisor shall attend.
2. All work and materials shall be in accordance with the latest revision, including addenda and updates, of the Mukilteo Water and Wastewater District Developer Standards. Contractor to have Mukilteo Water and Wastewater District Standards on job site at all times while construction is in progress.
3. A District approved signed copy of the Plans must be on the job site whenever construction is in progress.
4. All work and material shall be in accordance with the applicable standards and specifications of the District, the Project Specifications, and the most recent edition of the APWA Standards and specifications.
5. Work shall not commence until approval is received from the State Department of Ecology, unless the review and approval is waived by Ecology.
6. Front property corners shall be set by a land surveyor licensed in the State of Washington prior to the start of construction.
7. Notify the District 72 hours (3 working days) prior to beginning construction and for any restarts of work.
8. For aid in utility location, call 1-800-424-555, a minimum of 48 hours (2 working days) prior to beginning of construction. Existing utilities, whether shown or not, shall be located prior to construction, so as to avoid damage or disturbance, and the Developer shall assume all responsibility and costs connected therewith to protect, maintain and repair, where necessary.
9. Pipe lengths, manhole depths, etc., as shown are approximate. Developer is responsible for supplying proper quantities of materials.
10. Provide the District's inspector with a copy of all cut sheets prior to construction.
11. Permanent access for District service vehicles shall be provided at all manholes. Manholes shall be constructed as per District standard details, including construction of channels. Where indicated, provide knock-outs and channelization for side sewer or future mainline extensions; and for PVC pipe, provide a watertight flexible rubber boot or Heavy Duty sand collar. Provide locking lids for manhole covers.
12. Connection to existing main shall be done so as to prevent any foreign materials from entering existing sewers. Existing pipe in saddle manhole installations shall not be cut or removed until instructed to do so by the District.
13. Connection to existing manholes shall be made by utilization of a concrete core-drilling machine of adequate diameter to grout in place an adapter if PVC sewer

lines are installed. Align core-drilling machine to provide minimum of 0.10-foot drop across the manhole.

14. PVC pipe shall be SDR-35 ASTM D3034 furnished in 13-foot maximum lengths and shall be fully encased in pea gravel (or crushed rock, base course, if installed within the City limits of Everett) extending from 4 inches below to 12 inches above pipe barrel.
15. DI sanitary sewer pipe shall conform to AWWA C151 and shall be polyethylene or epoxy lined, restrained joint. The DI pipe shall be Class 52, unless otherwise approved.
16. Sewers to be located below potable water lines, with 18-inches vertical separation and with a minimum of 10-foot horizontal separation from parallel water lines. Crossing angles shall be 45 deg. or greater. Unusual or special conditions are addressed in accordance with the Department Ecology and Department of Health criteria.
17. Side sewer shall be a minimum of 6 inches in diameter and shall have a minimum slope of 2%. Side sewer shall include two 6-inch tees at the property line; one within the public right-of-way and one within the private property. See detail.
18. All sewer lines shall be cleaned and tested in accordance with District standards and specifications.
19. The Contractor shall be responsible for maintaining and/or repairing asphalt and gravel surface disturbed as a result of this construction until they are accepted by the public works department of the City and/or County.
20. Compaction: All trench backfill and roadway embankment shall be compacted to 95% of Modified Proctor dry maximum density in accordance with ASTM D1557, except the top 6 inches in paved areas which shall be 100%.
21. Manhole covers located in asphalt areas shall be adjusted to finish grade prior to paving.
22. No utility facilities will be accepted by the District if proper inspections have not been completed.
23. Sewer service is available only after transfer of ownership to the District and after payment of all current applicable fees.

## APPROVAL BLOCK

Approved by: \_\_\_\_\_  
Mukilteo Water and Wastewater Date

Mukilteo Water and Wastewater District Extension No. \_\_\_\_\_

Gray & Osborne No. \_\_\_\_\_

Project must be completed and ownership transferred to the Mukilteo Water and Wastewater District within 1 year from the date of approval. In the event that the project developer fails to do so, the project will be subject to reapplication, additional plan review and revision, due to any changes in District standards or requirements occurring prior to completion and transfer of ownership. Water/sewer service is available only after payment of all current fees, recording of easements and transfer of ownership to the District.

**APPLICATION AND AGREEMENT  
TO CONSTRUCT EXTENSION  
TO DISTRICT SYSTEM**

\_\_\_\_\_WATER      \_\_\_\_\_SEWER

**Project Name:** \_\_\_\_\_

**NO.**\_\_\_\_\_

**Address:** \_\_\_\_\_

The undersigned (the “Developer”) applies to the Commissioners of Mukilteo Water and Wastewater District (the “District”), for permission to construct and connect a private extension(s), as indicated above, to the District’s existing system as herein provided and agrees to the terms and conditions of this Developer Extension Agreement as follows:

**1. Location of Extension.**

A. Water

The proposed water system extension (the “extension”) will be installed in streets and other approved rights-of-way and/or easements and shall be for the use and benefit of the property hereinafter described, which property is owned by the Developer and/or other owners for whom the Developer is acting as agent. Any such owners have joined in this application and are designated on the signature page hereof as “additional owners.” Legal description of the property is noted in Exhibit “A” (provided by Developer):

B. Sewer

The proposed sewer system extension (the “extension”) will be installed in streets and other approved rights-of-way and/or easements and shall be for the use and benefit of the property hereafter described, which property is owned by the Developer and/or other owners for whom the Developer is acting as agent. Any such owners have joined this application and are designated on the signature page hereof as “additional owners.” Legal description of the property is noted in Exhibit “A” (provided by Developer):

**2. Warranty of Authority.**

The Developer and any additional owners warrant that they are the owners of all the property described in this Agreement. Developer shall provide a title report to the

District establishing that the parties executing this Agreement are the owners of all the real property described herein.

**3. Description of Extension.**

A. Water

The proposed extension will consist of approximately \_\_\_\_\_ lineal feet of water main and appurtenances and shall be installed in accordance with this Agreement and in accordance with Plans prepared in conformity with District Standard Details and Specifications and approved by the District.

B. Sewer

The proposed extension will consist of approximately \_\_\_\_\_ lineal feet of sewer main and appurtenance and shall be installed in accordance with this Agreement and in accordance with Plans prepared in conformity with District Standard Details and Specifications and approved by the District.

**4. Fees to be Paid by the Developer.**

A. A fee in the amount of \_\_\_\_\_ is payable prior to acceptance of this Agreement by the Commissioners of the Mukilteo Water and Wastewater District (the "Board") as an initial deposit for payment of District expenses including, but not limited to, engineering, inspection, legal, permit and administration costs.

Should said expenses exceed the deposit paid by the Developer, the difference shall be paid by the Developer to the District upon demand. If after the project is completed and accepted, it is determined that expenses were less than the deposit paid by the Developer, the balance, in excess of \$100.00, will be refunded to the Developer.

B. The foregoing fee is not intended to include allowance for any unusual costs incurred by the District on account of property surveys, changes in design, necessary construction engineer comment preparation, project coordination, errors or omissions by the Developer, its contractor or agents, unusual negotiations, legal expenses incurred beyond the expense of normal review of documents, and/or any other project related costs. The District will bill the Developer for any such unusual costs and the same shall be paid promptly by the Developer. The District may stop work until payment is received.

## 5. Preparation of Plans

The Developer shall retain its own engineer to prepare the Plans for the extension according to the District's Standard Details and Specifications and the following requirements apply:

- a. Developer must obtain District approval of the Developer's Engineer in accordance with Paragraph WS-11 of this agreement;
- b. After the Board accepts the Preapplication and Developer Extension Agreement and the required deposit is received, the Developer's Engineer shall arrange for a pre-design meeting and bring to that meeting:
  - 1) A complete set of base maps.
  - 2) A grading and clearing plan.
  - 3) A storm sewer plan.
  - 4) Sanitary sewer plans, if applicable.
  - 5) City/County fire flow requirements in the form of a letter from the appropriate Fire Official for multi-family and commercial projects (all projects other than single family).
  - 6) A contour map of the project with contour intervals of five (5) feet or less and using a scale of one (1) inch equals fifty (50) feet. All data shall be based on National Geodetic Vertical Datum (NGVD) 29.
  - 7) At the predesign meeting, a set of District drawing standards will be given to the Developer's Engineer at their request.
- c. The Developer shall arrange for the conference and the attendance of concerned parties.
- d. At the pre-design meeting, the Developer's Engineer shall submit to the District a conceptual plan for the utility development of the project.
- e. Upon preliminary review of the conceptual plan, the Developer's Engineer shall prepare and submit to the District a preliminary design and Plan for review and approval by the District. The District shall have the right to require changes in the preliminary design and Plan as may be deemed necessary. All Designs and Plans prepared by the Developer's Engineer shall be prepared in accordance with the District's Standard Details and Specification

- f. Upon approval of the preliminary design and Plan by the District, the Developer's Engineer shall prepare a proposed final Plan and submit three copies of the proposed final Plan to the District for review by the District. Upon receipt of the proposed final Plan, the District may require changes to the proposed final Plan.
- g. Upon completion of all required changes to the final Plan, if any are required, the Board shall consider the final Plan for approval at a regularly scheduled Board meeting. The Board may approve, reject, or require changes to the final Plan.
- h. Prior to approval of the final Plan, the Developer shall submit a copy of the preliminary plat as prepared for submittal to the applicable jurisdiction.
- i. Upon approval of the final Plan, the District shall indicate its one (1) year approval of the Plan on the Developer's original drawings.
- J. Upon approval of the Developer's original Plan drawings, the Developer's Engineer shall submit copies of the approved Plan so that the Developer (or District, when required) can apply for permits and approvals for the Plan. The Developer's Engineer shall notify the District of any permits required. Should changes to the Plan be required in order to receive said permits and approvals, the Developer's Engineer shall make all changes as required, subject to approval of the District.

**6. Warranties of Developer -- Water and Sewer.**

The bill of sale provided by the Developer to the District shall be on a District approved form and shall contain the following warranties with the District as beneficiary:

- a. That Developer is the owner of the extension, the same is free and clear of all encumbrances and the Developer has good right and authority to transfer title thereto to the District and will defend the title of the District against the claims of all third parties claiming to own the same or claiming any interest therein or encumbrance thereon; and
- b. That all bills and taxes relating to the construction and installation of the water/sewer main and appurtenances have been paid in full and that there are no lawsuits or claims pending involving this project. The undersigned further warrants that in the event any lawsuit is filed as a result of, or involving, this project the

undersigned shall undertake to defend the lawsuit and shall accept responsibility for all costs of litigation, including costs on appeal, and shall hold the District harmless on any judgment rendered against the District; and

- c. That all laws, ordinances and regulations respecting construction of this project have been complied with; the system extension is in proper working condition, order and repair, is adequate and fit for the intended purpose of use as a public (water) (sewer) system and as an integral part of the (water) (sewer) system of the District, and that it has been constructed in accordance with the conditions and standards of the District; and
- d. That for a period of 2 years from the date of final acceptance of the extension by the District, the extension and all parts thereof shall remain in proper working condition, order and repair; and that Developer shall repair or replace, at its expense, any work or material which may prove to be defective during the period of the warranty.

In addition, the Developer shall obtain warranties and guaranties from its subcontractor and/or suppliers where such warranties or guaranties are specifically required in this Agreement. When corrections of defects occurring within the warranty period are made, the Developer shall further warrant corrected work for 2 years after acceptance of the corrected work by the District.

## **7. Final Acceptance - Conditions Precedent.**

Compliance with all terms and conditions of this Agreement, the Plans and Specifications prepared hereunder and other District requirements shall be a condition precedent to the District's obligation to allow connection to the District's system, to accept the bill of sale to the extension(s), and to the District's agreement to maintain and operate the extension(s) and to provide service to the real property that is described in this Agreement.

The District shall not be required to allow any connection to the District's system of the portion of the real property described in this Agreement, if there are any unpaid fees or costs which are payable to the District under this Agreement or other unpaid fees arising under other District requirements, or if the easements have not been prepared to conform to the constructed alignment of the water and/or sewer system by the District and executed by the Developer and District for recording.

The District shall not be obligated to provide service to the property described in this Agreement, if construction by third parties of facilities to be deeded to the District has not been completed and title accepted by the District if such third-party facilities are necessary to provide service to the property described in this Agreement.

The District will accept title to the extension(s) when all work which may, in any way, affect the lines constituting the extension(s) has been completed, any damage to said extension(s) which may exist has been repaired, the District has made final inspection and given its approval to the extension(s) as having been completed in accordance with this Agreement, the Plans and Specifications and other requirements of the District, and all General Facilities Charges, Connection Charges and fees applicable to the Project in effect on the date of application have been paid.

The District shall not be obligated to allow service connections to its system until all fees, General Facility Charges and connection charges in effect on the date of application for service have been paid.

#### **8. Limitation of Period of Acceptance.**

The extension(s) shall be completed and accepted within 12 months of the date of acceptance of the Plans by the Board. If the extension is not completed and accepted within the 12 month period, then this Agreement and all of the Developer's rights herein shall terminate and cease. Under special circumstances, with a formal written request, an extension of the time for completion of the Agreement may be allowed at the sole discretion of the District. In the event the Agreement terminates, the Developer shall be required to make a new pre-application and new application for extension agreement to the District. Any such new agreement, including any extension, entered into between the District and the Developer pursuant to a new application shall be subject to any new or amended resolutions, policies, or standards and specifications which have taken effect since the execution of the terminated agreement.

#### **9. Maintenance Bond.**

Acceptance by the District shall not relieve the Developer of the obligation to correct defects in labor and/or materials as herein provided and/or the obligations set forth in applicable paragraphs hereof. Prior to acceptance of the extension(s) by the District and the transfer of title to such extension(s) as set forth herein, the Developer shall, if required by the District, furnish to the District a maintenance bond (cash or bond) which shall continue in force from the date of acceptance of said extension(s) for a period of 2 years. The bond shall be in a form provided by the District and shall require the Developer and/or the bonding company to correct the defects in labor and materials, which arise in, said system(s) and transfer of title. The maintenance bond

shall be in an amount equal to 10 percent of the cost of said extension(s), but not less than two thousand dollars (\$2,000.00).

**10. Procedure for Acceptance.**

Acceptance of title to the extension(s) shall be made by motion of the Board. Prior to such acceptance, an executed bill of sale in a form approved by the District and containing the warranties required by this Agreement shall be executed by the Developer and any additional owners and delivered to the District.

**11. Effect of Acceptance.**

Acceptance by District shall cause the extension(s) to be a public system subject to the control, use and operation of the District and all regulations, conditions of service, and service charges as the District determines to be reasonable and proper, and subject to the law of the State of Washington.

**12. Performance Guarantee.**

Developer shall, if requested, furnish to the District prior to the preconstruction conference a performance guarantee of a type and in a form as determined by the District, in its sole discretion, in an amount equal to 150 percent of the District approved Developer's Engineer estimated cost of the extension(s) or contractor bid price(s). The performance guarantee shall require completion of all work in accordance with the Agreement, the Plans and Specifications and other requirements of the District within a period of 12 months from the date of acceptance of the Plans by the Board. The District in its sole discretion may also require a payment bond of a type and in a form as determined by the District requiring the payment by the Developer of all persons furnishing labor and materials in connection with the work performed under the Agreement, and shall hold the District harmless from any claims there from. Any payment bond required by the District shall be provided to the District prior to the preconstruction conference as a condition of the District granting final acceptance of the work referenced herein. No third person or party shall have any rights under any performance guarantee the District may require from the Developer and such is provided entirely for the benefit of the District and the Developer and their successors in interest.

**13. Correction of Defects Occurring Within Warranty Period.**

When defects in the extension(s) are discovered within the warranty period, Developer shall start work to remedy any such defects within 7 calendar days of notice by the District and shall complete such work within a reasonable time. In emergencies, where damages may result from delay and where loss of service may result, corrections may be made by the District upon discovery, in which case the cost thereof shall be borne by the Developer. In the event the Developer does not commence and/or

accomplish corrections within the time specified, the work may be accomplished by the District at its option, and the cost thereof shall be paid by the Developer.

Developer shall be responsible for any expenses incurred by the District resulting from defects in the Developer's work, including actual damages, costs of materials and labor expended by the District in making repairs and the cost of engineering, inspection and supervision by the District.

**14. Rates and Charges.**

The property described in this Agreement shall be subject to all rates and charges established by the District.

**15. Subcontracting.**

Developer is fully responsible for the acts and omissions of subcontractors and persons employed, directly or indirectly, by subcontractors, as well as the acts and omissions of persons directly employed by the Developer.

**16. No Assignment Without District Approval.**

The Developer's rights and responsibilities arising out of this Agreement are not assignable unless District consent is obtained prior to any proposed assignment. Written documents as required by the District of any District approved assignment shall be filed with the District by the Developer herein at the time of any assignment.

**17. General Provisions, Technical Details, Specifications.**

Refer to the "Parts One, Two, and Three" for General Provisions, Water, Sewer Standard Specifications and Standard Details, which are attached hereto and made a part of this Agreement.

**18. Remedies Available to District.**

In the event the Developer fails to pay any of the extension fees and charges and fines referenced herein when due as determined by the District, the charge or fine shall then be delinquent and shall accrue interest at the highest legal rate per annum until paid. In addition to any other remedies available to the District, the District shall be entitled to file a lien against the Real Property referenced herein in the event of nonpayment and to foreclose such lien pursuant to RCW 57.08.081, or as such statutes may be revised, amended or superseded.

**19. Notice.**

Any notice required by this Agreement to be given by the District to the Developer shall be given at the following address:

Name: \_\_\_\_\_ Phone: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

**20. Complete Agreement.**

This Agreement, including Parts One, Two, and/or Three as appropriate and the plans approved by the District constitutes the entire Agreement between the Developer and District with respect to the rights and responsibilities of both parties in regard to Developer project referred to herein. For purposes of identification, this Agreement shall be assigned a number by the District, which number shall be endorsed on the first page of the Agreement. This Agreement may be changed in writing only upon mutual agreement of the Commissioners of the District and the Developer.

**ACCEPTANCE OF THIS APPLICATION BY THE DISTRICT CONSTITUTES A CONTRACT WITH THE APPLICANT, THE TERMS OF WHICH ARE EACH PARAGRAPH OF THIS MANUAL, THE DISTRICT'S MATERIALS, CONSTRUCTION AND STANDARD DETAILS, SPECIFICATIONS, AND THE EXTENSION DESIGN DRAWINGS APPROVED BY THE DISTRICT BOARD OF COMMISSIONERS.**

DEVELOPER, \_\_\_\_\_,  
a \_\_\_ corporation, \_\_\_ partnership, \_\_\_ joint venture, \_\_\_ sole proprietorship,  
\_\_\_ individual.

**NOTE:**

1. If the Developer is a corporation, this Agreement must be executed by its duly authorized representative and the Developer hereby warrants same.
2. If the Developer is a partnership, at least one of the general partners must sign this Agreement and indicate his/her capacity as such.
3. If the Development is a joint venture, each joint venturer shall sign. One may sign on behalf of the others pursuant to a power of attorney.

DATED this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

By \_\_\_\_\_  
(Owner)

\_\_\_\_\_  
(print/type name)

Its \_\_\_\_\_  
(print/type name)

**Individual**

STATE OF WASHINGTON                    )  
  )    ss.  
COUNTY OF SNOHOMISH            )

I certify that I know or have satisfactory evidence that \_\_\_\_\_ signed this instrument and acknowledged it to be \_\_\_\_\_ free and voluntary act for the uses and purposes mentioned in the instrument.

Dated \_\_\_\_\_

Signature of Notary Public \_\_\_\_\_

Title \_\_\_\_\_

My appointment expires \_\_\_\_\_

**Corporate/Partnership**

STATE OF WASHINGTON                    )  
  )    ss.  
COUNTY OF SNOHOMISH            )

I certify that I know or have satisfactory evidence that \_\_\_\_\_ signed this instrument, on oath stated that he/she was authorized to execute the instrument and acknowledge it as the \_\_\_\_\_ of \_\_\_\_\_ to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated \_\_\_\_\_

Signature of Notary Public \_\_\_\_\_

Title \_\_\_\_\_

My appointment expires \_\_\_\_\_



**PART 1**

**PROVISIONS APPLICABLE TO WATER AND SEWER  
EXTENSIONS**

## **A. GENERAL AND PRECONSTRUCTION**

### **WS-1 DEFINITIONS**

- (a) “Board” means Board of Commissioners of the Mukilteo Water and Wastewater District.
- (b) “Concerned Parties” means those persons, companies, or agencies designated by the District to attend the preconstruction conference.
- (c) “Contractor” means the person, firms, Contractors or Sub Contractors employed by the Developer to do any part of the work, all of whom shall be considered agents of the Developer.
- (d) “Design” means design and the preparation of the Plans for the extension to the District’s water distribution and/or sewer collection system.
- (e) “Developer” means the owner(s) of property to be benefited by the proposed extension, or that person or organization in charge of developing the project, either on behalf of the owner(s) or pursuant to an agreement to purchase the property, and includes the Developer’s agents.
- (f) “Developer Engineer” means the engineering firm, and that firm’s representatives, retained by the Developer to design and prepare the Plans for the work to be performed under this agreement in accordance with District specifications, and which shall be considered an agent of the Developer.
- (g) “District” means MUKILTEO WATER AND WASTEWATER DISTRICT and its employees.
- (h) “District Engineer” means the engineering firm, and that firm’s representatives, retained and assigned by the Board to act as the Engineer for the work to be performed under this Agreement.
- (i) “Otherwise Specified, or As Specified” means the directions contained in the Plans, Special Specifications, if any and otherwise as given by the District, incident to the performance of the work other than in these General Provisions.

- (j) “Plans” means drawings, including reproductions thereof, of the work to be performed as an extension to the District’s water distribution and/or sewer collection system, prepared or approved by the District, and approved by the Board.
- (k) “Specifications” means the directions, provisions, standards, and requirements as approved by the Board for the performance of the work and for the quantity and quality of materials.
- (l) “Work” means the labor, materials, superintendence, equipment, transportation, supplies, and other facilities necessary or convenient to the completion of the proposed extension described in the application contained herein.

## **WS-2 PURPOSE**

MUKILTEO WATER AND WASTEWATER DISTRICT, as a municipal corporation, has a responsibility to the public to ensure that water and sewer mains installed in public streets or easements are constructed in accordance with currently accepted standards for public work. The requirements imposed upon developers by these regulations are intended by the District as a contract with the Developer, incorporating minimum standards, which are prerequisite to acceptance of the work by the District as a part of its water and sewer systems. Privately constructed extensions shall not be permitted to connect thereto unless the work is performed and paid for in accordance with these regulations.

## **WS-3 AUTHORITY OF DISTRICT**

The District may approve, reject, or require changes in Plans prepared by the Developer’s Engineer, including such changes in the Plans as the District may deem necessary during the course of work. The District shall inspect the work and may stop work whenever necessary to ensure compliance with the approved Plans and Specifications. The District shall have authority to reject nonconforming work and materials and to decide questions arising during performance of the work. The failure of the District to reject or disapprove any part of the work or materials shall not be deemed an acceptance of any such part of the work or materials. The District shall have the authority to approve or disapprove the contractor selected by the Developer to perform the work.

#### **WS-4 GOVERNING LAW/FORUM**

This Agreement shall be construed and enforced in accordance with, and the validity and performance hereof shall be governed by the laws of the State of Washington. Any suit to enforce the provisions of the Agreement shall be brought in Snohomish County, Washington.

#### **WS-5 NO THIRD PERSON SHALL HAVE ANY RIGHTS HEREUNDER**

This Agreement is made entirely for the benefit of the District and the Developer and successors in interest and no third person or party shall have any rights hereunder whether by agency or as a third-party beneficiary or otherwise.

#### **WS-6 REIMBURSEMENT CHARGES**

The Developer shall also pay all reimbursement charges, if any, levied against the property pursuant to the District's reimbursement policy.

#### **WS-7 COSTS OF LITIGATION**

If the District or the Developer commences any legal action relating to the provisions of this Agreement, the prevailing party shall be entitled, in addition to all other amounts to which it is otherwise entitled by this Agreement, to all costs of litigation, including but not limited to costs, witness, expert and reasonable attorney's fees, including all such costs and fees incurred in appeal.

If litigation arises out of this Agreement or related to this project to which the District is not a party, the Developer will reimburse the District for all costs and expenses, including attorney's or engineer's fees, incurred as a result of such litigation, including but not limited to time and materials at the regular rates established by District resolution.

#### **WS-8 LIABILITY INSURANCE**

The Developer/Contractor shall purchase from insurance companies which have an A.M. Best rating of "AVII" or better commercial general liability and automobile liability insurance against liability to the Developer, the District, the Developer's engineer and the District employees for negligent injury to person or property resulting from performance, supervision, or inspection of the work. The District shall be named as an additional insured under such policy. Proof of the existence

of such insurance shall be provided to the District in a form acceptable to the District prior to the Pre-Construction Meeting.

The minimum limits of coverage shall be as follows:

General Aggregate	\$2,000,000.00
Products - Comp/OPS Aggregate	2,000,000.00
Personal Injury	2,000,000.00
Each Occurrence	2,000,000.00
Automobile Liability	2,000,000.00

Policies shall be kept in force until the project is accepted by the District. The District shall be given at least 30 days written notice of cancellation, non-renewal, material reduction, or modification of coverage.

The coverage provided by the insurance policies are to be primary to any insurance maintained by the District, except with respect to losses attributable to the sole negligence of the District. Any insurance that might cover this Agreement which is maintained by the District shall be in excess of the Developer's/Contractor's insurance and shall not contribute with it.

The insurance policy shall protect each insured in the same manner as though a separate policy had been issued to each. The inclusion of more than one insured shall not affect the rights of any insured with respect to any claim, suit or judgment made or brought by or for any other insured or by or for any employee of any other insured.

The general aggregate provisions of the insurance policy shall be amended to show that the general aggregate limit of the policies apply separately to this project.

The insurance policy shall not contain a deductible or self-insured retention in excess of \$10,000 unless approved by the District.

Providing coverage in the stated amounts shall not be construed to relieve the Developer from liability in excess of such limits.

## **WS-9 INDEMNITY**

The Developer shall indemnify, defend and hold the District and all its representatives harmless from and against all losses and claims, demands, payments, suits, actions, recoveries and judgments of every nature and description brought or recovered against the District by reason of the act or omission of the Developer, its agents or employees, in the performance of the

work, and for any cost or expense incurred by the District in connection therewith, including overhead expense, legal expense, attorney's fees and costs attributable thereto; and if suit in respect to the foregoing is filed, the Developer shall appear and defend the same at its own cost and expense, and if judgment is rendered or settlement made requiring payment of damages by the District, the Developer shall pay the same. The Developer's obligation to indemnify the District shall not extend to the sole negligence of the District or to the extent of any concurrent negligence of the District.

Developer agrees to hold the District harmless from any liability or expense, including reasonable attorney's fees incurred by District by reason of the Developer's (or the Developer's employees or contractors) breach of any covenant contained on any franchise or permit granted by state, city, county, or public or private utility to the District for the purpose of enabling the Developer to undertake construction within any right-of-way.

The Developer further agrees that if any official complains to the District that the Developer is violating such franchise or permit in any respect, or if the Developer damages any District facilities, the District Manager shall give the Developer such notice as is reasonable under the circumstances to comply with such franchise or permit or to make repairs or restoration. In such event that the District deems it necessary to make any repairs or restoration (emergency or otherwise), the District shall be reimbursed for the cost thereof by the Developer.

In any and all claims against the District or any of its agents or employees by any employees of the Developer, its Contractor, or any subcontractor, or anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this article shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Workmen's Compensation Acts, Disability Benefit Acts, or other employee benefit acts. THE WAIVER OF ANY LIMITATION OF THE INDEMNIFICATION OBLIGATION CONTAINED IN THIS PARAGRAPH HAS BEEN SPECIFICALLY NEGOTIATED BY THE PARTIES.

#### **WS-10 SELECTION OF DEVELOPER'S ENGINEER**

When the Developer submits this Agreement to the District for execution, the Developer shall notify the District in writing of the person or firm proposed to do the design. The Developer shall not employ any person or firm for any part of the design work that the District may object to as incompetent, unfit, or irresponsible. Nothing contained in this Agreement shall create any contractual

rights between the District and any person or firm employed by the Developer to design and prepare the Plans.

#### **WS-11 AUTHORITY OF DEVELOPER'S ENGINEER**

The Developer's Engineer shall only have authority to design and prepare the Plans for the extension to the District's water distribution and/or sewer collection system. The Plans shall conform in all respects to the District's Standard Details and Specifications and they must be approved by the District prior to commencement of work. The District shall have the sole right to approve or reject the Plans or require changes to be made to them. Failure of the District to require changes in the Plans prior to Plan approval shall not be deemed a waiver of the District's right to require such changes in the Plans as the District may deem necessary during the course of work. Failure by the District to discover errors, omissions, or discrepancies in the Plans shall not relieve the Developer of this responsibility.

#### **WS-12 OMISSIONS AND DISCREPANCIES**

Minor items of work or materials omitted from Plans and Specifications prepared by the District, the District's Engineer, or the Developer's Engineer, but clearly inferable from the same and which are called for by accepted good practice, shall be provided and/or performed by the Developer as part of the construction. In case of doubt, the District shall be consulted and its decision shall be final.

#### **WS-13 DEVELOPER TO BE INFORMED**

The Developer shall be fully informed regarding the nature, quality and extent of the work to be performed, and if in doubt, shall secure specific instructions from the District.

The Developer shall employ on the project site during progress of the construction of the project, a competent supervisor who shall represent the Developer during their absence, and to whom instruction may be given as though to the Developer. The Supervisor shall become familiar with the Plans and Specifications and shall promptly report to the District any error, inconsistency or omission which may be discovered.

#### **WS-14 PLANS AND SPECIFICATIONS ACCESSIBLE**

The Developer shall have one copy of the Signed Plans and Specifications constantly accessible on the job.

## **WS-15 OWNERSHIP OF PLANS**

The original mylars, three plan copies and an electronic file of all “as built” plans prepared by Developer’s Engineer shall be delivered to the District as a condition of and prior to acceptance of the project, and shall become the property of the District. Neither Developer nor Developer’s Engineer shall have any rights of ownership, copyright, trademark, or patent in the Plans.

## **WS-16 QUALITY OF MATERIALS AND WORKMANSHIP**

Unless otherwise specified, all materials shall be new, and workmanship and materials shall be of the highest quality commonly used. The Developer shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

## **WS-17 EXISTING UTILITIES OR OBSTRUCTIONS**

### **A. Preparation of Plans.**

The District shall make available to the Developer information it may have regarding existing utilities and obstructions. Such information will be provided to the Developer for whatever value it may have, without any guaranty of its accuracy or that it is complete. Incompleteness or errors in this information shall not be basis for a claim against the District nor shall it relieve the Developer or responsibility for repairing any damage its activities may cause to such utilities.

### **B. Notification of Utilities.**

In every case, the Developer shall contact all utilities and determine what existing utilities and obstructions may exist. The Developer shall reimburse the District for damage to the property of the District or damage to property of others caused by the Developer for which the District is liable and for other expenses, including attorney’s fees and court costs incurred by the District because of such damage. Whenever the Developer fails to repair or restore existing improvements damaged by its operation within 48 hours of notice, the District may perform the work or contract with others to perform the work and all costs incurred shall be paid by the Developer; provided that whenever the District determines an emergency exists, it may notify the Developer who shall commence repair or restoration work immediately, or the District may undertake the work itself or through another contractor at the Developer’s expense.

**C. Asbestos Cement Pipe.**

The Developer shall be aware that portions of the existing water mains within the District are asbestos cement pipe. The Developer shall conduct all work related to existing asbestos cement pipe in strict accordance with current WISHA safety regulations and provisions contained within the latest edition of “Recommended Standard Asbestos-Cement Pipe Work Practice Procedures and Training Requirements” adopted and published by the Pacific Northwest Section of the American Water Works Association. All costs related to work in compliance with established rules and regulations shall be the responsibility of the Developer.

**WS-18 MATERIALS AND EQUIPMENT LIST**

The Developer shall file a material and equipment list with the District no later than 14 calendar days prior to the start of construction, including the quantity, manufacturer, and model number, if applicable, of material and equipment to be installed as part of the work. This list shall be prepared even though the Developer utilizes materials and equipment named in the Specifications. The District shall have the right to reject materials and equipment, which in the District’s opinion do not conform to District specifications and the approved Plans. Failure of the District to reject materials and equipment at the time the list is filed shall not be deemed a waiver of the District’s right to reject such materials or equipment at a later time.

**WS-19 DETERMINATION OF “AS EQUAL”**

The District shall be sole judge whether supplies or material qualify “as equal” substitutions under the Plans and Specifications.

**WS-20 SPECIFICATIONS INCORPORATED BY REFERENCE**

Where federal, AWWA, ASTM, APWA, Snohomish County, WSDOT, City of Mukilteo, City of Everett, or any other standard specifications are referenced or included by reference herein the latest issue and/or amendment thereto published at the date of approval of the Agreement by the District shall be incorporated in the contract. Should a conflict exist between the approved design drawings and any standard specifications or details referenced herein, the District shall determine which shall prevail.

## **WS-21 COMPLIANCE WITH PUBLIC AUTHORITY**

The work shall be performed in accordance with regulations of each public authority, including federal, state, county, public health departments, and municipalities, which may have jurisdiction over the manner and quality of performance of the work. The Developer shall be responsible for investigating and ascertaining the requirements of each public authority. The Developer shall reimburse the District for all costs incurred by the District for permits, inspection fees and other charges imposed by public authority because of the work.

The public shall not be inconvenienced unnecessarily in its use of the public streets.

The Developer shall enforce discipline and good order among its employees and shall not employ on the work any unfit person or anyone not skilled in the work assigned to them. Employees or agents of the Developer who may impair the quality of the construction shall be removed from the work upon the written request of the District, without cost to the District.

All construction in public streets or rights-of-way shall be performed in accordance with the standards and requirements of the governmental agency having jurisdiction, and in accordance with requirements of the franchise or permit therefore. The Developer shall be responsible to ascertain these requirements and for assuring that its Contractor adheres thereto.

The Developer shall be responsible for assuring compliance with the requirements of all permits, franchises, and licenses.

## **WS-22 ROYALTIES AND PATENTS**

The Developer shall pay all royalties and license fees and defend all suits or claims for infringement of any patent rights and shall save the District harmless on account thereof, except the District shall be responsible for all such loss if a particular process or the product of a particular manufacturer is specified by the District, unless the Developer or its Contractor has information that the process or article is an infringement of a patent and fails to promptly notify the District thereof in writing.

## **WS-23 LAWS TO BE OBSERVED**

The Developer shall comply with all federal, state, and local laws, ordinances and regulations that affect the work, which is the subject of this Agreement.

## **WS-24 DISTRICT RESOLUTIONS AND FINES**

The Developer's attention is specifically directed to Resolution No. A-870 (unlawful connection) and/or any resolutions repealing and/or replacing said resolution. The foregoing Resolution imposes a fine for violating its terms and conditions. Specification of this Resolution is not intended to be inclusive or limiting, and the Developer hereby agrees to comply with all District Resolutions and to ensure compliance with District Resolutions by the Developer's agents. The Developer agrees to pay any fine imposed pursuant to District Resolutions as a condition of and prior to connection to the District's system.

## **WS-25 OTHER WORK**

The District has the right to let other contracts for other work which may affect the work hereunder. Other persons performing such other work shall be afforded reasonable opportunity by the Developer herein for introduction and storage of their materials and execution of their work. The work hereunder and such other work shall be properly coordinated and connected.

## **WS-26 CONTRACTORS**

Only Contractors licensed and bonded with the State of Washington and approved by the District shall be hired to install water and/or sewer extensions. Contractors must have prior experience in the installation of water and sewer extensions. A copy of the license shall be provided to the District. Nothing contained in this Agreement shall create any contractual rights between the District and any person or firm employed to do the work.

## **WS-27 EASEMENTS**

All easements required shall be obtained by the Developer in a form satisfactory to the District without cost to the District and shall provide for a permanent easement and temporary construction easement as shown on the Plans. All easements shall be of the following types, unless specifically modified by the District:

- 1) Offsite Easement

This easement is required for water and/or sewer facilities installed on private property offsite of the proposed development.

2) Onsite Easement (Private Road)

This easement is required for water and/or sewer facilities installed in a private road within the proposed development and shall include the full easement length and width provided for the private road together with an additional 10 feet parallel and adjoining each side of the private road.

3) Onsite Easement

This easement is required for water and/or sewer facilities installed on private property located within the proposed development and outside of private or public roads.

4) Parallel and Adjoining Easement

This easement is required parallel and adjoining to all public roads within or bordering the proposed development.

Parallel and Adjoining Easements shall be a minimum of ten feet in width and all other easements shall be a minimum of fifteen feet in width. The width of the onsite and/or offsite easements may be required to be increased by the District, at their discretion for reasons such as, but not limited to, water and/or sewer facilities installed at depths greater than 10 feet or in areas where access is difficult due to topographic constraints.

All easements shall be clearly identified on the plans and labeled as easements granted to the Mukilteo Water and Wastewater District.

All easements shall be clearly written in a manner that the easement can be plotted from the description. The Developer shall provide the District with supporting data to verify the location of all easements including 8-1/2" x 11" drawings of the property and easement with bearings and distances utilized in the easement description. When requested, the Developer shall provide the District satisfactory title insurance, insuring without exception the District's interest in all easements conveyed to the District.

Permanent easements shall be conveyed to the District free of any permanent structures or other structures which interfere with District maintenance and

operations. The Developer further covenants and agrees not to construct or install such structures on or near the easement.

Executed copies of offsite easements shall be delivered to the District prior to construction. All other easements shall be delivered to the District prior to the acceptance of the work addressed in this Agreement.

#### **WS-28 PRE-CONSTRUCTION CONFERENCE**

No work shall begin on the extension(s) until the Developer has held a pre-construction conference with all concerned parties at the District office. The Developer shall arrange for the conference and the attendance of concerned parties only when all necessary permits have been issued by public authority and are in District possession.

### **B. CONSTRUCTION**

#### **WS-29 PROTECTION OF WORK AND PROPERTY**

The Developer shall exercise due care to protect property and the work addressed by this Agreement. The Developer shall be solely responsible for any loss or damage to property or the work herein occurring prior to the completion of and acceptance of the work by the District.

#### **WS-30 PUBLIC HAZARD OR INCONVENIENCE**

If the performance of the work should result in hazard or substantial inconvenience to the public, the District may correct the same, if in the opinion of the District the same should be necessary, and the Developer shall, on request, reimburse the District for expense incurred. The Developer shall also reimburse the District for the expense incurred in complying with any order of public authority lawfully made with respect to the work during the performance of the work or within the two-year guarantee period after acceptance of the same.

#### **WS-31 SAFETY**

The Developer shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during the performance of the work, and for compliance with all federal, state, and local safety laws and regulations. This requirement will apply continuously and not be limited to normal working hours.

The right of the District or the District's Engineer to conduct construction review of the Developer's performance or inspection of the work or the site is not intended to include review of the adequacy of the Developer's safety measures in, on, or near the construction site.

### **WS-32 SANITATION**

Necessary sanitation convenience for the use of workmen on the job, properly secluded from public observation, shall be provided and maintained during the performance of the work as required by the appropriate agency.

### **WS-33 CROSS-CONNECTION CONTROL**

The Developer shall comply with all state, local and District rules and regulations prohibiting cross-connections. The Developer shall install and maintain state approved backflow prevention devices as required by the District in its absolute discretion as a condition of receiving final acceptance of the extension improvements and utility service from the District. Prior to acceptance of the Project, the Developer shall provide the District with a certified field test of all permanent backflow prevention devices.

### **WS-34 INSPECTION AND TESTS**

All work shall be subject to inspection by the District. The District shall at all times have access to the work whenever it is in preparation or progress, and the Developer shall provide proper facilities for such access and inspection. The Developer shall make reasonable tests of the work at the Developer's expense upon the District's request. Whenever work must be specially tested or inspected for compliance with public regulations, or with the Plans and Specifications, the Developer shall give the District reasonable notice of the readiness of the work for such test or inspection. The District shall make inspections within 24 hours of notification by the Developer. Work shall not be covered up without consent of the District, and if it should be covered without such consent, it shall be uncovered for inspection at the Developer's expense. Such inspections and tests shall not relieve the Developer of any of its responsibilities under this Agreement.

The presence or absence of a District inspector on any job will be at the sole discretion of the District, and such presence or absence of a District inspection

shall not relieve the Developer of its responsibility to obtain the construction results specified in the Agreement.

The District and the District's Engineer do not purport to be a safety experts, and are not so engaged in that capacity whenever performing inspections and tests pursuant to this provision. The authority of the District to perform inspection and tests shall not relieve the Developer of its responsibility for safety.

#### **WS-35 OVERTIME AND HOLIDAY WORK**

There will be no overtime work for District personnel. If it is necessary for District personnel to work overtime caused by the Developer, the time will be charged to the Developer at the District's established rate. If it is necessary for work to be done on a weekend or holiday, the Developer will be charged a 4 hour minimum call-out. If approved by the District, 72 hours notice shall be required.

#### **WS-36 TRAFFIC MAINTENANCE AND PROTECTION**

All work shall be performed with due regard for the safety and convenience of the public and so that interference with automotive and pedestrian traffic is minimized. Flagging personnel, barricades, signs, and traffic control shall be furnished as required by the appropriate agency.

#### **WS-37 ACCESS**

Bridging shall be provided across private driveways and roadways during the period when trenches are open to avoid interference with normal traffic flow.

#### **WS-38 REFERENCE POINTS AND INSTRUCTIONS**

The Developer shall provide all property corners and street centerline stakes, and shall provide reasonable and necessary opportunities and facilities for setting points and making measurements including construction staking. The Developer shall not proceed until provisions have been made to establish such points as may be necessary for the work. The work shall be performed in strict conformity with such points and instructions. The Developer shall carefully preserve all bench marks, reference points and stakes, and, in case of destruction, shall be responsible for any resulting expense such as the cost of restaking and shall be responsible for any errors that may be caused by their absence or disturbance.

### **WS-39 ALIGNMENT OF PIPES AND APPURTENANCES**

The Developer shall furnish sufficient horizontal control, including lot stakes and construction stakes, for locating and staking the lines and appurtenances. Correctness of such horizontal control is the sole responsibility of the Developer and any modification of horizontal location of any facility shall be at the Developers expense.

### **WS-40 CONFINEMENT OF DEVELOPER'S OPERATIONS**

The Developer shall confine construction activities within the property of the Developer and the limits of easements and construction permits outside of the Developer's property. All work on easements and permit areas outside the Developer's property shall be performed in strict compliance with the provisions of the easement or permit with which provisions the Developer shall familiarize itself. Any damage to property or persons from any encroachment beyond these limits shall be the responsibility of the Developer.

### **WS-41 RESTORATION OF IMPROVEMENTS**

Culverts, driveways, roadways, pipelines, or other existing improvements located within easements and public rights-of-way which are removed or disturbed in the course of the work shall be restored to their original condition at the expense of the Developer. In cutting through established lawns, the sod shall be removed before trenching and replaced after backfilling to the satisfaction of the property owner. Private improvements and landscaped areas shall be restored to their former condition at the expense of the Developer. A signed release from the affected property owner will be required. As a minimum requirement, all restoration shall be conformed to the condition of the area prior to construction.

In areas where restoration of existing improvements is necessary and to provide records of existing improvements, the Developer shall provide photographs before and after construction as required in a format acceptable to the District.

### **WS-42 EROSION CONTROL**

Erosion and sediment control throughout the project including abutting and downstream properties shall be the responsibility of the Developer.

The Developer shall determine the appropriate temporary erosion and sediment control necessary for the construction time of the year and shall furnish and install the necessary controls as the first order of work. Such erosion control shall be fully maintained during the course of construction, modifying the control when necessary.

Temporary erosion and sediment control shall consist of and be installed in accordance with the Department of Ecology's Storm Management for the Puget Sound Basin Technical Manual for water quality.

Upon failure of the Developer to provide immediately such erosion control, the District shall be at liberty, without further notice to the Developer to install and remove the necessary erosion control. The Developer shall reimburse the District for any costs incurred on account thereof.

### **WS-43 TRENCH SAFETY SYSTEMS**

The Developer shall provide safety systems for trench excavation that meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW, and any regulations published thereunder, for all trench excavation that will exceed a depth of 4 feet.

### **WS-44 EXCAVATION AND BACKFILL**

These Specifications refer particularly to trench excavation. However, the applicable provisions shall also apply to all excavation and backfill for manholes, structures and other appurtenances.

All excavation performed shall be considered unclassified. Excavation shall consist of the removal of any and all material encountered, including, but not limited to cutting and removal of existing surfacing, tree stumps, trees, logs, abandoned rail ties, piling, riprap, rock, etc.

The root systems of all trees which are outside of the easements or the right-of-way shall not be cut or disturbed, but shall be tunneled or otherwise protected by the Developer to ensure that no damage is done.

Where trenching is performed through paved and concrete areas, the hard surface shall be precut with saws or mechanical cutters in neat, straight lines before removal. The pavement and concrete so removed shall be loaded and hauled to waste.

During excavation, installing of pipelines and structures, and the placing of backfill, excavations shall be kept free of water. The Developer shall furnish all equipment necessary to dewater the excavation and shall dispose of the water as required by the regulatory agencies and in such a manner as not to cause a nuisance or menace to the public. The dewatering system shall be installed and operated by the Developer so that the ground water level outside the excavation

is not reduced to the extent that the adjacent structures or property are endangered or damaged. The release of ground water to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soil, prevent disturbance of backfill, and prevent movement of structures and pipelines.

Where the undisturbed condition of natural soils is inadequate for support of the planned construction, excavation shall be extended below the structure or pipeline grades to permit the placing of foundation gravel.

The water main shall be bedded to a point 6 inches over the crown of the pipe by hand shoveling the material into place and working it under and around the pipe and compacting it with foot tamping or other suitable means to provide proper support to the pipe in its backfilled condition. Excavated material which is unsuitable for bedding the pipe shall be hauled to waste and the pipe bedded with gravel backfill for pipe bedding as indicated in the Specifications for Gravel Materials.

The gravity sewer shall be bedded to a point 12 inches over the crown of the pipe by hand shoveling the material into place and working it under and around the pipe and compacting it with foot tamping or other suitable means to provide proper support to the pipe in its backfilled condition. The pipe shall be bedded with gravel backfill for pipe bedding (or pea gravel) except that all sewer pipes installed within the city limits of Everett shall be bedded with crushed surfacing, base course as indicated in the Specifications for Gravel Materials.

From the points described above to finished grade, all backfill materials shall be compacted to a minimum of 95 percent of the Modified Proctor dry maximum density per ASTM D1557. The Developer shall provide the District with laboratory test results indicating compaction of the trenches meet this requirement.

## **Compaction Test Table**

### Minimum Sampling

Material Trenches	Gradation/Classification See Note 1	Soils evaluation before and during construction by Developer's soils geologist. Testing as recommended.
	In-Place Density See Note 2 & 3	Minimum of one every 200 feet of trench, a minimum of one per day or as approved by the Engineer in areas of existing or proposed streets and one every 200 feet of trench in easements.
	Moisture-Density Relationships	Required for varying soil conditions as determined by soils geologist.

- Note 1: All acceptance tests shall be conducted from in-place samples.
- Note 2: Additional tests may be required when variations occur due to the Contractors operations, weather conditions, site conditions, etc.
- Note 3: For trenches 12 feet and under, complete a minimum of one test at approximately 50 percent of trench depth and an additional test at or near the surface.

For **trenches 12-feet to 16-feet deep**, complete one test at approximately 4 feet above the pipe, one test at or near the surface and one test approximately halfway in between.

For **trenches greater than 16-feet deep**, complete tests at approximately 4-foot intervals above the pipe to the surface (four tests required) or as directed by the Engineer.

If compaction within any area of the project is questionable as determined by the District and prior to paving, additional excavation and testing in accordance with the above table as directed by the District shall be completed.

The Developer shall prepare and restore all test sites with his own equipment, labor, and materials. All costs incidental to the preparation and restoration of all test sites shall be at the Developer's cost.

The Developer shall remedy, at his expense, any defects that appear in the backfill prior to final acceptance of the work.

Within existing streets and rights-of-way, all trench backfill material shall be gravel base as indicated in the Specifications for Gravel Base or controlled density fill (CDF) as required by District or permits.

Partial backfill to protect the pipe will be permitted immediately after the pipe has been properly installed. Complete backfilling of trenches will not be permitted until the section of work in question has been inspected by the District.

Cleanup operations shall progress directly behind backfilling to accommodate the return to normal use of the trench area. Cleanup shall include cleaning streets over which wastehaul has been carried and spilled.

The District reserves the right to restrict the Contractor in the amount of trench open during the working day. Should the Contractor, in the District's opinion, fail to diligently pursue the backfill and cleanup, this limit shall be 200 LF and shall be strictly enforced.

The Developer shall remedy, at no cost to the District, any defects that appear in the backfill prior to final acceptance of the work and also prior to termination of the performance bond. Such repair work required because of defective backfill shall also include replacement of any damaged surface improvements.

When trench dams are required, they shall be installed across the entire trench section keyed a minimum of 12-inches into undisturbed soil and to the full depth of all granular backfill materials. Trench dams shall be utilized in all areas of steep slopes, stream, and wetlands crossings and as determined by the District and other local governmental authorities. A drain may be required at the discretion of the District.

#### **WS-45 GRAVEL MATERIALS**

The types of gravel material which are to be used in trenches or other excavations are divided into the following classifications.

**A. Foundation Gravel**

This material shall be 1/2- to 2-inch gravel or broken stone. No more than 20 percent by weight shall pass the 1/2-inch sieve and not more than 2 percent shall pass the U.S. No. 200 sieve. The material shall be free of clay and organic material, but the material need not be washed. The material shall not have a wear percentage exceeding 35 percent after 500 revolutions by the use of the Los Angeles Machine.

Foundation gravel shall be used only where foundations are unstable and suitable excavated material immediately adjacent to the excavation is not available to stabilize such foundations.

**B. Gravel Backfill for Pipe Bedding**

Gravel backfill for pipe bedding shall consist of crushed, processed, or naturally occurring granular material. The material shall be free of clay and organic material. Not less than 95 percent shall pass the 1/2-inch sieve and not less than 95 percent shall be retained on the No. 4 sieve. Grading shall be to the limiting dimensions, but the material need not be washed. Saturated material will not be acceptable.

Gravel backfill for pipe bedding shall be placed under and around pipes as shown on the Standard Details when existing excavated material does not meet the above specification.

**C. Crushed Surfacing, Base Course**

This material shall conform to the Specifications for Crushed Surfacing, base course, Section 9-03.9(3) of the Standard Specification for Roads, Bridge, and Municipal Construction of the State of Washington.

Crushed Surfacing, base course shall be placed under and around all sewer pipes installed within the city limits of Everett as shown on the Standard Details.

**D. Gravel Base**

This material shall conform to the Specification for Gravel Base, Section 9-03.19 of the Standard Specifications for Roads, Bridge and Municipal Construction of the State of Washington, except that 25 percent of the material shall be retained

on the 1/4-inch sieve. The material is to be used for backfill of trenches, around manholes and structures, within all existing streets and rights-of-way and elsewhere where excavated material is unsuitable for backfill.

**E. Quarry Spalls - Drainage Ditches**

This material shall conform to the Specifications for Quarry Spalls, Section 9-13.6 of the Standard Specification for Roads, Bridge, and Municipal Construction of the State of Washington, modified for 100 percent to pass the 6-inch screen.

Quarry spalls shall be placed in ditches and on slopes to be protected. After placement, the quarry spalls shall be compacted by tracked equipment making a minimum of three passes.

**WS-46 CONTROLLED DENSITY FILL**

Controlled Density Fill (CDF) shall be a mixture of Portland cement, fly ash, aggregates, water and admixtures proportioned to provide a non-segregating, self-consolidating, free-flowing and excavatable material which will result in a hardened, dense, non-settling fill.

CDF shall be batched and mixed in accordance with Section 6-02.3 Standard Specifications for Road, Bridge, & Municipal Construction of the State of Washington.

Materials are as follows:

- |    |                 |                          |
|----|-----------------|--------------------------|
| 1. | Portland Cement | AASHTO M85 or WSDOT/9-01 |
| 2. | Fly Ash         | Class F                  |
| 3. | Aggregates      | WSDOT/9-03.1(2)B         |
| 4. | Water           | WSDOT/9-25               |
| 5. | Admixtures      | WSDOT/9-23.6             |

CDF shall be used in the following proportions for 1 cubic yard. Batch weights may vary depending on specific weights of aggregates.

Max. Gallons Of Mixing Water per Cubic Yard	50
Lbs. of Cement per Cubic Yard	50
Lbs. of Fly Ash per Cubic Yard	300
Lbs. of Dry Aggregate per Cubic Yard (Class 1 or 2 Sand per WSDOT 9-03.1(2)B)	3,200
Compressive Strength	100 psi maximum at 28 days

CDF shall be batched to provide a flowable, non-segregating mix, with a slump between 6 and 8 inches.

CDF shall be discharged from the mixer by any reasonable means into the area to be filled. The CDF shall be brought up uniformly to the elevation shown on the Plans.

CDF shall not be placed on frozen ground.

CDF patching, mixing, and placing may be started if weather conditions are favorable, when the temperature is at 34 degrees F and rising. At the time of placement, CDF must have a temperature of at least 40 degrees F. Mixing and placing shall stop when the temperature is 38 degrees F or less and falling. Each filling stage shall be as continuous an operation as is practicable.

For flowable CDF, compaction is not necessary for placement. The Developer may, as an option, adjust the water content only to obtain a 0 to 1 inch maximum slump mixture which if used shall be compacted in lifts not to exceed 12 inches. Compaction shall be accomplished by use of a hand vibratory plate or hoe-pack.

The Developer shall have a steel plate cover placed and anchored over the trench until the District determines the mixture is sufficiently cured, so that a permanent patch can be placed.

#### **WS-47 STATE HIGHWAY AND STREAM CROSSINGS**

All state highway, rail road, stream or other crossings as determined by the District where boring is required to complete the crossing shall be encased with steel casing. Steel casing shall be of sufficient diameter (minimum of 24 inches), size, and strength to enclose the pipe and to withstand maximum loading. Sizing

and wall thickness of casing is subject to approval by the District. The carrier pipe shall be ductile iron, Class 52, restrained joint pipe unless otherwise approved by the District. Casing spacers shall be installed at each 10 feet of the pipeline. The spacers shall be Uni-Flange Series UFRCS 1300 or approved equal, sized to prevent uplift in the pipe. Sand backfill between the casing and the pipe shall be required. In order to prevent the sand from being washed from the casing, the ends of the casing shall be bricked and cemented or otherwise sealed after installation, backfill and testing of the pipe are complete.

## **WS-48 RESTORATION OF SURFACE IMPROVEMENTS**

The restoration of various types of surface improvements shall be as described below.

The Developer shall be responsible to maintain all roadway and walkway areas until the permanent repair is accomplished. The Developer shall repair or replace all areas damaged or disturbed during construction.

### **A. Temporary Surface Repair**

The Developer shall place a temporary surface repair immediately after backfill in all streets and driveways. The material shall be MC-2 asphaltic concrete commonly referred to as "cold mix." The backfill shall be thoroughly compacted and brought to a smooth grade prior to placing the material.

### **B. Asphalt Concrete Pavement Repair**

The width of all pavement cuts shall be approved by the District before removal of pavement. All pavement cuts shall be continuous and shall be made with a machine specially equipped for this purpose. No skip cutting will be allowed.

Materials shall conform with Section 9.03 of the Standard Specifications for Road, Bridge & Municipal Construction of the State of Washington. Asphalt treated base shall be used as shown on the Standard Detail. All asphalt treated base shall conform and be placed in accordance with the requirements of Section 4-06, Standard Specifications for Road, Bridge and Municipal Construction of the State of Washington. The penetration of the asphalt used shall be between 85 and 100, viscosity grade AR4000.

Asphalt used for pavement repair shall be asphalt concrete pavement Class "B" and shall conform and be placed in accordance with the requirements of

Section 5-04, Standard Specifications for Road, Bridge and Municipal Construction of the State of Washington. The penetration of the asphalt used shall be between 85 and 100, viscosity grade, AR4000.

All edges and joints of asphalt concrete pavement repair shall be sealed with asphalt cement. The asphaltic paint binder, or tack coat, shall conform in all respects to Section 5-04, Standard Specifications for Road, Bridge, and Municipal Construction of the State of Washington. After pavement is in place, all joints shall be sealed.

Existing monument cases, valve boxes, catch basins, manholes, cleanouts, or any other items shall be adjusted to grade at the top of the finished surface of the roadway or easement.

### **C. Crushed Rock Surfacing**

Shoulders, gravel driveways, roadways and alleys shall be resurfaced with crushed surfacing, top course. Crushed surfacing shall be manufactured in accordance with the provisions of Section 9-03.9(3) of the Standard Specifications for Road, Bridge, and Municipal Construction of the State of Washington, and installed to a minimum thickness of 2 inches.

Special care shall be taken to ensure that the surface has been brought to a uniform grade prior to placement of the material. Immediately prior to placement of the gravel, the drainage ditch, shoulders and/or driveways shall be graded to the original smooth contours existing prior to the construction in the area. Spreading shall be done as soon as each load is placed. The Developer shall be required, as far as practical, to haul material over the surfacing as it is placed.

### **D. Cement Concrete Curb**

Cement concrete curbs shall be installed in accordance with Section 8-04.3(1) of the Standard specifications for Road, Bridge, and Municipal Construction of the State of Washington.

Existing curbs and gutters that are damaged or removed in performing the Project within the trench sections or as designated by the District shall be replaced in kind with the same shape and dimensions.

**E. Extruded Cement Concrete Curb**

Extruded cement concrete curbs shall be installed as shown on the Plans and in accordance with Section 8-04.3(1)A of the Standard specifications for Road, Bridge and Municipal Construction of the State of Washington.

**F. Cement Concrete Sidewalks**

Cement concrete sidewalks shall be installed as shown on the Plans and Section 8-14 of the Standard Specifications for Road, Bridge, and Municipal Construction of the State of Washington.

**G. Landscaped, Improved, and Unimproved Areas**

Certain improvements and landscaping exist in and along the public rights-of-way including the adjacent private properties. Wherever such property is damaged, destroyed, or the use thereof is interfered with due to the operation of the Developer, it shall be immediately restored to its former condition by the Developer. Notice should be given to the property owner along the route of construction by the Developer advising them of the methods to be used to preserve and restore the improvements.

The construction areas not improved with surfacing or landscaping shall be restored to original grade and shape, smooth with no debris remaining in or adjacent to the site.

The area shall be hydro-seeded in accordance with Section 8-01 of the Standard Specifications for Road, Bridge, and Municipal Construction of the State of Washington.

**WS-49 CLEANUP**

The construction site shall be kept clear during the progress of the work. Before the work shall be considered complete, the Developer shall clean out ditches that may have been filled during the work, replace damaged surfacing, remove surplus materials and trash and dispose of brush, repair all damages, and otherwise leave the job in a neat, orderly, and workmanlike condition. Dust control shall be provided during the progress of the work and during cleanup. The Developer shall keep existing roads and streets adjacent to or within the limits of the project open to and maintained in a good and safe condition for traffic at all times. The Developer shall remove, on a daily basis, any deposits or

debris which may have accumulated on the roadway surface as a result of construction operations. Removal shall be performed on a more frequent basis should the District determine that such removal is necessary. Any damage resulting from the Developer's operation shall be repaired at no expense to the District.

#### **WS-50 USE OF COMPLETED PORTIONS**

The District shall have the right to take possession of and use any completed or partially completed portions of the work although the time may not have expired for completing the entire work, and this shall not be deemed acceptance of any of the work.

#### **WS-51 FINAL INSPECTION**

All material and completed work are subject to final inspection by the District, which shall have the right to subject any portion thereof to such tests as in the opinion of the District shall be necessary to determine whether the work complies with the Plans and Specifications.

#### **WS-52 "AS-BUILT" DRAWINGS**

The District will maintain "as-built" information about the project as it is constructed. This information will be made available to and utilized by the Developer's Engineer for preparation of "as-built" drawings. The "as-built" drawings shall be prepared at the Developer's expense.

### **C. POST CONSTRUCTION**

#### **WS-53 OWNERSHIP OF PLANS**

The original mylars, three copies and an electronic file of all "as-built" Plans prepared by the Developer's Engineer shall be delivered to the District as a condition of and prior to acceptance of the Project, and shall become the property of the District. Neither the Developer nor the Developer's Engineer shall have any rights of ownership, copyright, trademark or patent in respect to the Plans.

#### **WS-54 LIENS**

Prior to acceptance of the work, the Developer shall deliver to the District either a complete release of all liens that arise out of the performance of the work or evidence acceptable to the District that there are no liens filed against the work. If any lien arises or remains unsatisfied after acceptance of the work, the Developer shall reimburse the District for any costs incurred on account thereof.

#### **WS-55 RECORDING**

The District will not approve the Plat for recording until the entire underground portion of the water and/or sewer facilities have been installed, tested and in the case of sewers, televised; and a copy of the final plat to be recorded is delivered to the District for review of adequacy of easements. A copy of the final recorded plat and all necessary recorded easements shall be delivered to the District before service connections to the extension will be allowed.

#### **WS-56 COMPLETION BOND**

If the Developer completes the underground portion of the water and/or sewer system and desires water and/or sewer service prior to the final paving of streets within the development, or prior to final acceptance of such extension(s), and if approved by the District, then an additional cash completion bond shall be deposited with the District in an amount to be determined by the District to cover the cost of work yet to be completed in conjunction with the final paving, grading and transfer of ownership. An assignment of funds will be unacceptable.

#### **WS-57 BILL OF SALE**

Upon completion of the work and approval of the District, the Developer shall, as a condition of acceptance by the District, convey the work to the District by Bill of Sale, in accordance with the form attached as an appendix hereto.

**END PART 1**

**PART 2**

**WATER MAINS**

## **W-1 WATER MAIN PIPE**

Water mains to be installed shall be ductile iron pipe for all sizes, unless specifically noted otherwise.

The ductile iron pipe shall conform to AWWA C151 Standards, except the minimum nominal thickness shall be as follows:

4" - 0.29" (Class 52 for bell and spigot, Class 53 for threaded spools)  
6" - 0.31" (Class 52)  
8" - 0.33" (Class 52)  
12" - 0.37" (Class 52)  
16" - 0.40" (Class 52)

Grade of iron shall be 60-42-10. The pipe shall be cement-lined to a minimum thickness of 1/16 inch meeting NSF standards for potable water and the exterior shall be coated with an asphaltic coating.

Each length shall be plainly marked with the manufacturer's identification, year cast, thickness, class of pipe and weight. The pipe shall be furnished with mechanical joint or push-on joint, conforming to AWWA C111 Standards, except where otherwise noted as calling for flanged joints.

Polyethylene encased or "bagged" pipe, where shown on the Plans shall be minimum of 8 mil thick, tube bagged, in accordance with AWWA C105.

Restrained joint pipe, where shown on the Plans, shall be push-on joint pipe with "Field Lok" gaskets or TR FLEX as furnished by US Pipe, or approved equal.

The pipe manufacturer shall certify in writing that the inspection and all tests of the specified standards for both pipe and gaskets being supplied for this project have been made and that the results thereof comply with the requirements of the Standard.

Joints shall be "made-up" in accordance with the manufacturer's recommendations. Standard joint material, including rubber ring gaskets shall be furnished with the pipe. Materials shall be suitable for the specified pipe sizes and pressures. The pipe joint utilized shall be the patented "Tyton" joint.

Except where necessary, in making connections with other lines and unless authorized by the District, pipes shall be laid with bells facing in the direction of laying and for lines on an appreciable slope, the bells shall face upwards.

All pipe shall be delivered to the job site with water tight wrapping or pipe plugs. All pipe shall be carefully checked on delivery as well as before placing in the trench. Pipe shall be carefully bedded, joined and protected. It shall be laid to the line and grade established and at all times the interior kept free from dirt, gravel, and all other foreign matter. The open ends shall be wrapped or plugged and secured at any time pipe laying is not in progress.

Water mains shall be laid on a uniform grade and the Developer shall anticipate those places where additional depth is required to avoid certain utilities, and adjust the pipeline profile accordingly to maintain uniform grade.

Prior to making permanent connections to the existing system, the new water main including service lines shall have passed a pressure test, been adequately flushed, and finally passed the required bacteriological test.

All types of pipe shall be handled in a manner that will prevent damage to the pipe, pipe lining or coating. Pipe and fittings shall be loaded and unloaded using hoists and slings in a manner to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled against other pipe. Damaged pipe will be rejected, and the contractor shall immediately place all damaged pipe apart from the undamaged and shall remove the damaged pipe from the site within 24 hours.

Methods of handling shall be corrected by the Developer if the District determines that these methods are damaging to the pipe.

All pipe to be purchased and installed as a part of the Developers water system shall be delivered to the job site with water tight wrapping or pipe plugs. Furthermore, to comply with AWWA Standards, these pipe plugs or wrappings shall remain in place until the pipe is installed in the trench at which time one end plug would be removed for joining pipe ends.

If there is any pipe not meeting this requirement, the District shall reject it, or under special circumstances may allow that it be swabbed out with chlorine solution and capped before accepted by the District.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and relayed. A clean whiskbroom shall be used for this purpose and for brushing to remove foreign matter prior to joining of pipe ends. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the District to ensure cleanliness inside the pipe.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails or other similar supports. Pipe on succeeding tiers shall be alternated by bell and plain end. Timbers 4-inches by 4-inches in size shall be placed between tiers and chocks shall be placed at each end to prevent movement. For safety each size of pipe shall be stacked separately.

## **W-2 WATER MAIN FITTINGS**

All fittings shall be short-bodied, ductile iron complying with applicable AWWA C110 or C153 Standards. All fittings shall be cement-lined and either mechanical joint or flanged, as indicated on the Plans.

Fittings in sections shown on the Plans requiring restrained joints shall be mechanical joint fittings with a mechanical joint restraint device. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc. MEGALUG, Romac Industries, Inc., Grip Ring Pipe Restrainer or approved equal. Stargrip Series 3000 mechanical joint restraint devices are not accepted or approved as equal.

Fittings shall be adequately "blocked" with poured-in-place concrete, within wooden forms shaped to establish a firm minimum bearing area, against an undisturbed earth wall as shown on the Standard Details. 4" x 4" minimum size Timber blocking may be permitted as temporary blocking, when utilized as forms outside the poured-in-place concrete when fittings are to be pressurized prior to the 24 hour minimum "set" time. The concrete thrust blocks must be in place at least 24 hours before beginning the pressure test, to allow the concrete to "set". The strength of the concrete shall be 2,000 psi minimum.

All valves and all fittings requiring a concrete block shall first be covered with 4-mil Visqueen plastic sheets, before concrete is poured. The concrete shall not cover joints, bolt heads or nuts.

All bolts shall be coated with Armite Anti-Seize Compound No. 609, or equal, prior to installation.

Before cutting existing pipes, the Developer shall measure the pipe outside diameter to determine if pipe was manufactured to a diameter which is different than presently specified in /AWWA Standards, and if required, the Developer shall furnish alternate or additional fittings more compatible with the pipe outside diameter.

All connections to ductile or cast iron pipe shall be with ductile iron mechanical joint sleeves, or approved equal, except as shown on the Plans for mechanical joint tees, valves, etc.

All connections to pipe other than cast or ductile iron shall be with Romac, Smith-Blair, Dresser or Ford flexible couplings. The couplings shall have long middle rings and shall have a fusion-bonded epoxy coating. Coupling gaskets shall be Grade 60. The bolts and nuts shall be high strength, low alloy steel or electro-galvanized mild steel.

All joints in the pipe, fittings, valves, flexible couplings, and sleeves, shall be fully seated with small clearances allowed for pipe expansion. Where flexible couplings and sleeves are called for, the space between pipe ends shall not exceed one-quarter (1/4) inch.

When the space between pipe ends is excessive, a short section of pipe may be inserted as a spacer ring to limit such pipe movement within the coupling or sleeve, to obtain the one-quarter (1/4) inch limitation stipulated herein.

### **W-3 VALVES**

All valves 12 inch and smaller shall be resilient seated ductile iron gate valves except where shown on the Plans. All valves 16 inch and larger shall be ductile iron butterfly valves.

The valve manufacturer shall certify in writing that the inspection and all tests of the specified standards for the valves being supplied for this project have been made and that the results thereof comply with the requirements of the Standard.

## **A. Resilient-Seated Gate Valves**

The gate valves shall be resilient seated ductile iron body valves with non-rising stems (NRS) opening counterclockwise and equipped with a 2-inch square operating nut. Valves shall meet the full requirements of the AWWA C509 or C515 Standards. The valves shall have double "O" ring stem seals which shall withstand the test pressure without leakage. Valves shall be rated at 250 pounds per square inch (psi), minimum working pressure and furnished with either flanged and/or mechanical joints as shown on the Plans. All surfaces, interior and exterior, shall be epoxy-coated, acceptable for potable water.

Valves shall be Mueller, M&H, Clow, American Flow Control Series 2500, U.S. Pipe or approved equal.

## **B. Butterfly Valves**

The butterfly valves shall be either mechanical joint or flanged ductile iron body valves equipped with a 2-inch square operating nut and shall be of the tight closing, rubber seat type. Valves shall meet the full requirements of AWWA C504-87 Standards, Class 150-B except the valve shall be able to withstand 200 psi differential pressure without leakage.

Butterfly valves shall be Henry Pratt Company "Groundhog," "Dresser „450," or approved equal.

All valves shall be set with the operating stems vertical. The axis of the valve box shall be common with the projected axis of the valve operating stem. The tops of the adjustable valve boxes shall be set to the existing or established grade, whichever is applicable.

All valves with operating nuts located more than 3 feet-6 inches below finished grade shall be equipped with extension stems to bring the operating nut from 2 feet-0 inches to 1 foot-0 inches from finished grade.

The extension stem of the length required to meet field conditions shall be a manufactured unit with a 1-inch-diameter mild steel rod. At the top of the extension stem there shall be a 2-inch standard operating nut complete with a centering flange.

Valve boxes shall be equal to the "Rich 940-B" Model. The flared end of the valve box shall be set at the bottom elevation of the 2-inch operating nut to allow space for rocks to be moved laterally from the operation nut. The "ears" on the valve box top shall be aligned parallel in the direction of the branch the valve opens and closes.

The valve box shall be placed over the valve or valve operator in such a manner that the valve box does not transmit shock or stress loads to the valve. The casting shall not rest directly upon the body of the valve or upon the water main.

Any extension of the valve box shall utilize additional flared end valve box bottom sections or cast iron hub soil pipe. Other materials are not acceptable.

In areas where the valve box is not in concrete or asphalt a 24-inch by 24-inch by 4-inch cement concrete block shall be installed around the valve box at finished grade. The valve box shall be flush with the top and centered.

A fiberglass valve marker post shall be furnished and installed where directed. Valve marker posts shall be blue in color, 3.75 inches wide (flat), 60-inches long and furnished with a 3-inch by 3-inch high density white reflector (250 candle power) and a flexible anchor barb. Valve markers shall be Carsonite Utility Marker CUM 375.

Markers shall be placed at the edge of the right-of-way opposite the valve and set so as to leave 36 inches of the post exposed above grade. The size of the valve and the distance in feet and inches to the valve shall be noted with decals, typically designed for use on fiberglass boats, placed on the face of the post, using letters approximately 2-inches high. Each post shall include the following decal: "Caution Water Valve, Before Digging, Call 1-800-424-5555, Utility Underground Location Center."

#### **W-4 TAPPING TEES AND TAPPING VALVES**

The tapping sleeves shall be rated for a working pressure of 250 psi minimum and furnished complete with joint accessories. Tapping sleeves shall be constructed in two sections for ease of installation and shall be assembled around the main without interrupting service.

Fabricated steel style sleeves shall be fusion bonded coated, acceptable for potable water, and shall be manufactured by JCM, Romac or approved equal.

Size on size connections shall utilize stainless steel full circle tapping tee or DI MJ cut-in tee.

Tapping valves shall be resilient-seated ductile iron body gate valves provided with a standard mechanical joint outlet for use with ductile iron pipe and shall have oversized seat rings to permit entry of the tapping machine cutters. In all other respects, the tapping valves shall conform to the resilient seat gate valves herein specified with regards to operation and materials.

The tapping sleeve and valve shall be pressure tested to 200 psi (water) prior to tapping the main.

The installation of the tapping sleeves and valves and the tapping of the main shall be performed by Speer Taps, Superior Taps, or Approved by District.

#### **W-5 AIR RELIEF VALVES**

Air and vacuum release assemblies shall be installed at high points on the water system as shown on the Plans or designated in the field by the District.

The air relief assemblies shall be a combination air and vacuum valve, Crispin #UL-10, Valmatic 201-C or APCO 143C complete as shown on the Standard Detail.

#### **W-6 BLOWOFF ASSEMBLIES**

The blowoff assemblies shall be furnished and installed as shown on the Standard Detail.

Temporary blowoffs utilized by the Contractor for flushing the water main shall be sufficient size to obtain 2.5 feet per second velocity in the main.

#### **W-7 FIRE HYDRANTS**

The fire hydrants shall be the break-away compression type, meeting AWWA C502-85 Standards, in which the valve will remain closed if the barrel is broken. The hydrants shall have a barrel diameter of not less than 8-1/2 inches, and the main valve opening shall be not less than 5-1/4 inches in diameter. The fire hydrants shall be equipped with two, 2-1/2-inch National Standard Thread (NST) hose nozzles and one, 4-1/2-inch NST pumper port. A permanent anodized Storz hydrant adapter and anodized Storz blind flange shall be installed on the 4-1/2-inch pumper port. Hydrants within the City of Mukilteo fire service area and Fire District #1 shall be equipped with 4-inch Storz adapters; all other

hydrants shall utilize a 5-inch Storz adapter. Branch connection shall be for 6-inch pipe, as noted on the Standard Details, and shall be mechanical joint.

Fire hydrants shall be Mueller Centurian (A-423), Clow Medallion or M&H Dresser "Reliant" (929).

The Contractor shall furnish fire hydrants with the correct bury depth (trench depth), in accordance with the specified pipe depth and special conditions of the Project. The fire hydrants shall be installed to provide the mounting height above finished grade as shown on the Standard Detail. The hydrant shall be installed plumb on the vertical axis.

A 36-inch by 36-inch by 8-inch cement concrete block shall be installed with a broomed surface and finished edge at the finished grade line and shall be located 2 inches below the bury line of the hydrant. One quarter inch expansion strips shall be placed between hydrant barrel and concrete. Forms shall be removed from the block prior to acceptance by the District.

The hydrants shall be wire brushed, primed with one coat of Preservative All Metal Guard II and painted with two coats of Preservative Lux-Light Caterpillar Yellow.

Between the time that the hydrant is installed and the completed facility is placed in operation, the hydrant shall at all times, be wrapped in burlap, bagged, or covered in some other suitable manner as approved by the District, to clearly indicate that the hydrant is not in service.

The resilient, seated ductile iron body gate valve shall have a flange by mechanical joint body, and be bolted to the main line tee.

The connecting pipe between the fire hydrant and gate valve shall be 6-inch ductile iron restraint joint pipe and shall not exceed 50 feet in length. The fire hydrant and gate valve shall be restrained with a mechanical joint restraint device as indicated in Water Main Fittings. In addition to this, the hydrant and tee shall be fully blocked with concrete.

Hydrant guard posts, where shown on the Plans or required by the District, shall be 9-inch-diameter by 6-foot-long reinforced precast concrete units and the portion above ground painted similar to requirements for the fire hydrant.

The Developer shall install a raised blue reflector on the final lift of asphalt in line with the fire hydrant in accordance with the fire district's requirements.

## **W-8 SERVICE CONNECTIONS**

Individual services to each structure and/or property shall be installed and connected to the new water mains.

Upon completion of the installation of the water main (before testing and disinfection) services shall be installed by connecting to the water main and extending the service line to the property line as shown on the Standard Details or approved equal. Service lines for residential property shall be Type "K" 1-inch (minimum size) copper service lines meeting the ASTM Specifications B-88-47. Larger service lines shall be of the type and style as designated in the Standard Details and shown on the Plans.

Commercial and multi-family projects that require larger than 1-inch meters shall provide 1-1/2-inch or 2-inch meter service installations per the District standards as shown on the Standard Details. Two inch and smaller meters are supplied by the District. Three inch and larger meters fall into a different design criteria and will be specifically designated as needed and supplied by other.

Corporation stops and the single meter shut-off valves shall be "Mueller" of the type and style noted on the Standard Details or approved equal. Included as a part of the service connection shall be the furnishing and installation of the meter box complete with a cast iron traffic lid, set flush with the proposed finished grade of the lot in the designated location near the property line, all as shown on the Standard Details. The angle type of shut-off valve shall be set inside the meter box in a proper position for installation of a future meter by the District. Upon completion of each service line as indicated herein, the Developer shall flush the service line to remove the debris that may interfere with the future meter installation, and further verify that the service line has full pressure and flow to the meter box. Meter boxes shall be marked with a painted 2 x 4 stake as shown on the Standard Details.

Service lines between the main and the property line shall be placed at a trench depth sufficient to maintain a 3-foot cover over the top of the service line for its full length, taking into consideration the final finished grade of the proposed street and the final finished grade of any storm ditches.

## **W-9 LARGE METER AND TESTS**

If extensions require water meters 3 inches or larger, then such entire meter installations, including but not limited to, valves, piping, vaults, drain lines and meters shall be installed by the Developer conforming to District standards. The Developer shall pay the meter test fee established by the District and shall sign a District meter application form and pay all fees and charges due at that time.

## **W-10 FIRE LINE SERVICES**

If extensions require a fire line service, then such entire installation, including but not limited to, valves, piping, vaults, drain lines and meters shall be installed by the Developer conforming to District standards. The service shall have a Double Check Detector Backflow Prevention Assembly installed in a utility vault at the ROW/Property line with a 6" PVC gravity drain to storm. Fire line service shall terminate in the structure to be served as shown on the Districts Riser Detail.

## **W-11 HYDROSTATIC PRESSURE TEST**

The water mains shall be hydrostatically tested before being placed in service. Water for testing must be obtained by the Developer by arrangement with the District. A positive displacement type pump shall be furnished by the Developer for the testing. Feed for the pump shall be from a disinfected clean container, wherein the actual amount of "makeup" water can be measured.

Upon completion of sections of the pipe installation, the water main shall be pressure tested in segments of 1,000 lineal feet or less. The test pressure shall be either 200 pounds per square inch, or twice the system pressure, using the greater value, and shall maintain the test for a period of not less than 2 hours.

Pressure testing against existing valves shall not be permitted unless authorized by the District.

The Developer shall provide temporary plugs, caps and blocking as required to pressure test and disinfect the new water main prior to making connections to the existing system.

Concrete thrust blocking for fittings shall be in place and the concrete "set" sufficiently to withstand the test pressure before starting the test.

All pressure tests shall be made with the hydrant auxiliary gate valves open and pressure against the hydrant valve. After this basic pipe line test has been completed, each valve shall be tested including the hydrant auxiliary valve by closing each in turn and relieving the pressure beyond. This test of the valves will be acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The Developer shall verify and assure that the pressure differential across the valve does not exceed the rated working pressure of the valve.

Prior to calling for the District to witness the pressure test, the Developer shall first perform a satisfactory pressure test. The allowable leakage rate per thousand feet of each size pipeline is as follows:

Allowable Leakage	
<u>Pipe Size</u>	<u>Gallon per hour per 1,000 Ft. @ 200 psi</u>
6"	0.64
8"	0.85
10"	1.06
12"	1.28
16"	1.70

Any leakage caused by defective workmanship or materials shall be repaired, and the line shall again be tested to full compliance.

All visible leaks in pipelines or fittings shall be repaired even if the test results fall within the allowable leakage.

**W-12 DISINFECTION OF WATER MAINS**

Water mains and appurtenances shall be disinfected in accordance with AWWA C651 before being placed in service. Water for disinfection must be obtained by the Developer by arrangement with the District.

The method of placing calcium hypochlorite granules in the water main as it is being installed is acceptable if the pipe and appurtenances are kept clean and dry during construction.

The calcium hypochlorite granules contain approximately 65 percent available chlorine by weight. The minimum amount of calcium hypochlorite granules placed at the beginning and in each 500 feet of pipe is as follows:

<u>Pipe Size</u>	<u>Calcium Hypochlorite Granules</u>
6"	1.0 oz.
8"	2.0 oz.
12"	4.0 oz.
16" and larger	8.0 oz.

When the line is completed and ready to disinfect, water shall be allowed to flow in slowly, until it appears at the far end of the line so as not to displace the disinfecting agent. The system shall then be allowed to stand for at least 24 hours. The line shall then be flushed through the fire hydrants until a test shows the CL2 residual no longer exceeds distribution system residual.

In all instances, the Developer shall utilize a state approved double check valve type backflow prevention device to protect the potable water supply while filling, flushing and disinfecting the particular water main.

In the process of chlorinating newly laid water pipe, all valves, fire hydrants and other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.

The Developer is herein advised that prior to making any restoration or permanent connections to the existing water mains the Developer shall first demonstrate to the District that the new water main has adequately passed a pressure test, been adequately flushed, and finally passed the required bacteriological test.

In all disinfection processes, the Developer shall take particular care in flushing and wasting the chlorinated water from the mains to assure that the flushed and chlorinated water does no physical or environmental damage to property, streams, storm sewers or any waterways. Flushing water must be disposed of in accordance with Washington State Department of Ecology Standards. Flushing water shall require dechlorination or disposal to sewer system to prevent damage to the affected environment, particularly aquatic and fish life of receiving streams.

Before placing the lines in service, a satisfactory bacteriological report or approval shall be received from a State approved laboratory on samples collected from representative points in the new system. The District shall collect all samples for the bacteriological tests. However, the Developer shall notify the District requesting collection of samples 2 working days in advance, and schedule on days wherein samples can be conveniently processed by a State

Department of health approved laboratory. If any of the pipeline materials are replaced thereafter, then that section shall again be disinfected, pressure tested and tested for bacteriological count.

If disinfection of mains by the above methods prove unsatisfactory and the lab report indicates any type of bacteria count, then the Developer shall re-chlorinate using other methods in accordance with AWWA C691, approved by the District.

### **W-13 CONNECTIONS TO EXISTING SYSTEMS**

All cut-in connections to the existing system shall be made after a successful pressure test of the new main has been witnessed by the District and after a purity test has been satisfactorily evidenced.

Size on size connections shall utilize stainless steel full circle tapping tee or DI cut-in tee.

Where it is necessary to shut-off the existing (or new) mains to make a connection, the Developer shall notify the District 72 hours or 3 working days in advance of such shut-off, and the District will notify customers of the shut-off, provide temporary services to critical customers and shut-off the mains. Connections shall be performed between the hours of 9:00 a.m. and 4:30 p.m. only. No cut-in connections or connections of new piping to the existing piping shall be scheduled for Fridays or Mondays. Once the water has been shut-off, the Developer shall diligently pursue the connection to completion, so that the time required for the shut-off may be held to a minimum. The District will notify customers in the area of the scheduled shut-off.

The required connections shall not be started until all of the materials, equipment and labor necessary to properly complete the work are assembled on the site. All connections shall be completed the same day they are started. The Developer shall time its operations so that water will not be shutoff overnight or over weekends or holidays.

The location, type and size of existing facilities have been determined from available records and are approximate. It is anticipated that connections to these existing facilities may be made, in general, as shown on the Plans, except where adjustments are required for vertical and horizontal alignment.

It shall be the responsibility of the Developer to determine the exact horizontal and vertical location of connections, ascertain the type and size of existing

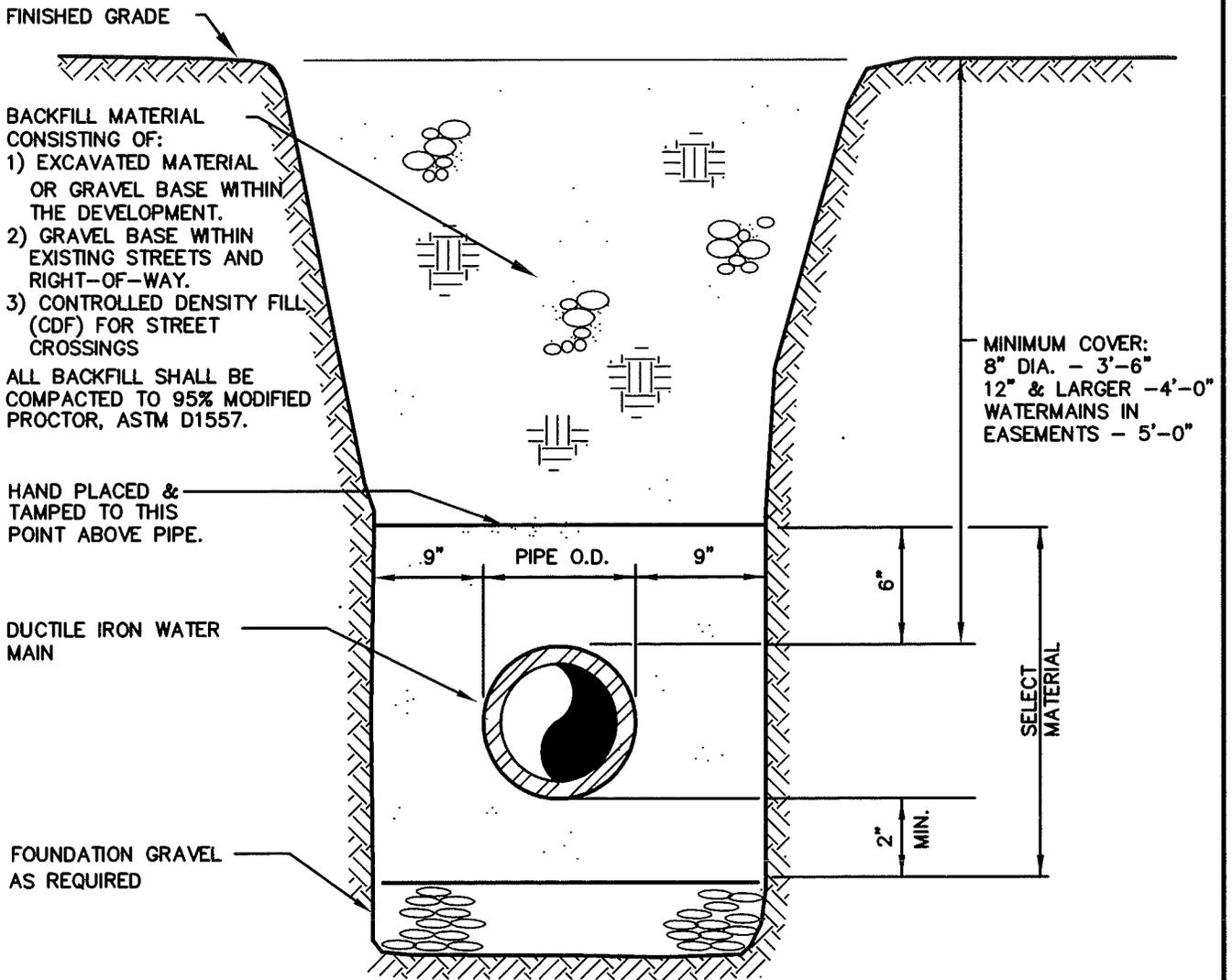
facilities and determine potential conflicts prior to starting work on any connection. Alternatives shall be provided as required to complete the connection detail.

Connections to existing facilities shall be made with the use of fittings, valves, flexible couplings, solid sleeves, shackling and other miscellaneous fittings, including thrust blocks as shown on the Plans and with additional pipe or fittings as approved by the District.

Where connections are made to existing facilities and it is impractical to use the methods described herein to disinfect the section between the existing water main and the point of installation of the new water main (valve or temporarily plugged line) the Developer shall clean and swab the pipe, fittings and valves with a minimum 5 percent chlorinated solution immediately before making said connection and thereby disinfect the necessary connection.

All pipe and fittings used for the connection shall be clean and disinfected. The Developer shall take extra precautions to ensure the tightness of the connections, nuts and bolts. The existing water main shall be placed back into service by the District and the connection observed for leakage by the District prior to backfilling the pipe.

**END PART 2**



**NOTES:**

1. THE DEVELOPER SHALL PROVIDE THE DISTRICT WITH LABORATORY TEST RESULTS INDICATING COMPACTION OF THE TRENCH MEET THE REQUIREMENT OF 95% MODIFIED PROCTOR, ASTM D1557.
2. IN EASEMENTS, DURING BACKFILL OPERATIONS, FURNISH AND INSTALL 3" WDE METALLIC MARKER TAPE WITH 3 FT. OF COVER OVER WATER MAIN.

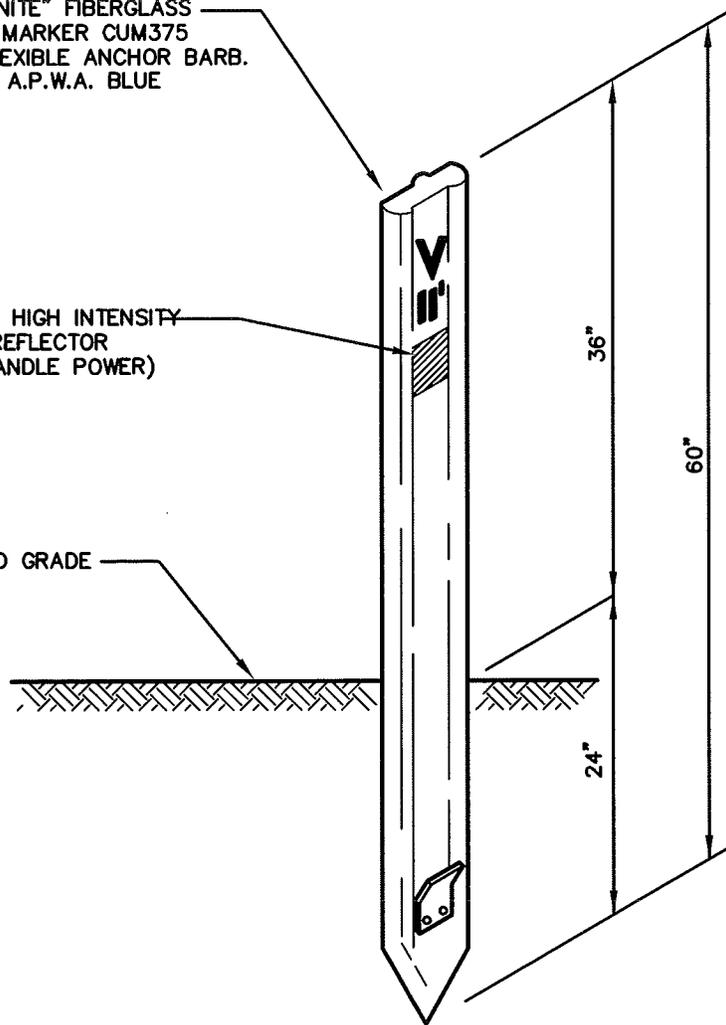
**WATER MAIN  
 TYPICAL TRENCH SECTION**

Mukilteo Water and Wastewater  
 District  
 STANDARD DETAILS

"CARSONITE" FIBERGLASS  
UTILITY MARKER CUM375  
WITH FLEXIBLE ANCHOR BARB.  
COLOR: A.P.W.A. BLUE

3" x 3" HIGH INTENSITY  
WHITE REFLECTOR  
(250 CANDLE POWER)

FINISHED GRADE



**NOTES:**

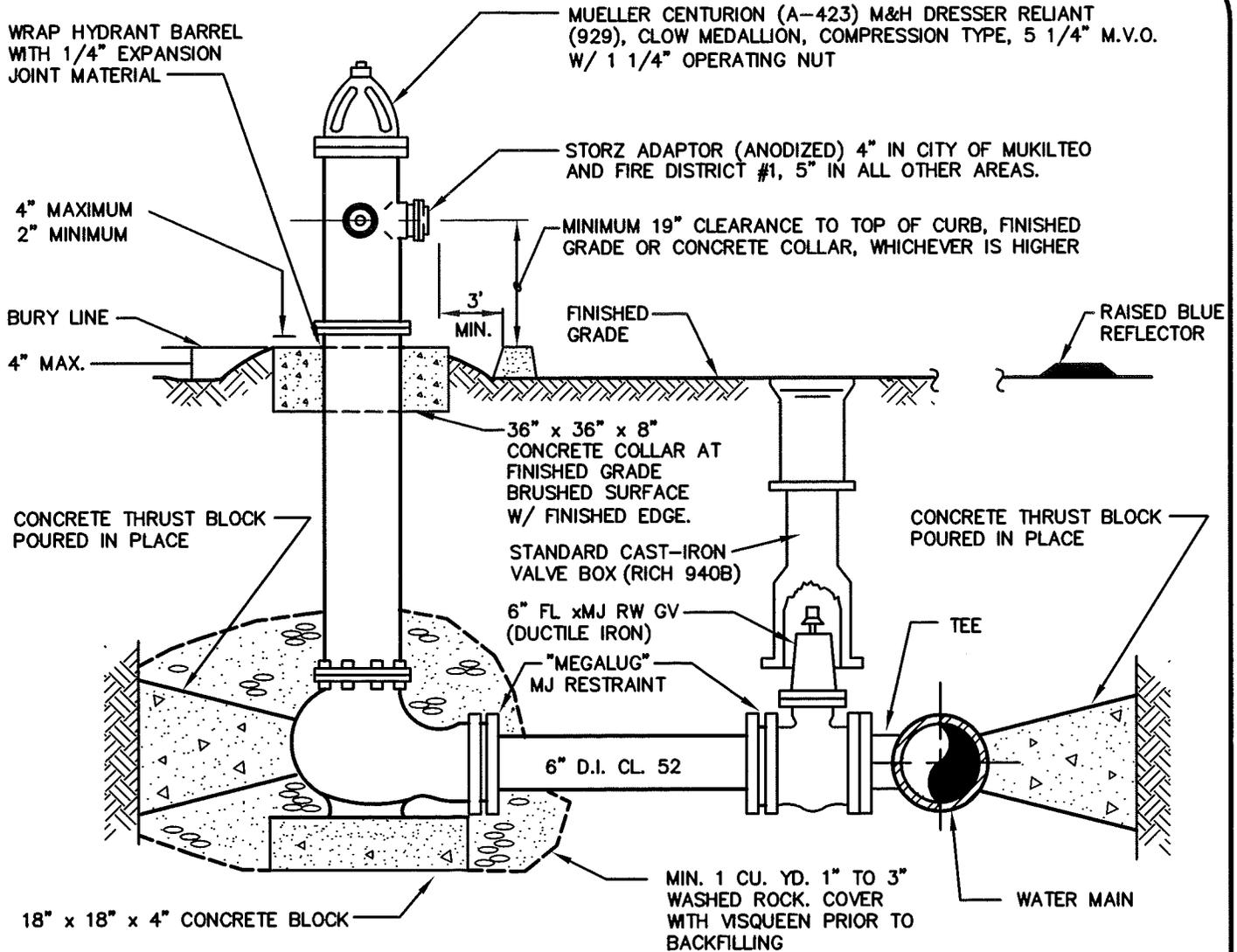
1. THE LETTER "V" AND THE DISTANCE IN FEET TO THE VALVE SHALL BE ON THE POST WITH 2" HIGH DECALS DESIGNED FOR USE ON FIBERGLASS BOATS.
2. EACH POST SHALL INCLUDE THE FOLLOWING DECAL:  
"CAUTION WATER VALVE, BEFORE DIGGING, CALL  
1-800-424-5555, UTILITY UNDERGROUND LOCATION CENTER."

**VALVE MARKER**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

**W-D2**

8/09

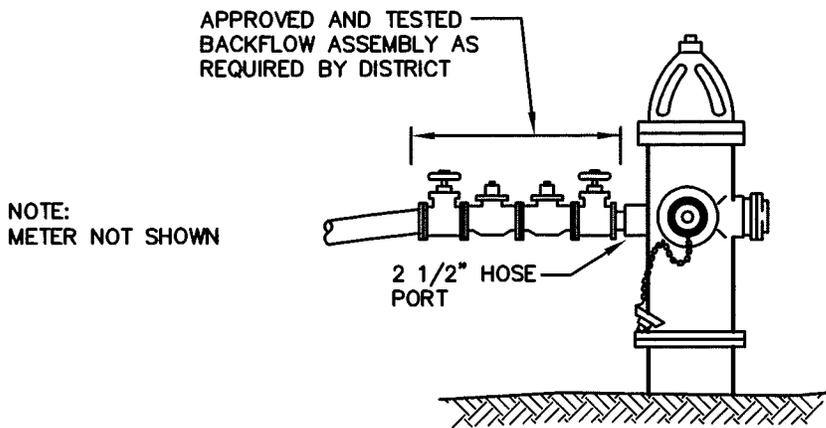


**NOTES:**

1. AFTER INSTALLATION, HYDRANT SHALL BE WIRE BRUSHED, PRIMED WITH PRESERVATIVE PAINT CO. ALL METAL GUARD II PRIMER & FIELD PAINTED WITH 2 COATS OF LUX-LIGHT CATERPILLAR YELLOW.
2. WHEN HYDRANT SPOOL EXCEEDS 18', USE FULL CIRCLE MJ REPAIR SLEEVE WITH 'MEGALUGS' OR FIELD LOK GASKETS. MAXIMUM LENGTH IS 50'.
3. HYDRANTS SHALL BE BREAK-AWAY TYPE IN WHICH VALVE WILL REMAIN CLOSED IF BARREL IS BROKEN.
4. PROVIDE MINIMUM 3'-0" CLEARANCE AND LEVEL AREA AROUND HYDRANT.
5. GUARD POSTS MAY BE REQUIRED BY THE DISTRICT. SEE GUARD POST DETAIL FOR ADDITIONAL REQUIREMENTS.
6. DISTANCE IN FEET TO THE VALVE BOX SHALL BE PLACED AT THE BARREL, BELOW THE PUMPER PORT, WITH 2" HIGH DECALS DESIGNED FOR USE ON FIBERGLASS BOATS.
7. RAISED BLUE REFLECTOR IN ACCORDANCE WITH THE FIRE DISTRICTS REQUIREMENTS
8. 3' MINIMUM CLEARANCE FROM BACK OF CURB OR BACK OF SIDEWALK TO ANY PART OF HYDRANT.

**FIRE HYDRANT  
ASSEMBLY**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

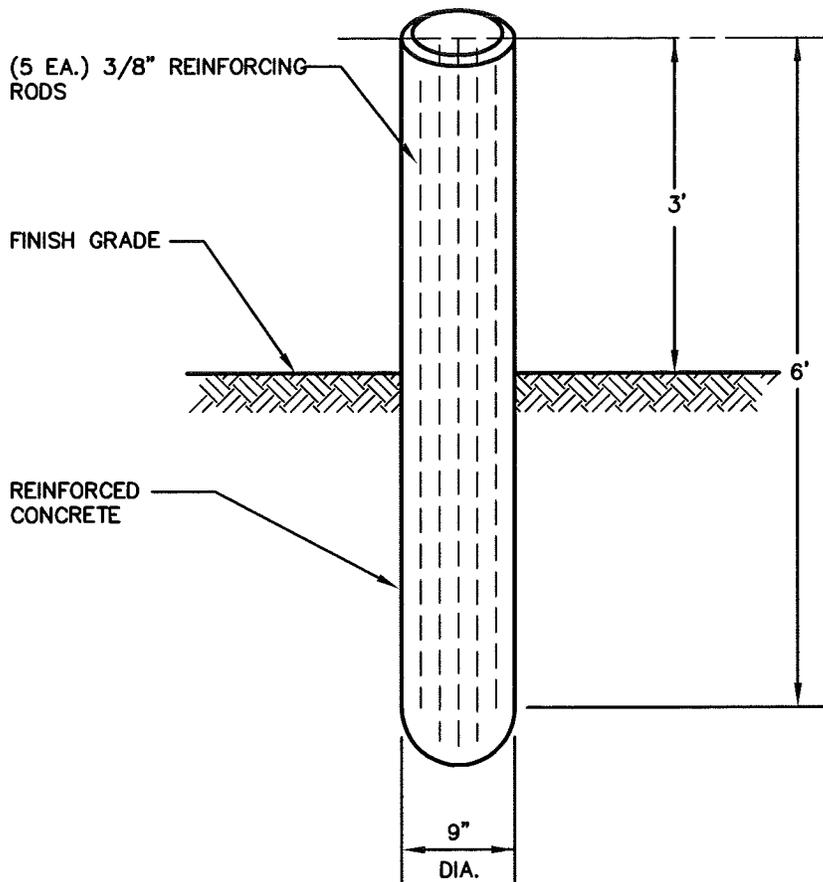


**HYDRANT USE PROCEDURES**

1. ACQUIRE HYDRANT METER FROM MWWD.
2. THERE SHALL BE AN ACCEPTABLE WASHINGTON STATE APPROVED BACKFLOW ASSEMBLY FURNISHED AND INSTALLED BY CONTRACTOR. A HYDRANT METER SHALL BE OBTAINED FROM DISTRICT. (NOT SHOWN ABOVE)
3. OPENING & CLOSING OF HYDRANT VALVE SHALL BE WITH AN ACCEPTABLE HYDRANT WRENCH.
4. THERE SHALL BE AN AUXILIARY VALVE ATTACHED TO THE 2 1/2" HOSE PORT OF THE HYDRANT.
5. THE HYDRANT VALVE SHALL BE FULLY OPENED AND THE WATER USE CONTROLLED EXCLUSIVELY BY THE AUXILIARY VALVE.
6. THE AUXILIARY VALVE SHALL BE OPERATED IN A SLOW MANNER TO PREVENT UNDUE EXCESSIVE PRESSURE ON THE WATER SYSTEM.
7. ANY VIOLATION OF ANY OF THE ABOVE SHALL BE SUBJECT TO A FINE.

**HYDRANT USE**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

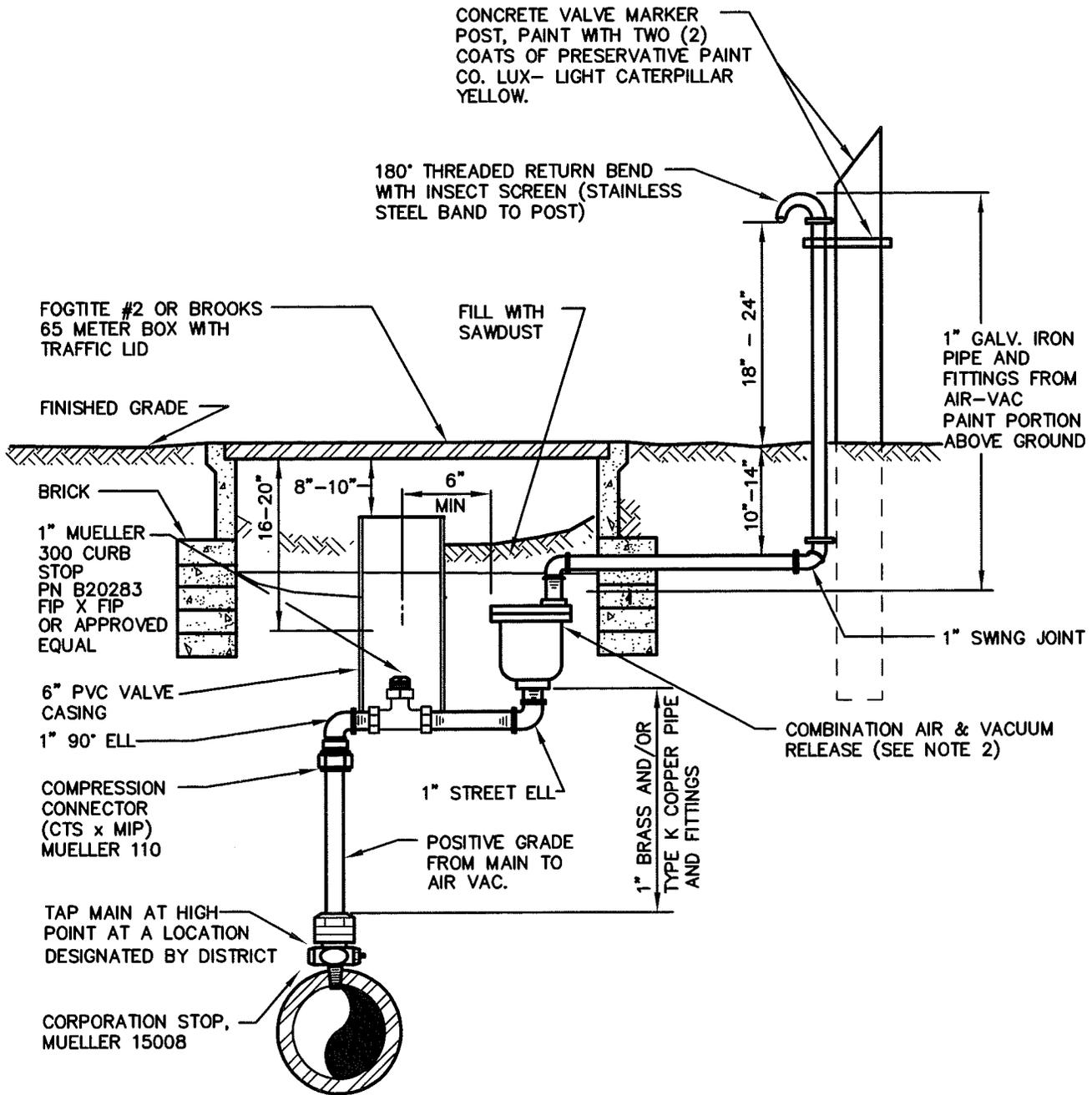


**NOTES**

1. GUARD POSTS SHALL CONSIST OF REINFORCED 9" DIA. PRECAST UNIT.
2. THE NUMBER AND CONFIGURATION OF THE GAURD POSTS MAY BE 2, 3, OR 4 AND SHALL BE DETERMINED BY THE DISTRICT BASED ON FIELD CONDITIONS.
3. GUARD POSTS SHALL BE PAINTED WITH TWO (2) COATS OF PRESERVATIVE PAINT CO. LUX-LIGHT CATERPILLAR YELLOW PAINT.

**GUARD POST**

Mukilteo Water and Wastewater  
 District  
 STANDARD DETAILS



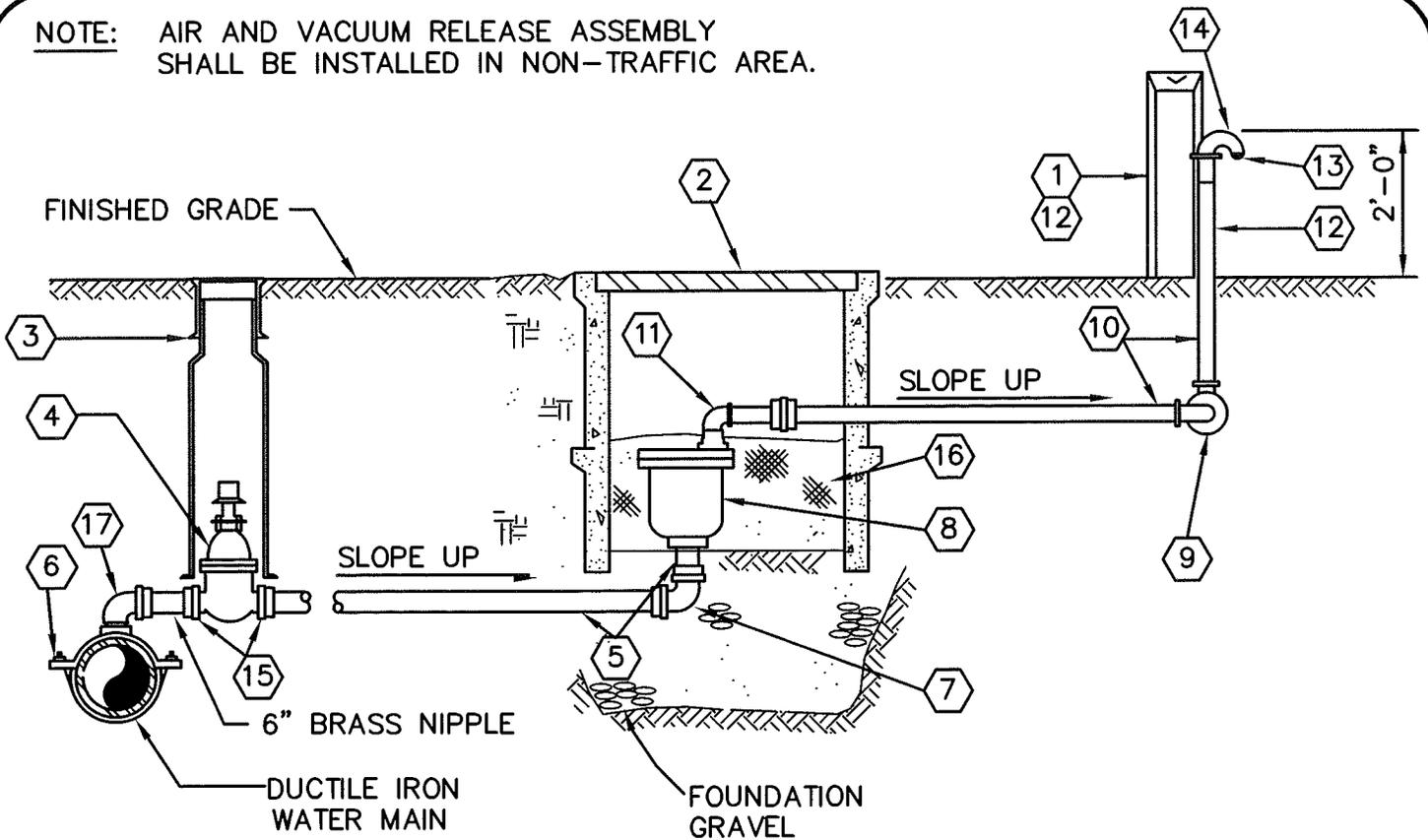
**NOTES:**

1. AIR-RELIEF ASSEMBLY LOCATION SHALL BE AT ALL HIGH POINTS OF THE SYSTEM.
2. APPROVED COMBINATION AIR & VACCUM RELEASE ASSY'S:
  - a. CRISPEN UL-10
  - b. VALMATIC 201-C
  - c. APCO-143C

**1" AIR RELEASE ASSEMBLY**

Mukilteo Water and Wastewater District  
STANDARD DETAILS

**NOTE:** AIR AND VACUUM RELEASE ASSEMBLY SHALL BE INSTALLED IN NON-TRAFFIC AREA.



- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>① CONCRETE VALVE MARKER POST</li> <li>② CONC. METER BOX, FOGTITE # 2 OR BROOKS 65</li> <li>③ CAST IRON VALVE BOX</li> <li>④ 2" AWWA RESILIENT SEAT GATE VALVE THD X THD, WITH OPERATING NUT</li> <li>⑤ 2" TYPE "K" COPPER TUBING</li> <li>⑥ DOUBLE STRAP STAINLESS STEEL SERVICE CLAMP</li> <li>⑦ 90° BEND MUELLER No. H-15526 COMPRESSION X COMPRESSION</li> </ul> | <ul style="list-style-type: none"> <li>⑧ 2" COMBINATION AIR &amp; VACUUM RELEASE ASSEMBLY; A. APCO MODEL 144. B. CRISPIN MODEL CRAL 2. C. VALMATIC</li> <li>⑨ 2, 2"X90° ELL, GALV.</li> <li>⑩ 2" GALV. IRON PIPE (FIELD LOCATE NEXT TO EXISTING PROPERTY LINE).</li> <li>⑪ 2"X90° ELL (GALV.)</li> <li>⑫ PAINT PORTION ABOVE GROUND WITH TWO COATS OF PRESERVATIVE PAINT CO. LUX-LIGHT CATERPILLAR YELLOW #43-616 -1</li> <li>⑬ 2" BEEHIVE STRAINER</li> <li>⑭ 2" OPEN PATTERN RETURN BEND</li> <li>⑮ STRAIGHT COUPLING, MUELLER No. H-15428 COMPRESSION TO M.I.P.</li> <li>⑯ SAWDUST OR VERMICULITE</li> <li>⑰ 90° BEND MUELLER No. H-10096 FEMALE X M.I.P.</li> </ul> |
|--|---|

**NOTES:**

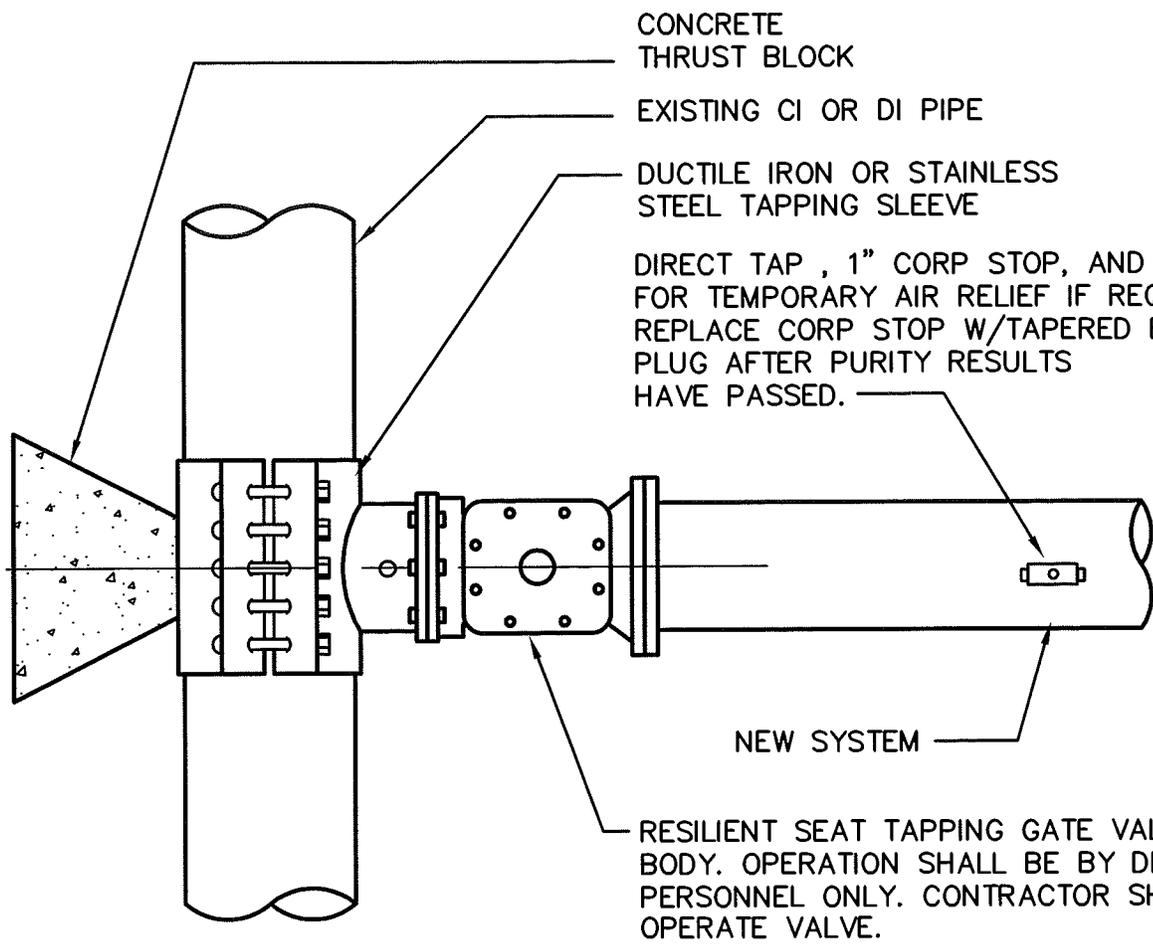
1. ALL PIPING BETWEEN DOUBLE STRAP SADDLE AND INLET SIDE OF COMBINATION AIR AND VACUUM ASSEMBLY SHALL BE COPPER OR BRASS
2. TAP WATER MAIN AT HIGH POINT, LOCATION TO BE DETERMINED BY THE DISTRICT

2' AIR RELEASE ASSEMBLY

Mukilteo Water and Wastewater District  
STANDARD DETAILS

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CONCRETE THRUST BLOCK

EXISTING CI OR DI PIPE

DUCTILE IRON OR STAINLESS STEEL TAPPING SLEEVE

DIRECT TAP , 1" CORP STOP, AND HOSE FOR TEMPORARY AIR RELIEF IF REQ'D. REPLACE CORP STOP W/TAPERED BRASS PLUG AFTER PURITY RESULTS HAVE PASSED.

NEW SYSTEM

RESILIENT SEAT TAPPING GATE VALVE W/ DI BODY. OPERATION SHALL BE BY DISTRICT PERSONNEL ONLY. CONTRACTOR SHALL NOT OPERATE VALVE.

**NOTES:**

1. SIZE-ON-SIZE TAPPING TEES SHALL BE STAINLESS STEEL FULL CIRCLE MECHANICAL SLEEVE.
2. DUCTILE IRON TAPPING TEES SHALL BE ALLOWED IF TAP IS AT LEAST 2" SMALLER IN DIAMETER THAN THE EXISTING WATER MAIN.
3. TAPPING TEES SHALL BE PRESSURE TESTED TO 200 PSI
4. CONNECTIONS NOT ALLOWED ON FRIDAYS, HOLIDAYS, OR WEEKENDS

**WET TAP CONNECTION**

Mukilteo Water and Wastewater District  
STANDARD DETAILS

8/09

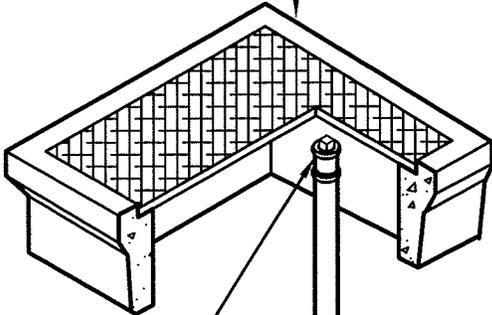
**W-D8**

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"CARSONITE" FIBERGLASS UTILITY MARKER TO SPECS, COLOR: APWA BLUE SEE WD-2

FOGTITE #2 OR BROOKS 65 METER BOX WITH TRAFFIC LID FLUSH WITH FINISHED GRADE



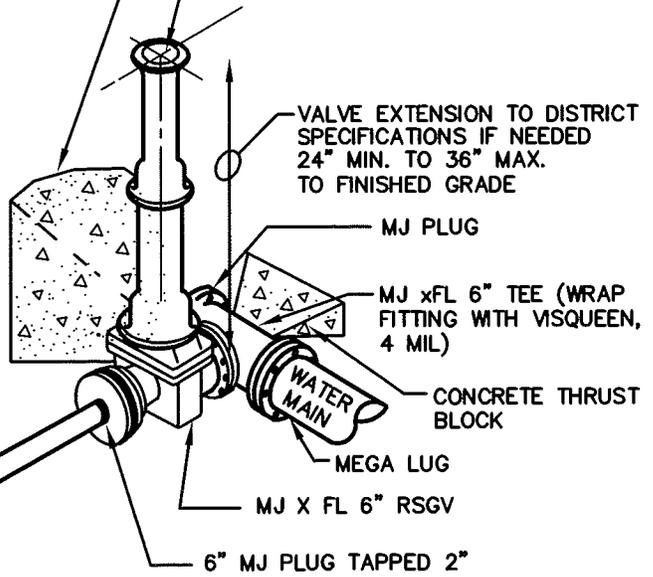
CONCRETE THRUST BLOCK SHALL NOT ENCASE ANY PORTION OF VALVE OR BOLTS

STANDARD CAST-IRON VALVE BOX "RICH 940B" ("CARSONITE" VALVE MARKER POST REQUIRED WITH BLOWOFF ASSY.)

VALVE EXTENSION TO DISTRICT SPECIFICATIONS IF NEEDED 24" MIN. TO 36" MAX. TO FINISHED GRADE

2" GALV. COUPLING & 2" SQ. PLUG (INSTALL 8" BELOW METER LID)

2" GALV. PIPE



MJ PLUG

MJ xFL 6" TEE (WRAP FITTING WITH VISQUEEN, 4 MIL)

CONCRETE THRUST BLOCK

MEGA LUG

MJ X FL 6" RSGV

6" MJ PLUG TAPPED 2"

2" GALV. NIPPLE

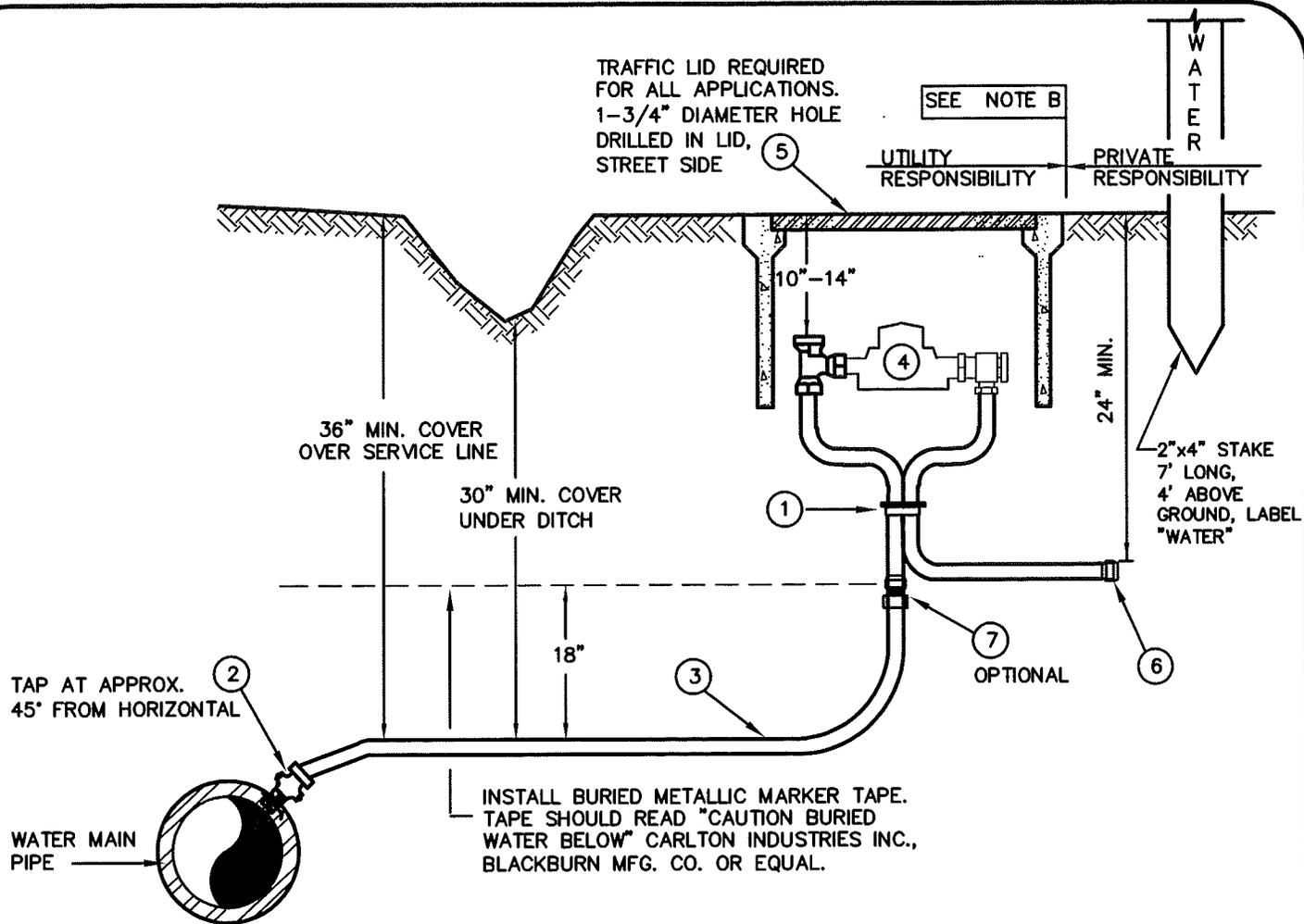
(SWING JOINT) 2" STREET EL. & 2" STREET EL. & 2" 90° EL.

**NOTE:**

WHERE LAST STICK OF PIPE IS LESS THAN 18' INSTALL FIELD LOC GASKET AT LAST JOINT.

## 2" BLOWOFF ASSEMBLY

Mukilteo Water and Wastewater District  
STANDARD DETAILS



NO.	ITEM	MATERIAL	SIZE	APPROVED MODELS
1	METER SETTER	COPPER	1"	FORD: VBH 94-15 W-11-44AVH WITH VERTICAL INLET MUELLER: B-24104-2
2	CORPORATION STOP	FOR COPPER SERVICE	1"	FORD: FB-1000-4-Q   MUELLER: B-25008
3	DIAMETER OF PIPE SHALL MATCH METER SIZE	COPPER	1"	FEDERAL SPEC. WW-T-799. TYPE K ASTM SPEC. B88, TYPE K AWWA SPEC. 7S-CR, TYPE K
4	METER (FURNISHED BY MWD)			
5	METER BOX			FOGTITE: B 9 1/2 T; WITH 1-3/4" HOLE IN LID JR BROOKS: 37 W/CAST TRAFFIC LID; WITH 1-3/4" HOLE IN LID
6	PVC PLUG AT END OF TAIL PIECE		1"	
7	COPPER X IP ADAPTOR		1"	FORD: C-8433-Q   MUELLER: H-14227

**NOTES:**

A. SPLICES - NOT ALLOWED UNLESS APPROVED BY THE DISTRICT. USE MUELLER 110 OR FORD QUICK JOINT.

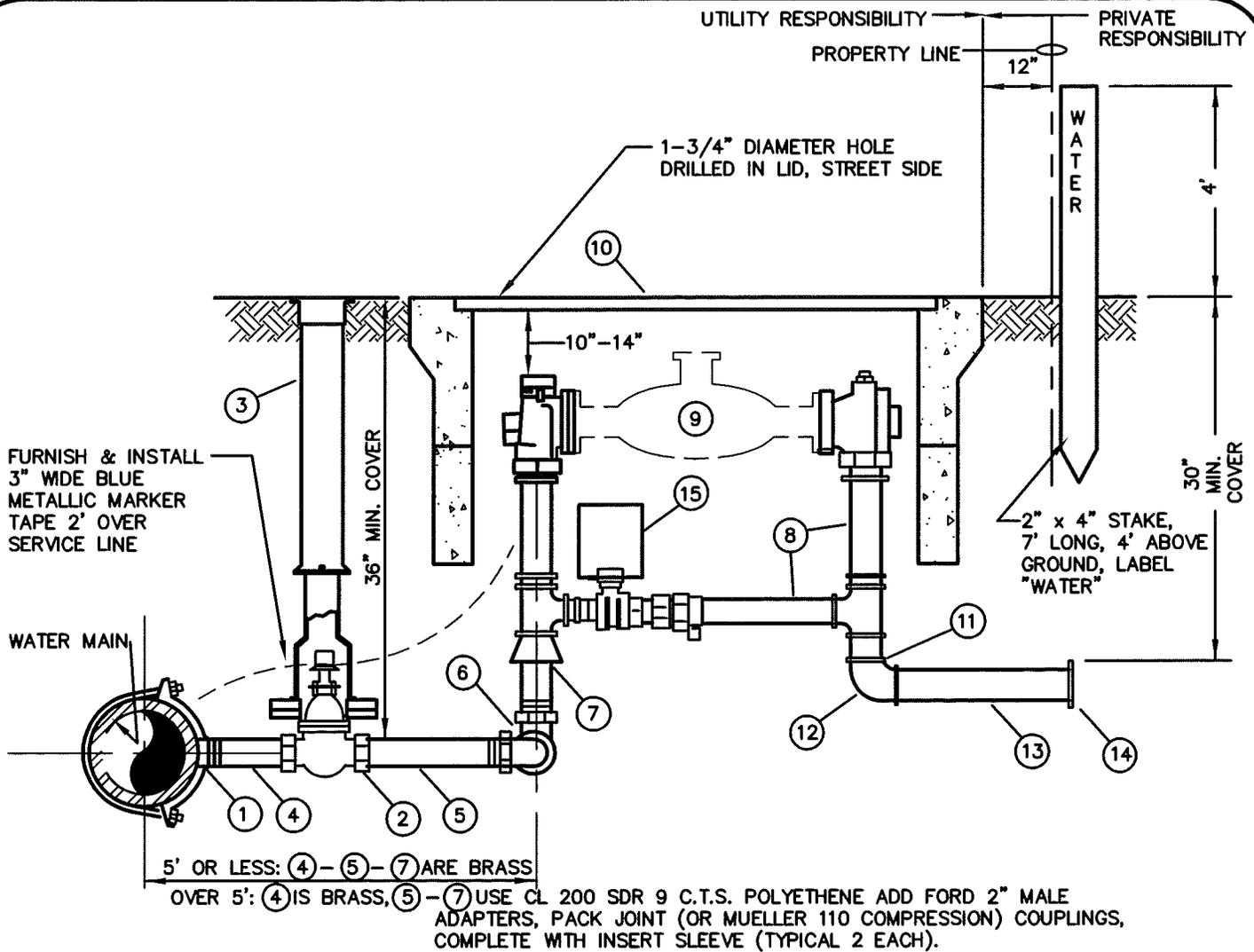
B. OWNERS ARE RESPONSIBLE FOR INSTALLING PRESSURE REDUCER ON THEIR SYSTEM TO PROTECT THEIR FACILITIES FROM HIGH PRESSURE.

C. SURFACE RESTORATION IN ACCORDANCE WITH JURISDICTIONAL AUTHORITY.

D. 4" OF BEDDING REQUIRED ON ALL COPPER. SAND ONLY.

**1" WATER SERVICE INSTALLATION**

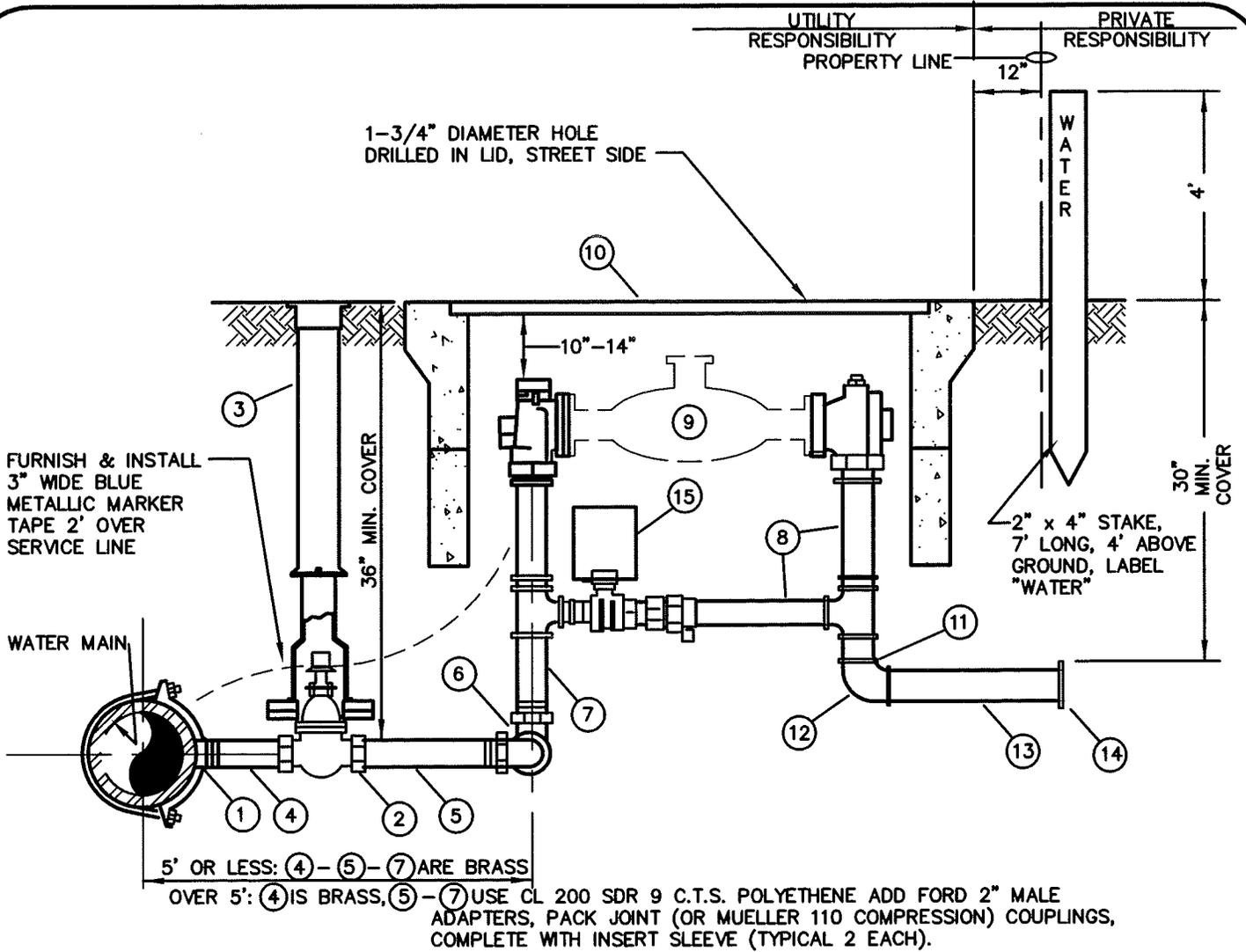
Mukilteo Water and Wastewater District  
STANDARD DETAILS



NO.	ITEM
1	ROMAC STYLE 202S STAINLESS STEEL DOUBLE STRAP TYPE SADDLE
2	2" RESILIENT WEDGE GATE VALVE WITH 2" OPERATING NUT
3	STANDARD CAST-IRON VALVE BOX (RICH NO. 940)
4	BRASS NIPPLE (3" MIN., 6" MAX.)
5	NIPPLE (SEE NOTE ABOVE)
6	BRASS SWNG JOINT
7	NIPPLE (SEE NOTE ABOVE) WITH 2" x 1 1/2" REDUCER (FORD C-84-67)
8	METER SETTER, 1 1/2" FORD VBH66-12B WITH METER SPACER (LENGTH DETERMINED BY DISTRICT PRIOR TO INSTALLATION)
9	METER (FURNISHED BY DISTRICT) 13 1/4" LONG
10	METER BOX, NO.2 FOG TITE OR BROOKS NO. 65, WITH STEEL TRAFFIC COVER (FURNISH 2 BOXES). 1-3/4" DIAMETER HOLE IN LID.
11	1 1/2" BRASS NIPPLE
12	1 1/2" BRASS 90° EL
13	1 1/2" x 12" BRASS NIPPLE
14	1 1/2" CAP
15	6" PVC PIPE OVER BY-PASS VALVE.

## 1 1/2" WATER SERVICE INSTALLATION

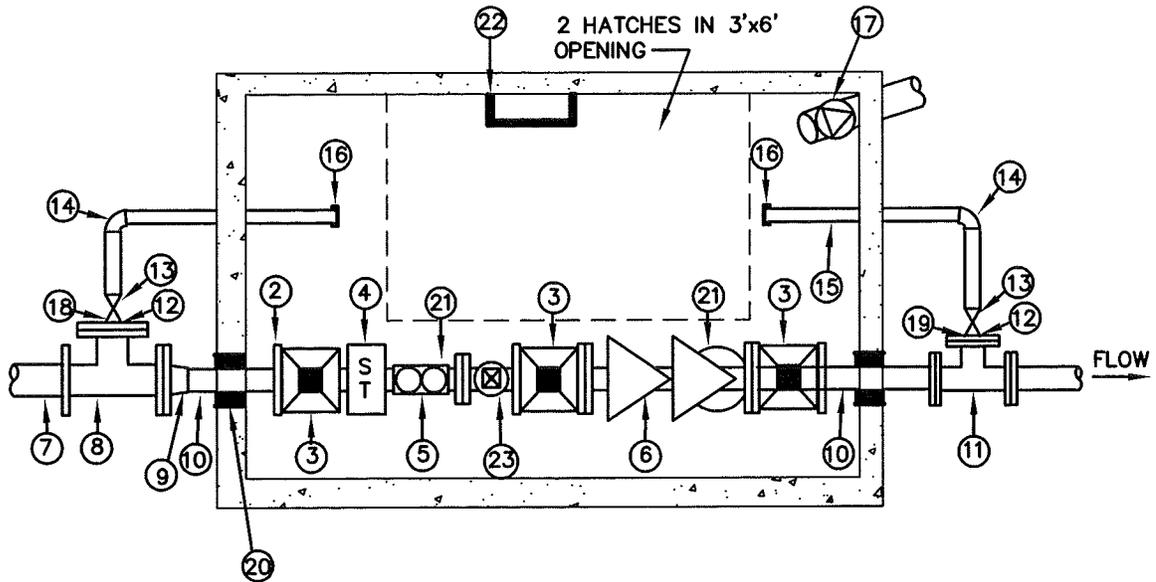
Mukilteo Water and Wastewater District  
STANDARD DETAILS



NO.	ITEM
1	ROMAC STYLE 202S STAINLESS STEEL DOUBLE STRAP TYPE SADDLE
2	2" RESILIENT WEDGE GATE VALVE WITH 2" OPERATING NUT
3	STANDARD CAST-IRON VALVE BOX (RICH NO. 940)
4	BRASS NIPPLE (3" MIN., 6" MAX.)
5	NIPPLE (SEE NOTE ABOVE)
6	BRASS SWING JOINT
7	NIPPLE (SEE NOTE ABOVE)
8	METER SETTER, 2" FORD VBH66-12B WITH METER SPACER (LENGTH DETERMINED BY DISTRICT PRIOR TO INSTALLATION)
9	METER (FURNISHED BY DISTRICT) 17 1/4" LONG
10	METER BOX, NO.2 FOG TITE OR BROOKS NO. 65, WITH STEEL TRAFFIC COVER (FURNISH 2 BOXES). 1-3/4" DIAMETER HOLE IN LID.
11	2" BRASS NIPPLE
12	2" BRASS 90° EL
13	2" x 12" BRASS NIPPLE
14	2" CAP
15	6" PVC PIPE OVER BY-PASS VALVE.

## 2" WATER SERVICE INSTALLATION

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS



NO.	DESCRIPTION
1	UTILITY VAULT 4484-LA OR APPROVED EQUAL
2	UNIFLANGE ADAPTER
3	3" RWGV
4	3" STRAINER
5	NEPTUNE 3" COMPOUND METER W/REMOTE PRO READ REGISTERS. INSTALL REMOTE READ PADS TO TOP OF VAULT AS DIRECTED
6	STATE HEALTH DEPT. APPROVED 3" DOUBLE CHECK VALVE ASSEMBLY
7	4" DIP
8	4" TEE (MF X FL) W/MEGA LUGS
9	4" X 3" REDUCER (4" PE X 3" MJ) W/MEGA LUG
10	3" DIP
11	3" TEE (MJ X FL) W/MEGA LUGS
12	2" BRASS CLOSE NIPPLE
13	2" RWGV W/STANDARD C.. VALVE BOX AND COVER
14	2" BRASS ELBOW
15	2" THREADED BRASS PIPE
16	2" BRASS CAP
17	6" PVC DRAIN TO DAYLIGHT OR CB. MINIMUM SLOPE 1%. SCREENS AT BOTH ENDS W/BACKWATER VALVE IN VAULT
18	4" BLIND FLANGE TAPPED 2"
19	3" BLIND FLANGE TAPPED 2"
20	NON SHRINK WATER TIGHT GROUT, INLETS AND OUTLETS
21	PLACE PIPE SUPPORTS STANDON S-92 OR EQUAL UNDER ASSEMBLY IN TWO PLACES
22	GALV STEEL LADDER, LOCATE AS DIRECTED BY DISTRICT, SECURE TO VAULT
23	3" TEE (FL), 3" BLIND FLANGE TAPPED 2" (FIP), 2" CLOSENIPPLE BRASS, 2" BALL VALVE, 2" MIPx 2 1/2" NST HOSE NOZZLE

\* LARGER SERVICES REQUIRE 3" FITTINGS AND PIPE BE REPLACED WITH LARGER/LIKE SIZE.

\*\* 4" DIAMETER AND SMALLER DIP SHALL BE CLASS 53 IF USED IN A THREADED APPLICATION.

### 3" AND LARGER WATER SERVICE AND INSTALATION

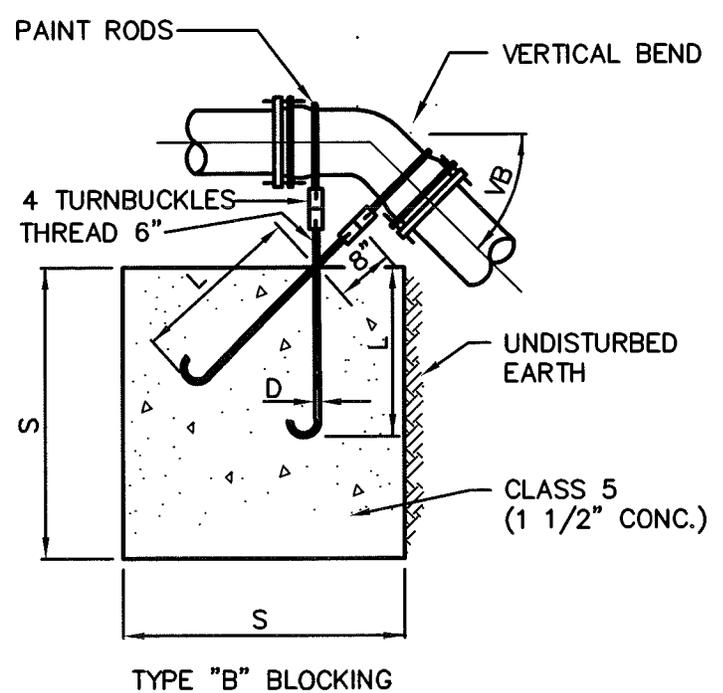
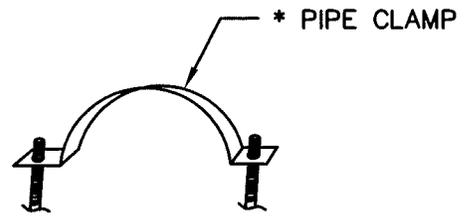
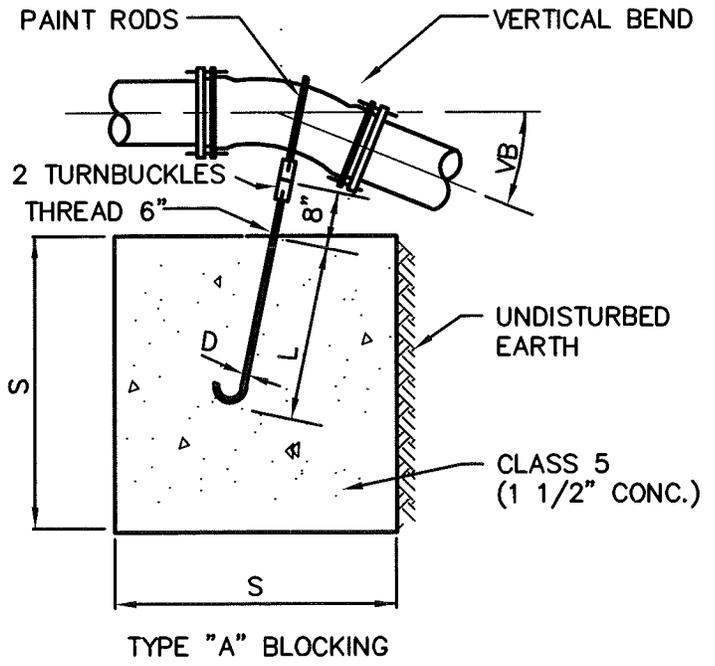
Mukilteo Water and Wastewater District  
STANDARD DETAILS

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TYPE "A" BLOCKING						
FOR 11 1/4"-22 1/2"-30" VERTICAL BENDS						
PIPE SIZE NOMINAL DIAMETER - INCHES	TEST PRESSURE PSI	VB	S	D	L	
		VERTICAL BEND DEGREES	No. OF CU. FT. OF CONC. BLOCKING	SIDE OF CUBE LIN. FT.	DIAM. OF RODS (2) INCHES	DEPTH OF RODS IN CONCRETE LIN. FT.
4"	300	11 1/4	8	2	5/8"	1.5
		22 1/2	11	2.2		2.0
		30	17	2.6		
6"	300	11 1/4	11	2.2	5/8"	2.0
		22 1/2	25	2.9		
		30	41	3.5		
8"	300	11 1/4	16	2.5	5/8"	2.0
		22 1/2	47	3.6		
		30	70	4.1	3/4"	2.5
12"	250	11 1/4	32	3.2	5/8"	2.0
		22 1/2	88	4.5	7/8"	3.0
		30	132	5.1		
16"	225	11 1/4	70	4.1	7/8"	3.0
		22 1/2	184	5.7	1 1/8"	4.0
		30	275	6.5	1 1/4"	
20"	200	11 1/4	91	4.5	7/8"	3.0
		22 1/2	225	6.1	1 1/4"	4.0
		30	330	6.9	1 3/8"	4.5
24"	200	11 1/4	128	5.0	1"	3.5
		22 1/2	320	6.8	1 3/8"	4.5
		30	480	7.9	1 7/8"	5.5

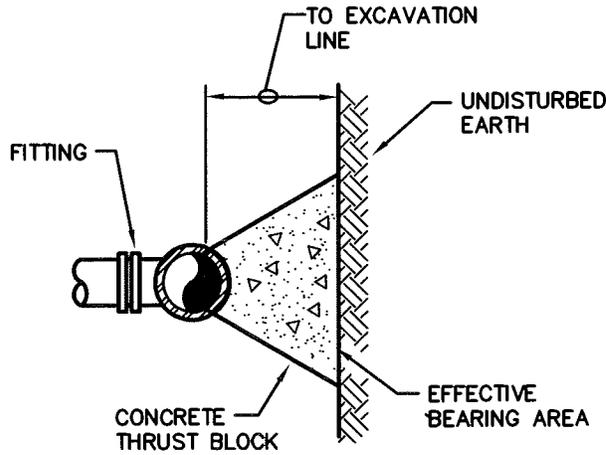
TYPE "B" BLOCKING							
FOR - 45° VERTICAL BENDS							
		VB	S	D	L		
4"	300	45	30	3.1	5/8"	2.0	
6"			68	4.1			
8"			123	5.0			
12"	250		232	6.1	3/4"	2.5	
16"	225		478	7.8	1 1/8"	4.0	
20"	200		560	8.2	1 1/4"		
24"		820	9.4	1 3/8"	4.5		

\* PIPE CLAMP, WASHERS AND NUTS MAY BE SUBSTITUTED FOR TURN BUCKLES. ALL OTHER SPECIFICATIONS THE SAME.

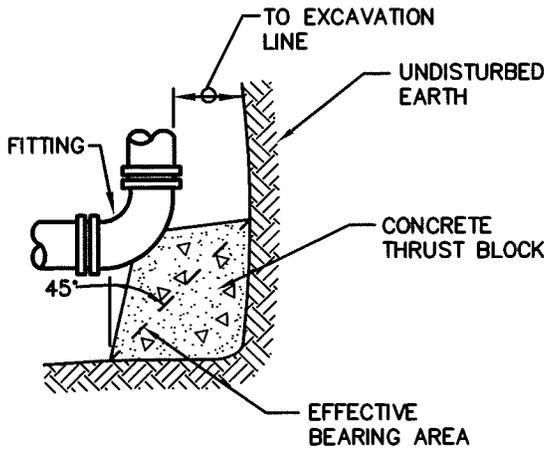


## VERTICAL ANCHOR BLOCK

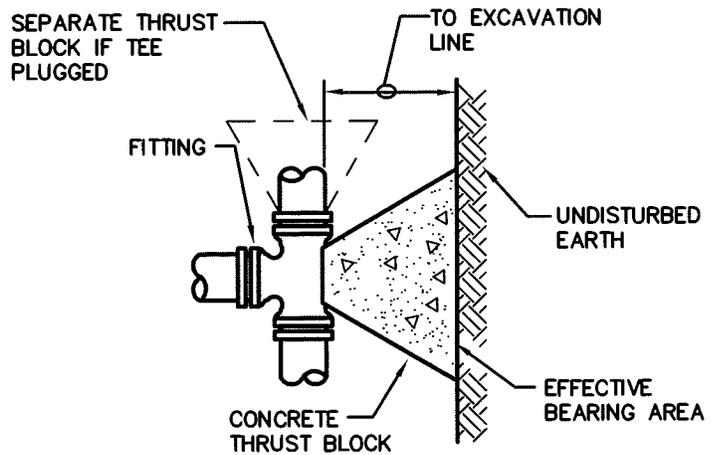
Mukilteo Water and Wastewater District  
STANDARD DETAILS



**TYPICAL SECTION**



**90° EL PLAN**



**TEE PLAN**

**EFFECTIVE BEARING AREA REQUIRED**

PIPE SIZE	90° EL	45° EL	22 1/2° EL	11 1/4° EL	TEE
8"	7 SQ. FT.	4 SQ. FT.	2 SQ. FT.	2 SQ. FT.	5 SQ. FT.
12"	16 SQ. FT.	9 SQ. FT.	4 SQ. FT.	3 SQ. FT.	11 SQ. FT.
16"	28 SQ. FT.	15 SQ. FT.	8 SQ. FT.	5 SQ. FT.	20 SQ. FT.

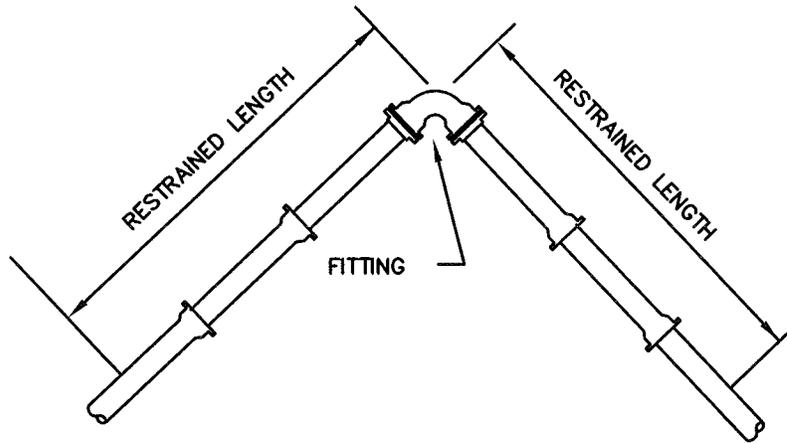
TYPICAL FOR SANDY SOIL WITH 2,000 P.S.F. BEARING STRENGTH & 200 P.S.I. PRESSURE. IF PRESSURE IS GREATER OR SOIL BEARING IS LESS, THE THRUST BLOCK SIZE SHALL BE INCREASED.

**NOTES:**

1. BLOCKING SHALL BE TO SOLID BEARING SURFACE.
2. ALL FITTINGS SHALL BE COVERED WITH 4 MIL VISQUEEN BEFORE CONCRETE IS POURED.
3. CONCRETE BLOCKING SHALL BE 2000 PSI MINIMUM CONCRETE POURED IN PLACE. ALL BLOCKS ON TEES SHALL BE SEPARATED FOR DIRECTION OF THRUST.
4. THIS TABLE REPRESENTS THE "MINIMUM" CONSTRUCTION STANDARDS. THE DEVELOPER'S ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING THE APPROPRIATE SIZE OF ALL THRUST BLOCKS BASED ON EXISTING AND LOCAL CONDITIONS.

**THRUST BLOCKING**

Mukilteo Water and Wastewater District  
STANDARD DETAILS



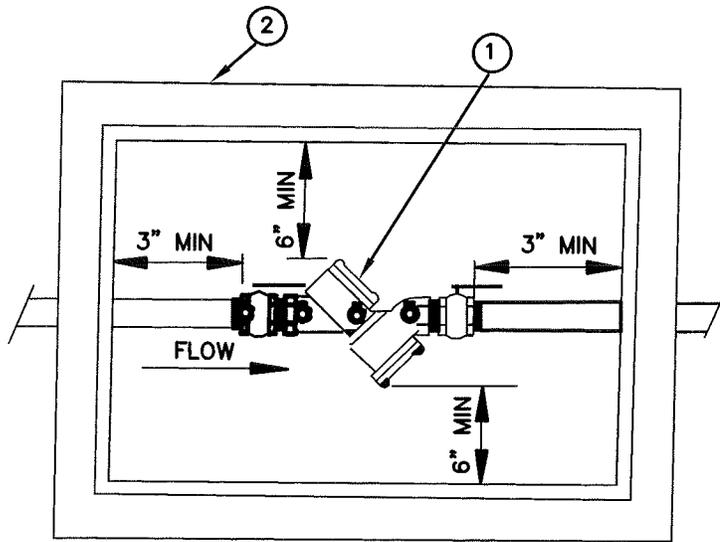
PIPE SIZE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	TEE OR DEAD END CAP
	RESTRAINED LENGTH IN FEET				
4"	32	14	7	3	26
6"	44	19	9	5	32
8"	58	24	12	6	43
10"	70	29	14	7	54
12"	82	34	16	8	66
16"	106	44	21	11	88
18"	116	48	23	12	100

**NOTES:**

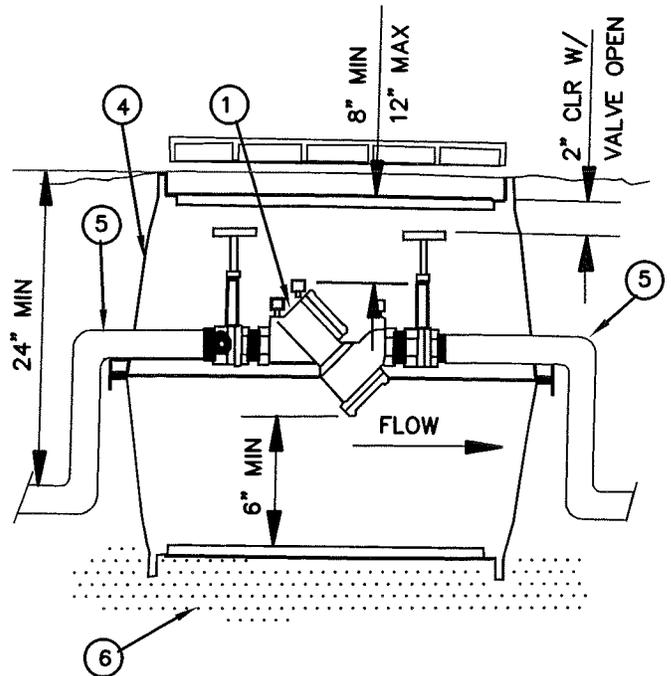
- ① RESTRAINED LENGTHS SHOWN ARE MINIMUM AND FOR LINEAL FEET REQUIRED ON EACH SIDE OF FITTING INDICATED.
- ② FOOTAGES ARE BASED ON 200 PSI PRESSURE AND 42 INCHES COVER. IF PRESSURE IS GREATER OR COVER IS LESS, THE RESTRAINED LENGTH SHALL BE INCREASED.
- ③ THIS TABLE REPRESENTS THE "MINIMUM" CONSTRUCTION STANDARDS. THE DEVELOPER'S ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING THE APPROPRIATE LENGTH OF ALL RESTRAINED JOINT BASED ON EXISTING AND LOCAL CONDITIONS.

**THRUST RESTRAINT FOR  
DUCTILE IRON PIPE**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS



PLAN



ELEVATION

## LEGEND

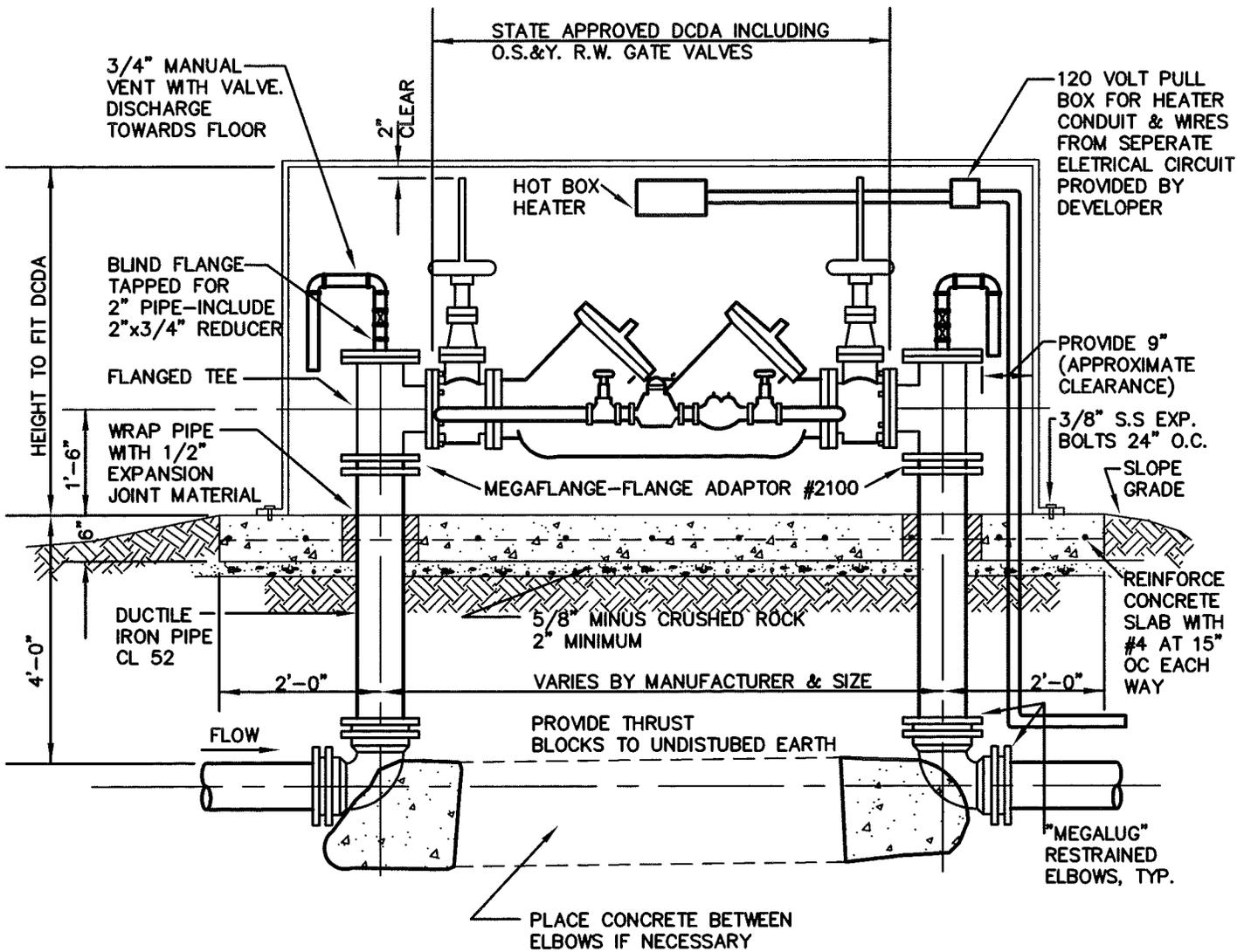
- ① STATE APPROVED DOUBLE CHECK VALVE ASSEMBLY
- ② IN NON-TRAFFIC AREAS USE:  
PRECAST CONCRETE VAULT (UTILITY VAULT CO 233-LA, OR APPROVED EQUAL) OR  
PLASTIC VALVE BOX (UTILITY VAULT CO 1324-12L OR APPROVED EQUAL)  
IN TRAFFIC AREAS:  
A TRAFFIC LOADED BOX MUST BE USED AND LOCATION APPROVED BY THE DISTRICT  
PRIOR TO INSTALLATION.
- ③ ALL ASSEMBLIES SHALL BE INSTALLED IN ACCORDANCE WITH WASHINGTON STATE DEPARTMENT OF HEALTH  
REQUIREMENTS.
- ④ A DAYLIGHT DRAIN SHALL BE PROVIDED THERE MUST BE A 4" MIN LAYER OF FREE DRAINING  
GRAVEL AT THE BOTTOM OF BOX.
- ⑤ ANGLES MAY BE IN OR OUT OF BOX SO LONG AS SUFFICIENT ROOM IS ALLOWED AT EACH  
END FOR VALVE OPERATOR AND DCVA REPAIR OR MAINTENANCE.
- ⑥ PROVIDE FREE DRAINING SOIL.

## NOTES

1. ALL TEST COCKS MUST HAVE BRASS PLUGS.
2. TEST COCKS MUST FACE UP OR SIDEWAYS WHICH EVER IS MORE ACCESSIBLE

### **DOUBLE CHECK VALVE ASSEMBLY FOR 2' & SMALLER SERVICE**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

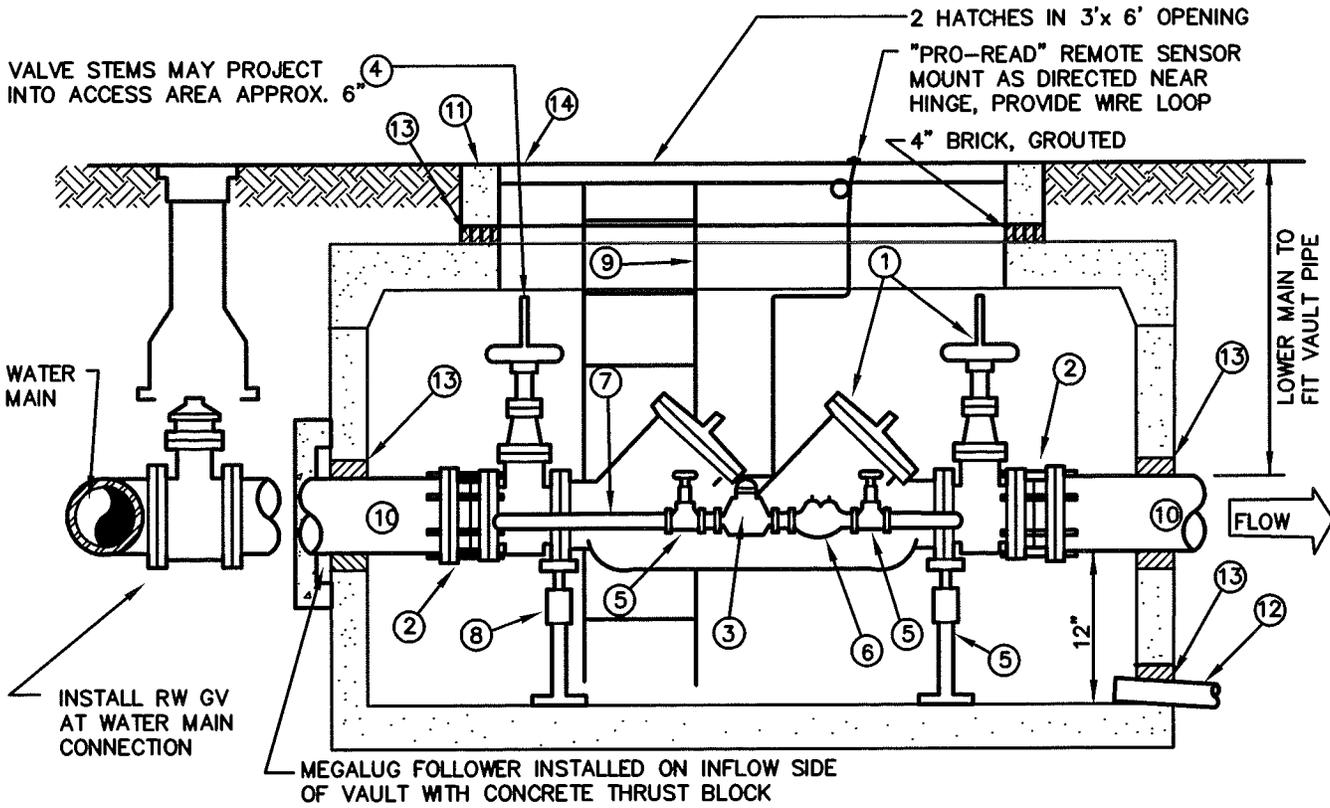


**NOTES:**

1. INSTALLATION OF HOT BOX SUBJECT TO APPROVAL OF DISTRICT AS AN ALTERNATE TO VAULTS.
2. ALUMINUM "HOT BOX" MODELS 4 THROUGH 10 FOR RESPECTIVE SIZE DCDA SHALL BE MODIFIED TO FIT ABOVE HEIGHT REQUIREMENTS. VALVE STEM SHALL NOT BE ALLOWED TO EXTEND OUTSIDE OF BOX.
3. HEATERS SHALL BE 2,000 WATT FOR 6" AND 8" SIZE; 3,000 WATT FOR 10" OR LARGER.
4. PROVIDE SPECIAL LOCK FOR 2 PADLOCKS.
5. CONCRETE TO BE 2500 PSI MIX WITH AIR ENTRAINMENT.
6. "PRO READ" REMOTE SENSOR. MOUNT IN DISTRICT APPROVED LOCATION.

**DOUBLE CHECK DETECTOR  
HOT BOX ENCLOSURE**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS



NO.	DESCRIPTION
1	STATE APPROVED DOUBLE CHECK DETECTOR ASSEMBLY (DCDA) BACKFLOW PREVENTION ASSEMBLY WITH O.S.&Y. R.W. GATE VALVE
2	ROMAC STYLE 'FCA 501' FLANGED COUPLING ADAPTER
3	5/8" x 3/4" NEPTUNE T-10 METER WITH NEPTUNE PRO-READ SENSOR MOUNTED ON VAULT SURFACE OR HATCH: 6 WHEEL READING IN GALLONS.
4	LOCATE CENTER OF VALVE 15" FROM CENTER OF VAULT TO ALLOW STEMS TO EXTEND INTO ACCESS OPENING WHEN APPLICABLE
5	3/4" SHUTOFF VALVE; BRASS GATE VALVE
6	STATE APPROVED 3/4" DOUBLE CHECK VALVE ASSEMBLY (DCVA)
7	BRASS OR TYPE K COPPER, DETECTOR CHECK PIPING (BY PASS LINE)
8	2 EA. GALVANIZED ADJUSTABLE STANCHIONS (LOCATE AT ENDS OF DOUBLE CHECK ASSEMBLY)
9	GALVANIZED STEEL LADDER, LOCATE AS DIRECTED BY DISTRICT, SECURE TO VAULT.
10	PIPE SPOOL, CL. 52 D.I., PLAIN END
11	"UTILITY VAULT" OR APPROVED EQUAL WITH 4" BRICK AND ADJUSTABLE COVER; 2 ACCESS HATCHES: EXCEPT 3 HATCHES FOR 10" DCDA. LW PRODUCTS OR EQUAL, H-20 LOADING 4" DCDA, USE 575 LA + 57 AT (4'-2" x 6'-6" x 4'-0" INSIDE) 6" DCDA, 4484 LA + 57 AT (4'-4" x 8'-4" x 6'-2" INSIDE) 6" DCDA, 5106 LA + 57 AT (5'-0" x 10'-6" x 4'-4" INSIDE) 8" DCDA, 5106 LA + 57 AT (5'-0" x 10'-6" x 6'-2" OR 4'-4" INSIDE) 10" DCDA, 5106 LA + 5106 AT (3 HATCH) (5'-0" x 10'-6" x 6'-2" OR 4'-4")
12	6" PVC DRAIN, DISCHARGE TO DAYLIGHT OR TO CATCH BASIN. MINIMUM SLOPE 1% UNLESS OTHERWISE APPROVED. ADD SCREENS AT BOTH ENDS.
13	WATERTIGHT GROUT, INLET AND OUTLET PIPE, DRAIN PIPE AND BRICK ACCESS OPENING
14	SIGN READING "DANGER-PERMIT REQUIRED-CONFINED SPACE, DO NOT ENTER"

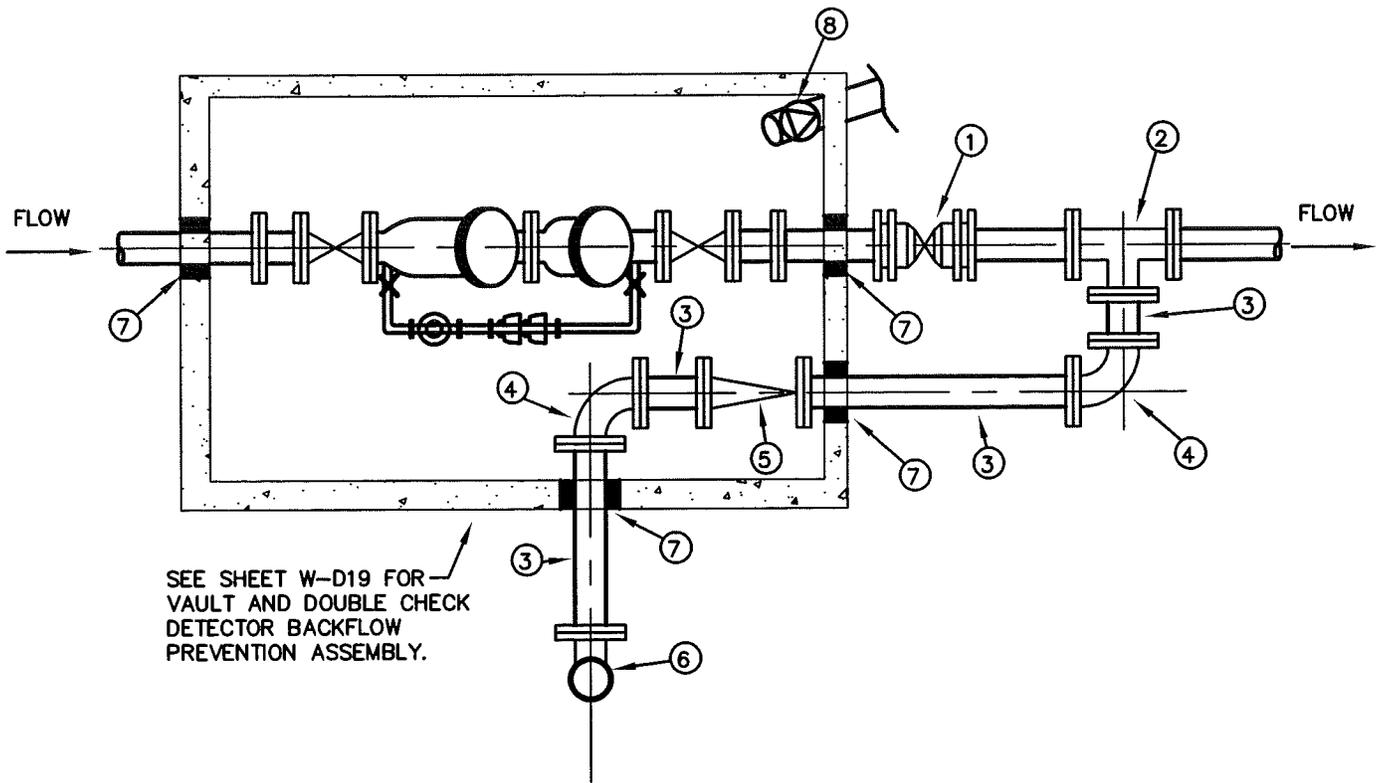
**NOTE:**

AFTER PRESSURE TEST AND PURITY SAMPLES ARE RECEIVED, A CERTIFIED BACKFLOW ASSEMBLY TESTER SHALL SUPPLY DISTRICT WITH A WRITTEN TEST REPORT ON EACH BACKFLOW ASSEMBLY.

**DOUBLE CHECK DETECTOR BACKFLOW PREVENTION ASSY.**

Mukilteo Water and Wastewater District  
STANDARD DETAILS

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SEE SHEET W-D19 FOR  
VAULT AND DOUBLE CHECK  
DETECTOR BACKFLOW  
PREVENTION ASSEMBLY.

NO.	DESCRIPTION
1	POST INDICATOR VALVE, MJ WITH MEGALUGS
2	MAIN LINE SIZE X 4" TEE, MJ WITH MEGALUGS
3	4" DUCTILE IRON PIPE, CLASS 52*
4	4" x 90° BENDS, MJ WITH MEGALUGS
5	4" FLAPPER CHECK VALVE WITH BALL CHECK DRAIN VALVE, MJ WITH MEGALUGS
6	FIRE DEPARTMENT CONNECTION, STORZ ADAPTER. CONNECTION TO COMPLY WITH FIRE DEPARTMENT REQUIREMENTS. 4" MUKILTEO & DIST. #1, 5" ELSEWHERE. ALL ABOVE GROUND PIPING TO BE PAINTED SAME COLOR RED AS P.I.V.
7	WATERTIGHT GROUT
8	6" PVC DRAIN TO DAYLIGHT OR CB, MINIMUM SLOPE 1%. SCREEN AT BOTH ENDS W/BACKWATER VALVE IN VAULT

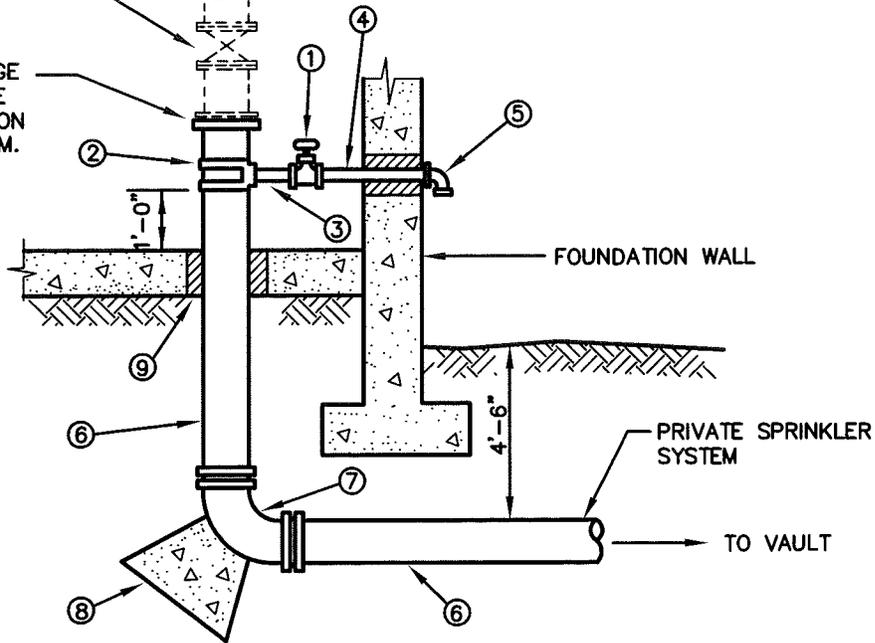
\* 4" DIAMETER AND SMALLER DUCTILE IRON PIPE SHALL BE CLASS 53 IF USED IN A THREADED APPLICATION.

## FIRE LINE CONNECTION

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

ALARM CHECK VALVE  
(BY OTHERS)

PROVIDE BLIND FLANGE  
TO TEST SUPPLY LINE  
PRIOR TO INSTALLATION  
OF SPRINKLER SYSTEM.



No.	DESCRIPTION
1	2" RWGV OR BRONZE BALL VALVE
2	ROMAC STYLE 202S STAINLESS STEEL DOUBLE STRAP SADDLE (OR APPROVED EQUAL)
3	2" BRASS NIPPLE
4	2" GALVANIZED NIPPLE
5	2" GALVANIZED 90° EL
6	D.I. CL. 52 SUPPLY MAIN (SIZE AS DETERMINED BY FIRE FLOW REQUIREMENTS).
7	90° BEND (MJ x MJ) WITH MEGALUG
8	CONCRETE THRUST BLOCK (SIZE TO BE APPROVED BY DISTRICT)
9	1/2" EXPANSION JOINT

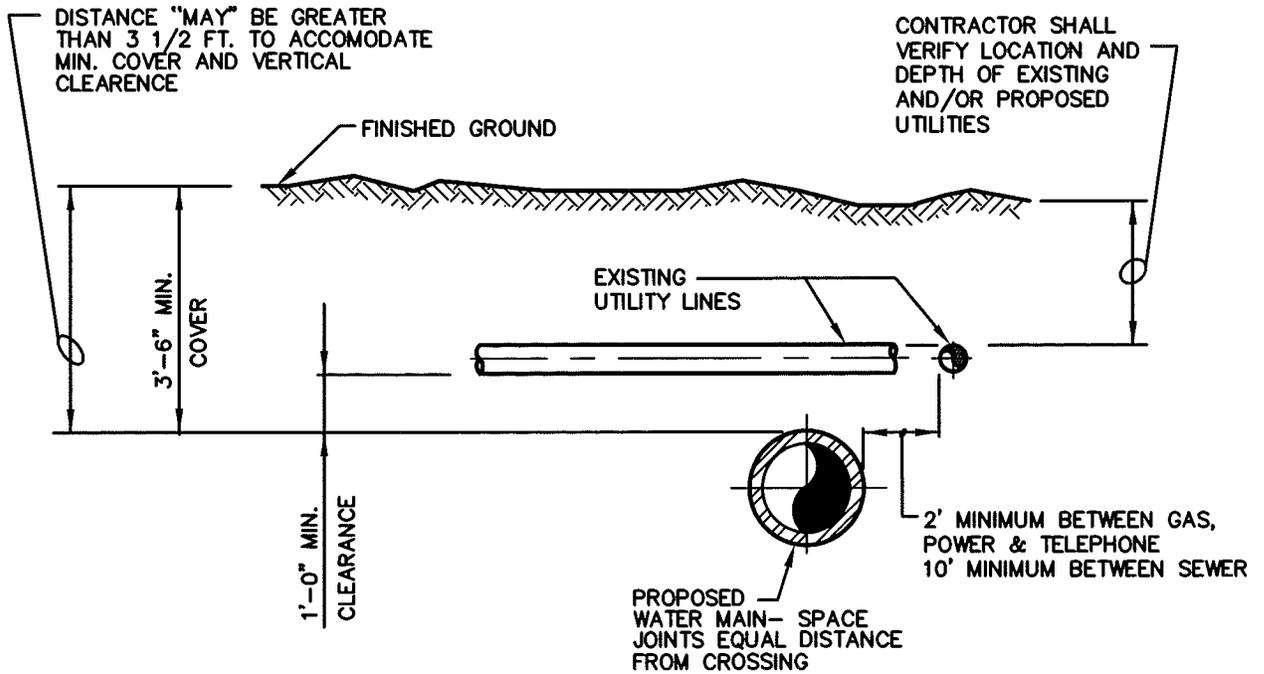
**NOTE**

AFTER SYSTEM IS PRESSURE TESTED, PURITY SAMPLES SHALL BE TAKEN AT ALL RISERS IN SYSTEM.

4" DIAMETER AND SMALL DUCTILE IRON PIPE SHALL BE CLASS 53 IF USED IN A THREADED APPLICATION.

**FIRE LINE  
RISER DETAIL**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS



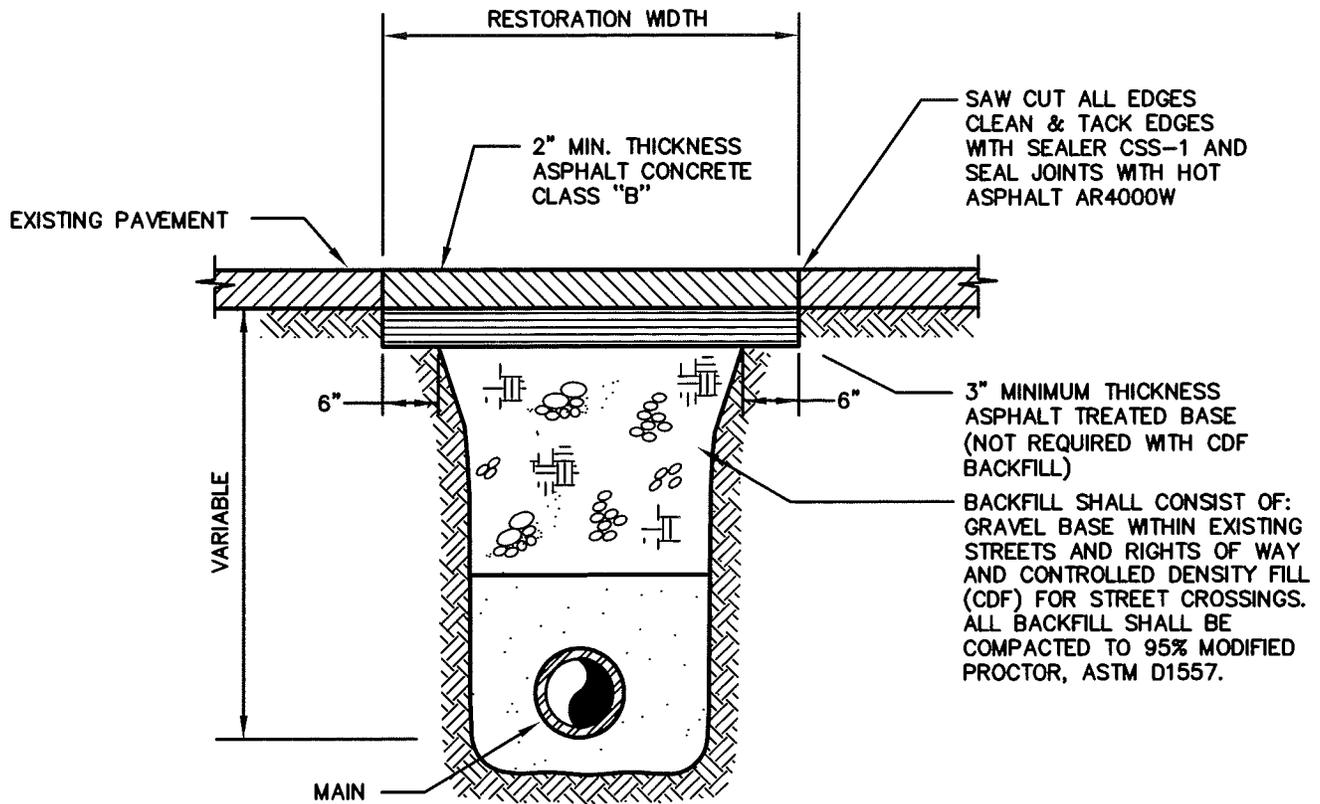
**NOTES:**

MINIMUM COVER SHOWN IS FOR 8" DIAMETER PIPE.  
SEE W-D1 FOR MINIMUM COVER FOR ALL PIPES.

**TYPICAL UTILITY CROSSING**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

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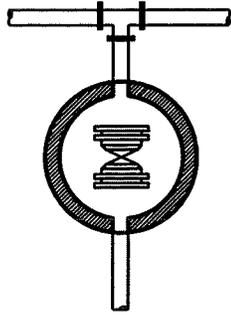


**NOTES:**

1. ALL ASPHALT STREETS AND DRIVEWAYS SHALL BE TEMPORARILY REPAIRED WITH COLD MIX, EXCEPT CROSSINGS WITH CDF SHALL BE COVERED WITH STEEL PLATES UNTIL THE CDF HAS CURED TO ALLOW FOR PLACEMENT OF THE ASPHALT.
2. PATCH SHALL BE MACHINE ROLLED FLUSH WITH EXISTING PAVEMENT AND SHALL BE PLACED PER SEC. 5-04 OF THE WA. STATE D.O.T. SPECIFICATIONS.

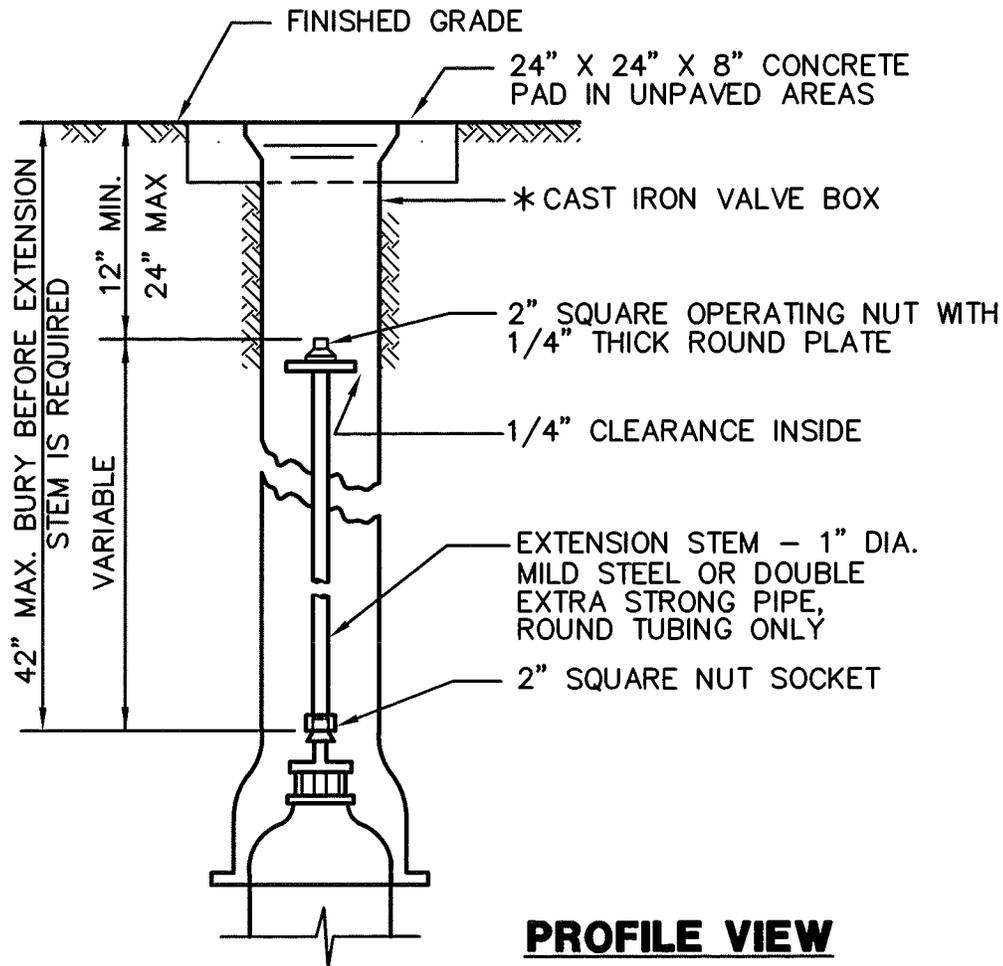
**ASPHALT PAVEMENT REPAIR**

Mukilteo Water and Wastewater District  
STANDARD DETAILS



ALIGN "EARS" ON VALVE BOX TOP WITH DIRECTION OF PIPE BRANCH THE VALVE OPENS AND CLOSES.

**PLAN VIEW**



**PROFILE VIEW**

\*CAST IRON VALVE BOX EXTENSION SHALL UTILIZE 5" CAST IRON "SOIL PIPE". BELL END TO BE PLACED OVER TOP OF VALVE BOX BOTTOM.

**VALVE STEM EXTENSION**

Mukilteo Water and Wastewater District  
STANDARD DETAILS

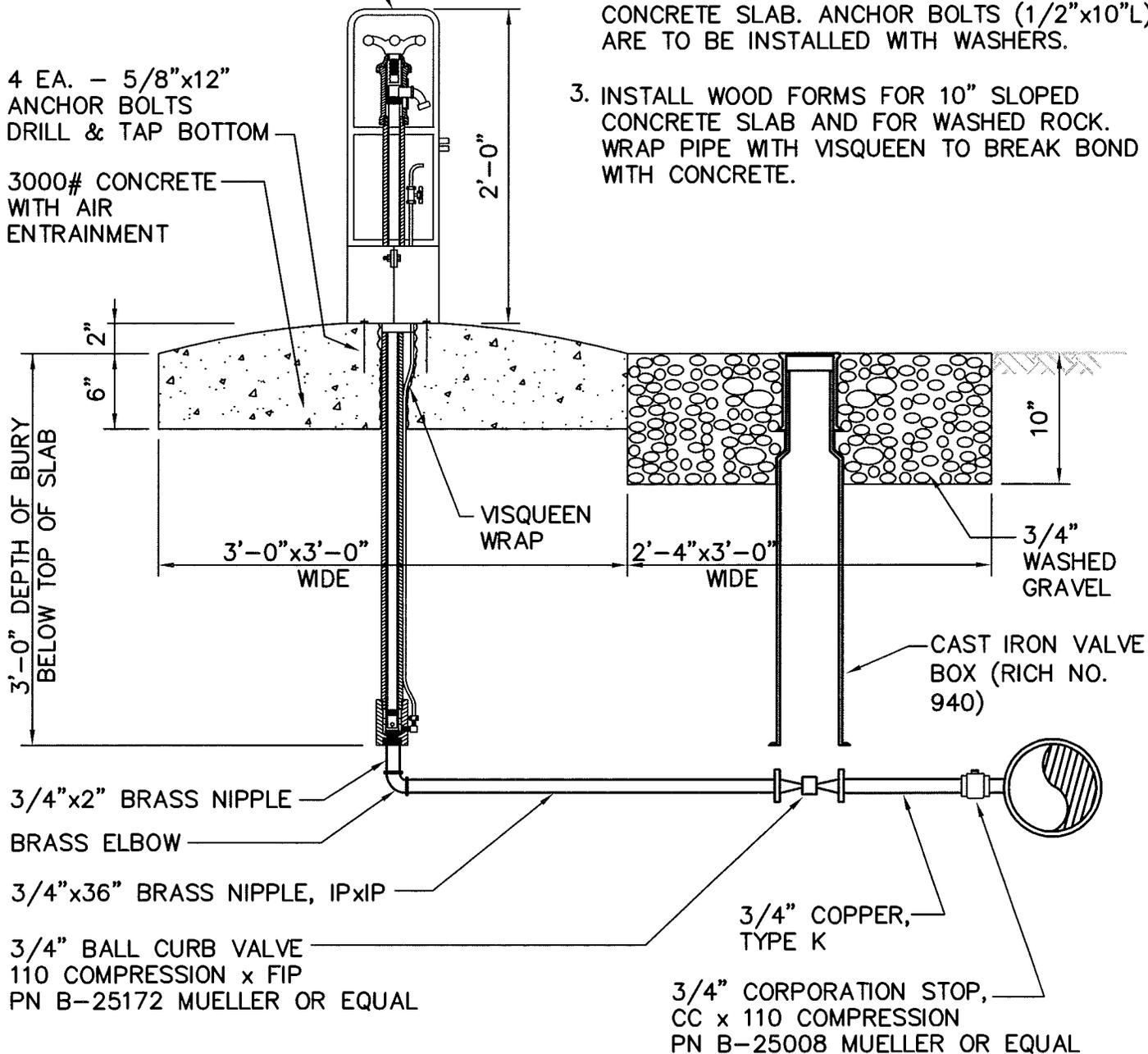
NOTES:

1. DEPTH OF BURY FOR ORDERING SAMPLER IS 36", WHICH DEPTH IS MEASURED FROM TOP OF CONCRETE SLAB.
2. INSTALL SAMPLER AND THE ASSOCIATED PIPE AND VALVES, SETTING THE BOTTOM OF THE ALUMINUM HOUSING ON THE PROPOSED CONCRETE SLAB. ANCHOR BOLTS (1/2"x10"L) ARE TO BE INSTALLED WITH WASHERS.
3. INSTALL WOOD FORMS FOR 10" SLOPED CONCRETE SLAB AND FOR WASHED ROCK. WRAP PIPE WITH VISQUEEN TO BREAK BOND WITH CONCRETE.

ECLIPSE MODEL NO. 88  
SAMPLING STATION  
(GREEN AS SUPPLIED)

4 EA. - 5/8"x12"  
ANCHOR BOLTS  
DRILL & TAP BOTTOM

3000# CONCRETE  
WITH AIR  
ENTRAINMENT



\* WHERE APPLICABLE CAST IRON VALVE BOX  
MAY BE ENCLOSED BY CONCRETE PAD.  
REQUIRES 3/4"x12" BRASS NIPPLE, IP x IP.

**WATER SAMPLING STATION  
WATER DISTRIBUTION SYSTEM**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

**W-D25**

8/09

CONCRETE OR IMPACT RESISTANT METER OR IRRIGATION BOX SIZED FOR ASSEMBLY (INSULATED RECOMMENDED)

WASHINGTON STATE APPROVED RPBA W/ TEST COCK PROTECTION AND STAINLESS STEEL OR BRONZE BODY BALL VALVE AT EACH END.

HEAT TAPE AND PIPE INSULATION IS RECOMMENDED FOR FREEZE PROTECTION. PROVIDE ELECTRICAL FROM SERVED FACILITY.

12" MIN. TO DISCHARGE

BOLT TO PAD W/ 3/8" S.S. ANCHOR BOLTS AND WASHERS, MIN. 4 LOCATIONS

UNION (TYP. OF 2) SEE NOTE 7

GATE VALVE

DRAIN TO DAYLIGHT WITH BIRD SCREEN

PIPE SUPPORT

TYPE K COPPER OR BRASS PIPE BETWEEN METER AND RPBA

FLOW

FLOW

PROPERTY LINE

PRIVATE RESPONSIBILITY

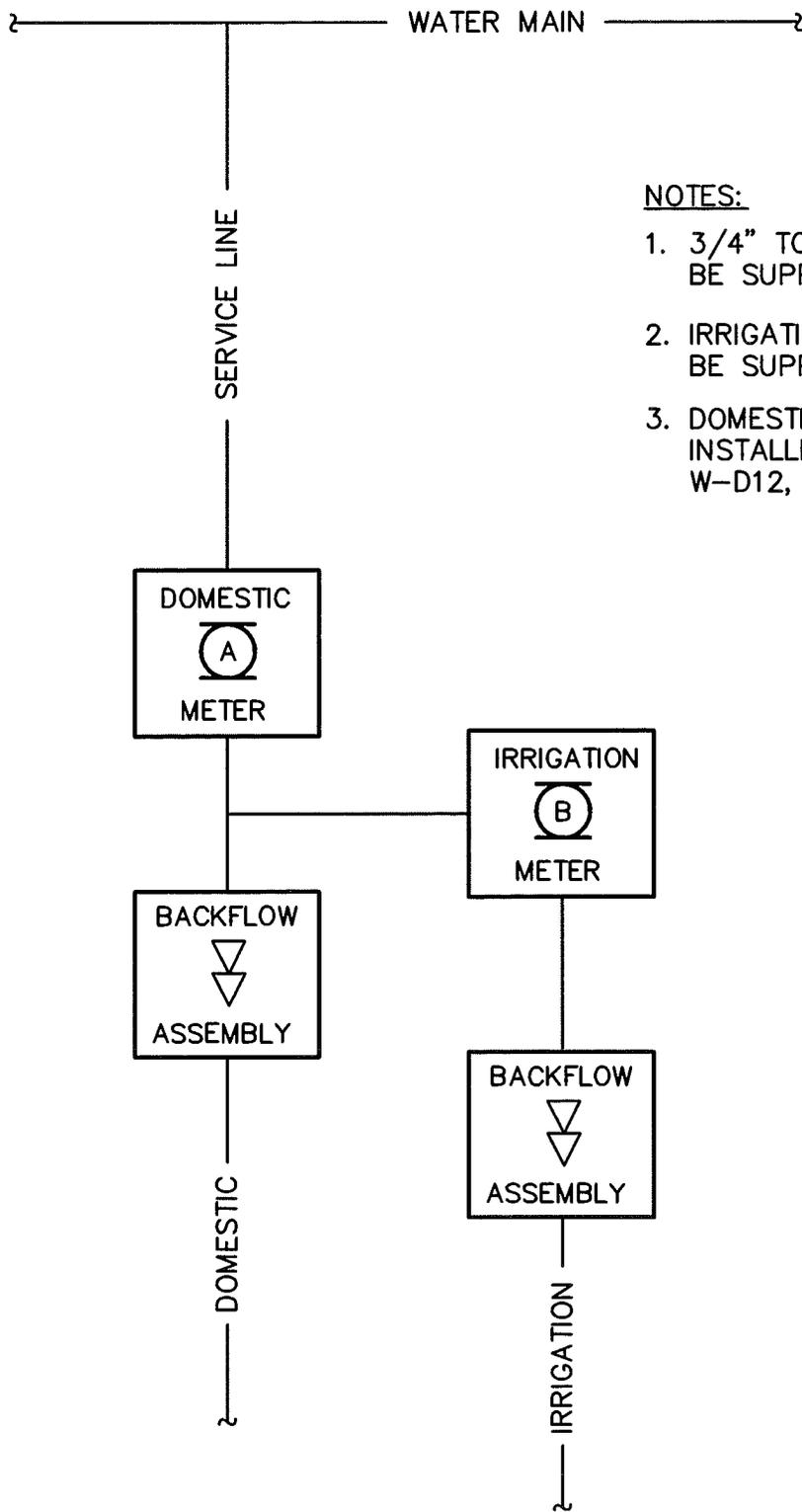
PUBLIC/UTILITY RESPONSIBILITY

**NOTES:**

1. BACKFLOW ASSEMBLY SHALL BE SELECTED FROM WASHINGTON STATE DEPARTMENT OF HEALTH CURRENT APPROVED LIST.
2. CONCRETE TO BE 2500 PSI MIX WITH AIR ENTRAINMENT.
3. COMPLETE ALL WORK IN ACCORDANCE WITH STATE, DISTRICT AND MANUFACTURER STANDARDS.
4. SYSTEM SHALL NOT BE PUT INTO SERVICE UNTIL RPBA IS APPROVED BY THE DISTRICT AND TESTED/CERTIFIED BY A WASHINGTON STATE LICENSED TESTER.
5. RPBA IS CONSIDERED PART OF THE PRIVATE SYSTEM AND SHALL BE MAINTAINED BY THE PROPERTY OWNER WITH ANNUAL CERTIFICATION REQUIRED.
6. PRESSURE TEST AND DISINFECT PER A.W.W.A. STANDARDS.
7. DIELECTRIC UNIONS SHALL BE USED TO SEPARATE DISSIMILAR MATERIALS.
8. RPBA BOX SHALL BE LOCATED IMMEDIATELY DOWNSTREAM OF WATER SERVICE BOX PRIOR TO ANY BRANCH CONNECTIONS WITH NO MORE THAN 1'-2' BETWEEN BOXES.

**REDUCED PRESSURE BACKFLOW ASSEMBLY - 3/4" TO 2"**

Mukilteo Water and Wastewater District  
STANDARD DETAILS



**NOTES:**

1. 3/4" TO 2" DOMESTIC METER TO BE SUPPLIED BY THE DISTRICT.
2. IRRIGATION DEDUCT METER TO BE SUPPLIED BY OTHERS.
3. DOMESTIC SERVICE TO BE INSTALLED PER W-D10, W-D11, W-D12, OR W-D13.

**TYPICAL IRRIGATION  
DEDUCT SERVICE**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

**PART 3**

**SEWER MAINS**

## **S-1 SEWER MAINS, LATERALS AND FORCE MAINS**

Sewer pipe shall be polyvinyl chloride (PVC) or polyethylene or epoxy lined ductile iron (DI) with restrained joints for all sizes unless specifically noted otherwise.

Sewer mains to be installed shall be of material noted below:

Gravity Sewer and Laterals:

PVC Pipe: 5' - 18' Cover  
DI Pipe: 3' - 5' Cover  
18' and Over  
Slopes of 18% or greater

Force Main: DI Pipe

All types of pipe shall be handled in a manner that will prevent damage to the pipe, pipe lining or coating. Pipe and fittings shall be loaded and unloaded using hoists and slings in a manner to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled against other pipe. Damaged pipe will be rejected, and the Developer shall immediately place all damaged pipe apart from the undamaged and shall remove the damaged pipe from the site within 24 hours.

Methods of handling shall be corrected by the contractor if the District determines that these methods are damaging to the pipe.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and relayed. A clean whiskbroom shall be used for this purpose and for brushing to remove foreign matter prior to joining of pipe ends. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the District to ensure cleanliness inside the pipe.

Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails or other similar supports. Pipe on succeeding tiers shall be alternated by bell and plain end. Timbers 4 inch by 4 inch in size shall be placed between tiers and chocks shall be placed at each end to prevent movement. For safety each size of pipe shall be stacked separately.

Immediately upon beginning pipe installation, the Contractor shall place and secure a watertight plug in the sewer manhole. The plug shall remain in place throughout the project until such time as the project is accepted by the District. Failure to place the plug or removal of a plug prior to approval shall be ground for District issued penalties.

#### **A. Ductile Iron Pipe and Fittings**

The ductile iron pipe shall conform to AWWA C151 Standards, except the minimum nominal thickness shall be as follows:

- 6" - 0.25" (Class 52)
- 8" - 0.27" (Class 52)
- 10" - 0.29" (Class 52)
- 12" - 0.31" (Class 52)

Grade of iron shall be 60-42-10. The pipe shall be polyethylene or epoxy lined to a nominal thickness of 40 mils. Minimum lining thickness shall be 30 mils. The exterior shall be coated with an asphaltic coating. Products meeting the standard are US pipe "Polylined," "Protecto 401" and American Pipe "Polyband" or approved equal.

Each length shall be plainly marked with the manufacturer's identification, year cast, thickness, class of pipe and weight. The pipe shall be furnished with mechanical joint or push-on joint, conforming to AWWA C111 Standards, except where otherwise noted calling for flanged joints.

Restrained joint pipe, where shown on the Plans, shall be push-on joint pipe with "Field Lok" gaskets or TR FLEX as furnished by US Pipe, or approved equal.

The pipe manufacturer shall certify in writing that the inspection and all tests of the specified standards for both pipe and gaskets being supplied for this project have been made and that the results thereof comply with the requirements of the Standard.

Joints shall be "made-up" in accordance with the manufacturer's recommendations. Standard joint material, including rubber ring gaskets shall be furnished with the pipe. Materials shall be suitable for the specified pipe sizes and pressures. The pipe joint utilized shall be the patented "Tyton" joint.

All fittings shall be short-bodied, ductile iron complying with applicable AWWA C110 or C153 Standards. All fittings shall be polyethylene or epoxy lined and either mechanical joint or flanged, as indicated on the Plans.

Fittings in sections shown on the Plans requiring restrained joints shall be mechanical joint fittings with a mechanical joint restraint device. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc., MEGALUG, Romac Industries, Inc., Grip Ring Pipe Restraint or approved equal. Stargrip Series 3000 mechanical joint restraint devices are not accepted or approved as equal.

Fittings shall be adequately "blocked" with poured-in-place concrete, within wooden forms shaped to establish a firm minimum bearing area, against an undisturbed earth wall as shown on the Standard Details. Timber blocking will not be permitted. The concrete thrust blocks must be in place at least 24 hours before beginning the pressure test, to allow the concrete to "set." The strength of the concrete shall be 2,000 psi minimum.

All fittings requiring a concrete block shall first be covered with 4-mil Visqueen plastic sheets, before concrete is poured. The concrete shall not cover joints, bolt heads or nuts.

All bolts shall be coated with Armite Anti-Seize Compound No. 609, or equal, prior to installation.

All connections to ductile or cast iron pipe shall be with ductile iron mechanical joint sleeves except as shown on the Plans for mechanical joint tees, valves, etc.

## **B. PVC Pipe and Fittings**

The PVC pipe shall be a minimum Class S.D.R. 35 and be manufactured in accordance with ASTM D3034. The pipe and fittings shall be furnished with bells and spigots, which are integral with the pipe wall. Pipe joints shall use flexible elastomeric gaskets conforming to ASTM D3212. Nominal laying lengths shall be 13 feet.

Tees for side sewer laterals shall be 6-inch-diameter fabricated tees. No field cut-in tees will be allowed without approval of the District.

If approved by the District, the connection shall be made by machine-made tap and Romac Style Sewer "CB" Saddle or Inserta Tee, available from Fowler Manufacturing Company or equal.

The gravity sewer pipe, unless otherwise approved by the District shall be laid upgrade from point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell end forward or

upgrade. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with an approved temporary plug. Wherever movable shoring (steel box) is used in the ditch, pipe shall be restrained by use of a winch mounted in the downstream manhole and a line of sufficient strength threaded through the pipe and set tight before each move. Any indication that joints are not being held shall be sufficient reason for the District to require restraints, whether or not movable shoring is being used.

All gravity sewer pipe shall be laid in straight lines and at uniform rate of grade between manholes. Variance from established line and grade shall not be greater than 1/2 inch, provided that such variation does not result in a level or reverse sloping invert; provided, also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed 1/64 inch per inch of pipe diameter, or a total of 1/2 inch maximum. Any corrections required in line and grade shall be reviewed with the District and the repairs shall be made at the expense of the Developer.

Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or fouling the gasket with dirt or other foreign material. Any gaskets so disturbed shall be removed, cleaned, re-lubricated if required, and replaced before the rejoining is attempted.

Care shall be taken to properly align the pipe before joints are forced entirely home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and thereby maintain concentricity until the gasket is properly positioned. Since most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted. At the end of the workday, the last pipe laid shall be blocked in an effective way to prevent creep during "down time."

All gravity sewer pipe shall be bedded with pea gravel (or crushed surfacing, base course, if installed within the city limits of Everett). The pipe shall be bedded from a depth of 4 inches below the pipe to 12 inches above the pipe. The bedding material shall extend across the full width of the trench and shall be compacted under the haunches of the pipe.

Special concrete bedding when required to provide additional support for the pipe shall consist of a pipe cradle constructed of Portland cement concrete containing not less than four sacks of cement per cubic yard. Sand, gravel and water proportions are subject to approval by the District. Maximum aggregate size shall be one and 1-1/2 inches. Maximum slump shall be 4 inches. The bottom of the trench shall be fully compacted before the placement of pipe cradle. The Developer shall protect pipe against flotation and disturbing the horizontal alignment of the pipe during the pouring of the concrete.

Clay or bentonite dams shall be installed across the trench, keyed into native undisturbed soil and to the full depth of the granular material in all areas of steep slopes, stream crossings and within wetlands to prevent migration of water along the pipeline. The District shall determine where trench dams are required. See WS 44 P III-20.

### **C. High Density Polyethelene Pipe (HDPE)**

HDPE pipe may be used, under special circumstances only, with approval of the District. Approval shall be subject to a case-by-case review of the proposed application and of the proposed pipe and installation specifications. Design calculations shall be submitted to support the proposed SDR-rating, with respect to surge pressure and buckling, for District review and approval.

HDPE pipe shall conform to AWWA C-906. The HDPE pipe shall be butt-fused welded pipe (Driscopipe Prisma 4200 or equivalent) and shall be high-density, PE 3408 pipe. The material shall have a long term hydrostatic strength of 1,600 psi per ASTM D2837.

The pipe shall be made from polyethylene resin compound. Type III, Category 5, Class C, Grade P34 per ASTM D-1248. The minimum cell classification shall be PE334434C for PE 3408 materials per ASTM D-3350. The manufacturer shall provide the proper certification to ensure the materials comply with the specifications requirements.

The material shall contain a sufficient UV stabilization for 24 month of outdoor storage.

The manufacturer shall furnish an affidavit that all materials delivered comply with the requirements of the specifications together with copies of the test results (nominal values).

The manufacturer shall furnish a certification that Compressed Ring Test (ASTM F-1248) has been utilized to test for environmental stress crack resistance and results equal or exceed  $F_{5000}$  hours.

The pipe shall be homogenous throughout and uniform in density, color and other properties.

Pipe markings shall include name or trademark of pipe fabricator, pipe outside diameter, standard dimension ratio (SDR), polyethylene cell classification per ASTM D-3350, production code from manufacturing location, name of manufacturer, and date of production.

Pipe and polyethylene fittings shall be produced by the same manufacturer from identical material meeting the requirements of this specification. Polyethylene fittings may be molded, or fabricated by heat fusion joining polyethylene components prepared from pipe, molded fittings, or polyethylene sheet or block, except fittings 8-inches nominal diameter and smaller shall be molded meeting the requirements of ASTM D-3261. Fittings fabricated from pipe shall be manufactured from pipe stock with a wall thickness not less than 25 percent greater than that of the pipe to which the fitting is to be jointed. The wall thickness of an outlet may be the same as the wall thickness of the pipe to which the outlet is to be jointed. Flange fittings to ductile iron pipe shall comply with ANSI 150 and shall be designed and manufactured at not less than the design pressure of the system.

With the District's prior approval, electrofusion couplings may be used to facilitate pipe installation in the vicinity of existing utilities. Electrofusion couplings shall meet the standard of AWWA C906.

Thermal stability of resin:	ASTM D-3350 (220 degrees C) <sup>(4)</sup>
Ring-tensile strength test:	ASTM D-2290 92,900 psi <sup>(1)</sup>
Elongation-at-break test:	ASTM D-638 (750%) <sup>(4)</sup>
Carbon black content:	ASTM D-4218 (2% min.; 3% max.) <sup>(2)</sup>
Melt index:	ASTM D-1238 (0.1 gm/10 min.) <sup>(2)</sup>
Density:	ASTM D-1505 (0.955 gm/cm <sup>3</sup> ) <sup>(2)</sup>
Toe-in:	ASTM D-2122 (<1.5% smaller than average O.D., 12" from end) <sup>(3)</sup>
Environmental stress crack resistance:	ASTM D-1693 (F>192 hours min.) <sup>(4)</sup>

Frequency of Tests:

- (1) At least one per production run.
- (2) At least one per day (24 hours).
- (3) At least one per day (or one per each 8-hour shift).
- (4) At least one per resin lot.

Flanged joining of pipe shall be performed with a convoluted ductile iron backup flange conforming to the vital dimensions of ANSI 16.5. The flange shall be epoxy coated ductile iron conforming to ASTM 536, Grade 65/45/12.

Gaskets provided at all flanged joints shall be Buna "N," grade 60, or equal suitable for wastewater. Bolts and nuts for flanged joints shall be low-carbon steel conforming to ASTM A-307, 60,000 psi tensile strength, grade B. The bolts shall be evenly tightened using a crossing pattern and each flanged joint shall be checked and retightened after 1 hour or more has passed.

Flexible couplings used for connections of high density polyethylene to ductile iron pipe shall include an adaptor ring. Adaptor ring shall be pre-fabricated lap joint (follower ring) per ASTM 207 Class "D" with two sets of bolt circles. One bolt circle to match the lap joint bolt pattern and the other bolt circle to match the bolt pattern of a Standard Class 125 flange. Gasket shall be made of rudder 1/8-inch full face type. Bolts shall be provided as required for the connection. Flanges shall have a fusion bonded epoxy coating.

The polyethylene (HDPE) pipe shall be handled, stored, and installed so as to avoid physical damage to the pipe including cuts or gouges to depths in excess of 10 percent of wall thickness. The damaged portions of the pipe shall be removed and the undamaged portions rejoined using the thermal butt fusion joining method unless the pipe is acceptable to the District and manufacturer.

Sections of polyethylene pipeline shall be joined into continuous lengths by the butt fusion method above ground along the trench or by flanged connections in the trench as required to avoid existing utilities. The joining method shall be performed by personnel trained to assemble the pipe and in strict accordance with the pipe manufacturer's recommendation. The pipe shall be assembled as a continuous piping system to avoid the need for thrust blocks for thrust restraint at bends or fittings for thrust restraint.

In some cases along the pipeline, the manufacturers recommend bending radius may be exceeded and may require a fabricated fitting. All fabricated fittings shall be fully pressure rated and configured to conform to the total deflection angle noted on the Plans. As an alternative, fully pressure rated mitered fittings are acceptable.

Thermal butt fusion joining of the polyethylene pipe shall be performed with field-proven equipment that has a centerline guidance system to hold the pipe and fittings in close alignment while the opposing butt ends are faced, cleaned, melted and fused together and then cooled, all in strict accordance with the pipe manufacturer's recommendations. Butt fusion joining shall be 100 percent efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe.

Butt fusion joining of polyethylene pipe of unlike SDRs shall not be permitted unless assembled by butt fusion procedures as recommended by the manufacturer and approved by the District. Alternatively, joining of pipe with unlike SDRs shall be performed with flanged connections.

Care shall be taken to install the HDPE pipe in accordance with the pipe manufacturer's recommendations. Standard installation practice shall include techniques recommended by the manufacturer to compensate for high thermal expansion and contraction characteristics of HDPE pipe, including adequate backfill compaction, snaking the pipe in the trench, and making tie-in connections at anticipated operating temperatures.

Where an HDPE main connects to or passes through a buried structure, such as a manhole, valve vault or wet well, the connection to the structure shall be made using a ductile iron wall spool or sleeve cast or grouted into the structure wall. The force main shall transition from HDPE to ductile iron pipe outside the manhole using a flange adapter with a ductile iron backing ring, or other approved method. The transition shall occur within the greater of 1 foot or 1-1/2 pipe diameters of the structure wall. The connection shall be anchored against pull-out at the structure in accordance with the pipe manufacturer's recommendations.

#### **D. Side Sewer Laterals**

A side sewer lateral is considered to be that portion of a sewer line that will be constructed between a main sewer line and a property line or easement limit line.

All applicable specifications given herein for sewer construction shall be held to apply to side sewer laterals. The side sewer lateral shall be of the same material as the mainline, except as noted in the Standing Side Sewer Detail.

Side sewers shall be for a single service connection only and be a minimum 6-inch-diameter pipe. Side sewers shall be connected to the tee, provided in the sewer main where such is available, utilizing approved fittings or adapters. The side sewer shall rise at a maximum of 45 degrees and a minimum of 2 percent, extending from the sewer main.

The maximum bend permissible at any one fitting shall not exceed 45 degrees. Any bend, or combination of bends equaling 45 degrees shall consist of or be followed by a wye clean out.

Where there are no basements, the minimum side sewer depth shall be 6 feet below existing curb line and 5 feet below ground at the property line, except where existing improvements, proposed improvements or topography may dictate additional depth. The elevations of the side sewer connections shall be of sufficient depth to serve all existing and potential future basements.

The Developer shall provide for each 6-inch side sewer service a 12-foot-long 2 x 4 wooden post, which extends from the invert of the end of the 6-inch pipe to above the existing ground. The exposed area of the post shall be painted white and shall have stenciled thereon in 3-inch letters (black paint) "S/S" and shall also indicate the total length of the 2 x 4.

Where there are no basements, the maximum side sewer depth at the 2 x 4 shall be no greater than 8 feet unless approved by the District.

All side sewers, other than single-family, shall have a standard sewer manhole installed, 10 feet into the property for sampling purposes.

Sewer Grinder Pumps are not allowed. Where standard conforming gravity service cannot be achieved and denial of service is the only remaining option, private ownership of grinder pumps may be considered by the District. The Developer's

Engineer shall provide the District with information utilized in determining gravity service unavailability showing that all means of achieving gravity service, regardless of cost, have been reviewed and eliminated. If it is proven that gravity service is unavailable, only then will the District accept the Developers Engineer's proposal identifying pump design and the areas to be served for District review and approval.

#### **E. Grease Interceptors**

When specified by the District, grease interceptors shall be provided for all Commercial, Industrial or School food establishments and when specified by the District (Interceptor shall be installed as close as possible to source of grease/fat). When specified by the District, a Sample Chamber shall be installed immediately downstream of the Grease Interceptor.

### **S-2 MANHOLES**

Permanent access for District service vehicles shall be provided at all manholes. Manholes shall be of the offset type and shall be precast concrete sections with either a cast in place base, or a precast base made from minimum 3,000 psi structural concrete. Joints between precast wall sections shall be confined O-ring or as otherwise specified. All manholes over 20 feet in depth shall be a minimum of 54 inches in diameter.

For connections to existing manholes, a concrete coring machine, suitable for this type of work, shall be utilized in making the connection. The existing manhole shall be rechanneled as required. The new pipe connection shall be plugged (water tight) until the new pipe system has been installed and approved. The Developer shall be responsible for any existing defects in the existing manhole unless these defects are witnessed by the District prior to any work being performed to make the connection. The Developer shall be required to remove any and all deleterious material in the existing manhole and downstream reaches as a result of their connection.

The Developer shall excavate completely around the manhole to prevent unbalanced loading. The manhole shall be kept in operation at all times and the necessary precautions shall be taken to prevent debris or other material from entering the sewer.

#### **A. Manhole Sections**

Manhole sections shall be placed and aligned so as to provide vertical sides and vertical alignment of the ladder steps. The completed manhole shall be rigid, true to dimension, and be watertight. Rough, uneven surfaces will not be permitted.

## **B. Manhole Steps and Ladders**

Manhole steps shall be polypropylene, Lane International Corp. No. P13938 or equal.

Ladders shall be polypropylene Lane International Corp. or equal, and shall be compatible with the steps.

## **C. Grade Adjustment**

Each manhole shall be provided with not less than 16 inches or more than 24 inches of grade adjustment between the top of the cone and the top of the manhole frame.

Masonry units or precast concrete adjustment rings shall be installed to adjust to final grade. The outside and inside of manhole adjusting bricks or rings and the joints of precast concrete sections shall be plastered and troweled smooth with 1/2 inch (minimum) of mortar in order to attain a watertight surface.

In unpaved areas, a 4-foot-diameter by 8-inches-thick concrete collar shall be poured around the manhole with a manhole marker post unless prior authorization has been granted by the District.

## **D. Channels**

Channels shall be made to conform accurately to the sewer grade and shall be brought together smoothly with well-rounded junctions, satisfactory to the District. The channels shall be field poured after the inlet and outlet pipes have been laid and firmly grouted into place at the proper elevation. Allowances shall be made for a 0.1-foot drop in elevation across the manhole in the direction of flow. Channel sides shall be carried up vertically from the invert to three-quarters of the diameter of the various pipes. The concrete shelf shall be warped evenly and sloped 3/8 inch per foot to drain. Rough, uneven surfaces will not be permitted. Channels shall be constructed to allow the installation and use of a mechanical plug or flow meter of the appropriate size.

## **E. Pipe Connections**

All pipe connections to the manhole shall be with a water tight flexible rubber boot, Kor-N-Seal, or by casting or grouting a Heavy Duty sand collar, or equal into the manhole wall.

## **F. Drop Manholes**

Drop manholes shall, in all respects, be constructed as a standard manhole with the exception of the drop connection as shown on the Standard Detail.

### **G. Lift Holes and Steel Loops**

All lift holes shall be completely filled with expanding mortar, smoothed both inside and outside, to insure water tightness. All steel loops shall be removed, flush with the manhole wall. The stubs shall be covered with mortar and smoothed. Rough, uneven surfaces will not be permitted.

### **H. Frames and Covers**

Frames and covers shall be ductile iron. Castings shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects, which would impair serviceability. Repair of defects by welding, or by the use of "smooth-on" or similar material, will not be permitted. Frames and covers shall be machine finished or ground on seating surfaces so as to assure non-rocking fit in any position and interchangeability of covers.

All frames and covers shall be provided with three bolt locking lids. Rings and covers shall be positioned so one of the three locking bolts is located over the manhole steps.

Frames and covers shall be adjusted to conform to the final finished surface grade of the street or easement to the satisfaction of the District.

In easements and/or under special circumstances and at the sole discretion and approval of the District, manhole frames and covers shall be by Pamrex 24, available from Titus Industrial Group, 62292 Bryan Road, Bend, Oregon 97701, (541) 389-1975, or equal as approved by the District.

### **I. Manhole Marker Posts**

A fiberglass manhole marker post shall be located adjacent to all manholes located in easement areas. The marker post shall be green in color, 3.75 inches wide (flat), 60-inches long and furnished with a 3-inch by 3-inch-high intensity white reflector (250 Candle Power) and a flexible anchor barb. Each post shall include the following decal: "Caution Sewer Manhole. Before digging, call 1-800-424-5555, Utility Underground Location Center". Manhole markers shall be Carsonite Utility Marker CUM 375.

The marker posts shall be set so as to leave thirty-six (36) inches of the post exposed above grade.

### **J. Manhole Fall Protection**

All manholes that are 20 feet or over in depth, measured from finished grade to invert of the pipe, shall be a minimum of 54 inches in diameter (or a size specified by the District) to facilitate the use of fall protection equipment.

### **S-3 TESTING GRAVITY SEWERS**

The Developer shall furnish all facilities and personnel for conducting tests under the observation of the District. Methods other than low-pressure air test shall be subject to the approval of the District.

#### **A. Preparation for Testing for Leakage**

Before any leakage test is performed, the Developer shall clean and flush all gravity sewer lines with an approved rodding method or with a cleaning ball and clean water prior to testing. The inflatable diagonally ribbed rubber ball shall be of a size that will inflate to fit snugly into the pipe to be tested. After completion of backfill and cleaning, the completed gravity sewer, including side sewer stubs, shall be televised inspected. This will be permitted prior to paving. If the television inspection reveals excess debris, the Developer shall clean and televise again at its own expense. The sewer shall then be tested by the low-pressure air test method but only after all utilities are installed and the project paved. Except, however, that in certain conditions an exfiltration test may be required by the District.

The first section of pipe, not less than 300 feet in length, installed by each crew shall be tested in order to qualify the crew and/or the material. A successful installation of this first section shall be a prerequisite for further pipe installation by the crew. At the Developer's option, crew and/or material qualification testing may be performed at any time during the construction process after at least 2 feet of backfill has been placed over the pipe.

All debris flushed out of the line shall be removed at the first manhole where its presence is noted. In the event cemented or wedged debris or a damaged pipe shall stop the cleaning operation, the Developer shall remove the obstruction, and/or repair any damaged pipe. All visible leaks showing flowing water in pipelines or manholes shall be stopped even if the test results fall within the allowable leakage. The cleaning shall be carried out in such a manner as to not infiltrate water into existing facilities. Precautions shall be taken to prevent any damage caused by cleaning and testing. Any damage resulting shall be repaired by the Developer at its own expense. The manner and time of testing shall be subject to approval of the District.

#### **B. Low Pressure Air Test**

The sewer pipe shall be tested for leaks through the use of air in the following manner:

Immediately following the pipe cleaning and television inspection, the pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0 pound per square inch greater than the average back pressure of any ground water that may

submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.

The rate of air loss shall then be determined by measuring the time interval required for the internal pressure to decrease from 3.5 to 2.5 pounds per square inch while maintaining the stipulated pressure greater than the pipe section's average adjacent groundwater back pressure.

The pipeline shall be considered acceptable if the total rate of air loss from any section tested in its entirety between manholes, cleanouts or pipe ends does not exceed the following table:

TABLE OF TEST TIME IN MINUTES AND SECONDS  
Length of 6" Pipe (ft.)

	0	50	100	150	200	250	300	350	400	
Length of 8" Pipe (ft.)	0	0	0:40	1:20	1:58	2:38	3:18	3:58	4:38	5:16
	50	1:10	1:50	2:30	3:10	3:48	4:28	5:08	5:48	5:56
	100	2:20	3:00	3:40	4:20	5:00	5:38	6:14	6:12	6:08
	150	3:32	4:10	4:50	5:30	6:10	6:30	6:26	6:22	6:18
	200	4:42	5:22	6:00	6:40	6:44	6:38	6:34	6:30	6:26
	250	5:52	6:32	6:48	6:58	6:50	6:44	6:40	6:36	6:32
	300	7:02	7:20	7:10	7:02	6:06	6:50	6:44	6:40	6:36
	350	7:34	7:22	7:14	7:06	7:00	6:54	6:50	6:44	6:42
	400	7:34	7:24	7:16	7:08	7:02	6:58	6:52	6:48	6:44

Test times will be provided by the District for combinations other than 8-inch mains and 6-inch laterals.

If the pipe installation fails to meet these requirements, the Developer shall determine at its own expense the source or sources of leakage, and shall repair (if the extent and type of repairs proposed by the Developer appear reasonable to the District) or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of this low-pressure air test or the alternative water exfiltration test before being considered for acceptance.

Plugs used to close the sewer pipe for the air test shall be securely braced with non buoyant material to prevent the unintentional release of a plug, which can become a high velocity projectile. Gauges, air piping manifolds and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure release device such as a rupture disk or a pressure relief valve designed to relieve pressure on the pipe under test at 6 psi.

#### **S-4 TESTING FORCE MAINS**

The force mains shall be hydrostatically tested before being placed in service. Water for testing must be obtained by the Developer by arrangement with the District. A positive displacement type pump shall be furnished by the Developer for the testing. Feed for the pump shall be from a container, wherein the actual amount of "makeup" water can be measured.

The test pressure shall be either 200 pounds per square inch, or twice the system pressure, using the greater value and shall maintain the test for a period of not less than 1 hour. The test pressure shall be applied at the low end of the section tested.

The Developer shall provide temporary plugs, caps and blocking as required to pressure test the new force main.

Concrete thrust blocking for fittings shall be in place and the concrete "set" sufficiently to withstand the test pressure before starting the test.

Prior to calling for the District to witness the pressure test, the Developer shall first perform a satisfactory pressure test. The allowable leakage rate per thousand feet of each size pipeline is as follows:

<u>Pipe Size</u>	<u>Allowable Leakage Gal. per Hour per 1,000 Ft. @ 200 psi</u>
6"	0.64
8"	0.85
10"	1.06
12"	1.28

Any leakage caused by defective workmanship or materials shall be repaired, and the line shall again be tested to full compliance.

#### **S-5 TELEVISED INSPECTION**

After manhole adjustment, installation of ATB, channeling and the gravity sewer lines have been cleaned and flushed, the Developer shall provide a complete televised inspection.

The Developer shall perform a complete televised inspection of the sewer pipe and appurtenances and shall provide to the District, a 1/2-inch VHS colored audio-visual tape recording, DVD or CD of the inspections together with a written log of the television inspection. The camera shall be a pan and tilt type equipped with adequate light and focusing to allow inspection of sewer main, side sewers and full

circumference inspection of main line joints and fittings. The District shall determine if the quality of the tape is acceptable.

Immediately prior to the televised inspection, the Developer shall run water through each sewer line for 5 to 10 minutes to provide water for detection of any adverse grade sections visible by the presence of ponded water. The camera shall be stopped periodically at the ponded areas and the depth of water shall be measured with a ball of known diameter on the pull line. Ponding shall not be greater than 1/16-inch per inch of pipe diameter and not exceed 1/2 inch in depth. During the inspection, all tees and other fittings shall be logged as to exact location within 1 percent maximum error in measurement, wherein accuracy is checked with various fittings and the terminating manhole.

The District shall be notified 48 hours prior to any television inspection and this work shall be performed on a schedule to allow the District to witness the inspection.

If the television inspection shows indications of deflections in the pipe, the District may require that the Developer pull a proper sized mandrel for the main through the pipe to confirm that the pipe deflection does not exceed the manufacturer's recommendations.

Any defects in material or installation identified by the television inspection shall be repaired as required by the District at the Developer's expense.

**END PART 3**

M:\MUKILTEO\DETAILS\UPDATED STANDARD DETAILS (8-09)\S-D1.DWG. LAYOUT, 8/12/2009 12:46:27 PM, BY: RHORITA

FINISHED GRADE

BACKFILL MATERIAL  
CONSISTING OF:

- 1) EXCAVATED MATERIAL  
OR GRAVEL BASE WITHIN  
THE DEVELOPMENT.
- 2) GRAVEL BASE WITHIN  
EXISTING STREETS AND  
RIGHT-OF-WAY.
- 3) CONTROLLED DENSITY FILL  
(CDF) FOR STREET  
CROSSINGS.

ALL BACKFILL SHALL BE  
COMPACTED TO 95% MODIFIED  
PROCTOR, ASTM D1557.

HAND PLACED &  
TAMPED TO THIS  
POINT ABOVE PIPE.

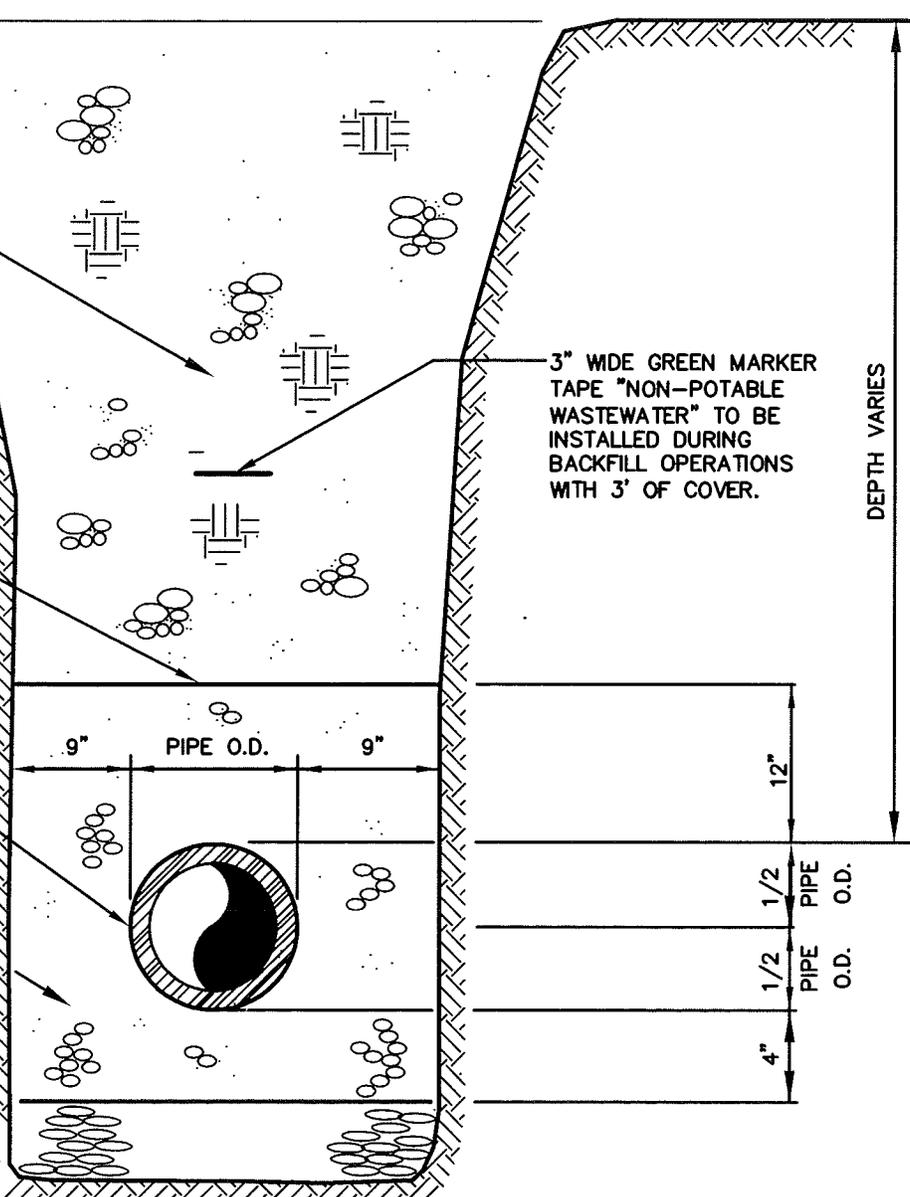
3" WIDE GREEN MARKER  
TAPE "NON-POTABLE  
WASTEWATER" TO BE  
INSTALLED DURING  
BACKFILL OPERATIONS  
WITH 3' OF COVER.

DEPTH VARIES

PVC AND DI  
SEWER PIPE

GRAVEL BACKFILL  
FOR PIPE BEDDING  
(PEA GRAVEL) EXCEPT  
MATERIAL SHALL BE  
CRUSHED SURFACING,  
BASE COURSE WITHIN  
CITY LIMITS OF EVERETT.  
MATERIAL TO BE PLACED  
TO A MINIMUM OF 12"  
ABOVE PVC PIPE AND  
TO THE SPRING LINE OF  
DI PIPE (MINIMUM).

FOUNDATION GRAVEL  
AS REQUIRED

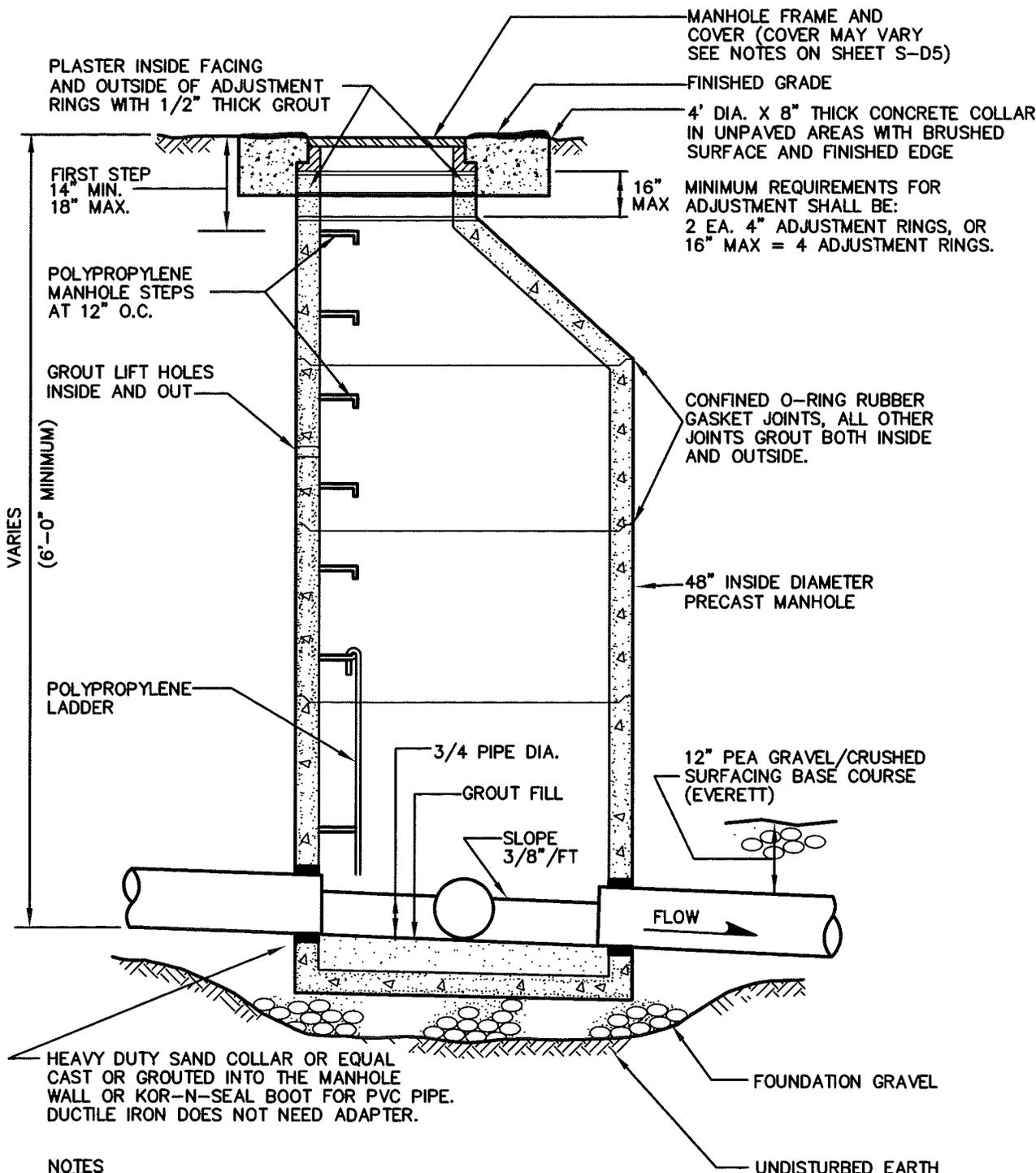


**NOTES:**

THE DEVELOPER SHALL PROVIDE THE DISTRICT WITH LABORATORY TEST RESULTS INDICATING  
COMPACTION OF THE TRENCHES MEET THE REQUIREMENT OF 95% MODIFIED PROCTOR, ASTM D1557

**SANITARY SEWER  
TYPICAL TRENCH SECTION**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

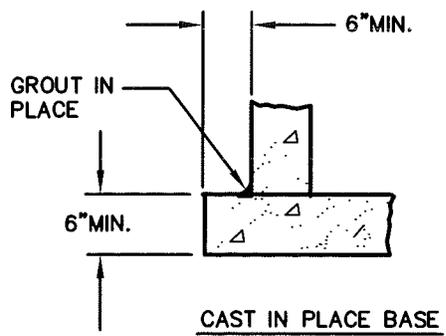


**NOTES**

DROP OF GRADE THRU 48" MANHOLE SHALL BE 0.10', UNLESS OTHERWISE NOTED.

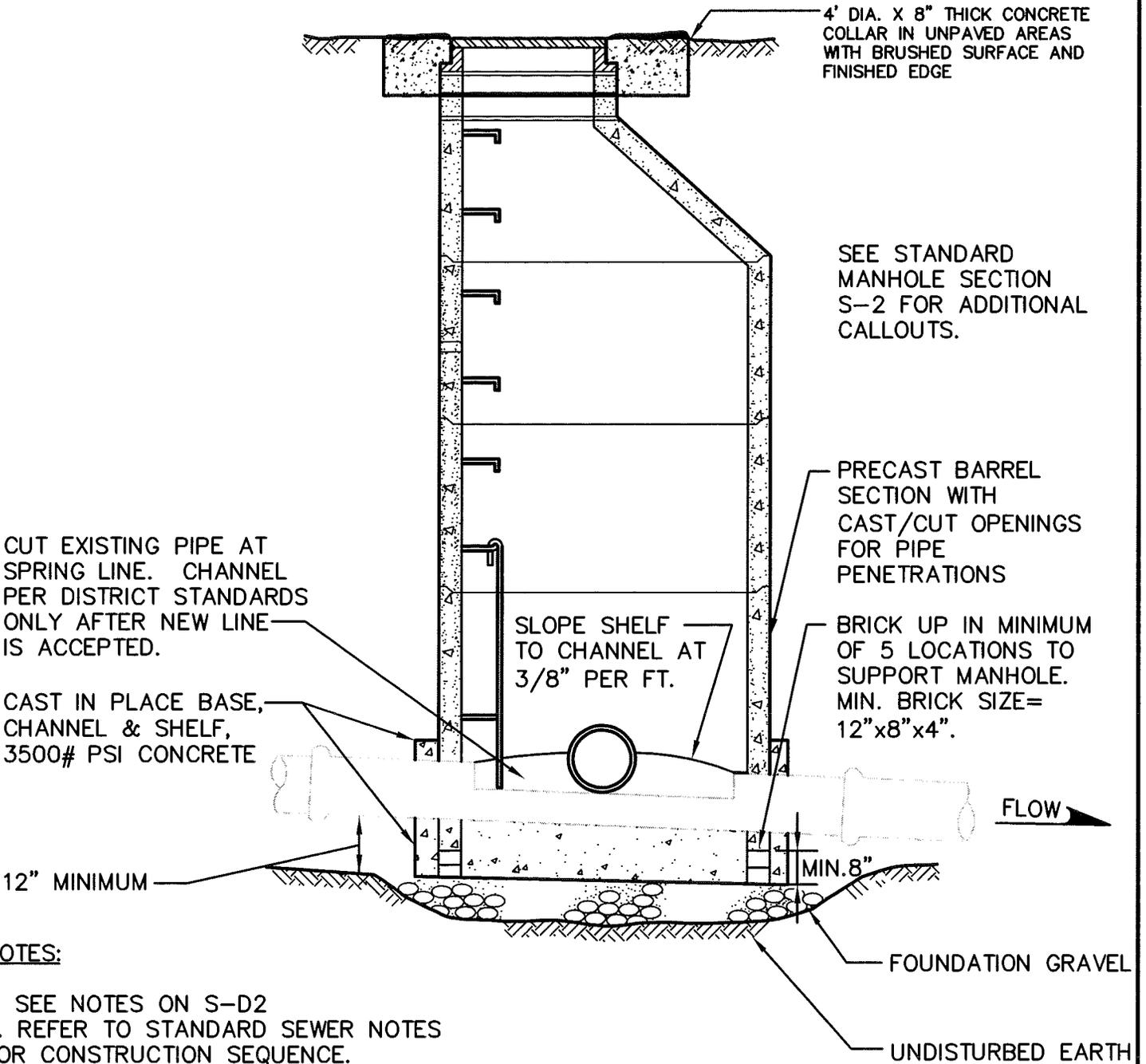
**MANHOLE SIZES:**

- 48" FOR DEPTH < 20 FT.
- 54" FOR DEPTH ≥ 20 FT.
- 60" FOR PIPE DIA. ≥ 15"
- 72" FOR PIPE DIA. ≥ 24"



**SANITARY SEWER MANHOLE SECTION**

Mukilteo Water and Wastewater District  
STANDARD DETAILS

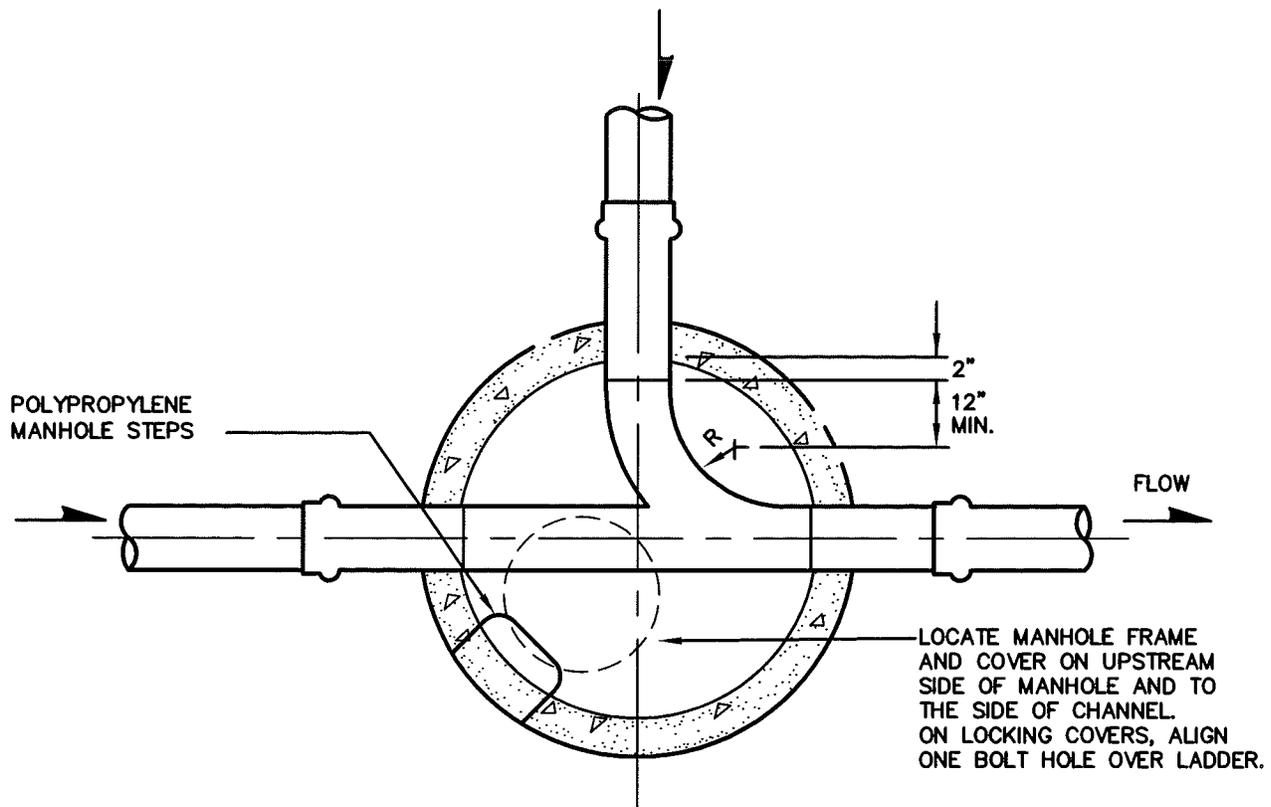


**NOTES:**

1. SEE NOTES ON S-D2
2. REFER TO STANDARD SEWER NOTES FOR CONSTRUCTION SEQUENCE.

**SANITARY SEWER SADDLE  
MANHOLE**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS



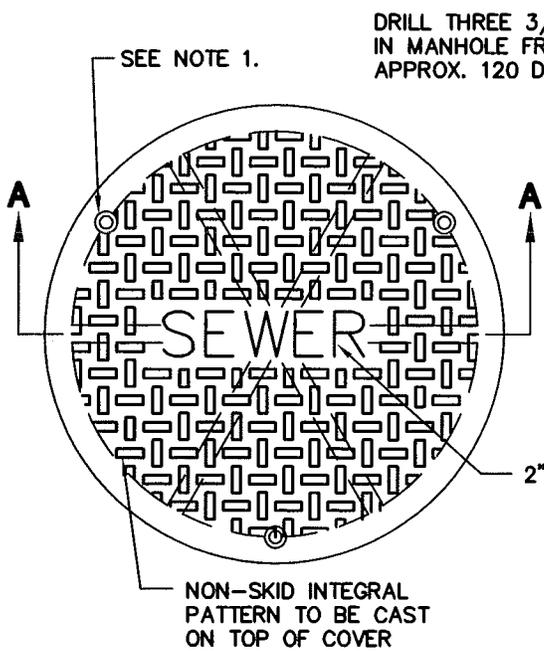
### NOTES

#### MANHOLE FRAME & LOCKING COVER

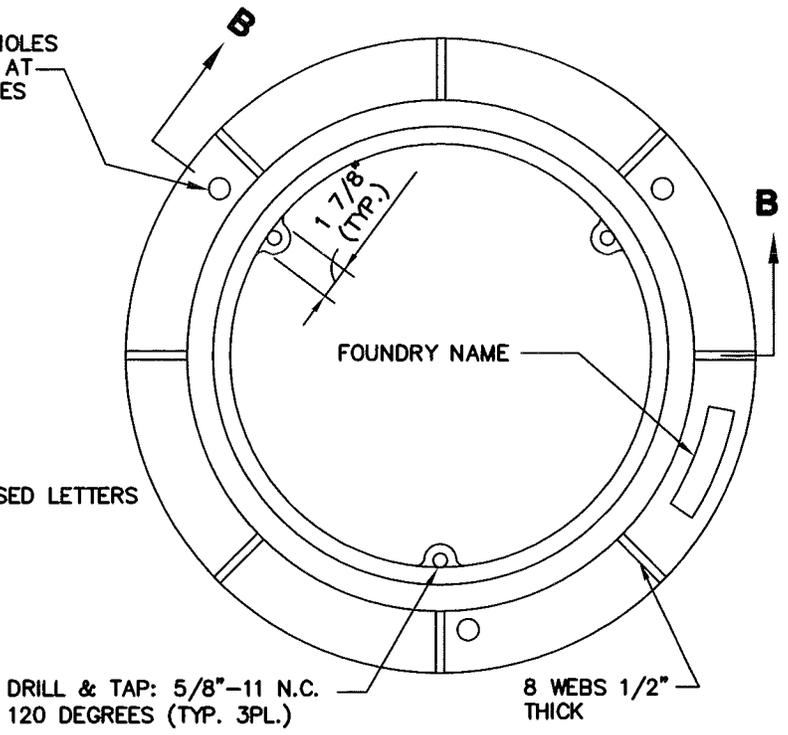
- a. COVER SHALL HAVE THE WORD "SEWER" CAST WITH 2" HIGH LETTERS AND RAISED 3/8".
- b. TOTAL WEIGHT OF FRAME & COVER SHALL BE 360 LBS. MIN.
- c. DUCTILE IRON FRAME & COVER SHALL BE A.P.W.A. PLAN NO. 42.
- d. NON-SKID PATTERN TO BE CAST INTEGRAL ON TOP OF COVER.
- e. COVER SHALL BE PROVIDED WITH 3 EACH HOLES FOR LOCK DOWN PURPOSES.
- f. PROVIDE 3 EACH 5/8", 11 N.C. SOCKET HEAD STAINLESS STEEL SCREWS, 3 5/8" LONG.
- g. ALL HOLES FOR LOCKING COVER SHALL BE IN ALIGNMENT AND INTERCHANGEABLE.
- h. FRAME AND COVER POSITIONED SO ONE OF THE LOCKING BOLTS IS CENTERED OVER THE STEPS.
- i. WATERTIGHT MANHOLE COVER REQUIRED IN AREAS SUBJECT TO FLOODING AND/OR WHEN SPECIFIED BY THE DISTRICT. WATERTIGHT MANHOLE COVER SHALL BE PAMREX 24 OR EQUAL AS APPROVED BY THE DISTRICT.

## SANITARY SEWER MANHOLE PLAN

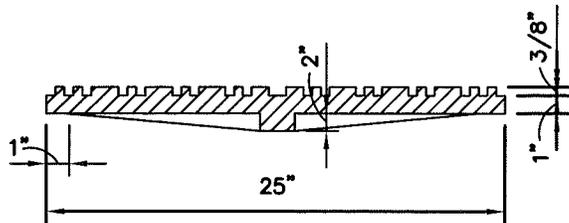
Mukilteo Water and Wastewater  
District  
STANDARD DETAILS



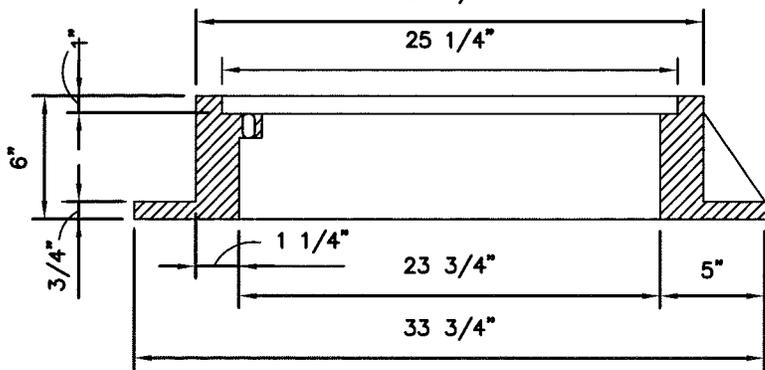
**COVER PLAN**



**RING PLAN**



**SECTION A-A**



**SECTION B-B**

**GENERAL NOTES:**  
 MANHOLE RING AND COVER SHALL BE OLYMPIC FOUNDRY MH30A D/T, OR EQUAL.

**COVER NOTES:**

1. USE WITH THREE LOCKING BOLTS 5/8"-11 NC STAINLESS TYPE 304 STEEL SOCKET HEAD (ALLEN HEAD) BOLTS, 3" LONG. DRILL HOLES SPACED 120°, TO MATCH HOLES IN RING.
2. COVER MATERIAL IS DUCTILE IRON ASTM A536 GRADE 80-55-06.
3. SHALL CONFORM TO SEC. 9-05.15 OF THE STANDARD SPECIFICATIONS, AS MODIFIED HEREIN.
4. APPROXIMATE WEIGHT OF COVER IS 150 LBS.
5. RATING - H30.

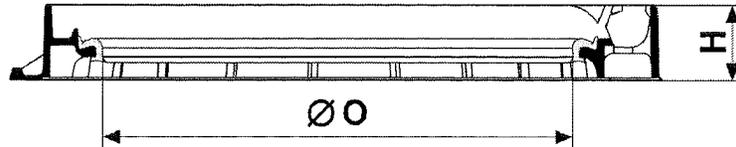
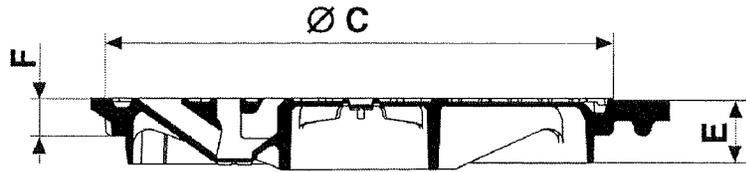
**RING NOTES:**

1. DRILL AND TAP THREE 5/8"-11 NC HOLES THROUGH RING AT 120°.
2. RING MATERIAL IS GREY IRON, ASTM A-48 CLASS 30.
3. SHALL CONFORM TO SEC. 9-05.15 OF THE STANDARD SPECIFICATIONS, AS MODIFIED HEREIN.
4. APPROXIMATE WEIGHT OF RING IS 215 LBS.
5. RATING - H30.

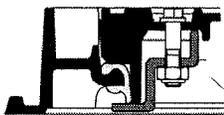
**STANDARD MANHOLE FRAME AND COVER**

Mukilteo Water and Wastewater District  
 STANDARD DETAILS

Model	A inches	C inches	E inches	F inches	H inches	O inches	Reference	Weight lbs	Cover Weight lbs
Non ventilated	33	28	3.5	2	4	24	RE 60 R8 FD	195	122

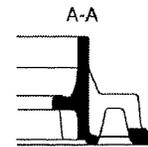


LOCKING OPTION

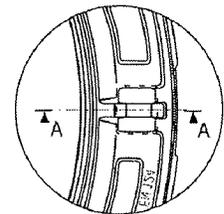
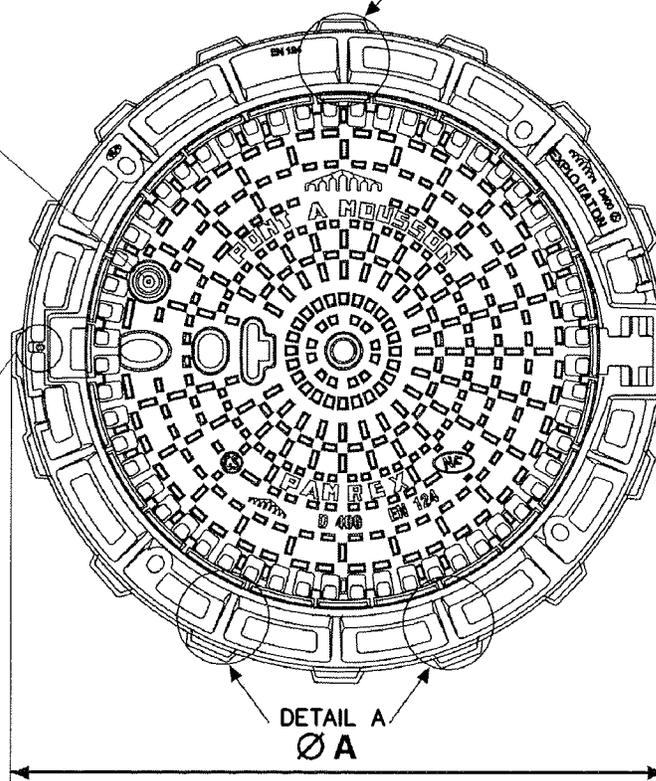
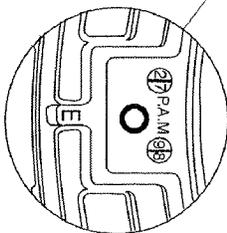


DETAIL A

DETAIL A:  
LIFTING HOLES



FRAME MARKING



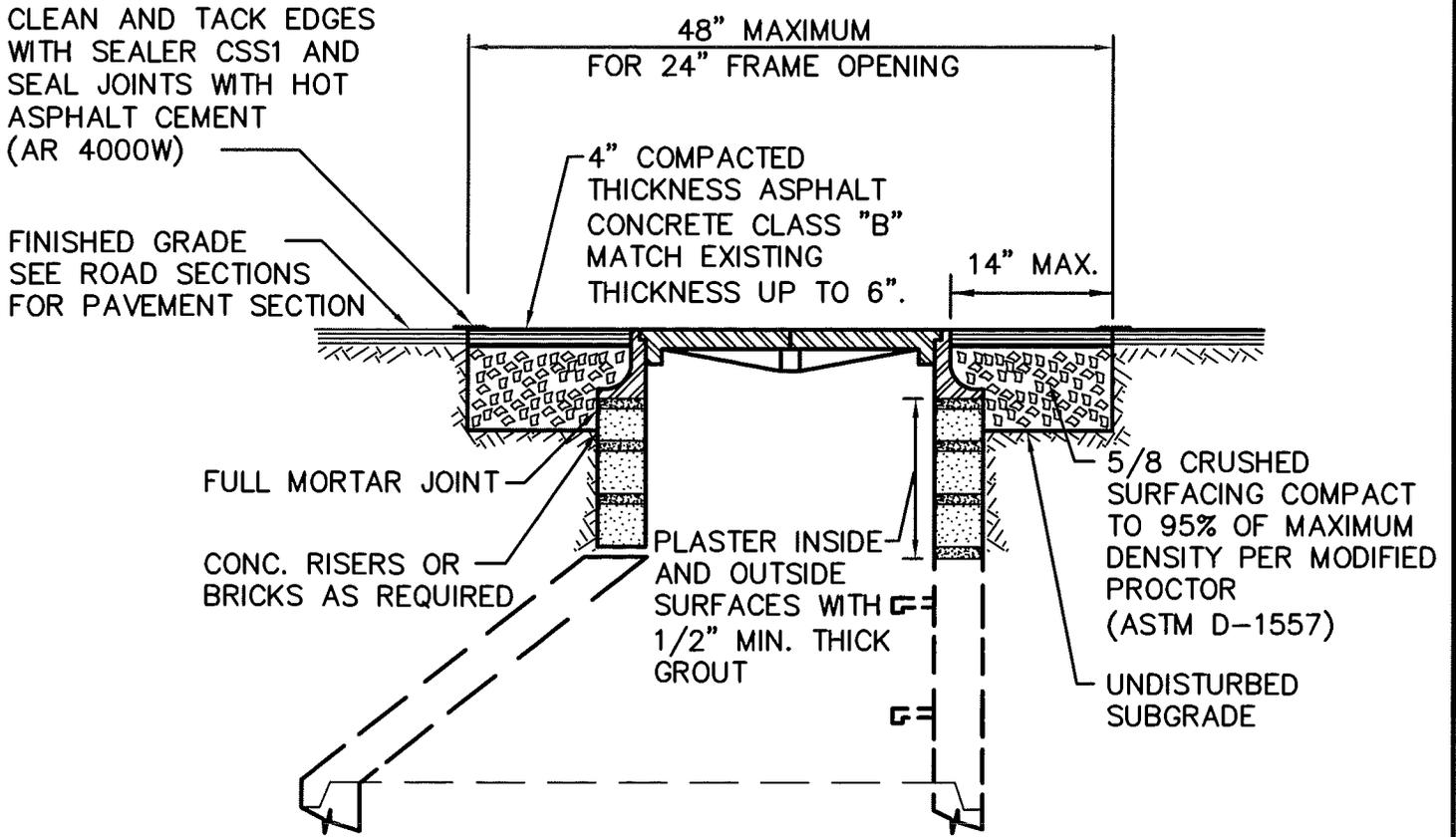
**NOTES:**

MANHOLE COVER AND FRAME SHALL BE PAMREX. COVERS AND FRAMES SHALL BE MANUFACTURED FROM DUCTILE IRON IN ACCORDANCE WITH ISO 1083. COVERS SHALL BE HINGED AND INCORPORATE A 90 DEGREE BLOCKING SYSTEM TO PREVENT ACCIDENTAL CLOSURE. COVERS SHALL BE ONE MAN OPERABLE USING STANDARD TOOLS AND SHALL BE CAPABLE OF WITHSTANDING A TEST LOAD OF 120,000 LBS. FRAMES SHALL BE CIRCULAR WITH A 24" CLEAR OPENING AND SHALL INCORPORATE A 360° MECHANICALLY ATTACHED ELASTOMER SEATING GASKET FOR INFILTRATION CONTROL AND TRAFFIC SHOCK. THE HINGE BOX SHALL INCLUDE A SELF-CLEANING, DUAL WIPER INFILTRATION PLUG. THE FRAME DEPTH SHALL NOT EXCEED 4 INCHES, AND THE FLANGE SHALL INCORPORATE BEDDING SLOTS, BOLT HOLES AND LIFTING EYES. ALL COMPONENTS SHALL BE BLACK COATED. FRAME WEIGHT: 73 LBS. COVER WEIGHT: 122 LBS. TOTAL WEIGHT 195 LBS. PAMREX IS AVAILABLE FROM TITUS INDUSTRIAL GROUP 877-582-9899

**ALTERNATE  
MANHOLE FRAME AND COVER**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

CONSTRUCTION, INSTALLATION OR ADJUSTING TO GRADE OF MANHOLE RIMS SHALL CONFORM TO 2002 WSDOT STANDARD SPECIFICATION 7-05.



NOT TO SCALE

**NOTE:**

MAX. 4 EA, MIN. 2 EA 4" RISERS FOR NEW CONSTRUCTION

**MANHOLE GRADE  
ADJUSTMENT DETAIL**

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Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

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6" SIDE SEWER

6" TEE ON SEWER MAIN  
8" OR LARGER. USE 6"  
WYE ON 6" SEWER.

SEWER MAIN

PROPERTY LINE OR  
EDGE OF M.W.D. ESMT.

6" TEE OR WYE  
WITH WATERTIGHT  
PLUGS

10'-0"

2x4x12' LONG  
SERVICE MARKER  
(SEE NOTE 1)

6" TEE OR WYE  
WITH 2 WATERTIGHT  
PLUGS

2x4x12' LONG  
SERVICE MARKER  
PAINTED WHITE  
WITH "SEWER"  
STENCIL USING  
2" BLACK LETTERS

FINISHED GRADE

INSTALL 3" WIDE GREEN METALLIC  
MARKER TAPE OVER PIPE. LOOP  
AROUND MAIN AND EXTEND UP TO  
AROUND 2x4 SERVICE MARKER.

6" SIDE SEWER

6" TEE ON  
SEWER MAIN

SEWER MAIN

45° MAXIMUM SLOPE  
2% MINIMUM SLOPE

6'-0" MINIMUM

5'-0" MINIMUM

VARIES

2% MINIMUM SLOPE

**NOTES:**

1. PAINT PORTION OF SERVICE MARKER THAT IS ABOVE FINISHED GRADE WITH WHITE PAINT. STENCIL WITH BLACK LETTERS "S/S" USING 3" HIGH LETTERS. LOCATE MARKER AT END OF EACH SERVICE.
2. SIDE SEWER TO BE LOCATED AT NEAR CORNER OF LOT ON LOWER SIDE OF PROPERTY UNLESS OTHERWISE APPROVED BY THE DISTRICT.
3. MAXIMUM DEFLECTION NOT TO EXCEED PIPE MANUFACTURER RECOMMENDATIONS.
4. SIDE SEWER LATERAL SHALL BE THE SAME MATERIAL AS THE MAIN LINE SEWER AND BEDDED THE SAME. MANHOLE PER S-D2 REQUIRED 10' INTO PROPERTY ON ALL SIDE SEWERS OTHER THAN SINGLE FAMILY.

**ELEVATION**

**STANDARD SIDE SEWER**

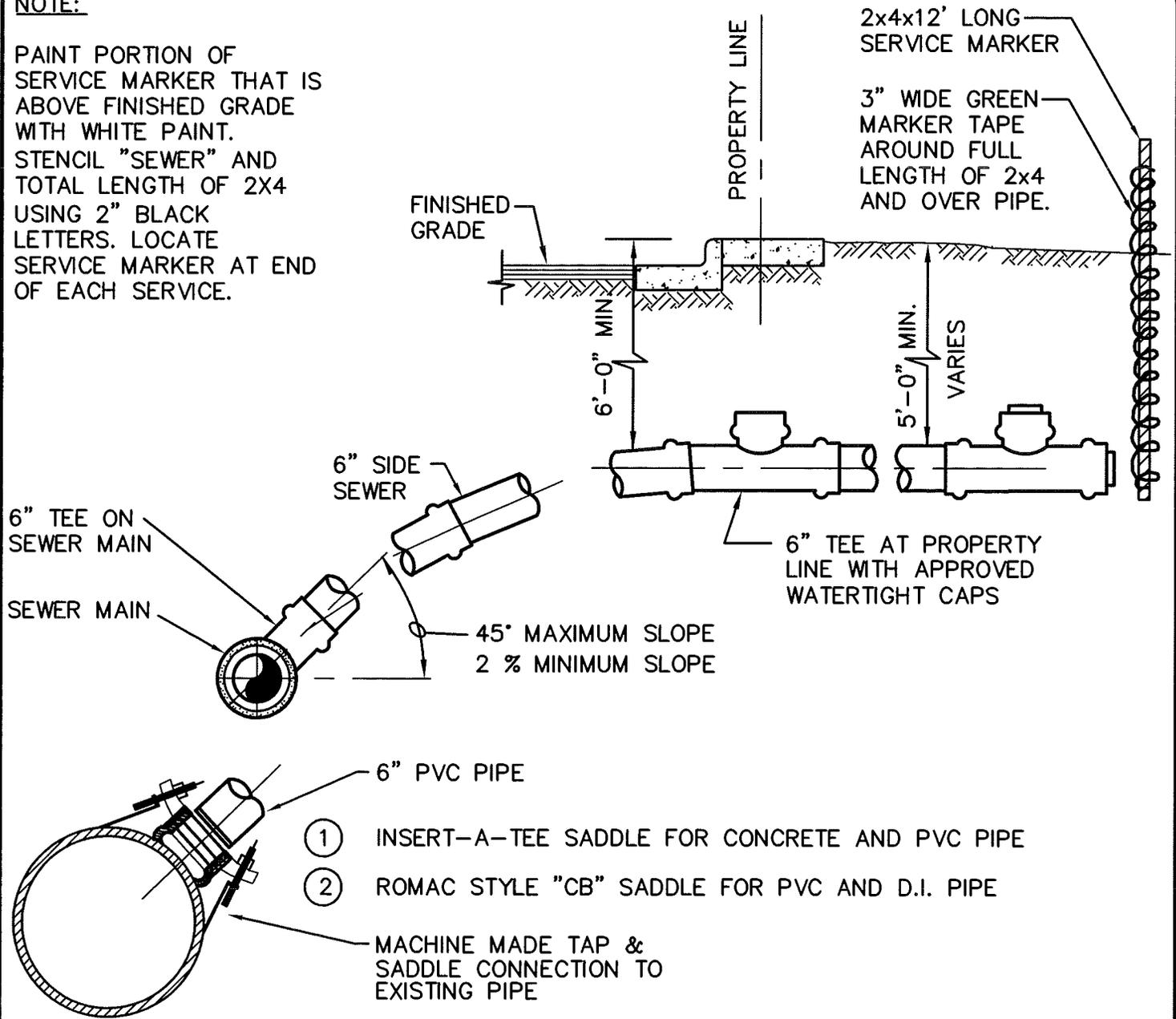
Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

8/09

**S-D8**

**NOTE:**

PAINT PORTION OF SERVICE MARKER THAT IS ABOVE FINISHED GRADE WITH WHITE PAINT. STENCIL "SEWER" AND TOTAL LENGTH OF 2X4 USING 2" BLACK LETTERS. LOCATE SERVICE MARKER AT END OF EACH SERVICE.



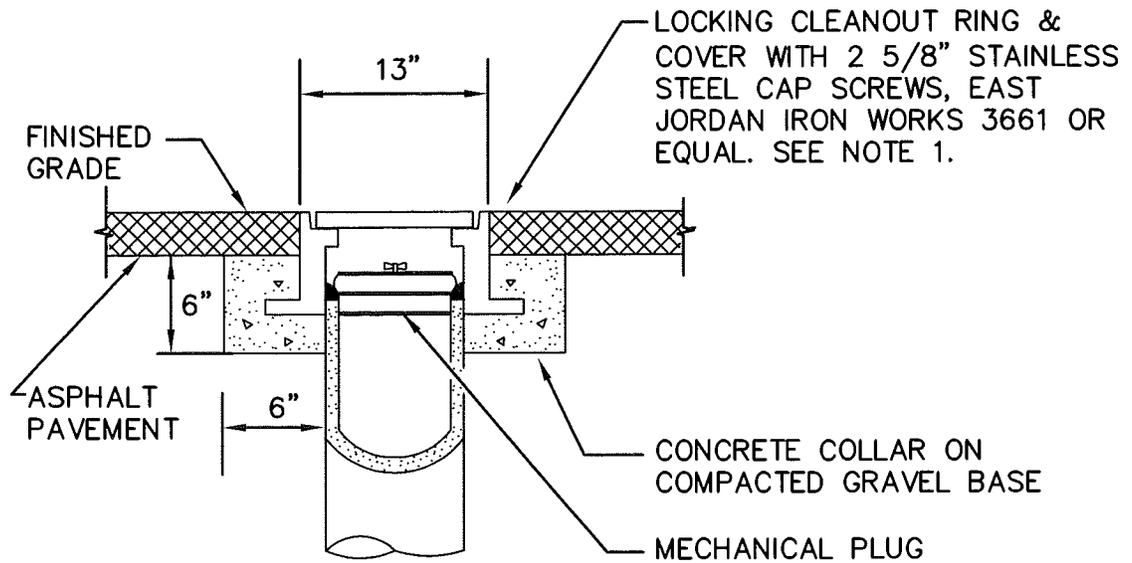
**NOTES:**

1. SEE STANDARD SIDE SEWER DETAIL FOR NEW CONSTRUCTION.
2. DEVELOPER TO PROVIDE ALL MATERIALS, TRAFFIC CONTROL, PERMITS, SHORING AND MISC. WORK AS REQUIRED TO TAP THE MAIN AND INSTALL THE SIDE SEWER.
3. CUT-IN TEES ARE PERMITTED ONLY WITH DISTRICT APPROVAL.

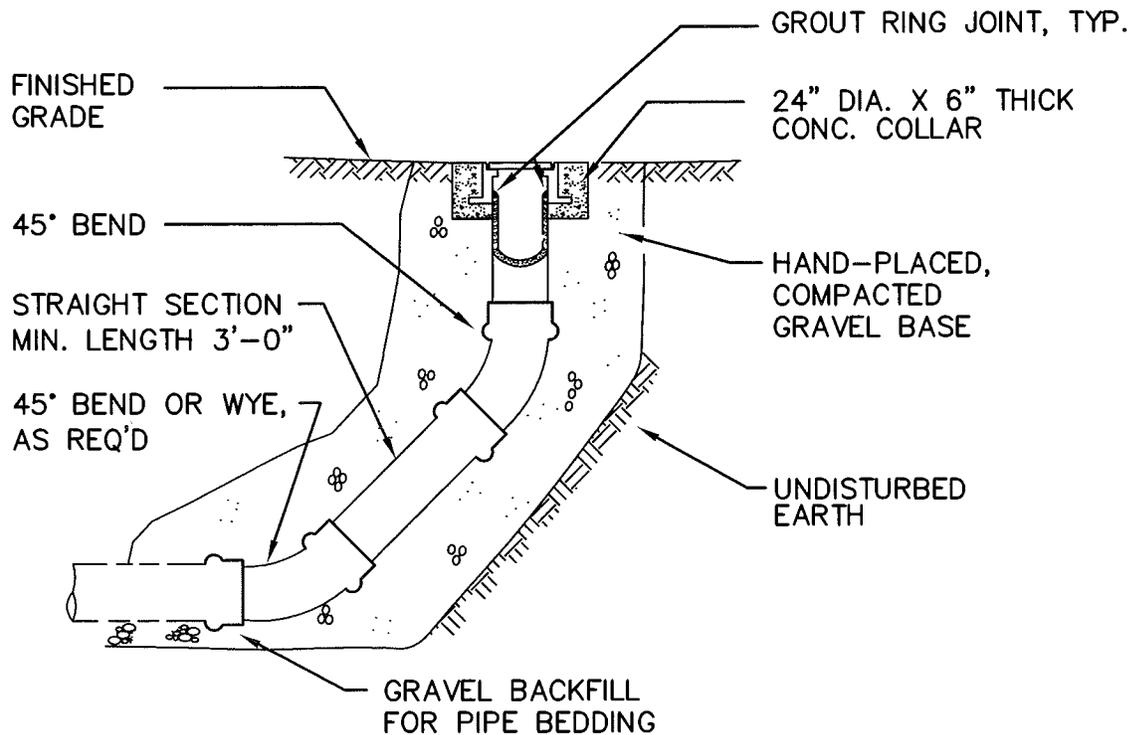
**SIDE SEWER LATERAL  
CONNECTION TO EXISTING MAIN**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

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## **STREET USE**



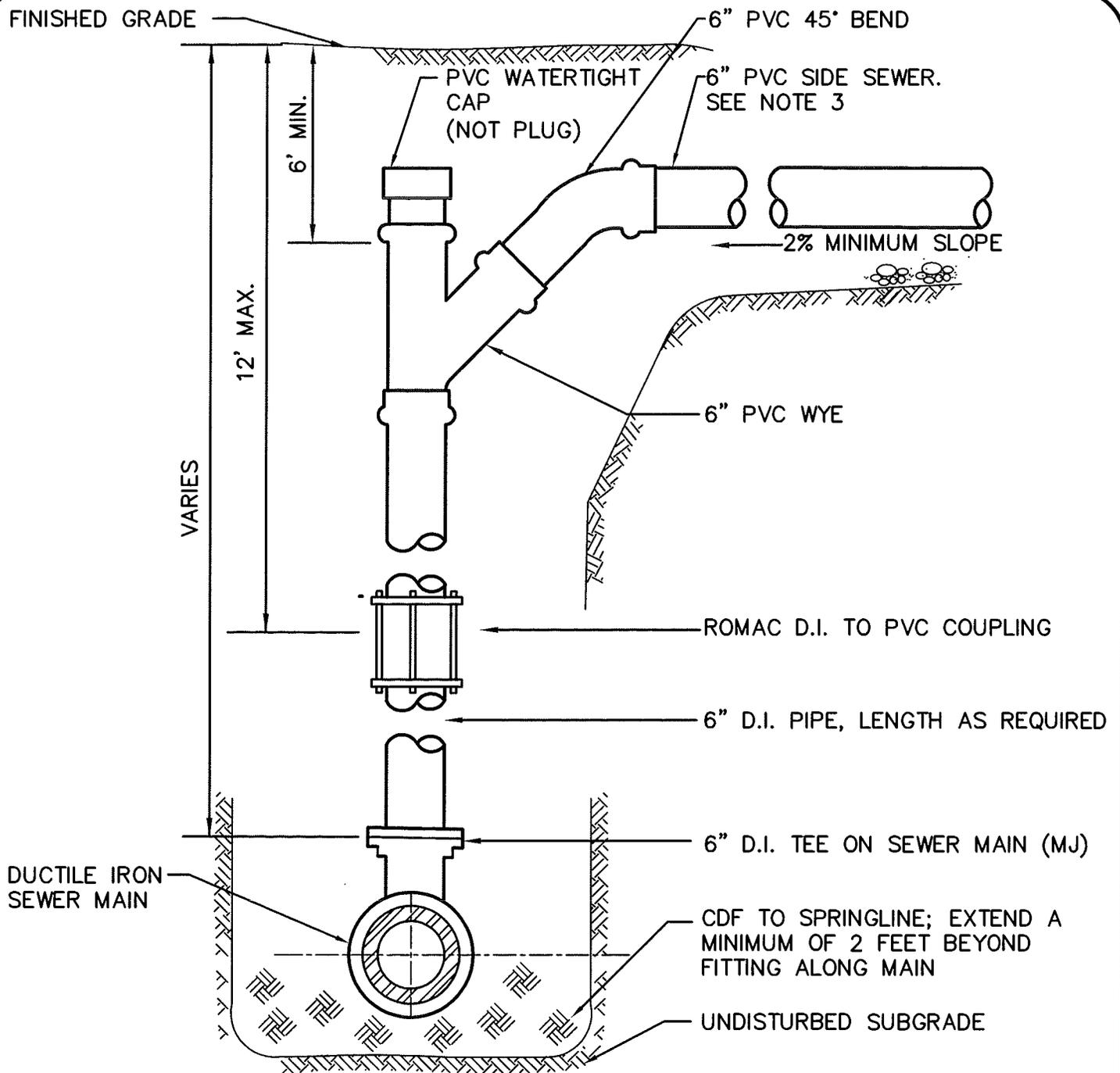
## **EASEMENT USE**

### NOTES:

1. INSTALL CARRIAGE BOLT/OVERSIZE WASHER/LOCK NUT ASSEMBLY IN VENT HOLE TO PROTECT AGAINST GROSS INFLOW, PER STANDARD NOTES.

## **SANITARY SEWER CLEANOUT**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS



**NOTES:**

1. USE OF STANDING SIDE SEWER REQUIRES DISTRICT APPROVAL.
2. USE WILL ONLY BE CONSIDERED WHEN DEPTH OF MAIN EXCEEDS 18' AND REQUIRED DEPTH OF SIDE SEWER IS LESS THAN 10' AT PROPERTY LINE, AND WHERE STANDARD SIDE SEWER CONNECTION IS NOT FEASIBLE.
3. EXTEND 6" CLEANOUT TO SURFACE AT PROPERTY LINE (OR OTHER LOCATION AS DETERMINED BY THE DISTRICT).
4. REFER ALSO TO STANDARD SIDE SEWER DETAIL FOR ADDITIONAL REQUIREMENTS.

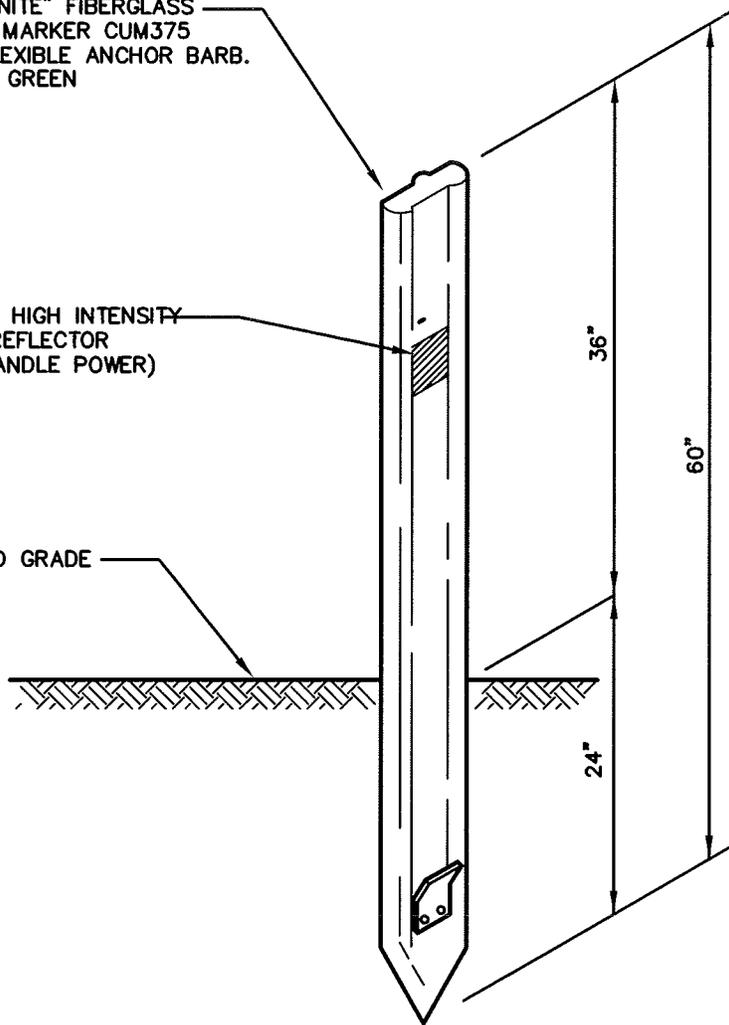
**STANDING SIDE SEWER**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

"CARSONITE" FIBERGLASS  
UTILITY MARKER CUM375  
WITH FLEXIBLE ANCHOR BARB.  
COLOR: GREEN

3" x 3" HIGH INTENSITY  
WHITE REFLECTOR  
(250 CANDLE POWER)

FINISHED GRADE

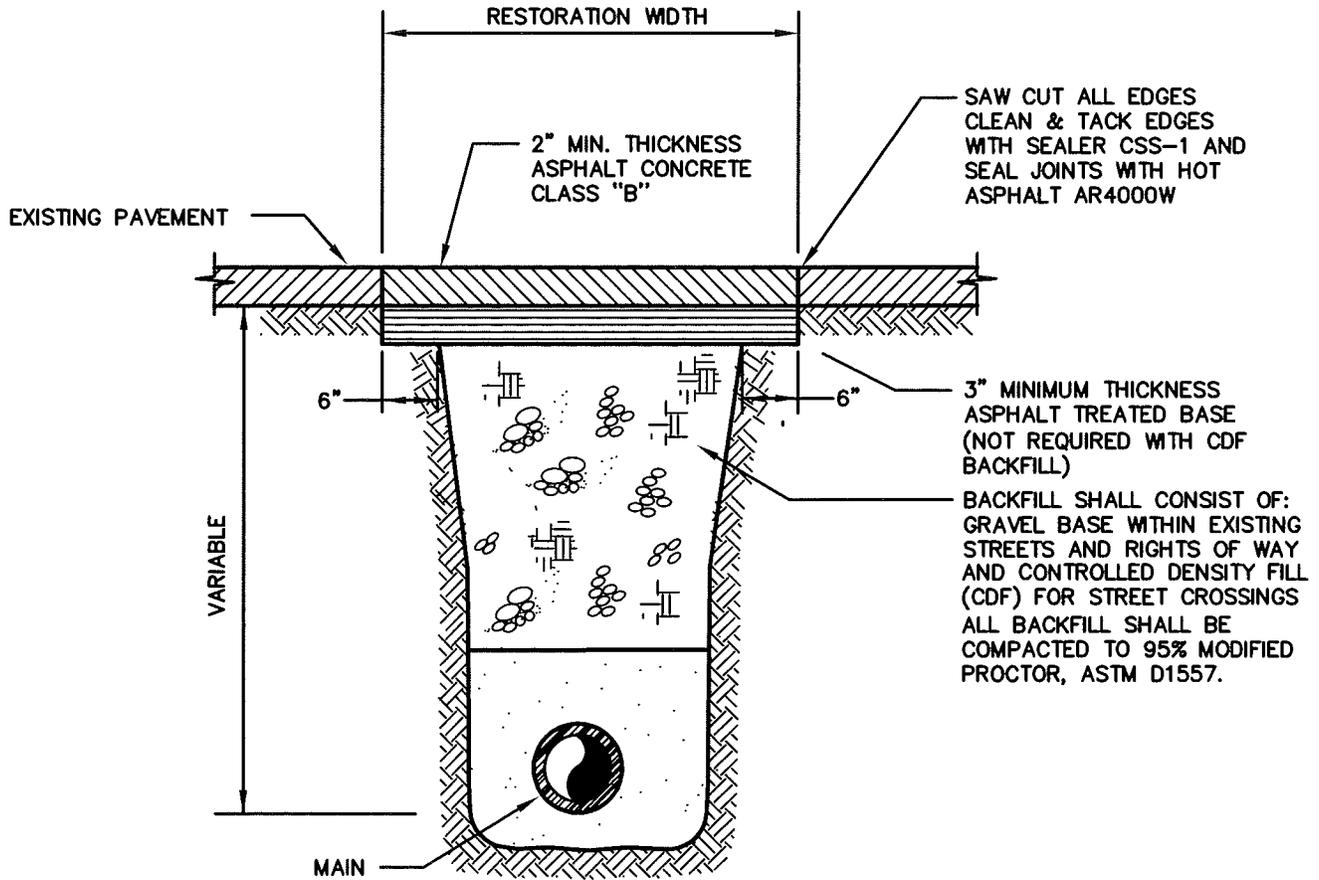


**NOTES:**

1. A MARKER POST SHALL BE LOCATED ADJACENT TO EACH MANHOLE LOCATED IN EASEMENT AREAS.
2. EACH POST SHALL INCLUDE THE FOLLOWING DECAL:  
"CAUTION SEWER MANHOLE, BEFORE DIGGING, CALL  
1-800-424-5555, UTILITY UNDERGROUND LOCATION CENTER."

**MANHOLE MARKER**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS



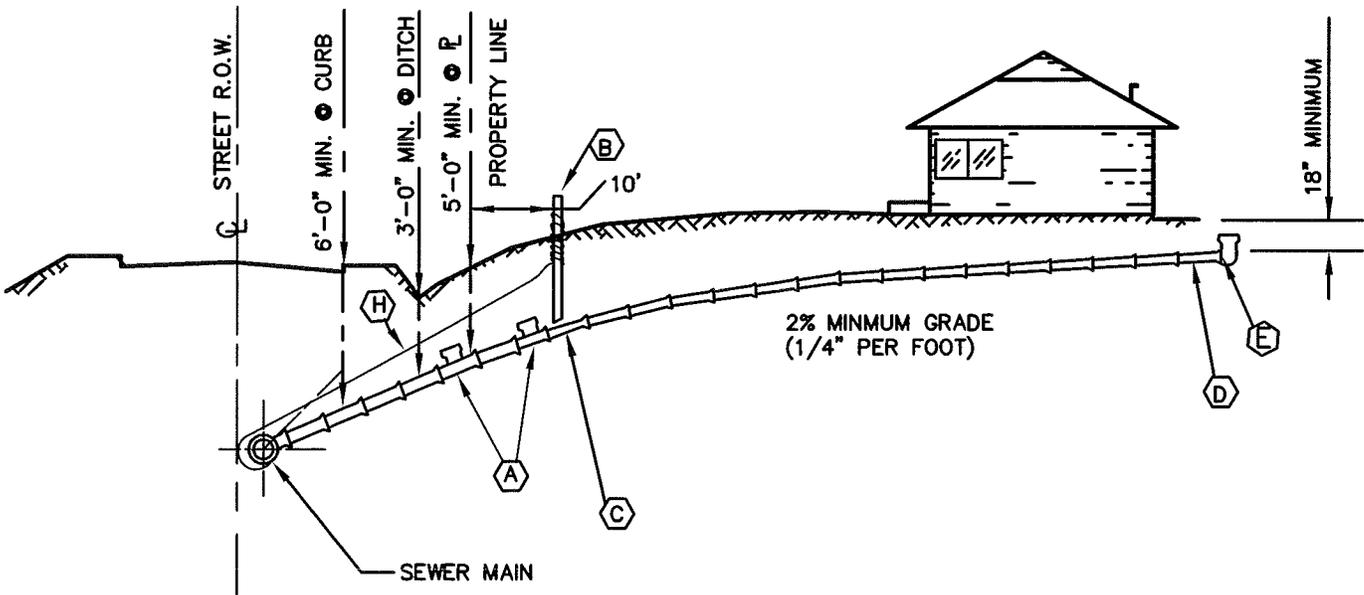
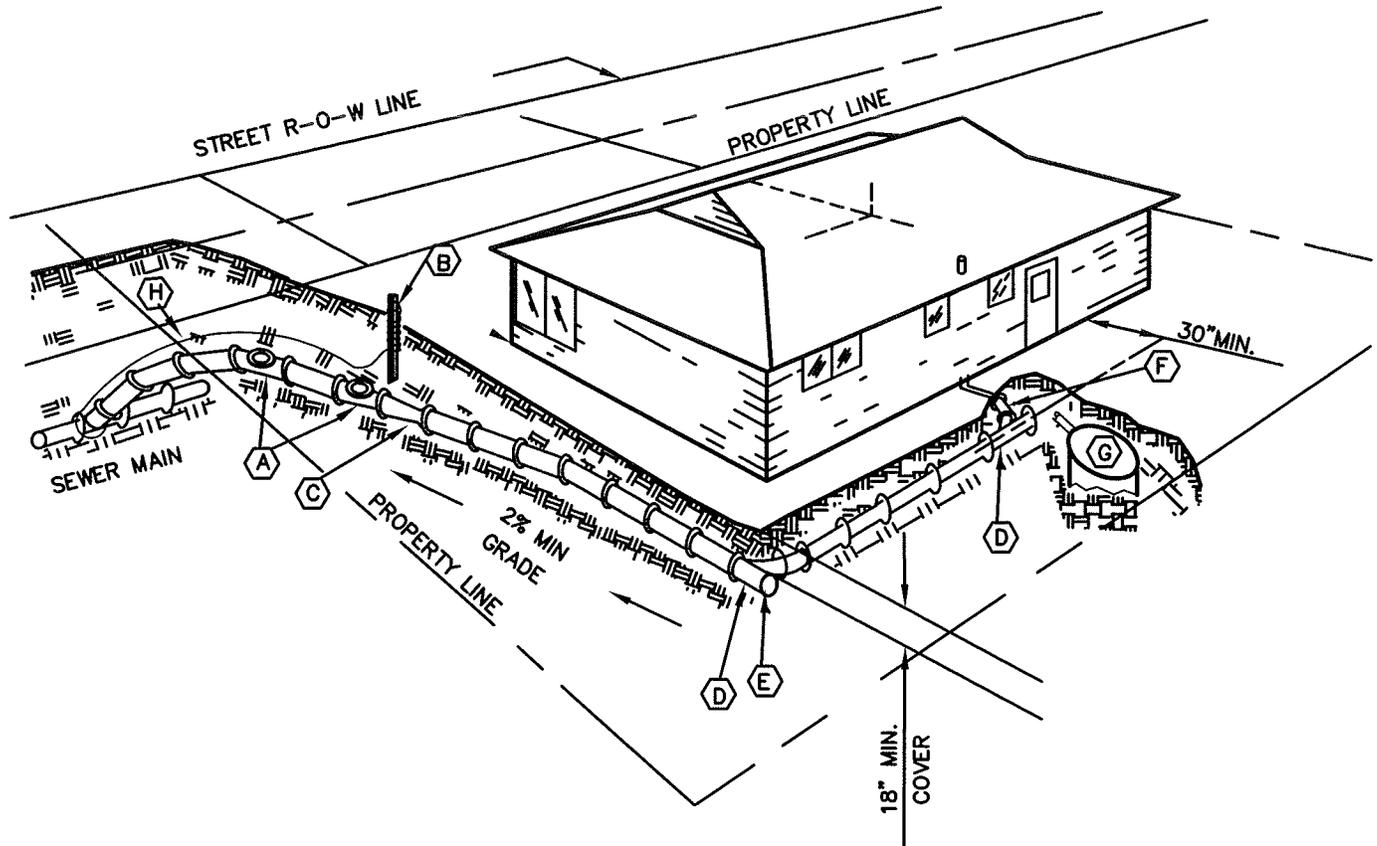
**NOTES:**

1. ALL ASPHALT STREETS AND DRIVEWAYS SHALL BE TEMPORARILY REPAIRED WITH COLD MIX, EXCEPT CROSSINGS WITH CDF SHALL BE COVERED WITH STEEL PLATES UNTIL THE CDF HAS CURED TO ALLOW FOR PLACEMENT OF THE ASPHALT.
2. PATCH SHALL BE MACHINE ROLLED FLUSH WITH EXISTING PAVEMENT AND SHALL BE PLACED PER SEC. 5-04 OF THE WA. STATE D.O.T. SPECIFICATIONS.

**ASPHALT PAVEMENT REPAIR**

Mukilteo Water and Wastewater District  
STANDARD DETAILS

**S-D13**



NOTE:  
 CLEAN OUT (D) SHALL BE 36" TO 48"  
 FROM FOUNDATION WALL

**TYPICAL SIDE SEWER CONNECTION**

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Mukilteo Water and Wastewater  
 District  
 STANDARD DETAILS

- A. INSPECTION TEE
- B. 2 X 4 SERVICE MARKER
- C. APPROVED 6" X 4" REDUCER (SINGLE FAMILY RESIDENCE ONLY)
- D. WYE (CLEANOUT) AND 45 DEGREE BEND
- E. CLEANOUT WITH APPROVED PLUG. CLEANOUT SHALL BE BROUGHT TO WITHIN 18" OF SURFACE IN UNPAVED AREA OR BROUGHT TO SURFACE IN PAVED AREA WITH CAST-IRON COVER.
- F. 45 DEGREE BEND. CONNECT HOUSE SEWER PIPE TO SIDE SEWER WITH APPROVED ADAPTER.
- G. EXISTING SEPTIC TANK - CUT AND PLUG INLET LINE, PUMP TANK DRY AND FILL TANK WITH SUITABLE MATERIAL.
- H. FURNISH AND INSTALL 3" WIDE GREEN METALLIC MARKER TAPE AT 2' OVER PIPE. LOOP AROUND MAIN AND EXTEND UP TO AND AROUND 2"x4" SERVICE MARKER.

GENERAL NOTES

1. SIDE SEWER PIPE SHALL BE 4" OR LARGER FOR SERVICING SINGLE FAMILY AND 6" FOR SERVICING MULTIPLE (DUPLEXES), COMMERCIAL ESTABLISHMENTS, SCHOOLS, OR ANY BUILDING OTHER THAN SINGLE FAMILY RESIDENCES, DUCTILE IRON OR PVC ASTM 3034, AND SHALL BE INSTALLED AT 2% MIN. GRADE (1/4" FALL PER FOOT). CONSTRUCTION ON PRIVATE PROPERTY MAY BE DONE BY OWNER BUT REQUIRES A PERMIT.
2. ALL PIPE JOINTS SHALL BE RUBBER GASKET TYPE.
3. ALL PIPE SHALL BE BEDDED AND ENCASED WITH CRUSHED SURFACING 1-1/4" BASE COURSE ROCK IN ACCORDANCE WITH SECTION 9-03-9(3) OF THE WSDOT STANDARD SPECIFICATIONS, UNLESS OTHERWISE APPROVED BY THE DISTRICT. BEDDING MATERIAL SHALL BE INSTALLED WITH A MINIMUM OF 3" BELOW THE BOTTOM OF THE PIPE TO 6" ABOVE THE TOP OF THE PIPE UNLESS OTHERWISE APPROVED BY THE DISTRICT. BEDDING WITH SAND OR PEA GRAVEL WILL NOT BE ACCEPTED
4. ON PRIVATE PROPERTY MIN. COVER SHALL BE 18" OVER TOP OF PIPE AT 30" DISTANCE FROM BUILDING.
5. PARALLEL WATER AND SEWER LINES SHALL BE 10' APART HORIZONTALLY WHEREVER POSSIBLE.
6. CLEANOUTS AT STRUCTURE CONNECTION SHALL BE 30" FROM STRUCTURE WALL UNLESS APPROVED BY THE DISTRICT.
7. CLEANOUTS ARE REQUIRED FOR 45° BEND OR ANY COMBINATION OF BENDS EQUAL TO 45° OR GREATER. DISTANCE BETWEEN CLEANOUTS SHALL NOT EXCEED 100'. CLEANOUT SHALL BE A PLUGGED TEE OR A PLUGGED WYE LATERAL.
8. 6" SEWER PIPE IS REQUIRED IN THE STREET RIGHT-OF-WAY AND SHALL HAVE A 2% MIN. GRADE. CONSTRUCTION IN STREET MUST BE DONE BY A STATE LICENSED SIDE SEWER CONTRACTOR AND REQUIRES A RIGHT OF WAY PERMIT FROM THE CITY OR COUNTY.
9. SIDE SEWER SHALL BE INSPECTED BY THE DISTRICT PRIOR TO BACKFILLING. SIDE SEWER SHALL BE PLUGGED & TESTED IN PRESENCE OF DISTRICT INSPECTOR BY FILLING WITH WATER. LEAKAGE RATE SHALL NOT EXCEED 0.31 GAL/HR FOR 4" PIPE & 0.47 GAL/HR FOR 6" PIPE, PER 100' OF PIPE.
10. THE OWNER AND/OR HIS/HER CONTRACTOR HEREBY AGREE TO SAFEGUARD THE WORK DONE UNDER THIS PERMIT IN SUCH A MANNER AS TO PREVENT INJURY AND/OR DAMAGE TO THE PUBLIC. SUCH PRECAUTIONS SHALL INCLUDE THE EMPLOYMENT OF ALL NECESSARY DITCH SAFEGUARDS SUCH AS LANTERNS, BARRICADES, A TRENCH BOX FOR ANY DITCH OVER 4' DEEP AND SAFE ACCESS OR EGRESS THROUGH THE WORKING AREA.
11. BACK-WATER VALVES MAY BE REQUIRED IF DWELLING HAS POSSIBILITY OF SEWAGE BACKING UP INTO THE DWELLING.

**SIDE SEWER  
INFORMATION**

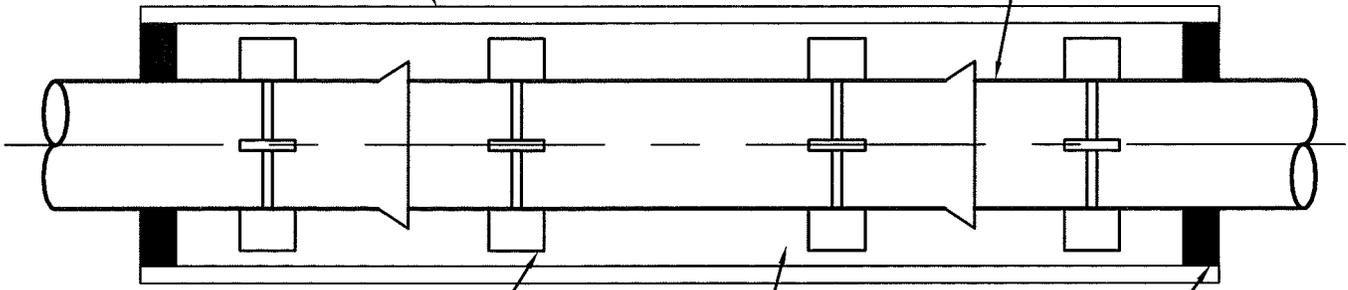
Mukilteo Water and Wastewater  
District  
STANDARD DETAILS

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STEEL OR D.I. ENCASEMENT PIPE. SEE TABLE FOR MINIMUM DIAMETER.

10' MAXIMUM SPACING

CARRIER PIPE, D.I. RESTRAINED JOINT PIPE UNLESS OTHERWISE APPROVED BY THE DISTRICT



UNI-FLANGE UFRCS 1300, OR EQUAL, SIZED TO PREVENT UPLIFT OF THE CARRIER PIPE.

FILL VOIDS WITH SAND

BRICK AND CEMENT ENDS (TYP.). SEE NOTE 3.

**NOTE:**

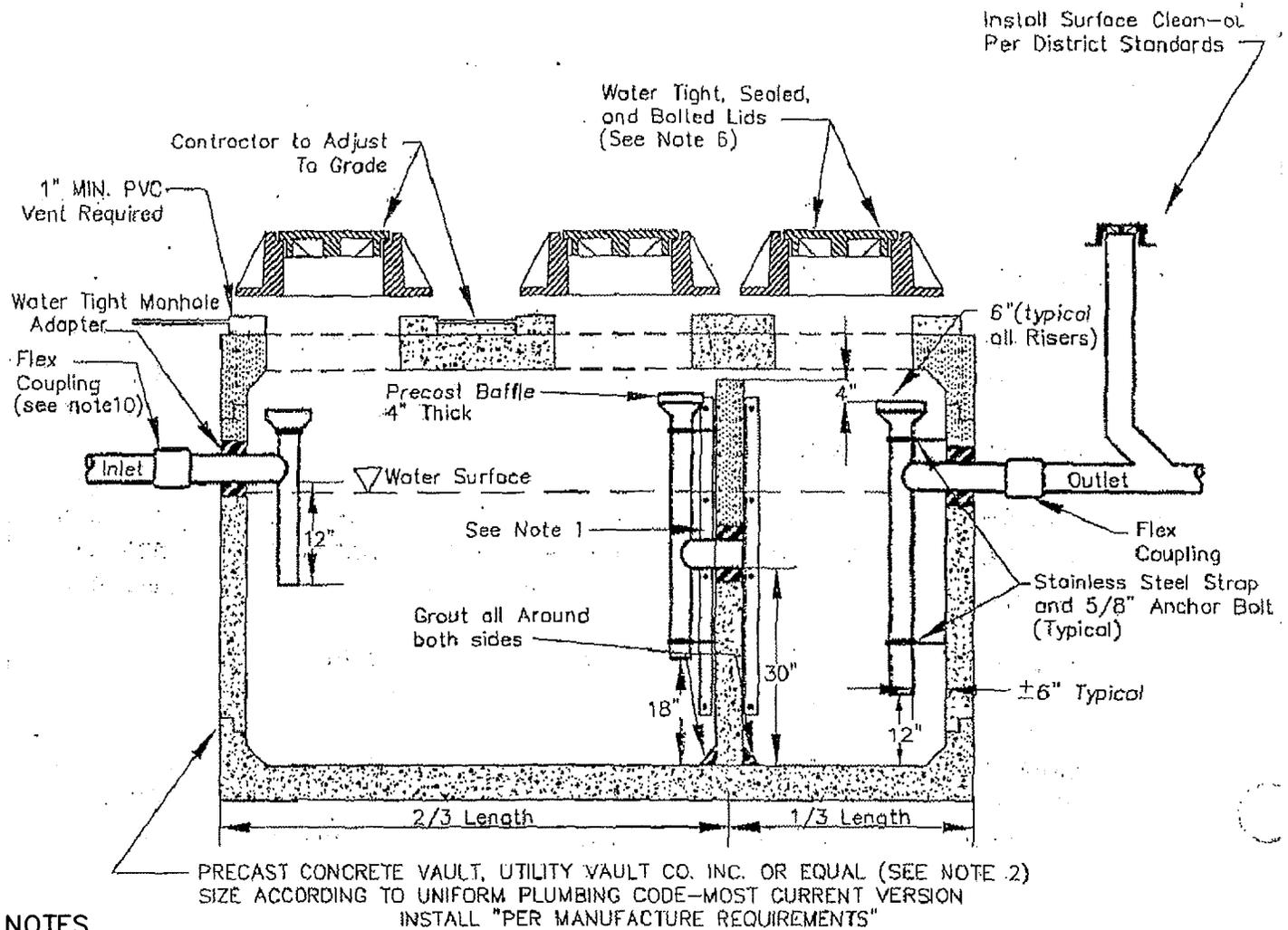
MINIMUM ENCASEMENT INSIDE DIAMETER (I.D.) SHALL BE 24"

**NOTES:**

1. CONTRACTOR TO VERIFY LINE AND GRADE PRIOR TO FILLING VOIDS WITH SAND.
2. CARRIER PIPE WITHIN THE LENGTH OF THE ENCASEMENT PIPE SHALL HAVE RESTRAINED JOINTS.
3. REGULATORY AGENCY REQUIREMENTS SHALL SUPERCEDE DISTRICT STANDARDS IF MORE STRINGENT.

**ENCASEMENT/CARRIER PIPES**

Mukilteo Water and Wastewater District  
STANDARD DETAILS

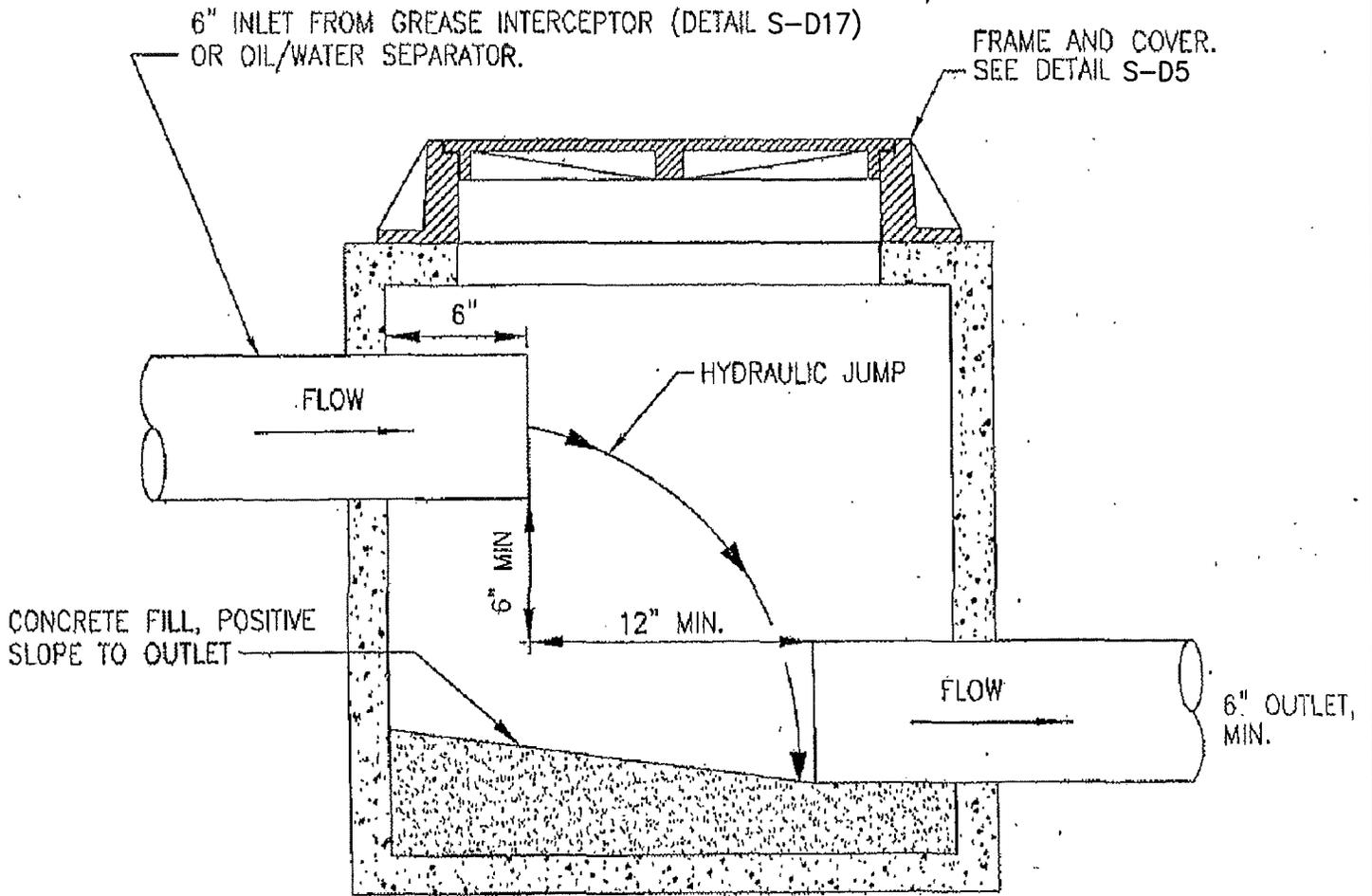


**NOTES.**

1. IF VAULT IS NOT SLOTTED TO ACCEPT PRECAST CONC. BAFFLE THEN PRECAST CONC. SHALL BE HELD IN PLACE BY (2) 3"x3"x3/8" ANGLE (4 FT. LONG) ATTACHED TO VAULT WALL WITH (4 EA.) 1/2" BOLTS AND NUTS (WITH WASHERS) SPACED 14" O.C. ANGLE AND FASTENERS SHALL BE STAINLESS STEEL.
2. PRECAST VAULT AND BAFFLE SHALL HAVE KNOCKOUTS AT ALL PIPE OPENINGS. IF KNOCKOUTS ARE NOT PRESENT THEN PIPE OPENINGS SHALL BE 2" LARGER THAN PIPE DIAMETER.
3. POSITION RISERS BELOW ACCESS OPENINGS TO ALLOW CLEAR ACCESS TO RISER AND VAULT CHAMBER.
4. LOCATE INTERCEPTOR WITHIN CLOSE PROXIMITY OF DRIVE FOR ACCESS BY MAINT. VEHICLE.
5. CONNECTIONS TO CONCRETE WALLS REQUIRE WATERTIGHT MANHOLE ADAPTERS. SEAL ALL PIPE CONNECTIONS WITH NON-SHRINK GROUT.
6. LIDS, FRAMES, AND BOLTS SHALL MEET DISTRICT STANDARDS FOR MANHOLE LIDS AND/OR CLEANOUTS AS APPLICABLE.
7. GRAY-WATER ONLY. BLACK-WATER SHALL BE CARRIED BY SEPARATE SIDE SEWER.
8. CLEANOUT REQUIRED PER DISTRICT STANDARDS.
9. FILL WITH CLEAN WATER PRIOR TO START-UP OF SYSTEM.
10. ROMAC 501 FLEX COUPLING OR APPROVED EQUAL.
11. DISCHARGE REQUIRED TO COMPLY WITH DISTRICT DISCHARGE LIMITS.
12. ALL RINGS AND COVERS SHALL BE BOLT-LOCKING TYPE. COMPLY WITH DISTRICT STANDARDS.
13. GREASE INTERCEPTORS SHALL HAVE VENTING PER UNIFORM PLUMBING CODE (1" MINIMUM).
14. VAULT AND FITTINGS SHALL BE WATERTIGHT.
15. VAULT OPENINGS MUST PROVIDE ABILITY TO OBTAIN SAMPLE OF DISCHARGE AND VISUALLY INSPECT INLET AND DISCHARGE.

**GREASE INTERCEPTOR**

Mukilteo Water and Wastewater  
District  
STANDARD DETAILS



**NOTES:**

1. COMPLY WITH ALL REGULATORY REQUIREMENTS OF JURISDICTIONAL AUTHORITY.
2. OUTLET PIPE SHALL BE OF EQUAL OR GREATER DIAMETER THAN THE INLET PIPE.
3. STRUCTURE AND FRAME AND COVER SHALL BE H-20 LOAD RATED IF LOCATED IN TRAFFIC AREA.

**SAMPLE CHAMBER FOR GREASE INTERCEPTOR & OIL/WATER SEPARATOR**

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Mukilteo Water and Wastewater District  
STANDARD DETAILS

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## **APPENDIX**

MAINTENANCE BOND  
MUKILTEO WATER AND WASTEWATER DISTRICT

KNOW ALL MEN BY THESE PRESENTS: That, \_\_\_\_\_,  
as Principal, and \_\_\_\_\_ as surety, and jointly and  
severally held firmly bound unto the Mukilteo Water and Wastewater District of  
Snohomish County, State of Washington, ("the District") in the sum of  
\_\_\_\_\_ (\$ \_\_\_\_\_) dollars for the  
payment of which, well and truly to be made, we jointly and severally bind ourselves  
and our heirs, executors, administrators, and assigns, firmly by these presents.

Whereas, the above-named Principal has pursuant to Developers Extension  
Agreement proposed Plans and Specifications, and constructed a \_\_\_\_\_ sewer  
\_\_\_\_\_ water system(s) in the (short) Plat of \_\_\_\_\_  
Section \_\_\_\_\_, Township \_\_\_\_\_ North, Range \_\_\_\_\_ East, W.M.,  
Snohomish County, State of Washington; and

Whereas, the District accepted the work by Resolution dated \_\_\_\_\_.

Now, therefore, the conditions of this obligation are such that, if the Principal  
shall maintain and remedy said work free from defects in material and workmanship, as  
more fully set forth in Paragraphs 5, 6 and WS 24 of the Developer Extension  
Agreement referenced above and as contained in the Bill of Sale delivered to the  
District, for a period of not less than two years from the date of final acceptance, then  
upon written notification to the Principal by the District of inspection and approval of the  
work, this obligation shall be void; otherwise, it shall remain in full force and effect.

The Developer agrees to notify the District at least 30 days in advance of the end  
of the two year period to allow for inspection and to prepare letters of notifications.

DATED this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

Mukilteo Water and Wastewater District  
Maintenance Bond

Received and approved by  
Mukilteo Water and Wastewater District on:

Date: \_\_\_\_\_

By \_\_\_\_\_

\_\_\_\_\_  
Principal

\_\_\_\_\_  
Authorized signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Address

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
Telephone Number

The above address to be used for  
notifying the principal of repairs, etc.,  
including post-notice of any emergency  
repairs made by County.

\_\_\_\_\_  
Surety

\_\_\_\_\_  
Mailing Address

\_\_\_\_\_  
Attorney in fact  
(attach Power of Attorney)

## PERFORMANCE, PAYMENT AND GUARANTY BOND

\_\_\_\_\_, as Principal,  
and \_\_\_\_\_ as Surety, a corporation duly licensed  
and authorized to do business in the state of Washington, are held and firmly bound unto the  
Mukilteo Water and Wastewater District hereinafter called "Owner," in the full sum of  
\_\_\_\_\_  
\_\_\_\_\_ dollars (\$ \_\_\_\_\_), for the payment of which sum  
well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and  
assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has been awarded and has entered into that Contract dated  
\_\_\_\_\_ and attached hereto with Owner to perform the work as  
specified or indicated in the Contract Documents entitled Mukilteo Water and Wastewater  
District,  
\_\_\_\_\_, according  
to the terms, conditions and covenants specified in the Contract including all of the contract  
documents therein referred to which are hereby referred to and made a part hereof as fully and  
completely as though set forth in detail herein.

NOW THEREFORE, if said Principal shall perform all the requirements of said Contract  
Documents required to be performed on its part, at the times and in the manner specified therein;  
and

If Principal shall pay for all materials, equipment, or other supplies, or for rental of same,  
used in connection with the performance of work contracted to be done, and for all amounts due  
under applicable State law for any work or labor thereon; and

If Principal shall pay the sales, use and any other applicable taxes of the State of  
Washington or any political subdivision of said State relating to this Agreement or to the work  
performed under this Agreement, and amounts due said State pursuant to Titles 50 and 51 of the  
Revised Code of Washington; and

If Principal shall indemnify and hold the Owner harmless from any defects in the  
workmanship or materials incorporated into the work for a period of two years after the final  
acceptance of the work;

THEN the obligation of Principal and Surety under this bond shall be void, but otherwise  
it shall remain in full force and effect.

This bond shall inure to the benefit of any persons, companies, or corporations entitled to file claims under applicable State law.

In the event suit is brought upon this bond, a reasonable attorney's fee shall be awarded to the prevailing party.

Any alterations in the work to be done or the materials to be furnished, or changes in the time of completion, which may be made pursuant to the terms of the Contract Documents, shall not in any way release Principal or Surety thereunder, nor shall any extensions of the time granted under the provisions of the Contract Documents release either Principal or Surety, and notice of such alterations or extensions of the Contract is hereby waived by Surety.

It is further agreed that nothing of any kind or nature that will not discharge the Principal shall operate as a discharge or release of the Surety, regardless of law, rule of equity or usage relating to the liability of sureties to the contrary notwithstanding.

SIGNED AND SEALED, this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

(Seal)

(Seal)

\_\_\_\_\_  
(Principal)

\_\_\_\_\_  
(Surety)

By: \_\_\_\_\_  
(Print Name)

By: \_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Title)

Address: \_\_\_\_\_

Telephone No.: \_\_\_\_\_

ACORD™

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

PRODUCER

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

PHONE

INSURER AFFORDING COVERAGE

NAIC #

INSURED

INSURER A:

INSURER B:

INSURER C:

INSURER D:

INSURER E:

Holder Identifier :

COVERAGES

STUR May 2001

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YYYY)	POLICY EXPIRATION DATE (MM/DD/YYYY)	LIMITS								
		<b>GENERAL LIABILITY</b> <input type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input type="checkbox"/> OCCUR _____ GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC				EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG								
		<b>AUTOMOBILE LIABILITY</b> <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> NON OWNED AUTOS _____				COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)								
		<b>GARAGE LIABILITY</b> <input type="checkbox"/> ANY AUTO _____				AUTO ONLY - EA ACCIDENT OTHER THAN AUTO ONLY: EA ACC AGG								
		<b>EXCESS/UMBRELLA LIABILITY</b> <input type="checkbox"/> OCCUR <input type="checkbox"/> CLAIMS MADE <input type="checkbox"/> DEDUCTIBLE <input type="checkbox"/> RETENTION				EACH OCCURRENCE AGGREGATE								
		<b>WORKERS COMPENSATION AND EMPLOYERS' LIABILITY</b> ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below				<table border="1"> <tr> <td>WC STATU-TORY LIMITS</td> <td>OTH-ER</td> </tr> <tr> <td colspan="2">E.L. EACH ACCIDENT</td> </tr> <tr> <td colspan="2">E.L. DISEASE-EA EMPLOYEE</td> </tr> <tr> <td colspan="2">E.L. DISEASE-POLICY LIMIT</td> </tr> </table>	WC STATU-TORY LIMITS	OTH-ER	E.L. EACH ACCIDENT		E.L. DISEASE-EA EMPLOYEE		E.L. DISEASE-POLICY LIMIT	
WC STATU-TORY LIMITS	OTH-ER													
E.L. EACH ACCIDENT														
E.L. DISEASE-EA EMPLOYEE														
E.L. DISEASE-POLICY LIMIT														
		OTHER	SP9574WA	05/01/06	05/01/07	EL Each Accident \$1,000,000 EL Disease - Policy \$1,000,000 EL Disease - Ea Emp] \$1,000,000								

SAMPLE

Certificate No :

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS  
Excess Workers Compensation/Excess Employers Liability - Excess of \$500,000 self Insured Retention.

CERTIFICATE HOLDER

CANCELLATION

MUKILTEO WATER & WASTEWATER DISTRICT  
ATTN: GENERAL MANAGER  
7824 MUKILTEO SPEEDWAY  
P.O. BOX 260  
MUKILTEO, WA 98275-0260

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT. BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE



PARALLEL AND ADJOINING EASEMENT

THIS INSTRUMENT made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_,  
by \_\_\_\_\_ herein called  
the "Grantor", and the Mukilteo Water and Wastewater District, Mukilteo, Washington herein called the  
"Grantee".

**WITNESSETH:**

That said Grantor for valuable consideration does hereby convey and confirm unto the said grantee, right-of-way or easement across, under and upon the exterior ten –feet (10) parallel with and adjoining the street frontages, of all lots in which to install, lay, construct, renew, operate and maintain water and sewer mains, and related appurtenances for the purpose of serving this subdivision and other property with water and sewer service, together with the right to enter upon the lots at all times for the purposes stated upon the following described property in Snohomish County, Washington, more particularly described as follows:

**ASSESSOR'S PROPERTY TAX NUMBER:** \_\_\_\_\_

**LEGAL DESCRIPTION:**

And also granting to the Grantee and to those acting under said Grantee the use of such additional area immediately adjacent to said easement as shall be required for the construction and maintenance of the water and sewer mains and appurtenances in the above-described easement such additional area to be held to a minimum and returned to its original state by the Grantee or its agents.

That said Grantee shall have the right without prior institution of any suit or proceeding at law, at times as may be necessary, to enter upon said property for the purpose of construction, repairing, altering or reconstruction of said mains shall be accomplished in such a manner that the private improvements existing in this right-of-way shall not be disturbed or destroyed, or in the event they are disturbed or destroyed, they will be replaced in as good a condition as they were immediately before the property was entered upon by the Grantee.

The Grantor shall retain the right to use the surface of said easement, so long as said use does not interfere with the installation and maintenance of the mains and related appurtenances and so long as no permanent buildings or structures are erected on said easement.

This easement shall be a covenant running with the land and shall be binding on the successors, heirs, and assigns of both parties hereon.

INDIVIDUAL

STATE OF WASHINGTON )  
 ) ss.  
COUNTY OF SNOHOMISH )

I certify that I know or have satisfactory evidence that \_\_\_\_\_ is the person who appeared before me, and said person acknowledged that he signed this instrument and acknowledged it to be his free and voluntary act for the uses and purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the state of  
Washington, residing at \_\_\_\_\_  
My Appointment Expires \_\_\_\_\_

\*\*\*\*\*

CORPORATE/PARTNERSHIP

STATE OF WASHINGTON )  
 ) ss.  
COUNTY OF SNOHOMISH )

I certify that I know or have satisfactory evidence that \_\_\_\_\_ is the person who appeared before me, and said person acknowledged that \_\_\_\_\_ signed this instrument, on oath stated that \_\_\_\_\_ was authorized to execute the instrument and acknowledged it as the \_\_\_\_\_ of \_\_\_\_\_ to be the free and voluntary act of such corporation for the uses and purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the State of  
Washington, residing at \_\_\_\_\_  
My Appointment Expires \_\_\_\_\_

ON-SITE EASEMENT

THE UNDERSIGNED, \_\_\_\_\_, Grantor(s), heirs, successors and assigns (hereinafter together referred to as "Grantor"), for the purpose of providing utility service to Grantor's property, hereby conveys and grants to MUKILTEO WATER AND WASTEWATER DISTRICT, its successors and assigns (hereinafter referred to as the "District"), from the following described property:

**ASSESSOR'S PROPERTY TAX NUMBER:** \_\_\_\_\_

**LEGAL DESCRIPTION:**

a permanent easement over, across, along, in, upon and under the following described portion of the above-described property:

The District shall have the right, without prior institution of any suit or proceeding at law, at times as may be necessary, to enter upon the easement and no more than five (5) feet of property immediately adjacent to the described easement for the purpose of installing, constructing, operating, maintaining, removing, repairing, replacing and using a sewer system, together with all connections and appurtenances thereto (the "Facility"), together with the right of ingress to and egress from that property for the foregoing purposes.

The Grantor, by executing this Easement, and the District, by accepting and recording this Easement, do hereby mutually covenant and agree as follows:

1. The District shall, if either the property or easement is disturbed by the maintenance, removal, repair or replacement of the Facility, restore the surface of the property or easement as nearly as possible to the condition in which it existed at the commencement of said maintenance, removal, repair or replacement.
2. The District shall protect and save harmless Grantor from and against any and all claims, demands, loss, damage, expense and liability of every kind and description and for any damage to or loss or destruction of property suffered by Grantor, or any persons, firms, or corporations, because of the maintenance of the Facility; provided, however, that this hold harmless shall not apply to Grantor's negligence, or to any damage or injury resulting from a violation of Paragraph 5 herein.

3. The Grantor warrants that the Grantor has good title to the above property and warrants the Grantee title to, and quiet enjoyment of, the easement conveyed hereby.
4. All right, title and interest which may be used and enjoyed without interfering with the easement rights conveyed are reserved to the Grantor. The construction, installation or maintenance, after the date of this easement document, of structures of a permanent nature
  - A. within the above-described permanent easement, or
  - B. outside the aforementioned easements, but intruding intothe easements so as to interfere with maintenance and repair of the Facility shall be deemed an encroachment upon the easement rights and as to such structures the provisions of Paragraphs 1 and 2 shall not apply; and, further, Grantor shall be obligated to remove said encroachments at Grantor's expense.
5. Grantor covenants that no digging, tunneling, or other form of construction activity shall be done on the easement or on Grantor's property which would disturb or damage the Facility unearth or undermine District's Facility or endanger the lateral support to the Facility.
6. The Grantor herein grants to the District and to those acting under the District the use of such additional area immediately adjacent to the easement necessary for the installation, operation, maintenance and repair of the Facility; provided that such additional area shall be held to a minimum and returned to its original state by the District.
7. Should either party hereto, or their heirs or assigns, institute suit to enforce any covenant or right granted herein, the prevailing party shall recover its costs of litigation, including a reasonable attorney's fee.
8. The covenants contained herein are intended to and shall run with the land and shall benefit and bind the parties and their respective successors and assigns.

DATED this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
\_\_\_\_\_

INDIVIDUAL

STATE OF WASHINGTON )  
 ) ss.  
COUNTY OF SNOHOMISH )

I certify that I know or have satisfactory evidence that \_\_\_\_\_ is the person who appeared before me, and said person acknowledged that he signed this instrument and acknowledged it to be his free and voluntary act for the uses and purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the state of  
Washington, residing at \_\_\_\_\_  
My appointment expires \_\_\_\_\_

\*\*\*\*\*

CORPORATE/PARTNERSHIP

STATE OF WASHINGTON )  
 ) ss.  
COUNTY OF SNOHOMISH )

I certify that I know or have satisfactory evidence that \_\_\_\_\_ is the person who appeared before me, and said person acknowledged that \_\_\_\_\_ signed this instrument, on oath stated that \_\_\_\_\_ was authorized to execute the instrument and acknowledged it as the \_\_\_\_\_ of \_\_\_\_\_ to be the free and voluntary act of such corporation for the uses and purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the state of  
Washington, residing at \_\_\_\_\_  
My appointment expires \_\_\_\_\_

ON-SITE EASEMENT (PRIVATE ROAD)

THE UNDERSIGNED, \_\_\_\_\_, Grantor(s), heirs, successors and assigns (hereinafter together referred to as "Grantor"), for the purpose of providing utility service to Grantor's property, hereby conveys and grants to MUKILTEO WATER AND WASTEWATER DISTRICT, its successors and assigns (hereinafter referred to as the "District"), from the following described property:

**ASSESSOR'S PROPERTY TAX NUMBER:** \_\_\_\_\_

**LEGAL DESCRIPTION:**

a permanent easement over, across, along, in, upon and under the following described portion of the above-described property:

The District shall have the right, without prior institution of any suit or proceeding at law, at times as may be necessary, to enter upon the property or easement and adjoining property owned by Grantor and his assigns and successors for the purpose of installing, constructing, operating, maintaining, removing, repairing, replacing and using a \_\_\_\_\_, together with all connections and appurtenances thereto (the "Facility"), together with the right of ingress to and egress from that property for the foregoing purposes.

The Grantor, by executing this Easement, and the District, by accepting and recording this Easement, do hereby mutually covenant and agree as follows:

1. The District shall, if the property or easement are disturbed by the maintenance, removal, repair or replacement of the Facility, restore the surface of the property or easement as nearly as possible to the condition in which it existed at the commencement of said maintenance, removal, repair or replacement.
2. The District shall protect and save harmless Grantor from and against any and all claims, demands, loss, damage, expense and liability of every kind and description and for any damage to or loss or destruction of property suffered by Grantor, or any persons, firms, or corporations, because of the maintenance of the Facility; provided, however, that this hold harmless shall not apply to Grantor's negligence, or to any damage or injury resulting from a violation of Paragraph 5 herein.

3. The Grantor warrants that the Grantor has good title to the above property and warrants the Grantee title to, and quiet enjoyment of, the easement conveyed hereby.
4. All right, title and interest which may be used and enjoyed without interfering with the easement rights conveyed are reserved to the Grantor. The construction, installation or maintenance, after the date of this easement document, of structures of a permanent nature
  - A. within the above-described permanent easement, or
  - B. outside the aforementioned easements, but intruding into the easements so as to interfere with maintenance and repair of the Facility shall be deemed an encroachment upon the easement rights and as to such structures the provisions of Paragraphs 1 and 2 shall not apply; and, further, Grantor, shall be obligated to remove said encroachments at Grantor's expense.
5. Grantor covenants that no digging, tunneling, or other form of construction activity shall be done on the easement or on Grantor's property which would disturb or damage the Facility unearthen or undermine District's Facility or endanger the lateral support to the Facility.
6. The Grantor herein grants to the District and to those acting under the District the use of such additional area immediately adjacent to the easement necessary for the installation, operation, maintenance and repair of the Facility; provided that such additional area shall be held to a minimum and returned to its original state by the District.
7. Should either party hereto, or their heirs or assigns, institute suit to enforce any covenant or right granted herein, the prevailing party shall recover its costs of litigation, including a reasonable attorney's fee.
8. The covenants contained herein are intended to and shall run with the land and shall benefit and bind the parties and their respective successors and assigns.

DATED this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
\_\_\_\_\_

INDIVIDUAL

STATE OF WASHINGTON )  
 ) ss.  
COUNTY OF SNOHOMISH )

I certify that I know or have satisfactory evidence that \_\_\_\_\_ is the person who appeared before me, and said person acknowledged that he signed this instrument and acknowledged it to be his free and voluntary act for the uses and purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the state of  
Washington, residing at \_\_\_\_\_  
My Appointment Expires \_\_\_\_\_

\*\*\*\*\*

CORPORATE/PARTNERSHIP

STATE OF WASHINGTON )  
 ) ss.  
COUNTY OF SNOHOMISH )

I certify that I know or have satisfactory evidence that \_\_\_\_\_ is the person who appeared before me, and said person acknowledged that \_\_\_\_\_ signed this instrument, on oath stated that \_\_\_\_\_ was authorized to execute the instrument and acknowledged it as the \_\_\_\_\_ of \_\_\_\_\_ to be the free and voluntary act of such corporation for the uses and purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the state of  
Washington, residing at \_\_\_\_\_  
My Appointment Expires \_\_\_\_\_

## OFF-SITE EASEMENT

THE UNDERSIGNED, \_\_\_\_\_, Grantor(s), heirs, successors and assigns (hereinafter together referred to as "Grantor"), for the purpose of providing utility service to Grantor's property, hereby conveys and grants to Mukilteo Water and Wastewater District, its successors and assigns (hereinafter referred to as the "Grantee"), from the following described property:

a permanent easement over, across, along, in, upon and under the following described portion of the above-described property:

The Grantee shall have the right, without prior institution of any suit or proceeding at law, at times as may be necessary, to enter upon said property or easement and adjoining property owned by Grantor and his assigns and successors for the purpose of installing, constructing, operating, maintaining, removing, repairing, replacing and using a \_\_\_\_\_, together with all connections and appurtenances thereto (the "Facility"), together with the right of ingress to and egress from the property for the foregoing purposes.

Grantor does hereby convey and grant to the Grantee a temporary construction easement for all purposes during the construction of the Facility over, across, along, in, upon and under the following described property, together with the right of ingress to and egress from that property for the foregoing purposes, to commence on the date of this instrument and to terminate on the date actual use thereof shall terminate. The temporary construction easement is legally described as:

The Grantor, by executing this Easement, and the Grantee, by accepting and recording this Easement, do hereby mutually covenant and agree as follows:

1. The Grantee shall, upon completion of construction of the Facility and before the termination of the temporary construction easement, remove all debris and restore the surface of the above-described property or easement as nearly as possible to the condition in which it existed at the date of this easement document.

2. The Grantee shall, if the property or easements are disturbed by the maintenance, removal, repair or replacement of the Facility, restore the surface of the property or easements as nearly as possible to the condition in which it existed at the commencement of maintenance, removal, repair or replacement.
3. The Grantee shall protect and save harmless Grantor from and against any and all claims, demands, loss, damage, expense and liability of every kind and description and for any damage to or loss or destruction of property suffered by Grantor, because of the construction and/or maintenance of the Facility; provided, however, that this hold harmless shall not apply to Grantor's negligence, or to any damage or injury resulting from a violation of Paragraph 6 herein.
4. The Grantor warrants that the Grantor has good title to the property and warrants that Grantee title to, and quiet enjoyment of, the easement conveyed hereby.
5. All right, title and interest which may be used and enjoyed without interfering with the easement rights conveyed are reserved to the Grantor. The construction, installation or maintenance, after the date of this easement document, of structures of a permanent nature
  - a) within the permanent easement or within the temporary construction easement until such temporary construction easement shall have been terminated, or
  - b) outside the aforementioned easements, but intruding into the easements so as to interfere with maintenance and repair of the Facility

shall be deemed an encroachment upon the easement rights and as to such structures the provisions of Paragraphs 1, 2 and 3 shall not apply; and, further, Grantor, shall be obligated to remove the encroachments at Grantor's expense.

6. Grantor covenants that no digging, tunneling, or other form of construction activity shall be done on the easement or on Grantor's property which would disturb or damage the Facility unearth or undermine Grantee's Facility or endanger the lateral support to the Facility.
7. The Grantor grants to the Grantee and to those acting under the Grantee the use of such additional area immediately adjacent to the easement as shall be required for the installation, operation, maintenance and repair of the Facility; provided that such additional area shall be held to a minimum and returned to its original state by the Grantee.

8. Access to Grantor's property shall be maintained at all times during Grantee's installation.
9. The Grantee plans to assign the easement to the Mukilteo Water and Wastewater District on completion of the Facility and thereafter the Facility will be operated by the District. The Grantor consents to that assignment.
10. The Grantor may not connect Grantor's properties to the Facility without the consent of the District and then only upon payment of all charges imposed by the District for connection to and service by its facilities.
11. The Grantee agrees not to assign the easement to the District until Grantor's property is restored on the surface as nearly as possible to the condition in which it existed at the date of this easement document; at which time the Grantor shall sign a release to the Grantee.
12. Should either party hereto, or their heirs or assigns, institute suit to enforce any covenant or right granted herein, the prevailing party shall recover its costs of litigation, including a reasonable attorney's fee.
13. The covenants contained herein are intended to and shall run with the land and shall benefit and bind the parties hereto and their respective successors and assigns.

DATED this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
\_\_\_\_\_



**MUKILTEO WATER AND WASTEWATER DISTRICT**  
**ITEMIZED COST OF**  
**PUBLIC WATER SYSTEM INSTALLATION**  
**FOR \_\_\_\_\_**  
**EXT. # \_\_\_\_\_**  
**Date Accepted \_\_\_\_\_ Resolution # A- \_\_\_\_\_**

DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST
<b>6" DUCTILE IRON PIPE</b>			
<b>8" DUCTILE IRON PIPE</b>			
<b>12" DUCTILE IRON PIPE</b>			
<b>DUCTILE IRON PIPE</b>			
<b>FIRE HYDRANT ASSEMBLIES</b>			
<b>1" WATER SERVICE(S)</b>			
<b>2" WATER SERVICE(S)</b>			
<b>WATER SERVICE(S)</b>			
<b>PRV STATION</b>			

**TOTAL** \_\_\_\_\_

**NOTE:**

1. QUANTITY HAS BEEN COMPLETED BY DISTRICT FIELD INSPECTOR, FROM RECORD DRAWINGS. OWNER/DEVELOPER SHALL INSTALL THE UNIT COST AND SIGN THE DOCUMENT IF IN AGREEMENT WITH THE QUANTITY LISTED.
2. INCLUDE IN EACH PIPE PRICE (TOTAL COST & UNIT COST) THE COST OF GATE VALVES, FITTINGS, BLOW OFF ASSEMBLIES, AIR RELIEF ASSEMBLIES, PAVEMENT REPAIRS, AND ANY OTHER ITEMS NOT OTHERWISE LISTED ABOVE.
3. INCLUDE IN EACH FIRE HYDRANT PRICE THE MAIN LINE TEE, HYDRANT VALVE, VALVE BOXES, SHACKLE RODS, THRUST BLOCKS, HYDRANT POSTS AND OTHER RELATED ITEMS FOR A COMPLETE HYDRANT ASSEMBLY INSTALLATION.
4. BLANK SPACES RESERVED FOR MAJOR COST ITEMS SUCH AS PRESSURE REDUCING VAULTS, PRESSURE RELIEF VAULTS, PUMP STATION, ETC.

I \_\_\_\_\_, OWNER/DEVELOPER OF THE ABOVE DESCRIBED PROPERTY HAVE  
 (PRINT)  
 SUBMITTED THE UNIT COSTS FOR THAT PROPERTY AGREE TO THE MUKILTEO WATER AND WASTEWATER DISTRICT'S LISTED QUANTITIES.

DATE \_\_\_\_\_ SIGNED \_\_\_\_\_

**BILL OF SALE -- WATER**

THE UNDERSIGNED hereby conveys and transfers to the MUKILTEO WATER AND WASTEWATER DISTRICT (the "District") the following described personal property:

This conveyance is made in consideration of the District's agreement to provide routine maintenance of said property and to provide water services pursuant to the District's resolutions and regulations, which may be amended from time to time.

The undersigned, and its successors and assigns, covenants and agrees with the District, its successors and assigns, that the undersigned is the owner of said property and has the right and authority to sell the same, that the property is free of all liens or encumbrances, and that the undersigned will, and does, hereby warrant and agree to defend the title of the District, its successors and assigns, against the claims of all third parties claiming to own the same or claiming any interest therein or encumbrance thereon.

The undersigned warrants that all bills and taxes relating to the construction and installation of the water main and appurtenances have been paid in full and that there are no lawsuits pending involving this project. The undersigned further warrants that in the event any lawsuit is filed as a result of, or involving, this project the undersigned will undertake to defend the lawsuit and will accept responsibility for all costs of litigation, including costs on appeal, and will hold the District harmless on any judgment rendered against the District

The undersigned further warrants that all laws, ordinances and regulations respecting construction of this project have been complied with, and that the property is in proper working condition, order and repair and fit for purposes intended; i.e., for use as a water distribution system including distribution and supply lines adequate for the service intended and has been constructed in accordance with the conditions and standards of the District.

The undersigned covenants and agrees with the District to replace, repair and correct any defect in work or materials in respect to the personal property subject to this Bill of Sale arising during a period of two (2) years from date hereof, without cost to the District. The undersigned shall further warrant the corrected work for two (2) years after acceptance of the corrected work by the District.

DEVELOPER:

By \_\_\_\_\_

Its  
\_\_\_\_\_

INDIVIDUAL

STATE OF WASHINGTON                    )  
  ) ss.  
COUNTY OF SNOHOMISH            )

I certify that I know or have satisfactory evidence that \_\_\_\_\_  
is the person who appeared before me, and said person acknowledged that he signed  
this instrument and acknowledged it to be his free and voluntary act for the uses and  
purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the State of  
Washington, residing at  
\_\_\_\_\_. My Appointment  
Expires \_\_\_\_\_.

CORPORATE/PARTNERSHIP

STATE OF WASHINGTON                    )  
  ) ss.  
COUNTY OF SNOHOMISH            )

I certify that I know or have satisfactory evidence that \_\_\_\_\_  
is  
the person who appeared before me, and said person acknowledged that \_\_\_\_\_  
signed this instrument, on oath stated that \_\_\_\_\_ was authorized to execute the  
instrument and acknowledged it as the \_\_\_\_\_ of  
\_\_\_\_\_ to be the free and voluntary act of such corporation for the uses  
and purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the State of  
Washington, residing at  
\_\_\_\_\_. My Appointment  
Expires \_\_\_\_\_.

**MUKILTEO WATER AND WASTEWATER DISTRICT**  
**ITEMIZED COST OF**  
**PUBLIC SEWER SYSTEM INSTALLATION**  
**FOR \_\_\_\_\_**  
**EXT. # \_\_\_\_\_**  
Date Accepted \_\_\_\_\_ Resolution # \_\_\_\_\_

DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST
8" SEWER MAIN			
10" SEWER MAIN			
12" SEWER MAIN			
SIDE SEWER(S)			
MANHOLE(S)			

**TOTAL** \_\_\_\_\_

**NOTE:**

1. QUANTITY HAS BEEN COMPLETED BY DISTRICT FIELD INSPECTOR, FROM RECORD DRAWINGS. OWNER/DEVELOPER SHALL INSTALL THE UNIT COST AND SIGN THE DOCUMENT IF IN AGREEMENT WITH THE QUANTITY LISTED.
2. INCLUDE IN EACH PIPE PRICE (TOTAL COST & UNIT COST) THE COST OF FITTINGS, SELECT BACKFILL COMPACTION, PAVEMENT REPAIRS, AND ANY OTHER ITEMS NOT OTHERWISE LISTED ABOVE.
3. BLANK SPACES RESERVED FOR MAJOR COST ITEMS SUCH AS FORCE MAINS, VAULTS, PUMP STATIONS, ETC.

I \_\_\_\_\_, OWNER/DEVELOPER OF THE ABOVE DESCRIBED PROPERTY HAVE  
(PRINT)  
SUBMITTED THE UNIT COSTS FOR THAT PROPERTY AGREE TO THE MUKILTEO WATER AND WASTEWATER DISTRICT'S LISTED QUANTITIES.

DATE \_\_\_\_\_ SIGNED \_\_\_\_\_

**BILL OF SALE -- SEWER**

THE UNDERSIGNED hereby conveys and transfers to the MUKILTEO WATER AND WASTEWATER DISTRICT (the "District") the following described personal property:

This conveyance is made in consideration of the District's agreement to provide routine maintenance of said property and to provide sewer services pursuant to the District's resolutions and regulations, which may be amended from time to time.

The undersigned, and its successors and assigns, covenants and agrees with the District, its successors and assigns, that the undersigned is the owner of said property and has the right and authority to sell the same, that the property is free of all liens or encumbrances, and that the undersigned will, and does, hereby warrant and agree to defend the title of the District, its successors and assigns, against the claims of all third parties claiming to own the same or claiming any interest therein or encumbrance thereon.

The undersigned warrants that all bills and taxes relating to the construction and installation of the sewer main and appurtenances have been paid in full and that there are no lawsuits pending involving this project. The undersigned further warrants that in the event any lawsuit is filed as a result of, or involving, this project the undersigned will undertake to defend the lawsuit and will accept responsibility for all costs of litigation, including costs on appeal, and will hold the District harmless on any judgment rendered against the District

The undersigned further warrants that all laws, ordinances and regulations respecting construction of this project have been complied with, and that the property is in proper working condition, order and repair and fit for purposes intended; i.e., for use as a sewer distribution system including distribution and supply lines adequate for the service intended and has been constructed in accordance with the conditions and standards of the District.

The undersigned covenants and agrees with the District to replace, repair and correct any defect in work or materials in respect to the personal property subject to this Bill of Sale arising during a period of two (2) years from date hereof, without cost to the District. The undersigned shall further warrant the corrected work for two (2) years after acceptance of the corrected work by the District.

DEVELOPER:

By \_\_\_\_\_

Its \_\_\_\_\_

INDIVIDUAL

STATE OF WASHINGTON                    )  
  ) ss.  
COUNTY OF SNOHOMISH            )

I certify that I know or have satisfactory evidence that \_\_\_\_\_  
is the person who appeared before me, and said person acknowledged that he signed  
this instrument and acknowledged it to be his free and voluntary act for the uses and  
purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the State of  
Washington, residing at  
\_\_\_\_\_. My Appointment  
Expires \_\_\_\_\_.

CORPORATE/PARTNERSHIP

STATE OF WASHINGTON                    )  
  ) ss.  
COUNTY OF SNOHOMISH            )

I certify that I know or have satisfactory evidence that \_\_\_\_\_  
is  
the person who appeared before me, and said person acknowledged that \_\_\_\_\_  
signed this instrument, on oath stated that \_\_\_\_\_ was authorized to execute the  
instrument and acknowledged it as the \_\_\_\_\_ of  
\_\_\_\_\_ to be the free and voluntary act of such corporation for the uses  
and purposes mentioned in the instrument.

Dated \_\_\_\_\_

\_\_\_\_\_  
Notary Public in and for the State of  
Washington, residing at  
\_\_\_\_\_. My Appointment  
Expires \_\_\_\_\_.

# Industrial Pretreatment Program Preliminary Survey

## Mukilteo Water and Wastewater District

(Please fill in all blanks to the best of your ability.)

### **SECTION I: GENERAL INFORMATION**

#### *A. INDUSTRIAL USER, GENERAL*

1. Company name \_\_\_\_\_
2. Division name (if applicable) \_\_\_\_\_
3. Mailing address:
  - a. Street or P.O. Box \_\_\_\_\_
  - b. City, state and zip \_\_\_\_\_
4. Facility address:
  - a. Street \_\_\_\_\_
  - b. City, state and zip \_\_\_\_\_
5. Business type (check all that apply)

Manufacturing	_____
Distributing	_____
Retail	_____
Service	_____
Other	_____
6. Number of employees at this facility: \_\_\_\_\_
7. Please provide all 4-digit Standard Industrial Classification (SIC) Codes applicable to this facility.  
\_\_\_\_\_
8. Has this facility been issued a local, state or federal wastewater discharge permit? Yes \_\_\_\_\_ No \_\_\_\_\_  
If yes, permit number \_\_\_\_\_ Agency \_\_\_\_\_
9. Does this facility have floor drains that discharge to the sewer system? Yes \_\_\_\_\_ No \_\_\_\_\_
10. Does this facility have on-site electrical generation facilities and/or electrical transformers? Yes \_\_\_\_\_ No \_\_\_\_\_
11. Brief description of business activities on premises:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**SECTION II: WATER/WASTEWATER DATA**

**A. WATER USE**

1. Please indicate the source and approximate usage rate of water.

Source name	Quantity, GPD

2. Please give a brief description of how water is used at this facility.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**B. WASTEWATER DATA**

1. Number of sewer connections \_\_\_\_\_
2. Check type of discharge: Batch \_\_\_\_\_ Continuous \_\_\_\_\_
3. Approximate discharge in gallons per day for:
- a. Sanitary wastes \_\_\_\_\_
  - b. Industrial process wastewater \_\_\_\_\_
  - c. Cooling water \_\_\_\_\_
  - d. Other \_\_\_\_\_

Describe "other" \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Please note if any of the above wastewaters are not discharged to the District sewerage system.

4. Provide the following information to the best of your ability:

	YES	NO	UNKNOWN
a. Does wastewater pH ever fall below 5.5 or exceed 10?			
b. Does wastewater temperature ever exceed 140°F (60°C)?			
c. Do wastewater biological oxygen demand (BOD) or suspended solids ever exceed 300 mg/l			
d. Do wastewater oils and grease ever exceed 100 mg/l?			

5. Wastewater treatment:

Does this facility practice any sort of wastewater treatment prior to discharge? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, describe: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. Waste disposal:

Are any liquid wastes from this facility:

a. Disposed of other than to the sanitary sewer system:

Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, describe: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

b. Recycled or recovered:

Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, describe: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. Please provide a general list of chemicals and raw materials used at this facility. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The information contained in this questionnaire is familiar to me, and to the best of my knowledge and belief, is true, complete and accurate.

\_\_\_\_\_  
Contact official

\_\_\_\_\_  
Telephone

\_\_\_\_\_  
Name of signing official

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

A-19

MUKILTEO WATER DISTRICT  
SNOHOMISH COUNTY, WASHINGTON

RESOLUTION NO. A-870

A RESOLUTION FIXING CHARGES FOR UNAUTHORIZED TAKING OF WATER, TAMPERING WITH EQUIPMENT, AND UNAUTHORIZED CONNECTION TO THE DISTRICT'S SYSTEM

WHEREAS, the Commissioners of the Mukilteo Water District desire to repeal Resolution No. 317-A, and desire to provide for the levying of a charge for the unauthorized taking of water; tampering with equipment and unauthorized connection to the District's system; NOW, THEREFORE,

BE IT RESOLVED AS FOLLOWS:

THAT, in addition to any other remedies or penalties provided by law for unauthorized taking of water, tampering with District facilities, or unauthorized connection to the District's systems, charges shall be assessed as follows:

Section 1: There shall be levied a charge of Two Hundred Dollars (\$200.00) against each person, firm or corporation who shall take water from any water line, reservoir, or fire hydrant, or any facility of the Mukilteo Water District without the District's consent and without first having obtained from the District a permit to take such water. Such sum shall be due and payable immediately upon the taking of such water.

Section 2: There shall be levied a charge of Two Hundred Dollars (\$200.00) against each person, firm or corporation owning or occupying property connected to the District's water system who shall tamper with any water meter, fire line meter, service line, or any meter related appurtenances of the Mukilteo Water District. Such sum shall be payable at the time of discovery by the District of such tampering.

Section 3: There shall be levied a charge of Two Hundred Dollars (\$200.00) against each person, firm or corporation owning property that proposes to connect to a District service line who shall take water from an angle stop, service lead,

angle check valve or related appurtenances intended for a future meter installation without consent from the Mukilteo Water District to take such water. Such sum shall be due and payable immediately upon the taking of such water. A meter will not be installed to serve such property until such \$200.00 is paid together with the standard meter installation fee. If a meter application has been purchased from the Mukilteo Water District and, prior to installation of such meter, it is determined by the District that water has been taken in violation of this section then such meter will not be installed and the meter application will be held until the purchaser of such meter application pays the \$200.00 charge.

Section 4: There shall be levied a charge of Two Hundred Dollars (\$200.00) against each person, firm or corporation who shall operate any valve in the Mukilteo Water District's system without the District's consent. Such sum shall be due and payable at the time of discovery by the District of such unauthorized operation.

Section 5: In addition to any other method of collection or enforcement provided herein, (1) the charges imposed by sections 2 and 3 shall be charges against the property as provided in RCW 57.08.080 and subject to the foreclosure provisions of RCW 57.08.090; and (2) the District may, upon written notice and opportunity for hearing, discontinue service if a charge assessed pursuant to section 2 or 3 is not paid within 30 days of written notice, unless the Board after a hearing determines good cause exists not to impose the charges or discontinue service.

Section 6: Resolution No. 317-A is hereby repealed, effective the date of this Resolution.

PASSED by the Board of Commissioners of the Mukilteo Water District this 3rd day of September, 1986.

  
PRESIDENT and COMMISSIONER

Ronald A. Kane  
COMMISSIONER

Michael G. Babcock  
COMMISSIONER

ATTEST:

Michael G. Babcock  
SECRETARY OF SAID COMMISSION

I, the undersigned, Secretary of the Board of Commissioners of Mukilteo Water District, a municipal corporation of Snohomish County, Washington, certify that the foregoing is a true and correct copy of Resolution No. \_\_\_\_\_ of said Board, duly adopted at a regular meeting thereof held on the \_\_\_\_\_ day of \_\_\_\_\_, 1986.

WITNESS my hand and official seal this \_\_\_\_\_ day of \_\_\_\_\_, 1986.

Michael G. Babcock  
SECRETARY OF SAID COMMISSION

MWD1-22.0

**APPENDIX H**  
**WATER QUALITY RESULTS**

# CITY OF EVERETT

## 2014 Water Quality Summary

**Table 1: Primary Standards (Mandatory Health-Related Standards)**

Physical Parameters, Bacteria, Inorganics, Disinfection By-Products, Radionuclides  
Established by the USEPA and DOH

Unless otherwise noted, values listed are for samples collected after treatment and at the entry point to the water distribution system.

Parameter	Unit	Maximum Contaminant Level	2014 Range of Results	2014 Average Result
<b>Physical</b>				
Turbidity (combined filter effluent)	NTU	TT	0.02–0.11	0.03
Asbestos <sup>1</sup>	MF/L > 10µm	7	–	Less than 0.12
<b>Microbiological</b>				
Total Coliform Bacteria <sup>2</sup>	Positive (present) or negative (absent)	5% positive per month	0.0–0.8	0.08%
<b>Inorganic Chemicals</b>				
Antimony	ppm	0.006	–	Less than 0.0005
Arsenic	ppm	0.010	<0.0001–0.0004	0.0002
Barium	ppm	2	0.0034–0.0042	0.0038
Beryllium	ppm	0.004	–	Less than 0.0005
Cadmium	ppm	0.005	–	Less than 0.0002
Chromium	ppm	0.1	–	Less than 0.0005
Copper <sup>3</sup>	ppm	1.3	0.004–0.235	0.109
Lead <sup>3</sup>	ppm	0.015	<0.001–0.010	0.002
Mercury	ppm	0.002	–	Less than 0.0001
Nickel	ppm	0.1	–	Less than 0.0005
Selenium	ppm	0.05	–	Less than 0.0005
Thallium	ppm	0.002	–	Less than 0.0005
Cyanide	ppm	0.2	–	Less than 0.01
Fluoride <sup>4</sup>	ppm	4.0	0.2–0.9	0.8
Nitrate (NO <sub>3</sub> )	ppm	10	0.011–0.086	0.046
Nitrite (NO <sub>2</sub> )	ppm	1	<0.001–0.001	Less than 0.0008
<b>Radionuclides</b>				
Gross Alpha	pCi/L	15	–	Less than 3.0
Gross Beta	pCi/L	50	–	Less than 3.0
Radium-228	pCi/L	5	–	Less than 1.0
<b>Chlorine By-Products (also called Disinfection By-Products or DBPs)</b>				
Total Trihalomethanes (TTHM) <sup>5,6</sup>	ppm	0.080	0.028–0.057	0.039
Haloacetic Acids (5) <sup>5,6,7</sup>	ppm	0.060	0.024–0.044	0.032

<sup>1</sup>Sample collected in 2014 from a service supplied by an asbestos concrete (AC) water main.

<sup>2</sup>Everett collected monthly total coliform bacteria samples at 120 to 125 locations in the water distribution system. No more than 5 percent per month can be coliform positive. In 2014, total coliform bacteria was detected in one sample in November (0.76%). Resample results for this location were negative. No coliforms were detected the remainder of 2014.

<sup>3</sup>Samples collected from 107 consumer taps across the greater Everett water service area which includes most of SW Snohomish County. The result listed in the average column is the 90<sup>th</sup> percentile result, which is the highest result in 90 percent of the samples when ranked from highest to lowest. The action limit, or AL, for lead is 0.015 mg/L. The action limit for copper is 1.3 mg/L. In 2012, 100 percent of copper and lead sample results were below their respective action limits. Tap samples must be collected every three years. The next round of regional monitoring is scheduled for collection in the summer of 2015.

<sup>4</sup>Fluoride is added in carefully controlled levels for dental health. In January 2011, the US Dept of Health and Human Services (HHS) released a proposed recommendation to reduce the drinking water fluoride concentration target to 0.7 ppm. The recommendation is based on recent research on changed fluoride and water consumption patterns in the U.S. The recommendation has not been made final, but in the spring of 2011 Everett, Tacoma, Seattle and many other water systems in Washington reduced the target fluoride residual in the drinking water from 1.0 ppm to 0.8 ppm—the lowest level allowed under current State regulations. When HHS finalizes the recommendation, the State Board of Health is expected adopt 0.7 ppm as the new standard. Following revision of the regulations, water systems will adjust fluoride levels to the new recommended level. The low (0.2 mg/L) value occurred on November 26 when the fluoride system was shut down for 24 hours for repairs.

<sup>5</sup>Samples collected from eight required locations in Everett's service area.

<sup>6</sup>TTHM and HAA5 results were calculated using the running annual average results from the fourth quarter of 2014.

<sup>7</sup>Haloacetic Acids (5) or HAA5 is the sum of the concentrations of trichloroacetic acid, dichloroacetic acid, monochloroacetic acid, tribromoacetic acid and dibromoacetic acid. There are five additional HAA compounds that are not regulated.

# CITY OF EVERETT

## 2014 Water Quality Summary

**Table 2A: Secondary Standards and Aesthetic Standards**

Established by the USEPA and DOH

Unless otherwise noted, values listed are for samples collected after treatment and at the entry point to the water distribution system.

Parameter	Unit	Maximum Contaminant Level	2014 Range of Results	2014 Average Result
<b>Physical</b>				
Conductivity <sup>1</sup>	µmhos/cm	700	47–69	55
Total Dissolved Solids (TDS)	ppm	500	30–31	31
Color	c.u.	15	<5.0–8.0	Less than 5
<b>Chemical</b>				
Chloride	ppm	250	2.3–2.5	2.4
Sulfate	ppm	250	2.8–3.0	2.9
Iron	ppm	0.3	–	Less than 0.01
Manganese	ppm	0.05	0.0006–0.0068	0.0028
Silver	ppm	0.1	–	Less than 0.0005
Zinc	ppm	5.0	–	Less than 0.005
Free Chlorine Residual <sup>2</sup>	ppm	4	0.10–1.01	0.60
<sup>1</sup> Samples collected monthly in 2014 from 26 sample sites located across the Everett water distribution system. <sup>2</sup> Monitored monthly at 120 to 125 locations throughout the Everett water distribution system. A minimum of 120 samples must be collected each month at the same time and same locations as coliform bacteria sample collection. Chlorine residual varies within the distribution system. The residual level decays with time.				

# CITY OF EVERETT

## 2014 Water Quality Summary

### Table 2B: Unregulated Parameters

Established by the USEPA and DOH

Unless otherwise noted, values listed are for samples collected after treatment and at the entry point to the water distribution system.

Parameter	Unit	Maximum Contaminant Level	2014 Range of Results	2014 Average Result
<b>Conventional</b>				
Temperature (plant intake)	°C	No Standard	5.3–20.4	12.3
Temperature (distribution system) <sup>1</sup>	°C	No Standard	5.4–23.5	13.4
Alkalinity (as CaCO <sub>3</sub> ) <sup>1</sup>	ppm	No Standard	15.2–24.4	17.6
Total Hardness (as CaCO <sub>3</sub> ) <sup>1</sup>	ppm	No Standard	10.4–16.1	12.1
Turbidity <sup>1</sup>	NTU	No Standard	0.08–0.21	0.12
Calcium Hardness (as CaCO <sub>3</sub> ) <sup>1</sup>	ppm	No Standard	7.7–13.6	9.2
pH <sup>2</sup>	s.u.	≥7.4 (daily avg)	7.3–7.9	7.6
pH <sup>1</sup>	s.u.	No Standard	7.4–9.2	8.0
<b>Inorganic</b>				
Silica (total SiO <sub>2</sub> ) <sup>1,3</sup>	ppm	No Standard	3.6–4.8	4.1
Aluminum <sup>1</sup>	ppm	No Standard	0.01–0.10	0.02
Boron	ppm	No Standard	–	0.003
Copper <sup>4</sup>	ppm	No Standard	0.0006–0.0011	0.0008
Lead <sup>4</sup>	ppm	No Standard	<0.0001–0.0002	Less than 0.0001
Molybdenum	ppm	No Standard	–	Less than 0.0005
Potassium	ppm	No Standard	–	0.21
Sodium	ppm	No Standard	5.98–6.65	6.32
<b>Organic Carbon and DBP Precursors</b>				
Total Organic Carbon (untreated) <sup>5</sup>	ppm	No Standard	0.81–0.90	0.85
Total Organic Carbon	ppm	No Standard	0.52–0.66	0.59
Total Organic Carbon <sup>1</sup>	ppm	No Standard	0.40–0.85	0.57
Dissolved Organic Carbon (untreated) <sup>5</sup>	ppm	No Standard	0.81–0.90	0.86
Dissolved Organic Carbon	ppm	No Standard	0.51–0.67	0.58
UV-254 Absorbance <sup>5</sup>	cm <sup>-1</sup>	No Standard	0.023–0.031	0.028
UV-254 Absorbance	cm <sup>-1</sup>	No Standard	0.009–0.010	0.009
<b>Microbiological</b>				
<i>Giardia lamblia</i> cysts <sup>5,6</sup>	cysts/L	No Standard	–	0
<i>Cryptosporidium</i> oocysts <sup>5,6</sup>	oocysts/L	No Standard	–	0

<sup>1</sup> Values are from Everett distribution system and were collected in 2014 as part of the monthly water quality parameters (WQP) monitoring and/or quarterly disinfection by-product monitoring programs.

<sup>2</sup> Samples collected from treatment plant effluent.

<sup>3</sup> Total silica results are based on a strong acid digestion analysis method. Insoluble particulate silicates are not detected by this method.

<sup>4</sup> These results are for treatment plant effluent and represent the treated water before contact with distribution system piping or home plumbing. Lead and copper are monitored every three years at consumer taps in the distribution system. See Table 1 for the most recent consumer tap results.

<sup>5</sup> Samples collected from untreated raw water influent to the treatment plant.

<sup>6</sup> In 2014, *Cryptosporidium* and *Giardia* were monitored on a monthly basis at the plant intake.

# CITY OF EVERETT

## 2014 Water Quality Summary

**Table 3: Volatile Organic Chemicals (VOC) – Regulated**

Established by the USEPA and DOH

Contaminant	Maximum Contaminant Level (mg/L)	2014 Average Result
Benzene	0.005	ND <sup>1</sup>
Carbon tetrachloride	0.005	ND
1,2-Dibromo-3-chloropropane (DBCP) <sup>2</sup>	0.0002	ND
o-Dichlorobenzene	0.6	ND
p-Dichlorobenzene	0.075	ND
cis-1,2-Dichloroethylene	0.07	ND
trans-1,2-Dichloroethylene	0.1	ND
1,2-Dichloroethane	0.005	ND
1,1-Dichloroethylene	0.007	ND
1,1-Dichloropropane	0.005	ND
Ethylbenzene	0.7	ND
Dichloromethane (Methylene chloride)	0.005	ND
Monochlorobenzene (Chlorobenzene)	0.1	ND
Styrene	0.1	ND
Tetrachloroethylene	0.005	ND
Toluene	1.0	ND
1,2,4-Trichlorobenzene	0.07	ND
1,1,1-Trichloroethane	0.2	ND
1,1,2-Trichloroethane	0.005	ND
Trichloroethylene	0.005	ND
Vinyl chloride	0.002	ND
Xylenes (total)	10.0	ND
<b>Trihalomethanes<sup>3</sup></b>		
Total Trihalomethanes (TTHM) <sup>4</sup>	0.080	0.039
Bromodichloromethane	–	0.002
Dibromochloromethane	–	ND
Tribromomethane (bromoform)	–	ND
Trichloromethane (chloroform)	–	0.037
<b>Haloacetic Acids<sup>3</sup></b>		
Haloacetic acids [5] (HAA5) <sup>5</sup>	0.060	0.032
Dichloroacetic acid	–	0.011
Dibromoacetic acid	–	ND
Monobromoacetic acid	–	ND
Monochloroacetic acid	0.0021 and 0.0023	N/A
Trichloroacetic acid	–	0.021
<p><sup>1</sup>ND = None detected.</p> <p><sup>2</sup>DBCP was last monitored in 2012. The State DOH has issued monitoring waivers through 2016. It is not used or produced in the Sultan Basin Watershed and has never been detected in Everett's water.</p> <p><sup>3</sup>Results are for samples collected on a quarterly basis from eight compliance locations in Everett's distribution system.</p> <p><sup>4</sup>Total Trihalomethanes (TTHM) is the sum of the concentrations of four different trihalomethane compounds in a sample. Only TTHM has an MCL assigned to it. The individual trihalomethanes listed above have no MCL, but must be monitored to determine TTHM.</p> <p><sup>5</sup>Haloacetic acids (5), or HAA5, is the sum of the concentrations of five individual haloacetic acid compounds. Only the sum HAA5 has an MCL assigned to it. The five haloacetic acid compounds that are measured to determine HAA5 are listed.</p> <p><sup>6</sup>Only detected once at two of the eight monitoring locations during May 2014.</p>		

# CITY OF EVERETT

## 2014 Water Quality Summary

**Table 4: Volatile Organic Chemicals (VOC) – Unregulated**

No MCL, but monitoring is required by the USEPA or DOH

Contaminant	2014 Average Result
Tert-Amyl methyl ether	ND <sup>1</sup>
Bromobenzene	ND
Bromochloromethane	ND
Bromomethane	ND
2-Butanone (MEK)	ND
n-Butylbenzene	ND
sec-Butylbenzene	ND
tert-Butylbenzene	ND
Carbon Disulfide	ND
Chloroethane	ND
Chloromethane	ND
o-Chlorotoluene	ND
p-Chlorotoluene	ND
m-Dichlorobenzene	ND
1,1-Dichloroethane	ND
Dibromomethane	ND
Dichlorodifluoromethane	ND
1,3-Dichloropropane	ND
2,2-Dichloropropane	ND
1,1-Dichloropropene	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Di-isopropyl ether	ND
Hexachlorobutadiene	ND
Isopropylbenzene	ND
p-Isopropyltoluene	ND
4-Methyl-2-pentanone (MIBK)	ND
Methyl tertiary butyl ether (MTBE)	ND
Naphthalene	ND
n-Propylbenzene	ND
1,1,1,2-Tetrachloroethane	ND
1,1,2,2-Tetrachloroethane	ND
Trichlorotrifluoroethane (Freon 113)	ND
Trichlorofluoromethane	ND
1,2,3-Trichlorobenzene	ND
1,2,3-Trichloropropane	ND
1,2,4-Trimethylbenzene	ND
1,3,5-Trimethylbenzene	ND
m/p-Xylene	ND
o-Xylene	ND
<sup>1</sup> ND = None detected *VOC samples were collected after treatment and prior to distribution.	

# CITY OF EVERETT

## 2014 Water Quality Summary

**Table 5: Synthetic Organic Chemicals (SOC) – Regulated**

Established by the USEPA and DOH

Contaminant	Maximum Contaminant Level (mg/L)	2014 Average Result
Alachlor (Lasso)	0.002	ND <sup>1</sup>
Aldicarb (Temik) <sup>2</sup>	0.003	ND
Aldicarb sulfone <sup>2</sup>	0.002	ND
Aldicarb sulfoxide <sup>2</sup>	0.004	ND
Atrazine	0.003	ND
Benzo(a)pyrene	0.0002	ND
Carbofuran	0.04	ND
Chlordane	0.002	ND
2,4,D	0.07	ND
Dalapon	0.2	ND
Di(ethylhexyl)adipate	0.4	ND
Di(2-ethylhexyl) phthalate	0.006	ND
Dinoseb	0.007	ND
Diquat <sup>3</sup>	0.02	ND
Endrin	0.002	ND
Endothall <sup>3</sup>	0.1	ND
Ethylene dibromide (EDB) <sup>4</sup>	0.00005	ND
Glyphosate (Rodeo, Roundup) <sup>3</sup>	0.7	ND
Heptachlor	0.0004	ND
Heptachlor epoxide ("B")	0.0002	ND
Hexachlorobenzene	0.001	ND
Hexachlorocyclopentadiene (HEX)	0.05	0.000058
Lindane (BHC-gamma)	0.0002	ND
Methoxychlor	0.04	ND
Oxamyl (Vydate)	0.2	ND
Pentachlorophenol	0.001	ND
Picloram (Tordon)	0.5	ND
Polychlorinated biphenyls (PCBs, Aroclors) <sup>5</sup>	0.0005	ND
Simazine	0.004	ND
Toxaphene	0.003	ND
2,4,5-TP (Silvex)	0.05	ND
2,3,7,8-TCDD (Dioxin) <sup>6</sup>	3 X 10 <sup>-8</sup>	ND

<sup>1</sup>ND = None detected.

<sup>2</sup>MCLs for Aldicarb, Aldicarb Sulfone and Aldicarb Sulfoxide were established in 1991, however EPA has postponed the regulation of these compounds indefinitely pending the results of further research, a possible ban on their use, and an update of the MCL values. These substances have never been used in the Sultan Basin Watershed.

<sup>3</sup>Diquat, Endothall and Glyphosate were last monitored in 2005. The State DOH has issued monitoring waivers . They are not used or produced in the Sultan Basin watershed and have never been detected in Everett's water.

<sup>4</sup>EDB was last monitored in 2012. The State DOH has issued monitoring waivers through 2016. It is not used or produced in the Sultan Basin Watershed and has never been detected in Everett's water.

<sup>5</sup>Total PCBs measured as decachlorobiphenyl. There are seven regulated individual compounds that make up total PCBs. These compounds are known as aroclors. Samples are not measured for individual aroclors unless a measureable or detectable amount of total PCB is found.

<sup>6</sup>Dioxin was last monitored in 2002. The State DOH has issued a general monitoring waiver for it. It is not used or produced in the Sultan Basin Watershed and has never been detected in Everett's water.

\*SOC samples were collected after treatment and prior to distribution.

# CITY OF EVERETT

## 2014 Water Quality Summary

**Table 6: Synthetic Organic Chemicals (SOC) – Unregulated**

No MCL, but monitoring is required by the USEPA or DOH

Contaminant	2014 Average Result	Contaminant	2014 Average Result
2,4,5-T	ND <sup>1</sup>	Dicamba	ND
2,4-DB	ND	Dichlorprop	ND
2,4-Dinitrotolulene	ND	Dieldrin	ND
3-Hydroxycarbofuran	ND	Diethylphthalate	ND
3,5-Dichlorobenzoic acid	ND	Dimethoate	ND
Acenaphthylene	ND	Dimethylphthalate	ND
Acifluorfen	ND	Di-n-butylphthalate	ND
Aldrin	ND	Fluoranthene	ND
Alpha-Chlordane	ND	Fluorene	ND
Anthracene	ND	Gamma-Chloradane	ND
Bentazone	ND	Indenol(1,2,3,c,d)Pyrene	ND
Benz(a)Anthracene	ND	Isophorone	ND
Benzo(b)Fluoranthene	ND	Methiocarb	ND
Benzo(g,h,i)Perylene	ND	Methomyl	ND
Benzo(k)Fluoranthene	ND	Metolachlor	ND
Bromacil	ND	Metribuzin	ND
Butachlor	ND	Molinate	ND
Butylbenzylphthalate	ND	Phenanthrene	ND
Caffeine	ND	Propachlor	ND
Carbaryl	ND	Propoxur (Baygon)	ND
Chrysene	ND	Pyrene	ND
DCPA (Dacthal)	ND	Thiobencarb (ELAP)	ND
Diazinon	ND	Trans-Nonachlor	ND
Dibenz(a,h)anthracene	ND	Trifluralin	ND
<sup>1</sup> ND = None detected. *SOC samples were collected after treatment and prior to distribution.			

# CITY OF EVERETT

## 2014 Water Quality Summary

**Table 7: Unregulated Contaminant Monitoring Rule**

Established by the USEPA and DOH

Unless otherwise noted, values listed are for samples collected after treatment and at the entry point to the water distribution system.

Parameter	Unit	Maximum Contaminant Level	2014 Range of Results	2014 Average Result
<b>Volatile Organic Compounds</b>				
1,2,3-Trichloropropane	ppb	No Standard	–	<0.03
1,3-Butadiene	ppb	No Standard	–	<0.10
Chloromethane (Methyl Chloride)	ppb	No Standard	–	<0.20
1,1-Dichloroethane	ppb	No Standard	–	<0.03
Bromomethane (Methyl Bromide)	ppb	No Standard	–	<0.20
Chlorodifluoromethane	ppb	No Standard	–	<0.08
Bromochloromethane	ppb	No Standard	–	<0.06
<b>Synthetic Organic Compound</b>				
1,4-Dioxane	ppb	No Standard	–	<0.07
<b>Metals</b>				
Vanadium	ppb	No Standard	<0.2–0.20	<0.2
Vanadium <sup>1</sup>	ppb	No Standard	<0.2–0.28	<0.2
Molybdenum	ppb	No Standard	–	<1
Molybdenum <sup>1</sup>	ppb	No Standard	–	<1
Cobalt	ppb	No Standard	–	<1
Colbat <sup>1</sup>	ppb	No Standard	–	<1
Strontium	ppb	No Standard	14–16	15
Strontium <sup>1</sup>	ppb	No Standard	–	16
Chromium	ppb	No Standard	0.22–0.32	0.29
Chromium <sup>1</sup>	ppb	No Standard	0.23–0.36	0.28
<b>Chromium-6</b>				
Chromium-6	ppb	No Standard	0.20–0.29	0.25
Chromium-6 <sup>1</sup>	ppb	No Standard	0.21–0.31	0.26
<b>Oxyhalide Anion</b>				
Chlorate	ppb	No Standard	26–80	53
Chlorate <sup>1</sup>	ppb	No Standard	36–73	55
<b>Perfluorinated Compounds</b>				
Perfluoro octanesulfonic acid	ppb	No Standard	–	<0.04
Perfluorooctanoic acid	ppb	No Standard	–	<0.02
Perfluoro-n-nonanoic acid	ppb	No Standard	–	<0.02
Perfluoro-1-hexanesulfonic acid	ppb	No Standard	–	<0.03
Perfluoroheptanoic acid	ppb	No Standard	–	<0.01
Perfluoro-1-butanesulfonic acid	ppb	No Standard	–	<0.09
<b>Hormones</b>				
17-beta-Estradiol	ppb	No Standard	–	<0.0004
17 alpha-ethynylestradiol	ppb	No Standard	–	<0.0009
Estriol	ppb	No Standard	–	<0.0008
Equilin	ppb	No Standard	–	<0.004
Estrone	ppb	No Standard	–	<0.002
Testosterone	ppb	No Standard	–	<0.0001
4-androstene-3,17-dione	ppb	No Standard	<0.0003–0.00038	<0.0003

<sup>1</sup>Values are from a maximum residence time site in the Everett distribution system.

# CITY OF EVERETT

## 2014 Water Quality Summary

### Units & Acronyms

Unit	Definition
°C	Degrees Centigrade
CFU/100mL	Colony forming units per 100 mL of sample
CFU/mL	Colony forming units per 1 mL of sample
cm <sup>-1</sup>	UV light absorbance across a centimeter cell path
c.u.	cobalt-platinate standard color units
cysts/L	<i>Giardia lamblia</i> cysts per liter of sample
MF/L>10 µm	Millions of asbestos fibers per liter that are greater than 10 microns in length
mg/L	milligrams per liter (equivalent to ppm)
ND	None detected
NTU	Nephelometric Turbidity Units
oocysts/L	<i>Cryptosporidium spp.</i> oocysts per liter of sample
ppb	parts per billion (equivalent to µg/L).
pCi/L	picocuries per liter
ppm	parts per million (equivalent to mg/L)
s.u.	standard pH units
µmhos/cm	micro mhos per cm (conductivity unit)
<	Less than. Result was less than or below the detection limit for the analytical method. This result is equivalent to ND.

Acronym	Definition
AC	Asbestos concrete (material used in one type of water main pipe)
AL	Action Limit
DOH	Washington State Department of Health, Office of Drinking Water
HAA	Haloacetic acids
HAA5	Haloacetic acids five (sum of the concentrations of five haloacetic compounds)
HPC	Heterotrophic plate count (a standard analytical method for heterotrophic bacteria)
HPC R2A	Heterotrophic plate count analysis using a specialized method that attempts to mimic water main conditions and detect and evaluate bioslimes. The method uses low nutrient R2A growth media, longer incubation times and cooler incubation temperatures than the standard HPC method.
MCL	Maximum Contaminant Level
THM	Trihalomethane
TT	Treatment technique
TTHM	Total trihalomethanes (sum of concentrations of four compounds)
UV-254	Ultraviolet light absorbance at 254 nanometer wavelength
USEPA	United States Environmental Protection Agency

# CITY OF EVERETT 2014 Water Quality Summary

## Parameters for Home Brewing

Parameter	Unit	2014 Range of Results	2014 Average Result
Calcium (Ca) <sup>1</sup>	ppm	3.1–5.4	3.7
Magnesium (Mg) <sup>1</sup>	ppm	0.4–0.8	0.7
Alkalinity (as CaCO <sub>3</sub> ) <sup>1</sup>	ppm	15.2–24.4	17.6
Sulfate (SO <sub>4</sub> )	ppm	2.8–3.0	2.9
Chloride (Cl)	ppm	2.3–2.5	2.4
Potassium (K)	ppm	–	0.2
Bicarbonate (HCO <sub>3</sub> )	ppm	18.5–29.8	21.5
pH <sup>1,2</sup>	s.u.	7.4–9.2	8.0

<sup>1</sup>Values are from the Everett distribution system and were collected in 2014 as part of the monthly water quality parameters (WQP) monitoring program conducted at 26 locations in Everett.

<sup>2</sup>pH can vary significantly by location and should be measured at the tap you are using.

## **APPENDIX I**

### **PEAK HOUR MODELING RESULTS**

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
10	7.32	200	517	137.35
100	5.35	496	712.36	93.75
102	5.35	500	712.46	92.06
104	5.35	496	712.26	93.71
106	5.35	500	715.78	93.5
108	5.35	530	711.36	78.58
110	5.35	535	711.36	76.42
112	5.35	530	711.36	78.58
114	5.35	525	711.36	80.75
116	5.35	530	711.36	78.58
118	5.35	540	711.36	74.25
12	7.32	190	516.99	141.68
120	5.35	530	711.37	78.59
122	0	482	615.19	57.71
124	0	485	615.21	56.42
128	0	505	712.2	89.78
130	0	505	712.2	89.78
136	0	250	268.99	8.23
14	7.32	160	516.99	154.68
140	0	250	517.03	115.71
16	7.32	190	516.98	141.68
18	7.32	330	517.15	81.09
20	7.32	390	517.3	55.16
22	7.32	345	504.13	68.95
24	7.32	353	504.11	65.48
26	7.81	135	364.48	99.44
28	7.81	200	364.5	71.28
30	7.99	497	615.75	51.46
32	7.99	500	615.84	50.19
34	7.99	493	615.91	53.26
36	7.99	490	615.99	54.59
38	7.99	485	616.05	56.78
40	7.99	495	615.71	52.31
42	7.99	490	615.64	54.44
44	5.35	534	711.15	76.76
46	5.35	533	711.17	77.2
48	5.35	532	711.18	77.64
50	0	520	712.66	83.48
52	5.35	597	702.97	45.92
54	5.35	597	702.97	45.92
56	5.35	601	702.97	44.19
58	5.35	597	702.97	45.92
60	5.35	595	702.97	46.78
62	5.35	595	702.97	46.78
64	5.35	595	702.97	46.78
66	5.35	595	702.97	46.78

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
68	18.91	570	713.41	62.14
70	18.91	570	713.41	62.14
72	18.91	580	713.4	57.8
74	18.91	588	713.4	54.34
76	18.91	580	713.4	57.8
78	18.91	588	713.4	54.34
80	7.32	334	503.38	73.39
82	7.81	307	408.92	44.16
84	0	320	503.37	79.45
86	0	312	408.93	42
88	7.32	249	517.82	116.48
90	7.32	249	517.82	116.48
92	0	369	517.07	64.16
94	0	369	611.1	104.9
96	5.35	510	716.16	89.33
98	5.35	500	712.46	92.06
FCV-121-IN	0	530	703.02	74.97
FCV-399-IN	0	250	409.99	69.33
FCV-399-OUT	0	250	409.99	69.32
FCV-85-IN	0	582	713.35	56.91
FCV-85-OUT	0	582	713.35	56.91
J-102	10	554	712.68	68.76
J-104	18	554	712.68	68.76
J-105	18.91	553	711.94	68.87
J-107	6.15	560	713.07	66.33
J-110	18.91	551	711.94	69.74
J-114	18.91	550	711.94	70.17
J-115	18.91	546	711.95	71.9
J-116	18.91	508	711.65	88.24
J-117	18.91	502	711.65	90.84
J-118	6.15	538	712.91	75.79
J-121	1.74	530	712.82	79.22
J-122	6.15	514	712.72	86.11
J-123	30	527	712.55	80.4
J-124	18.91	529	712.07	79.32
J-125	18.91	530	712.01	78.86
J-134	0	555	713.35	68.61
J-135	0	555	713.34	68.61
J-139	5.35	580	732.62	66.13
J-140	5.35	580	732.44	66.05
J-141	0	580	713.72	57.94
J-142	0	580	713.65	57.91
J-145	7.99	399	611.42	92.04
J-149	5.35	537	711.18	75.47
J-150	7.81	200	341.91	61.49
J-151	6.15	580	714.16	58.13

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-155	5.35	520	711.11	82.81
J-156	7.32	365	517.01	65.87
J-158	5.35	596	702.98	46.35
J-160	5.35	580	732.75	66.19
J-161	18.91	542	712.04	73.68
J-163	5.35	585	703.01	51.13
J-165	7.99	436	612.82	76.62
J-167	7.32	360	517.04	68.04
J-168	7.32	374	519.46	63.03
J-169	7.99	413	612.74	86.55
J-170	7.99	415	611.22	85.02
J-171	7.32	374	519.38	62.99
J-172	7.99	374	615.83	104.79
J-173	7.32	392.8	519.38	54.85
J-174	7.32	303	519.38	93.76
J-176	7.32	338	519.38	78.59
J-177	7.32	348	519.38	74.26
J-178	7.32	305	519.38	92.89
J-179	7.32	272	519.39	107.19
J-180	7.99	430	611.22	78.52
J-183	5.35	585	702.98	51.12
J-1830	0	340	616.19	119.67
J-1832	0	580	733.04	66.31
J-1834	0	580	733.04	66.31
J-1836	0	582	702.98	52.42
J-1838	0	582	702.98	52.42
J-184	7.99	448	614.42	72.11
J-1842	0	530	703.02	74.97
J-1844	0	582	713.97	57.18
J-1846	0	582	713.97	57.18
J-185	7.99	454	614.4	69.5
J-1854	0	513	711.64	86.07
J-1856	0	532	718.51	80.81
J-186	7.99	459	614.41	67.34
J-1860	0	532	718.51	80.81
J-1862	0	315	533.77	94.79
J-1864	0	485	712.36	98.51
J-1866	0	480	712.64	100.8
J-1868	0	571	732.51	69.98
J-187	7.99	462	614.41	66.04
J-1872	0	567	703.02	58.94
J-189	7.99	506	614.41	46.97
J-190	7.81	120	409.99	125.65
J-191	5.35	575	703.02	55.47
J-193	5.35	575	703.04	55.48
J-194	5.35	567	703.02	58.94

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-195	7.32	340	517.03	76.71
J-197	4	20	268.94	107.87
J-198	7.99	420	613.97	84.05
J-199	7.99	415	613.97	86.21
J-200	5.35	575	702.98	55.45
J-2000	0	500	703.02	87.97
J-2004	0	522	712.62	82.6
J-2009	0	586	732.22	63.35
J-201	5.35	575	702.98	55.45
J-2010	0	590	732.25	61.64
J-2012	0	574	732.25	68.57
J-2013	0	568	732.25	71.17
J-2014	0	568	732.25	71.17
J-2015	0	578	732.25	66.84
J-2016	0	583	732.25	64.67
J-2019	0	520	717.71	85.67
J-202	5.35	600	702.98	44.62
J-2020	0	433	612.63	77.83
J-2021	0	422	612.62	82.59
J-2022	0	431	612.49	78.64
J-2023	0	582	732.77	65.33
J-2024	0	580	732.27	65.98
J-2025	0	581	732.33	65.57
J-2027	0	584	732.25	64.24
J-203	5.35	580	703	53.3
J-2030	0	580	732.25	65.97
J-2031	0	580	732.26	65.97
J-2032	0	411	611.57	86.91
J-2033	0	405	519.6	49.66
J-2034	0	415	611.57	85.18
J-2036	0	15	268.94	110.03
J-2037	0	500	634.11	58.11
J-2038	0	567	634.32	29.17
J-2039	0	500	634.71	58.37
J-204	5.35	575	703.05	55.48
J-2040	0	495	732.56	102.94
J-2041	0	0	732.56	317.42
J-2042	0	575	634.09	25.6
J-2044	0	417	634.52	94.25
J-2045	0	417	634.53	94.25
J-2046	0	417	634.53	94.25
J-2047	0	517	634.61	50.96
J-2048	0	600	634.88	15.11
J-2049	0	500	634.9	58.45
J-205	5.35	575	703.01	55.47
J-2050	0	575	703.02	55.47

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-2051	0	595	703.04	46.81
J-2052	0	575	703.02	55.47
J-2053	0	595	703	46.8
J-2054	0	595	703	46.8
J-2055	0	530	712.11	78.91
J-2056	0	535	712.11	76.74
J-2059	0	541	711.17	73.74
J-206	5.35	575	703.49	55.67
J-2060	0	538	711.2	75.05
J-2061	0	538	711.19	75.04
J-2062	0	538	711.2	75.05
J-2063	0	535	708.97	75.38
J-2064	0	534	710.96	76.68
J-2065	0	515	703.02	81.47
J-2067	0	540	711.17	74.17
J-2068	0	525	712.41	81.21
J-2069	0	526	712.46	80.79
J-207	5.35	575	703.16	55.53
J-2070	0	577	703.04	54.61
J-2072	0	577	703.04	54.61
J-2073	0	588	703.04	49.85
J-2074	0	576	703.04	55.05
J-2075	0	577	703.04	54.61
J-2076	0	575	703.47	55.66
J-2077	0	495	716.62	96.03
J-2078	0	495	716.35	95.91
J-2079	0	170	409.99	103.99
J-208	5.35	570	703.01	57.63
J-2080	0	110	409.99	129.99
J-2081	0	150	409.99	112.65
J-2082	0	187	409.99	96.62
J-2084	0	155	516.99	156.85
J-2085	0	540	711.17	74.17
J-2086	0	112	268.95	68.01
J-2087	0	155	409.99	110.49
J-2088	0	112	516.99	175.48
J-2089	0	112	409.99	129.12
J-209	5.35	593	703.01	47.67
J-210	5.35	570	703.01	57.63
J-212	5.35	570	703.05	57.65
J-213	5.35	592	703.01	48.1
J-215	5.35	570	703.16	57.7
J-216	5.35	570	703.14	57.69
J-217	5.35	575	703.05	55.48
J-218	5.35	575	703.05	55.48
J-219	5.35	595	703.04	46.81

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-220	5.35	595	703.03	46.81
J-221	5.35	595	703.02	46.81
J-222	5.35	575	703.02	55.47
J-223	5.35	575	703.02	55.47
J-224	5.35	575	703.03	55.47
J-225	5.35	577	703.03	54.61
J-226	5.35	577	703.04	54.61
J-227	5.35	577	703.06	54.62
J-228	5.35	578	703.09	54.2
J-229	5.35	577	703.07	54.62
J-23	5.35	582	732.37	65.15
J-230	5.35	577	703.05	54.62
J-231	5.35	577	703.03	54.61
J-233	5.35	577	703.04	54.61
J-234	5.35	577	703.04	54.61
J-235	4	15	268.94	110.03
J-236	4	35	268.95	101.37
J-237	7.32	245	516.93	117.83
J-238	7.81	150	341.9	83.15
J-239	4	112	268.96	68.01
J-240	7.99	369	611.1	104.9
J-241	7.32	390	517.26	55.14
J-242	7.32	350	517.16	72.43
J-243	7.32	315	517.97	87.95
J-244	7.32	360	518.71	68.77
J-245	7.32	370	518.82	64.48
J-248	7.32	330	504.05	75.41
J-250	7.32	330	504.06	75.42
J-251	7.81	325	433.76	47.12
J-253	7.99	400	613.84	92.66
J-255	6.15	540	713.67	75.25
J-258	7.32	296	503.49	89.91
J-261	5.35	495	716.93	96.16
J-262	7.99	420	613.22	83.72
J-263	7.99	420	613.2	83.72
J-264	7.99	400	613.2	92.38
J-265	7.32	400	503.52	44.86
J-266	7.99	475	615.14	60.72
J-267	5.35	475	713	103.12
J-268	5.35	500	712.72	92.17
J-269	5.35	490	712.26	96.3
J-270	7.99	490	615.73	54.48
J-271	7.99	480	615.67	58.78
J-272	7.99	490	615.68	54.46
J-273	7.99	510	615.66	45.78
J-274	7.99	490	615.64	54.44

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-275	7.99	490	615.61	54.43
J-276	7.99	500	615.67	50.12
J-277	7.99	500	615.67	50.12
J-278	7.99	500	615.69	50.13
J-279	7.99	500	615.67	50.12
J-280	7.99	490	615.64	54.44
J-281	7.32	410	615.53	89.06
J-282	7.99	460	615.52	67.39
J-283	7.81	230	364.33	58.2
J-285	0	445	519.6	32.32
J-286	5.35	530	711.22	78.52
J-287	5.35	534	710.92	76.66
J-288	5.35	590	702.97	48.95
J-289	5.35	590	702.98	48.95
J-29	0	560	713.97	66.72
J-290	5.35	590	702.98	48.95
J-291	5.35	585	702.97	51.12
J-292	5.35	585	702.97	51.12
J-293	5.35	585	702.97	51.12
J-294	5.35	590	702.98	48.95
J-295	5.35	595	702.99	46.79
J-296	5.35	590	703	48.96
J-297	5.35	590	703	48.97
J-298	0	615	714.86	43.27
J-299	5.35	597	703.06	45.95
J-30	0	560	714.01	66.73
J-300	5.35	582	732.21	65.08
J-3003	0	485	616.19	56.85
J-3004	0	485	625.53	60.89
J-3005	0	485	617.52	57.42
J-3006	0	485	626.17	61.17
J-3007	0	560	634.06	32.09
J-3008	0	595	632.07	16.06
J-3009	0	15	268.94	110.03
J-301	5.35	580	729.64	64.84
J-3010	0	15	268.94	110.03
J-3011	0	15	268.94	110.03
J-3012	0	560	703.02	61.97
J-3013	0	560	703.02	61.97
J-3014	0	546	703.02	68.04
J-3015	0	570	703.02	57.64
J-3016	0	570	703.02	57.64
J-3017	0	570	703.02	57.64
J-3018	0	546	703.02	68.04
J-3019	0	540	703.02	70.64
J-302	5.35	556	724.95	73.21

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-3020	0	510	703.02	83.64
J-3022	0	472	614.4	61.7
J-3023	0	498	614.4	50.44
J-3024	0	507	614.4	46.54
J-3025	0	465	614.4	64.74
J-3026	0	74	268.95	84.47
J-3027	0	73	268.95	84.9
J-3028	7.32	229	516.95	124.77
J-3029	7.32	205	516.95	135.17
J-303	5.35	547	718.54	74.33
J-3030	0	181	516.95	145.57
J-3031	0	183	516.95	144.7
J-3032	0	89	268.95	77.97
J-3033	0	69	268.95	86.64
J-3034	0	47	268.95	96.17
J-3035	0	26	268.95	105.27
J-3036	0	22	268.95	107
J-3037	0	9	268.95	112.64
J-3038	0	9	268.95	112.64
J-304	5.35	550	718.03	72.81
J-3040	0	9	268.95	112.64
J-3041	0	9	268.95	112.64
J-3043	0	9	268.95	112.64
J-3044	0	9	268.95	112.64
J-3045	0	9	268.95	112.64
J-3047	0	11	268.95	111.77
J-3048	0	11.25	268.95	111.66
J-3049	0	9.4	268.95	112.46
J-305	5.35	520	717.71	85.67
J-3050	0	9.2	268.95	112.55
J-3051	0	10.53	268.95	111.97
J-3052	0	581	703.04	52.88
J-3053	0	516	712.2	85.01
J-3054	0	519	712.2	83.71
J-3055	0	0	712.16	308.58
J-3057	0	0	712.18	308.59
J-3058	0	565	713.4	64.3
J-3059	0	410	519.54	47.46
J-306	5.35	535	718.03	79.31
J-3061	7.32	465	615.83	65.36
J-3062	0	9	268.95	112.64
J-3063	0	175	516.99	148.18
J-3067	0	575	632.27	24.82
J-307	5.35	541	718.47	76.9
J-308	5.35	532	718.51	80.81
J-309	5.35	547	724.91	77.09

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-310	5.35	530	724.91	84.46
J-311	5.35	496	724.91	99.19
J-312	5.35	500	724.91	97.45
J-313	5.35	533	724.62	83.03
J-314	5.35	551	723.23	74.63
J-315	5.35	544	732.4	81.63
J-316	5.35	450	732.4	122.36
J-317	5.35	556	732.58	76.51
J-318	5.35	565	732.61	72.63
J-319	5.35	582	732.77	65.33
J-32	0	567	714.42	63.88
J-320	5.35	575	732.68	68.32
J-321	5.35	580	732.72	66.17
J-322	5.35	578	732.67	67.02
J-323	5.35	578	732.67	67.02
J-324	5.35	555	732.58	76.95
J-325	5.35	556	732.58	76.51
J-326	5.35	542	732.58	82.58
J-327	5.35	582	733.04	65.44
J-328	5.35	433	732.56	129.8
J-329	5.35	471	732.56	113.33
J-33	25	564	714.5	65.21
J-330	5.35	502	732.57	99.9
J-331	5.35	538	732.58	84.31
J-332	5.35	553	732.59	77.82
J-333	5.35	569	732.6	70.89
J-334	5.35	578	732.61	66.99
J-335	5.35	571	732.58	70.01
J-336	5.35	571	732.44	69.95
J-337	5.35	545	732.56	81.27
J-338	5.35	459	732.56	118.53
J-339	5.35	542	732.56	82.57
J-34	170	610	714.92	45.46
J-340	5.35	553	732.56	77.8
J-341	13.53	493	732.56	103.8
J-342	5.35	532	732.56	86.9
J-343	5.35	521	732.56	91.67
J-344	5.35	536	732.56	85.17
J-345	5.35	581	703.2	52.95
J-349	0	555	712.68	68.32
J-35	28	606	714.92	47.2
J-350	0	530	712.57	79.11
J-351	0	540	712.62	74.8
J-352	0	540	712.58	74.78
J-353	0	530	712.57	79.11
J-354	0	530	712.5	79.08

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-355	6.15	490	712.41	96.37
J-356	6.15	540	712.13	74.58
J-357	18.91	520	712.16	83.26
J-358	7.99	420	613.97	84.05
J-359	18.91	500	711.66	91.71
J-36	9	574	714.92	61.06
J-360	18.91	520	711.73	83.08
J-362	0	560	714.04	66.74
J-37	12	594	714.92	52.39
J-377	6.15	610	714.55	45.3
J-38	12	564	714.91	65.39
J-380	18.91	510	711.67	87.38
J-381	18.91	510	711.66	87.38
J-382	18.91	580	713.4	57.8
J-383	18.91	580	713.4	57.8
J-384	18.91	580	713.42	57.81
J-385	18.91	580	713.4	57.8
J-386	18.91	580	713.47	57.83
J-387	18.91	580	713.39	57.8
J-388	18.91	580	713.39	57.8
J-389	6.15	580	713.2	57.72
J-39	41	567	714.91	64.09
J-392	6.15	580	713.11	57.68
J-393	5.35	475	732.56	111.6
J-394	7.99	410	613.86	88.33
J-395	7.99	402	611.5	90.78
J-396	7.99	410	613.97	88.38
J-397	7.99	405	613.97	90.55
J-398	5.35	473	713.04	104.01
J-399	0	250	409.99	69.33
J-400	7.81	125	409.99	123.49
J-401	4	119	268.95	64.97
J-402	4	112	268.95	68.01
J-403	4	108	268.95	69.74
J-404	4	98	268.95	74.07
J-405	4	96	268.95	74.94
J-406	4	52	268.95	94
J-407	4	63	268.95	89.24
J-408	4	83	268.95	80.57
J-409	4	15	268.94	110.03
J-410	4	48	268.94	95.74
J-411	4	71	268.94	85.77
J-412	4	71	268.94	85.77
J-413	4	113	268.95	67.57
J-414	4	92	268.93	76.67
J-415	4	96	268.93	74.93

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-416	4	111	268.96	68.44
J-417	5.35	500	714.37	92.89
J-418	4	105	268.95	71.04
J-419	4	109	268.95	69.31
J-420	4	121	268.95	64.11
J-421	4	147	268.97	52.85
J-423	4	37	268.94	100.5
J-424	4	42	268.94	98.33
J-425	4	118	268.93	65.4
J-426	4	80	268.93	81.87
J-427	4	135	268.96	58.04
J-428	4	128	268.95	61.07
J-429	4	120	268.95	64.54
J-430	7.81	200	409.98	90.98
J-431	7.81	248	409.97	70.18
J-433	5.35	500	712.11	91.91
J-434	5.35	500	714.1	92.77
J-435	5.35	485	615.04	56.35
J-436	5.35	496	715.91	95.29
J-437	5.35	489	714.94	97.9
J-438	18.91	543	711.99	73.23
J-439	18.91	534	711.99	77.12
J-440	18.91	534	711.99	77.12
J-441	18.91	490	712.41	96.37
J-442	18.91	499	712.3	92.42
J-443	18.91	499	712.3	92.42
J-444	18.91	502	712.3	91.12
J-445	18.91	516	712.29	85.05
J-446	18.91	508	712.29	88.52
J-447	18.91	508	712.28	88.52
J-448	0	520	712.31	83.33
J-449	18.91	530	712.47	79.06
J-450	18.91	524	712.46	81.66
J-451	18.91	505	712.2	89.78
J-452	18.91	514	712.2	85.88
J-453	18.91	510	712.15	87.59
J-454	18.91	510	712.15	87.59
J-455	18.91	520	712.15	83.26
J-456	18.91	515	712.15	85.43
J-457	18.91	522	712.15	82.39
J-458	18.91	522	712.14	82.39
J-459	18.91	524	712.13	81.52
J-46	0	552	713.82	70.12
J-460	18.91	522	711.8	82.24
J-467	7.99	430	612.41	79.04
J-470	7.81	175	364.62	82.16

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-471	7.81	159	364.62	89.1
J-472	7.32	210	519.35	134.04
J-474	7.32	235	519.35	123.21
J-483	7.99	360	613.86	110
J-484	7.32	350	504.06	66.76
J-485	7.99	390	613.82	96.98
J-486	7.99	412	613.88	87.48
J-487	7.99	420	613.89	84.01
J-488	7.99	385	613.84	99.16
J-492	5.35	515	711.37	85.09
J-496	5.35	600	702.98	44.62
J-497	5.35	601	702.98	44.19
J-499	0	580	615.86	15.54
J-500	7.99	441	614.51	75.18
J-501	7.99	441	614.46	75.16
J-502	7.99	451	614.36	70.78
J-503	7.99	466	614.4	64.3
J-504	7.99	401	613.97	92.28
J-505	7.99	403	613.95	91.4
J-506	7.99	385	613.87	99.17
J-507	7.99	361	613.84	109.55
J-508	7.32	339	504.07	71.52
J-509	7.81	320	433.85	49.33
J-510	7.81	178	433.77	110.83
J-511	7.99	400	613.97	92.71
J-512	7.99	416	614.33	85.94
J-513	7.99	498	614.58	50.51
J-514	7.99	487	614.63	55.3
J-515	7.99	471	614.49	62.18
J-516	7.99	412	614.39	87.69
J-517	7.99	421	614.35	83.78
J-518	7.99	417	614.33	85.5
J-519	7.99	395	614.31	95.03
J-52	24	618	714.94	42
J-520	7.99	400	614.24	92.83
J-521	7.99	396	613.94	94.43
J-522	7.99	403	613.76	91.32
J-523	7.99	402	613.7	91.73
J-524	7.99	390	613.76	96.95
J-525	7.99	368	612.75	106.05
J-526	7.32	378	503.92	54.56
J-527	7.32	386	503.79	51.04
J-528	7.32	404	503.59	43.15
J-529	7.32	390	503.53	49.19
J-530	7.32	365	503.49	60.01
J-531	7.32	352	503.48	65.63

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-532	7.32	340	503.46	70.83
J-533	7.32	328	503.46	76.03
J-534	7.32	302	503.46	87.29
J-535	7.32	289	503.46	92.92
J-536	7.32	296	503.46	89.89
J-537	7.32	315	503.49	81.67
J-538	7.32	309	503.5	84.27
J-539	7.81	294	408.91	49.79
J-540	7.81	290	408.91	51.52
J-541	7.81	252	408.9	67.99
J-542	7.81	255	408.9	66.68
J-543	7.81	272	408.9	59.32
J-544	7.81	175	408.89	101.34
J-545	5.35	480	615.07	58.52
J-546	7.99	440	615.16	75.9
J-547	7.99	420	615.16	84.56
J-548	7.99	375	615.16	104.06
J-549	7.99	460	615.17	67.23
J-55	77	545	714.09	73.27
J-550	7.99	462	615.17	66.37
J-551	7.99	380	615.16	101.9
J-552	7.99	400	615.16	93.23
J-553	7.99	482	615.24	57.73
J-554	7.99	482	615.34	57.78
J-555	7.99	480	615.4	58.67
J-556	7.99	451	615.39	71.23
J-557	7.99	440	615.39	76
J-558	7.99	476	615.43	60.41
J-559	7.99	480	615.46	58.69
J-560	7.99	480	615.53	58.72
J-561	7.99	486	615.44	56.08
J-562	7.99	490	615.49	54.37
J-563	7.99	490	615.43	54.35
J-564	7.99	488	615.48	55.24
J-565	7.99	500	615.6	50.09
J-566	7.99	506	615.56	47.47
J-567	7.99	477	615.53	60.03
J-568	7.99	483	615.54	57.43
J-569	7.32	409	533.78	54.07
J-570	7.32	323	533.78	91.33
J-571	7.32	319	533.78	93.06
J-572	7.32	275	533.77	112.13
J-573	7.81	261	364.33	44.77
J-575	7.81	268	364.33	41.74
J-576	7.81	111	364.34	109.77
J-577	7.81	122	364.38	105.02

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-578	7.81	265	364.33	43.04
J-579	7.81	200	364.39	71.23
J-580	7.81	191	364.61	75.22
J-582	7.32	251	533.77	122.53
J-583	7.32	215	519.36	131.88
J-584	7.99	415	615.83	87.02
J-585	7.99	462	615.83	66.65
J-586	7.99	463	615.83	66.22
J-587	7.99	461	615.83	67.09
J-588	7.32	250	519.36	116.71
J-589	7.99	476	615.83	60.59
J-59	6.15	558	713.35	67.31
J-590	7.99	483	615.86	57.57
J-591	7.99	485	615.87	56.7
J-592	7.99	487	615.92	55.86
J-593	7.99	485	616.19	56.85
J-594	7.99	496	615.84	51.93
J-595	7.99	491	615.84	54.09
J-596	7.99	490	615.84	54.52
J-597	7.99	486	615.84	56.26
J-598	7.99	488	615.83	55.39
J-599	5.35	498	615.67	50.99
J-600	5.35	513	711.64	86.07
J-601	5.35	522	711.61	82.16
J-602	5.35	517	711.86	84.43
J-603	5.35	497	711.95	93.14
J-604	5.35	522	711.48	82.1
J-605	5.35	523	711.41	81.64
J-606	5.35	537	711.31	75.53
J-607	5.35	542	711.19	73.31
J-608	5.35	536	711.1	75.87
J-609	5.35	534	710.28	76.38
J-610	5.35	545	711.09	71.97
J-611	5.35	532	711.15	77.63
J-612	5.35	532	711.15	77.63
J-613	5.35	543	711.18	72.87
J-614	5.35	543	711.18	72.87
J-615	5.35	543	711.18	72.87
J-616	5.35	543	711.21	72.89
J-617	5.35	541	711.22	73.76
J-618	5.35	544	711.27	72.48
J-619	5.35	534	711.19	76.78
J-62	6.15	601	714.74	49.28
J-620	7.99	470	611.12	61.15
J-621	7.99	418	613.98	84.92
J-622	7.99	410	613.91	88.35

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-623	7.99	380	613.87	101.34
J-624	7.99	412	613.86	87.47
J-625	7.99	399	613.86	93.1
J-626	7.99	394	613.66	95.18
J-627	7.99	396	613.64	94.3
J-628	7.99	399	613.61	92.99
J-629	7.99	398	613.49	93.37
J-630	7.99	392	613.49	95.97
J-631	7.99	434	613.21	77.65
J-632	7.99	438	613.64	76.1
J-633	7.99	439	613.94	75.8
J-634	7.99	425	611.76	80.92
J-635	13.53	420	611.42	82.94
J-636	7.99	407	611.76	88.72
J-637	13.53	407	519.69	48.83
J-638	7.32	385	519.1	58.11
J-639	7.32	355	518.68	70.92
J-640	7.99	395	611.32	93.73
J-641	7.99	396	611.31	93.29
J-642	7.99	481	611.35	56.48
J-643	7.99	471	611.31	60.79
J-644	7.99	490	611.32	52.57
J-645	7.99	451	611.2	69.41
J-646	7.99	467	611.15	62.46
J-647	7.99	470	611.11	61.14
J-648	7.99	470	611.11	61.14
J-649	7.99	461	611.11	65.04
J-650	13.53	409	611.18	87.6
J-651	7.99	415	611.13	84.98
J-652	7.32	396	517.32	52.57
J-653	7.32	364	517.46	66.5
J-654	7.32	344	517.72	75.27
J-655	7.32	292	517.92	97.89
J-656	7.32	280	517.86	103.07
J-657	7.32	232	517.82	123.85
J-658	7.32	372	517.14	62.89
J-659	7.32	369	517.12	64.18
J-660	7.32	337	517.12	78.05
J-661	7.99	375	611.11	102.3
J-662	7.99	385	611.11	97.97
J-663	7.99	395	611.11	93.64
J-664	7.99	405	611.11	89.31
J-665	7.99	415	611.11	84.97
J-666	7.99	425	611.11	80.64
J-667	7.99	435	611.11	76.31
J-668	7.32	355	517.05	70.22

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-669	7.32	360	517.05	68.05
J-670	7.32	342	517.03	75.84
J-671	7.32	365	517.04	65.88
J-672	7.32	370	517.03	63.71
J-673	7.32	370	517.03	63.71
J-674	7.32	245	516.96	117.84
J-677	5.35	601	702.98	44.19
J-678	5.35	599	702.99	45.06
J-68	9	558	713.8	67.51
J-685	5.35	540	711.17	74.17
J-686	7.32	453	533.83	35.02
J-687	7.81	161	364.62	88.23
J-700	7.32	364	519.46	67.36
J-701	5.35	485	712.16	98.43
J-702	5.35	515	711.76	85.26
J-703	5.35	520	711.31	82.9
J-704	5.35	505	711.87	89.64
J-705	5.35	496	711.38	93.33
J-706	5.35	505	711.39	89.43
J-707	5.35	529	711.39	79.03
J-708	5.35	534	711.38	76.86
J-709	5.35	510	711.37	87.25
J-711	5.35	510	711.35	87.25
J-712	7.32	360	517.04	68.05
J-713	7.32	360	517.03	68.04
J-714	7.32	320	517.18	85.44
J-715	7.32	320	517.32	85.5
J-716	7.32	330	517.43	81.21
J-717	7.32	280	517.88	103.07
J-718	5.35	590	703.01	48.97
J-719	7.32	265	517.06	109.22
J-72	8	557	713.68	67.89
J-720	5.35	600	703.01	44.63
J-721	5.35	495	614.81	51.91
J-722	5.35	590	703.01	48.97
J-723	5.35	595	703.01	46.8
J-724	5.35	595	703.01	46.8
J-726	5.35	590	703.01	48.97
J-727	7.32	350	517.09	72.4
J-728	7.32	350	504.07	66.76
J-74	8	569	713.56	62.64
J-78	24	577	714.42	59.54
J-79	15	570	713.5	62.18
J-802	0	490	615.43	54.35
J-803	5.35	541	711.16	73.73
J-804	0	582	713.97	57.18

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-806	0	192	409.24	94.13
J-808	0	178	409.24	100.19
J-810	0	225	409.24	79.83
J-812	0	340	409.24	30
J-814	0	340	616.19	119.67
J-815	5.35	500	711.74	91.75
J-816	5.35	495	711.68	93.89
J-818	0	314	518.11	88.44
J-820	0	300	517.92	94.42
J-822	0	578	615.64	16.31
J-824	0	340	409.24	30
J-826	18.91	543	711.95	73.21
J-827	18.91	541	711.91	74.05
J-828	18.91	529	711.89	79.25
J-829	18.91	520	711.89	83.15
J-830	18.91	534	711.89	77.08
J-831	18.91	532	711.88	77.94
J-832	18.91	530	711.88	78.81
J-833	18.91	528	711.88	79.68
J-834	18.91	528	711.89	79.68
J-842	18.91	512	711.68	86.52
J-843	18.91	510	711.69	87.39
J-845	18.91	508	711.71	88.27
J-846	18.91	515	711.75	85.25
J-847	18.91	508	711.71	88.27
J-848	18.91	515	711.68	85.22
J-85	5.35	582	713.35	56.91
J-850	0	232	409.97	77.12
J-86	6.15	558	713.47	67.36
J-87	6.15	548	713.57	71.74
J-88	6.15	549	713.73	71.38
J-89	6.15	576	714.06	59.82
J-90	24	570	714.27	62.51
PRV-172-IN	0	374	615.83	104.79
PRV-172-OUT	0	374	519.38	62.99
PRV-1-IN	0	498	615.67	50.99
PRV-1-OUT	0	498	615.67	50.99
PRV-237-IN	7.32	245	516.93	117.83
PRV-237-OUT	0	245	341.93	42
PRV-238-IN	0	150	341.9	83.15
PRV-238-OUT	0	150	268.95	51.54
PRV-240-IN	0	369	611.1	104.9
PRV-240-OUT	0	369	517.12	64.18
PRV-248-IN	0	330	504.05	75.41
PRV-248-OUT	0	330	433.85	45
PRV-250-IN	7.32	330	504.06	75.42

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
PRV-250-OUT	7.81	330	433.76	44.96
PRV-258-IN	0	296	503.49	89.91
PRV-258-OUT	0	296	408.91	48.92
PRV-261-IN	0	495	716.93	96.16
PRV-261-OUT	0	495	614.81	51.91
PRV-264-IN	7.99	400	613.2	92.38
PRV-264-OUT	7.32	400	503.52	44.86
PRV-281-IN	0	410	615.53	89.06
PRV-281-OUT	0	410	533.78	53.63
PRV-282-IN	0	460	615.52	67.39
PRV-282-OUT	0	460	533.85	32
PRV-284-IN	0	245	533.78	125.13
PRV-284-OUT	0	245	364.61	51.83
PRV-308-IN	5.35	532	718.51	80.81
PRV-308-OUT	7.99	532	614.63	35.8
PRV-341-IN	0	509	732.56	96.87
PRV-341-OUT	0	509	611.76	44.52
PRV-393-IN	0	475	732.56	111.6
PRV-393-OUT	0	470	611.12	61.15
PRV-400-IN	0	125	409.99	123.49
PRV-400-OUT	0	125	268.95	62.37
PRV-472-IN	0	210	519.35	134.04
PRV-472-OUT	0	210	364.63	67
PRV-483-IN	0	360	613.86	110
PRV-483-OUT	0	360	504.06	62.42
PRV-507-IN	0	361	613.84	109.55
PRV-507-OUT	0	361	504.09	62
PRV-525-IN	7.99	368	612.75	106.05
PRV-525-OUT	7.32	368	504.16	59
PRV-572-IN	0	275	533.77	112.13
PRV-572-OUT	0	275	364.33	38.71
PRV-591-IN	0	485	615.86	56.7
PRV-591-OUT	0	485	519.62	15
PRV-600-IN	0	513	711.64	86.07
PRV-600-OUT	0	513	615.67	44.49
PRV-609-IN	0	534	710.28	76.38
PRV-609-OUT	0	534	710.54	76.49
PRV-635-IN	0	407	611.41	88.57
PRV-635-OUT	0	407	520.09	49
PRV-650-IN	0	409	611.18	87.6
PRV-650-OUT	0	409	517.31	46.93

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
10	9.11	200	516.58	137.18
100	6.66	496	710.01	92.73
102	6.66	500	710.1	91.03
104	6.66	496	709.92	92.69
106	6.66	500	713.1	92.34
108	6.66	530	709.13	77.62
110	6.66	535	709.13	75.45
112	6.66	530	709.13	77.62
114	6.66	525	709.13	79.78
116	6.66	530	709.13	77.62
118	6.66	540	709.13	73.28
12	9.11	190	516.57	141.5
120	6.66	530	709.13	77.62
122	0	482	613	56.76
124	0	485	613.02	55.47
128	0	505	712.58	89.95
130	0	505	712.58	89.95
136	0	250	268.98	8.22
14	9.11	160	516.57	154.5
140	0	250	516.64	115.54
16	9.11	190	516.57	141.5
18	9.11	330	516.76	80.92
20	9.11	390	516.91	54.99
22	9.11	345	504.12	68.95
24	9.11	353	504.1	65.47
26	9.72	135	364.41	99.4
28	9.72	200	364.43	71.25
30	9.95	497	613.45	50.46
32	9.95	500	613.53	49.19
34	9.95	493	613.61	52.26
36	9.95	490	613.69	53.6
38	9.95	485	613.75	55.79
40	9.95	495	613.41	51.31
42	9.95	490	613.34	53.44
44	6.66	534	708.98	75.82
46	6.66	533	708.99	76.26
48	6.66	532	709	76.69
50	0	520	712.93	83.6
52	6.66	597	702.93	45.9
54	6.66	597	702.93	45.9
56	6.66	601	702.93	44.17
58	6.66	597	702.93	45.9
60	6.66	595	702.92	46.76
62	6.66	595	702.92	46.76
64	6.66	595	702.92	46.76
66	6.66	595	702.92	46.76

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
68	23.53	570	713.46	62.16
70	23.53	570	713.45	62.16
72	23.53	580	713.45	57.82
74	23.53	588	713.45	54.36
76	22.21	580	713.45	57.82
78	22.21	588	713.45	54.36
80	9.11	334	502.99	73.22
82	9.72	307	408.91	44.16
84	0	320	502.97	79.28
86	0	312	408.93	42
88	9.11	249	517.42	116.31
90	9.11	249	517.42	116.31
92	0	369	516.7	64
94	0	369	607.47	103.33
96	6.66	510	713.45	88.15
98	6.66	500	710.1	91.04
FCV-121-IN	0	530	702.98	74.95
FCV-399-IN	0	250	409.99	69.32
FCV-399-OUT	0	250	409.99	69.32
FCV-85-IN	0	582	713.41	56.94
FCV-85-OUT	0	582	713.41	56.94
J-102	10	554	712.97	68.88
J-104	18	554	712.97	68.88
J-105	16.55	553	712.38	69.06
J-107	6.15	560	713.22	66.39
J-110	16.55	551	712.38	69.93
J-114	16.55	550	712.38	70.36
J-115	16.55	546	712.38	72.09
J-116	16.55	508	712.16	88.46
J-117	16.55	502	712.16	91.06
J-118	6.15	538	713.11	75.87
J-121	1.74	530	713.04	79.31
J-122	6.15	514	712.97	86.22
J-123	30	527	712.85	80.53
J-124	16.55	529	712.48	79.5
J-125	16.55	530	712.43	79.05
J-134	0	555	713.54	68.69
J-135	0	555	713.54	68.69
J-139	6.66	580	728.7	64.43
J-140	6.66	580	728.53	64.36
J-141	0	580	713.76	57.96
J-142	0	580	713.69	57.93
J-145	9.95	399	608.49	90.77
J-149	6.66	537	709	74.53
J-150	9.72	200	341.9	61.48
J-151	6.15	580	714.22	58.16

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-155	6.66	520	708.99	81.89
J-156	9.11	365	516.61	65.69
J-158	6.66	596	702.93	46.33
J-160	6.66	580	728.83	64.49
J-161	16.55	542	712.46	73.86
J-163	6.66	585	702.99	51.12
J-165	9.95	436	610.58	75.64
J-167	9.11	360	516.64	67.87
J-168	9.11	374	519.38	62.99
J-169	9.95	413	610.46	85.56
J-170	9.95	415	607.93	83.6
J-171	9.11	374	519.26	62.94
J-172	9.95	374	613.51	103.78
J-173	9.11	392.8	519.26	54.8
J-174	9.11	303	519.26	93.71
J-176	9.11	338	519.26	78.54
J-177	9.11	348	519.26	74.21
J-178	9.11	305	519.26	92.84
J-179	9.11	272	519.27	107.14
J-180	9.95	430	607.93	77.1
J-183	6.66	585	702.93	51.1
J-1830	0	340	613.92	118.69
J-1832	0	580	729.13	64.62
J-1834	0	580	729.13	64.62
J-1836	0	582	702.93	52.4
J-1838	0	582	702.93	52.4
J-184	9.95	448	612.89	71.45
J-1842	0	530	702.98	74.95
J-1844	0	582	714	57.2
J-1846	0	582	714	57.2
J-185	9.95	454	612.82	68.82
J-1854	0	513	709.38	85.09
J-1856	0	532	715.57	79.54
J-186	9.95	459	612.85	66.66
J-1860	0	532	715.57	79.54
J-1862	0	315	533.73	94.78
J-1864	0	485	710.04	97.51
J-1866	0	480	710.28	99.78
J-1868	0	571	728.58	68.28
J-187	9.95	462	612.83	65.35
J-1872	0	567	702.98	58.92
J-189	9.95	506	612.84	46.29
J-190	9.72	120	409.99	125.65
J-191	6.66	575	702.98	55.46
J-193	6.66	575	703.01	55.47
J-194	6.66	567	702.98	58.92

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-195	9.11	340	516.64	76.54
J-197	4.97	20	268.9	107.85
J-198	9.95	420	612.18	83.27
J-199	9.95	415	612.18	85.44
J-200	6.66	575	702.93	55.43
J-2000	0	500	702.98	87.95
J-2004	0	522	712.91	82.72
J-2009	0	586	728.33	61.67
J-201	6.66	575	702.93	55.43
J-2010	0	590	728.36	59.95
J-2012	0	574	728.36	66.89
J-2013	0	568	728.36	69.49
J-2014	0	568	728.36	69.49
J-2015	0	578	728.36	65.15
J-2016	0	583	728.36	62.99
J-2019	0	520	714.85	84.43
J-202	6.66	600	702.93	44.6
J-2020	0	433	610.28	76.82
J-2021	0	422	610.26	81.57
J-2022	0	431	610.07	77.59
J-2023	0	582	728.85	63.63
J-2024	0	580	728.38	64.29
J-2025	0	581	728.43	63.88
J-2027	0	584	728.36	62.55
J-203	6.66	580	702.99	53.29
J-2030	0	580	728.36	64.29
J-2031	0	580	728.37	64.29
J-2032	0	411	608.72	85.67
J-2033	0	405	519.52	49.62
J-2034	0	415	608.72	83.94
J-2036	0	15	268.9	110.01
J-2037	0	500	634.06	58.09
J-2038	0	567	634.29	29.15
J-2039	0	500	634.7	58.37
J-204	6.66	575	703.01	55.47
J-2040	0	495	728.61	101.22
J-2041	0	0	728.61	315.71
J-2042	0	575	634.04	25.58
J-2044	0	417	634.5	94.24
J-2045	0	417	634.51	94.25
J-2046	0	417	634.5	94.24
J-2047	0	517	634.6	50.95
J-2048	0	600	634.88	15.11
J-2049	0	500	634.9	58.45
J-205	6.66	575	703	55.46
J-2050	0	575	702.98	55.46

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-2051	0	595	703	46.8
J-2052	0	575	702.98	55.46
J-2053	0	595	703	46.8
J-2054	0	595	703	46.8
J-2055	0	530	712.51	79.08
J-2056	0	535	712.51	76.92
J-2059	0	541	708.99	72.79
J-206	6.66	575	703.34	55.61
J-2060	0	538	709.02	74.1
J-2061	0	538	709.01	74.1
J-2062	0	538	709.02	74.1
J-2063	0	535	707.4	74.7
J-2064	0	534	708.87	75.77
J-2065	6.66	515	702.98	81.45
J-2067	0	540	708.98	73.22
J-2068	0	525	712.75	81.35
J-2069	0	526	712.79	80.94
J-207	6.66	575	703.11	55.51
J-2070	0	577	703.01	54.6
J-2072	0	577	703.01	54.6
J-2073	0	588	703	49.83
J-2074	0	576	703.01	55.03
J-2075	0	577	703.01	54.6
J-2076	0	575	703.33	55.6
J-2077	0	495	713.86	94.83
J-2078	0	495	713.62	94.73
J-2079	0	170	409.98	103.98
J-208	6.66	570	703	57.63
J-2080	0	110	409.98	129.98
J-2081	0	150	409.98	112.65
J-2082	0	187	409.98	96.62
J-2084	0	155	516.57	156.67
J-2085	0	540	708.99	73.22
J-2086	0	112	268.9	67.98
J-2087	0	155	409.98	110.48
J-2088	0	112	516.57	175.3
J-2089	0	112	409.98	129.12
J-209	6.66	593	703	47.66
J-210	6.66	570	703	57.63
J-212	6.66	570	703.02	57.64
J-213	6.66	592	703	48.1
J-215	6.66	570	703.1	57.67
J-216	6.66	570	703.08	57.66
J-217	6.66	575	703.01	55.47
J-218	6.66	575	703.01	55.47
J-219	6.66	595	703	46.8

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-220	6.66	595	703	46.79
J-221	6.66	595	702.99	46.79
J-222	6.66	575	702.98	55.46
J-223	6.66	575	702.98	55.46
J-224	6.66	575	702.99	55.46
J-225	6.66	577	703	54.59
J-226	6.66	577	703.01	54.6
J-227	6.66	577	703.02	54.6
J-228	6.66	578	703.04	54.18
J-229	6.66	577	703.02	54.61
J-23	6.66	582	728.46	63.46
J-230	6.66	577	703.01	54.6
J-231	6.66	577	703	54.59
J-233	6.66	577	703.01	54.6
J-234	6.66	577	703.01	54.6
J-235	4.97	15	268.9	110.01
J-236	4.97	35	268.9	101.35
J-237	9.11	245	516.47	117.63
J-238	9.72	150	341.89	83.15
J-239	4.97	112	268.92	67.99
J-240	9.95	369	607.51	103.34
J-241	9.11	390	516.88	54.98
J-242	9.11	350	516.77	72.26
J-243	9.11	315	517.64	87.8
J-244	9.11	360	518.47	68.66
J-245	9.11	370	518.59	64.39
J-248	9.11	330	504.02	75.4
J-250	9.11	330	504.05	75.41
J-251	9.72	325	433.71	47.1
J-253	9.95	400	611.88	91.81
J-255	6.15	540	713.72	75.27
J-258	9.11	296	503.16	89.76
J-261	6.66	495	714.14	94.95
J-262	9.95	420	611	82.76
J-263	9.95	420	610.98	82.75
J-264	9.95	400	610.97	91.41
J-265	9.11	400	503.2	44.72
J-266	9.95	475	612.99	59.79
J-267	6.66	475	710.6	102.08
J-268	6.66	500	710.34	91.14
J-269	6.66	490	709.92	95.29
J-270	9.95	490	613.43	53.48
J-271	9.95	480	613.37	57.79
J-272	9.95	490	613.38	53.46
J-273	9.95	510	613.36	44.79
J-274	9.95	490	613.34	53.44

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-275	9.95	490	613.31	53.43
J-276	9.95	500	613.36	49.12
J-277	9.95	500	613.37	49.12
J-278	9.95	500	613.38	49.13
J-279	9.95	500	613.37	49.12
J-280	9.95	490	613.34	53.44
J-281	9.11	410	613.23	88.06
J-282	9.95	460	613.22	66.39
J-283	9.72	230	364.18	58.14
J-285	0	445	519.59	32.32
J-286	6.66	530	709.02	77.57
J-287	6.66	534	708.84	75.76
J-288	6.66	590	702.93	48.93
J-289	6.66	590	702.93	48.93
J-29	0	560	714	66.73
J-290	6.66	590	702.93	48.93
J-291	6.66	585	702.93	51.1
J-292	6.66	585	702.93	51.1
J-293	6.66	585	702.93	51.1
J-294	6.66	590	702.93	48.93
J-295	6.66	595	702.96	46.78
J-296	6.28	590	702.98	48.95
J-297	6.28	590	702.98	48.95
J-298	0	615	714.87	43.27
J-299	6.66	597	703.02	45.94
J-30	0	560	714.04	66.75
J-300	6.66	582	728.32	63.4
J-3003	0	485	613.92	55.86
J-3004	0	485	624.46	60.43
J-3005	0	485	615.4	56.5
J-3006	0	485	625.17	60.73
J-3007	0	560	634.01	32.07
J-3008	0	595	632.03	16.04
J-3009	0	15	268.9	110.01
J-301	6.66	580	725.92	63.23
J-3010	0	15	268.9	110.01
J-3011	0	15	268.9	110.01
J-3012	0	560	702.98	61.95
J-3013	6.66	560	702.98	61.95
J-3014	6.66	546	702.98	68.02
J-3015	0	570	702.98	57.62
J-3016	6.66	570	702.98	57.62
J-3017	0	570	702.98	57.62
J-3018	0	546	702.98	68.02
J-3019	6.66	540	702.98	70.62
J-302	6.66	556	721.53	71.72

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-3020	0	510	702.98	83.62
J-3022	0	472	612.7	60.97
J-3023	0	498	612.74	49.72
J-3024	0	507	612.76	45.83
J-3025	0	465	612.82	64.05
J-3026	0	74	268.9	84.45
J-3027	0	73	268.9	84.88
J-3028	9.11	229	516.5	124.57
J-3029	9.11	205	516.5	134.97
J-303	6.66	547	715.61	73.06
J-3030	0	181	516.5	145.37
J-3031	0	183	516.5	144.51
J-3032	4.97	89	268.89	77.95
J-3033	4.97	69	268.89	86.61
J-3034	1.3	47	268.89	96.15
J-3035	0	26	268.89	105.25
J-3036	0	22	268.89	106.98
J-3037	0	9	268.89	112.61
J-3038	0	9	268.89	112.61
J-304	6.66	550	715.14	71.55
J-3040	0	9	268.89	112.61
J-3041	0	9	268.89	112.61
J-3043	0	9	268.89	112.61
J-3044	0	9	268.89	112.61
J-3045	0	9	268.89	112.61
J-3047	0	11	268.89	111.75
J-3048	0	11.25	268.89	111.64
J-3049	0	9.4	268.89	112.44
J-305	6.66	520	714.85	84.43
J-3050	0	9.2	268.89	112.53
J-3051	4.97	10.53	268.89	111.95
J-3052	0	581	703.01	52.86
J-3053	0	516	712.58	85.18
J-3054	0	519	712.58	83.88
J-3055	0	0	712.55	308.75
J-3057	0	0	712.57	308.76
J-3058	0	565	713.45	64.32
J-3059	0	410	519.5	47.44
J-306	6.66	535	715.14	78.06
J-3061	9.11	465	613.51	64.35
J-3062	4.98	9	268.89	112.61
J-3063	0	175	516.57	148
J-3067	0	575	632.22	24.79
J-307	6.66	541	715.54	75.63
J-308	6.66	532	715.57	79.54
J-309	6.66	547	721.49	75.61

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-310	6.66	530	721.49	82.97
J-311	6.66	496	721.49	97.7
J-312	6.66	500	721.49	95.97
J-313	6.66	533	721.21	81.55
J-314	6.66	551	719.94	73.2
J-315	6.66	544	728.48	79.93
J-316	6.66	450	728.48	120.66
J-317	6.66	556	728.63	74.8
J-318	6.66	565	728.67	70.92
J-319	6.66	582	728.85	63.63
J-32	0	567	714.44	63.89
J-320	6.66	575	728.76	66.62
J-321	6.66	580	728.79	64.47
J-322	6.66	578	728.74	65.31
J-323	6.66	578	728.73	65.31
J-324	6.66	555	728.64	75.24
J-325	6.66	556	728.64	74.8
J-326	6.66	542	728.63	80.87
J-327	6.66	582	729.13	63.75
J-328	6.66	433	728.61	128.09
J-329	6.66	471	728.61	111.62
J-33	25	564	714.52	65.22
J-330	6.66	502	728.61	98.19
J-331	6.66	538	728.63	82.6
J-332	6.66	553	728.65	76.11
J-333	6.66	569	728.65	69.18
J-334	6.66	578	728.66	65.28
J-335	6.66	571	728.63	68.3
J-336	6.66	571	728.53	68.26
J-337	6.66	545	728.61	79.56
J-338	6.66	459	728.61	116.82
J-339	6.66	542	728.61	80.86
J-34	170	610	714.93	45.47
J-340	6.66	553	728.61	76.09
J-341	16.84	493	728.61	102.09
J-342	6.66	532	728.6	85.19
J-343	6.66	521	728.6	89.95
J-344	6.66	536	728.6	83.45
J-345	6.66	581	703.13	52.92
J-349	0	555	712.97	68.45
J-35	28	606	714.93	47.2
J-350	0	530	712.88	79.24
J-351	0	540	712.92	74.92
J-352	0	540	712.88	74.91
J-353	0	530	712.87	79.24
J-354	0	530	712.82	79.21

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-355	6.15	490	712.75	96.52
J-356	6.15	540	712.53	74.76
J-357	16.55	520	712.55	83.43
J-358	9.95	420	612.19	83.27
J-359	16.55	500	712.16	91.93
J-36	9	574	714.93	61.06
J-360	16.55	520	712.22	83.29
J-362	0	560	714.13	66.78
J-37	12	594	714.92	52.39
J-377	6.15	610	714.59	45.32
J-38	12	564	714.92	65.39
J-380	16.55	510	712.17	87.6
J-381	16.55	510	712.16	87.6
J-382	23.53	580	713.45	57.82
J-383	23.53	580	713.45	57.82
J-384	23.53	580	713.47	57.83
J-385	23.53	580	713.45	57.82
J-386	23.53	580	713.52	57.85
J-387	23.53	580	713.44	57.82
J-388	23.53	580	713.45	57.82
J-389	6.15	580	713.31	57.76
J-39	41	567	714.91	64.09
J-392	6.15	580	713.25	57.74
J-393	6.66	475	728.6	109.88
J-394	9.95	410	612.02	87.54
J-395	9.95	402	608.61	89.52
J-396	9.95	410	612.16	87.6
J-397	9.95	405	612.16	89.76
J-398	6.66	473	710.64	102.97
J-399	0	250	409.99	69.32
J-400	9.72	125	409.99	123.48
J-401	4.97	119	268.9	64.95
J-402	4.97	112	268.9	67.99
J-403	4.97	108	268.9	69.72
J-404	4.97	98	268.9	74.05
J-405	4.97	96	268.9	74.92
J-406	4.97	52	268.9	93.98
J-407	4.97	63	268.9	89.22
J-408	4.97	83	268.9	80.55
J-409	4.97	15	268.9	110.01
J-410	4.97	48	268.9	95.71
J-411	4.97	71	268.9	85.75
J-412	4.97	71	268.89	85.74
J-413	4.97	113	268.9	67.55
J-414	4.97	92	268.88	76.64
J-415	4.97	96	268.88	74.91

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-416	4.97	111	268.92	68.43
J-417	6.66	500	711.83	91.78
J-418	4.97	105	268.91	71.02
J-419	4.97	109	268.9	69.29
J-420	4.97	121	268.9	64.09
J-421	4.97	147	268.94	52.84
J-423	4.97	37	268.89	100.48
J-424	4.97	42	268.89	98.31
J-425	4.97	118	268.88	65.38
J-426	4.97	80	268.88	81.84
J-427	4.97	135	268.92	58.03
J-428	4.97	128	268.91	61.06
J-429	4.97	120	268.9	64.52
J-430	9.72	200	409.97	90.98
J-431	9.72	248	409.95	70.17
J-433	6.66	500	709.83	90.92
J-434	6.66	500	711.58	91.68
J-435	6.66	485	612.94	55.43
J-436	6.66	496	713.22	94.12
J-437	6.66	489	712.34	96.77
J-438	16.55	543	712.42	73.41
J-439	16.55	534	712.42	77.31
J-440	16.55	534	712.42	77.31
J-441	16.55	490	712.74	96.51
J-442	16.55	499	712.66	92.58
J-443	16.55	499	712.66	92.58
J-444	16.55	502	712.66	91.28
J-445	16.55	516	712.65	85.21
J-446	16.55	508	712.65	88.67
J-447	16.55	508	712.65	88.67
J-448	0	520	712.67	83.48
J-449	16.55	530	712.8	79.21
J-450	16.55	524	712.79	81.8
J-451	16.55	505	712.58	89.94
J-452	16.55	514	712.59	86.05
J-453	16.55	510	712.55	87.76
J-454	16.55	510	712.55	87.76
J-455	16.55	520	712.54	83.43
J-456	16.55	515	712.55	85.6
J-457	16.55	522	712.55	82.56
J-458	16.55	522	712.54	82.56
J-459	16.55	524	712.53	81.69
J-46	0	552	713.86	70.13
J-460	16.55	522	712.28	82.45
J-467	9.95	430	609.96	77.98
J-470	9.72	175	364.62	82.16

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-471	9.72	159	364.62	89.09
J-472	9.11	210	519.21	133.98
J-474	9.11	235	519.22	123.15
J-483	9.95	360	612.03	109.2
J-484	9.11	350	504.04	66.75
J-485	9.95	390	612.02	96.2
J-486	9.95	412	612.11	86.71
J-487	9.95	420	612.12	83.25
J-488	9.95	385	612.03	98.37
J-492	6.66	515	709.13	84.12
J-496	6.66	600	702.93	44.6
J-497	6.66	601	702.93	44.17
J-499	0	580	615.83	15.52
J-500	9.95	441	613.17	74.6
J-501	9.95	441	613.03	74.54
J-502	9.95	451	612.65	70.04
J-503	9.95	466	612.67	63.55
J-504	9.95	401	612.15	91.49
J-505	9.95	403	612.11	90.61
J-506	9.95	385	612.02	98.37
J-507	9.95	361	611.97	108.75
J-508	9.11	339	504.05	71.52
J-509	9.72	320	433.84	49.33
J-510	9.72	178	433.73	110.81
J-511	9.95	400	612.15	91.92
J-512	9.95	416	612.53	85.16
J-513	9.95	498	612.71	49.71
J-514	9.95	487	612.73	54.48
J-515	9.95	471	612.62	61.36
J-516	9.95	412	612.54	86.89
J-517	9.95	421	612.52	82.99
J-518	9.95	417	612.52	84.72
J-519	9.95	395	612.49	94.24
J-52	24	618	714.94	42
J-520	9.95	400	612.39	92.03
J-521	9.95	396	612.02	93.6
J-522	9.95	403	611.81	90.48
J-523	9.95	402	611.71	90.87
J-524	9.95	390	611.81	96.11
J-525	9.95	368	610.34	105.01
J-526	9.11	378	503.8	54.51
J-527	9.11	386	503.61	50.96
J-528	9.11	404	503.31	43.03
J-529	9.11	390	503.21	49.05
J-530	9.11	365	503.16	59.86
J-531	9.11	352	503.13	65.49

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-532	9.11	340	503.11	70.68
J-533	9.11	328	503.11	75.88
J-534	9.11	302	503.11	87.14
J-535	9.11	289	503.11	92.77
J-536	9.11	296	503.1	89.74
J-537	9.11	315	503.15	81.52
J-538	9.11	309	503.16	84.13
J-539	9.72	294	408.9	49.79
J-540	9.72	290	408.89	51.52
J-541	9.72	252	408.89	67.98
J-542	9.72	255	408.88	66.68
J-543	9.72	272	408.88	59.31
J-544	9.72	175	408.87	101.33
J-545	6.66	480	612.95	57.61
J-546	9.95	440	613	74.96
J-547	9.95	420	612.99	83.62
J-548	9.95	375	612.99	103.12
J-549	9.95	460	612.99	66.29
J-55	77	545	714.18	73.31
J-550	9.95	462	612.99	65.42
J-551	9.95	380	612.98	100.95
J-552	9.95	400	612.98	92.29
J-553	9.95	482	613.05	56.78
J-554	9.95	482	613.11	56.81
J-555	9.95	480	613.15	57.69
J-556	9.95	451	613.13	70.25
J-557	9.95	440	613.13	75.02
J-558	9.95	476	613.16	59.43
J-559	9.95	480	613.18	57.71
J-560	9.95	480	613.23	57.73
J-561	9.95	486	613.18	55.11
J-562	9.95	490	613.22	53.39
J-563	9.95	490	613.18	53.37
J-564	9.95	488	613.21	54.25
J-565	9.95	500	613.31	49.1
J-566	9.95	506	613.27	46.48
J-567	9.95	477	613.23	59.03
J-568	9.95	483	613.23	56.43
J-569	9.11	409	533.75	54.05
J-570	9.11	323	533.74	91.31
J-571	9.11	319	533.74	93.05
J-572	9.11	275	533.73	112.11
J-573	9.72	261	364.18	44.71
J-575	9.72	268	364.18	41.67
J-576	9.72	111	364.19	109.71
J-577	9.72	122	364.26	104.97

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-578	9.72	265	364.18	42.98
J-579	9.72	200	364.27	71.18
J-580	9.72	191	364.6	75.22
J-582	9.11	251	533.73	122.51
J-583	9.11	215	519.23	131.82
J-584	9.95	415	613.51	86.01
J-585	9.95	462	613.51	65.65
J-586	9.95	463	613.51	65.22
J-587	9.95	461	613.51	66.08
J-588	9.11	250	519.23	116.66
J-589	9.95	476	613.51	59.58
J-59	6.15	558	713.54	67.39
J-590	9.95	483	613.54	56.56
J-591	9.95	485	613.54	55.7
J-592	9.95	487	613.61	54.86
J-593	9.95	485	613.92	55.86
J-594	9.95	496	613.53	50.92
J-595	9.95	491	613.52	53.09
J-596	9.95	490	613.52	53.52
J-597	9.95	486	613.52	55.26
J-598	9.95	488	613.52	54.39
J-599	6.66	498	613.36	49.99
J-600	6.66	513	709.38	85.09
J-601	6.66	522	709.35	81.18
J-602	6.66	517	709.59	83.45
J-603	6.66	497	709.67	92.15
J-604	6.66	522	709.24	81.13
J-605	6.66	523	709.18	80.67
J-606	6.66	537	709.1	74.57
J-607	6.66	542	709	72.36
J-608	6.66	536	708.95	74.94
J-609	6.66	534	708.36	75.55
J-610	6.66	545	708.94	71.03
J-611	6.66	532	708.98	76.68
J-612	6.66	532	708.98	76.68
J-613	6.66	543	708.99	71.92
J-614	6.66	543	708.99	71.92
J-615	6.66	543	708.99	71.92
J-616	6.66	543	709.02	71.94
J-617	6.66	541	709.02	72.8
J-618	6.66	544	709.06	71.52
J-619	6.66	534	709	75.83
J-62	6.15	601	714.76	49.29
J-620	9.95	470	607.65	59.64
J-621	9.95	418	612.22	84.15
J-622	9.95	410	612.12	87.58

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-623	9.95	380	612.05	100.55
J-624	9.95	412	612.02	86.67
J-625	9.95	399	612.03	92.31
J-626	9.95	394	611.82	94.38
J-627	9.95	396	611.79	93.5
J-628	9.95	399	611.75	92.18
J-629	9.95	398	611.57	92.54
J-630	9.95	392	611.56	95.14
J-631	9.95	434	611.16	76.76
J-632	9.95	438	611.79	75.31
J-633	9.95	439	612.25	75.07
J-634	9.95	425	608.98	79.72
J-635	16.84	420	608.5	81.68
J-636	9.95	407	608.97	87.51
J-637	16.84	407	519.62	48.8
J-638	9.11	385	518.92	58.03
J-639	9.11	355	518.43	70.82
J-640	9.95	395	608.24	92.4
J-641	9.95	396	608.19	91.94
J-642	9.95	481	608.18	55.11
J-643	9.95	471	608.11	59.41
J-644	9.95	490	608.13	51.19
J-645	9.95	451	607.87	67.97
J-646	9.95	467	607.74	60.98
J-647	9.95	470	607.64	59.64
J-648	9.95	470	607.64	59.64
J-649	9.95	461	607.64	63.54
J-650	16.84	409	607.83	86.15
J-651	9.95	415	607.7	83.5
J-652	9.11	396	516.93	52.4
J-653	9.11	364	517.08	66.33
J-654	9.11	344	517.35	75.11
J-655	9.11	292	517.58	97.74
J-656	9.11	280	517.48	102.9
J-657	9.11	232	517.42	123.67
J-658	9.11	372	516.76	62.72
J-659	9.11	369	516.73	64.01
J-660	9.11	337	516.74	77.88
J-661	9.95	375	607.56	100.77
J-662	9.95	385	607.59	96.45
J-663	9.95	395	607.62	92.13
J-664	9.95	405	607.6	87.79
J-665	9.95	415	607.63	83.47
J-666	9.95	425	607.63	79.13
J-667	9.95	435	607.62	74.8
J-668	9.11	355	516.67	70.05

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-669	9.11	360	516.66	67.88
J-670	9.11	342	516.64	75.67
J-671	9.11	365	516.65	65.71
J-672	9.11	370	516.64	63.54
J-673	9.11	370	516.64	63.54
J-674	9.11	245	516.5	117.64
J-677	6.66	601	702.93	44.17
J-678	6.66	599	702.94	45.04
J-68	9	558	713.93	67.56
J-685	6.66	540	708.99	73.22
J-686	9.11	453	533.82	35.02
J-687	9.72	161	364.62	88.23
J-700	9.11	364	519.38	67.33
J-701	6.66	485	709.87	97.44
J-702	6.66	515	709.53	84.29
J-703	6.66	520	709.16	81.96
J-704	6.66	505	709.61	88.66
J-705	6.66	496	709.15	92.36
J-706	6.66	505	709.15	88.46
J-707	6.66	529	709.15	78.06
J-708	6.66	534	709.14	75.89
J-709	6.66	510	709.13	86.28
J-711	6.66	510	709.12	86.28
J-712	9.11	360	516.65	67.88
J-713	9.11	360	516.64	67.87
J-714	9.11	320	516.79	85.27
J-715	9.11	320	516.93	85.33
J-716	9.11	330	517.05	81.05
J-717	9.11	280	517.53	102.92
J-718	6.66	590	703	48.96
J-719	9.11	265	516.66	109.04
J-72	8	557	713.82	67.95
J-720	6.66	600	703	44.63
J-721	6.66	495	612.82	51.05
J-722	6.66	590	703	48.96
J-723	6.66	595	703	46.8
J-724	6.66	595	703	46.8
J-726	6.66	590	703	48.96
J-727	9.11	350	516.71	72.24
J-728	9.11	350	504.05	66.75
J-74	8	569	713.72	62.71
J-78	24	577	714.47	59.57
J-79	15	570	713.67	62.25
J-802	0	490	613.18	53.37
J-803	6.66	541	708.98	72.79
J-804	0	582	714	57.2

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-806	0	192	409.24	94.13
J-808	0	178	409.24	100.19
J-810	0	225	409.24	79.83
J-812	0	340	409.24	30
J-814	0	340	613.92	118.69
J-815	6.66	500	709.48	90.77
J-816	6.66	495	709.42	92.91
J-818	0	314	517.79	88.3
J-820	0	300	517.57	94.27
J-822	0	578	615.64	16.31
J-824	0	340	409.24	30
J-826	16.55	543	712.39	73.4
J-827	16.55	541	712.35	74.25
J-828	16.55	529	712.34	79.44
J-829	16.55	520	712.34	83.34
J-830	16.55	534	712.34	77.28
J-831	16.55	532	712.34	78.14
J-832	16.55	530	712.33	79.01
J-833	16.55	528	712.33	79.87
J-834	16.55	528	712.34	79.87
J-842	16.55	512	712.18	86.74
J-843	16.55	510	712.18	87.61
J-845	16.55	508	712.2	88.48
J-846	16.55	515	712.23	85.46
J-847	16.55	508	712.2	88.48
J-848	16.55	515	712.18	85.44
J-85	6.66	582	713.41	56.94
J-850	0	232	409.96	77.11
J-86	6.15	558	713.52	67.39
J-87	6.15	548	713.63	71.77
J-88	6.15	549	713.79	71.4
J-89	6.15	576	714.12	59.85
J-90	24	570	714.33	62.54
PRV-172-IN	0	374	613.51	103.78
PRV-172-OUT	0	374	519.26	62.94
PRV-1-IN	0	498	613.36	49.99
PRV-1-OUT	0	498	613.36	49.99
PRV-237-IN	9.11	245	516.47	117.63
PRV-237-OUT	0	245	341.93	42
PRV-238-IN	0	150	341.89	83.15
PRV-238-OUT	0	150	268.9	51.52
PRV-240-IN	0	369	607.51	103.34
PRV-240-OUT	0	369	516.73	64.01
PRV-248-IN	0	330	504.02	75.4
PRV-248-OUT	0	330	433.85	45
PRV-250-IN	9.11	330	504.05	75.41

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
PRV-250-OUT	9.72	330	433.71	44.94
PRV-258-IN	0	296	503.16	89.76
PRV-258-OUT	0	296	408.9	48.92
PRV-261-IN	0	495	714.14	94.95
PRV-261-OUT	0	495	612.82	51.05
PRV-264-IN	9.95	400	610.97	91.41
PRV-264-OUT	9.11	400	503.2	44.72
PRV-281-IN	0	410	613.23	88.06
PRV-281-OUT	0	410	533.75	53.62
PRV-282-IN	0	460	613.22	66.39
PRV-282-OUT	0	460	533.85	32
PRV-284-IN	0	245	533.74	125.11
PRV-284-OUT	0	245	364.6	51.82
PRV-308-IN	6.66	532	715.57	79.54
PRV-308-OUT	9.95	532	612.73	34.98
PRV-341-IN	0	509	728.61	95.16
PRV-341-OUT	0	509	608.97	43.32
PRV-393-IN	0	475	728.6	109.88
PRV-393-OUT	0	470	607.65	59.64
PRV-400-IN	0	125	409.99	123.48
PRV-400-OUT	0	125	268.9	62.35
PRV-472-IN	0	210	519.21	133.98
PRV-472-OUT	0	210	364.63	67
PRV-483-IN	0	360	612.03	109.2
PRV-483-OUT	0	360	504.04	62.41
PRV-507-IN	0	361	611.97	108.75
PRV-507-OUT	0	361	504.09	62
PRV-525-IN	9.95	368	610.34	105.01
PRV-525-OUT	9.11	368	504.16	59
PRV-572-IN	0	275	533.73	112.11
PRV-572-OUT	0	275	364.18	38.64
PRV-591-IN	0	485	613.54	55.7
PRV-591-OUT	0	485	519.62	15
PRV-600-IN	0	513	709.38	85.09
PRV-600-OUT	0	513	613.36	43.49
PRV-609-IN	0	534	708.36	75.55
PRV-609-OUT	0	534	708.55	75.63
PRV-635-IN	0	407	608.5	87.31
PRV-635-OUT	0	407	520.09	49
PRV-650-IN	0	409	607.83	86.15
PRV-650-OUT	0	409	516.92	46.76

## **APPENDIX J**

### **FIRE FLOW MODELING RESULTS**

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
10	1,004.56	J-2038	29.35	634.73		3,198.59	J-156	-5.31	352.74	2,614.33	2,614.33
100	1,003.33	J-2038	29.35	634.74		7,011.55	100	20	542.16	6,967.37	6,967.37
102	1,003.33	J-2038	29.35	634.74		3,322.27	102	20	546.16	3,322.27	3,322.27
104	1,003.33	J-2038	29.35	634.74		6,173.04	104	20	542.16	6,173.05	6,173.05
106	1,003.33	J-2038	29.35	634.74		8,416.26	J-304	1.97	554.55	6,623.53	6,623.53
108	1,003.33	J-2038	29.35	634.74		6,719.71	118	17.07	579.4	6,493.02	6,493.02
110	1,003.33	J-2038	29.35	634.74		6,314.02	118	19.65	585.36	6,189.15	6,189.15
112	1,003.33	J-2038	29.35	634.74		6,177.50	118	17.26	579.84	5,770.47	5,770.47
114	1,003.33	J-2038	29.35	634.74		4,548.35	114	20	571.16	4,548.35	4,548.35
116	1,003.33	J-2038	29.35	634.74		6,243.84	118	16.25	577.5	5,720.45	5,720.45
118	1,003.33	J-2038	29.35	634.74		4,328.27	118	20	586.16	4,328.27	4,328.27
12	1,004.56	J-2038	29.35	634.73		2,883.78	J-156	8.99	385.75	2,614.33	2,614.33
120	1,003.33	J-2038	29.35	634.74		6,851.67	118	17.2	579.7	6,630.82	6,630.82
122	1,000.00	J-2038	29.3	634.61		2,944.48	122	20	528.16	2,944.48	2,944.48
124	1,000.00	J-2038	29.3	634.61		3,281.45	124	20	531.16	3,281.45	3,281.45
128	1,000.00	J-2038	29.35	634.74		5,184.77	128	20	551.16	5,184.77	5,184.77
130	1,000.00	J-2038	29.35	634.74		6,226.40	128	20	551.16	6,226.41	6,226.41
14	1,004.56	J-2038	29.35	634.73		2,824.99	J-156	11.5	391.55	2,614.33	2,614.33
140	1,000.00	J-2038	29.35	634.73		3,398.16	J-713	-1.48	356.58	2,874.25	2,874.25
16	1,004.56	J-2038	29.35	634.73		2,189.66	16	20	236.16	2,189.67	2,189.67
18	1,004.56	J-2038	29.35	634.73		4,252.00	J-648	4.84	481.17	3,362.05	3,362.05
20	1,004.56	J-2038	29.35	634.73		4,068.94	J-648	10.5	494.23	3,427.14	3,427.14
22	1,004.56	J-2038	29.35	634.73		3,996.83	22	20	391.16	3,996.82	3,996.82
24	1,004.56	J-2038	29.35	634.73		3,753.61	24	20	399.16	3,753.60	3,753.60
26	1,004.86	J-2038	29.3	634.61		3,900.18	J-575	16.74	306.64	3,587.17	3,587.17
28	1,004.86	J-2038	29.3	634.61		4,041.74	J-575	18.54	310.79	3,886.42	3,886.42
30	1,004.98	J-2038	29.3	634.61		6,730.46	J-273	19.46	554.9	6,685.47	6,685.47
32	1,004.98	J-2038	29.3	634.61		6,683.81	32	20	546.16	6,683.82	6,683.82
34	1,004.98	J-2038	29.3	634.61		6,686.96	34	20	539.16	6,686.97	6,686.97
36	1,004.98	J-2038	29.3	634.61		6,793.72	J-273	19.12	554.12	6,721.05	6,721.05
38	1,004.98	J-2038	29.3	634.61		7,085.09	J-273	15.42	545.58	6,721.79	6,721.79
40	1,004.98	J-2038	29.3	634.61		6,353.05	40	20	541.16	6,353.06	6,353.06
42	1,004.98	J-2038	29.3	634.61		5,883.33	42	20	536.16	5,883.35	5,883.35
44	1,003.33	J-2038	29.35	634.74		5,310.86	44	20	580.16	5,310.87	5,310.87
46	1,003.33	J-2038	29.35	634.74		5,273.10	46	20	579.16	5,273.11	5,273.11
48	1,003.33	J-2038	29.35	634.74		6,632.33	48	20	578.16	6,632.34	6,632.34
50	1,000.00	J-2038	29.35	634.74		10,404.36	J-105	14.42	586.28	9,788.17	9,788.17
52	1,003.33	J-2038	29.35	634.74		3,437.11	52	20	643.16	3,437.12	3,437.12
54	1,003.33	J-2038	29.35	634.74		3,610.54	54	20	643.16	3,610.54	3,610.54
56	1,003.33	J-2038	29.35	634.74		3,450.54	56	20	647.16	3,450.55	3,450.55
58	1,003.33	J-2038	29.35	634.74		3,649.27	58	20	643.16	3,649.27	3,649.27
60	1,003.33	J-2038	29.35	634.74		2,912.81	66	20	641.16	2,912.79	2,912.79
62	1,003.33	J-2038	29.35	634.74		2,568.29	66	20	641.16	2,568.29	2,568.29

64	1,003.33	J-2038	29.35	634.74		2,330.33	66	20	641.16	2,330.33	2,330.33
66	1,003.33	J-2038	29.35	634.74		2,127.13	66	20	641.16	2,127.14	2,127.14
68	1,011.78	J-2038	29.35	634.74		8,785.00	74	16.36	625.76	8,303.53	8,303.53
70	1,011.78	J-2038	29.35	634.74		8,522.71	74	16.57	626.24	8,081.08	8,081.08
72	1,011.78	J-2038	29.35	634.74		7,557.01	72	20	626.16	7,557.02	7,557.02
74	1,011.78	J-2038	29.35	634.74		7,608.47	74	20	634.16	7,608.49	7,608.49
76	1,011.11	J-2038	29.35	634.74		6,462.06	76	20	626.16	6,462.07	6,462.07
78	1,011.11	J-2038	29.35	634.74		7,218.90	78	20	634.16	7,218.91	7,218.91
80	1,004.56	J-2038	29.35	634.73		2,001.37	80	20	380.16	2,001.37	2,001.37
82	1,004.86	J-2038	29.35	634.73		2,088.81	86	19.5	357.01	2,079.80	2,079.80
84	1,000.00	J-2038	29.35	634.73		2,053.54	80	17.25	373.81	1,996.82	1,996.82
86	1,000.00	J-2038	29.35	634.73		460,251.91	86	20.45	359.21	2,056.12	2,056.12
88	1,004.56	J-2038	29.35	634.73		1,508.93	88	20	295.16	1,508.93	1,508.93
90	1,004.56	J-2038	29.35	634.73		1,565.42	88	20	295.16	1,565.41	1,565.41
92	1,000.00	J-2038	29.35	634.73		4,079.53	J-648	8.23	488.98	3,270.86	3,270.86
94	1,000.00	J-2038	29.35	634.73		2,136.75	94	20	415.16	2,136.75	2,136.75
96	1,003.33	J-2038	29.35	634.74		7,433.97	J-304	11.84	577.33	6,457.76	6,457.76
98	1,003.33	J-2038	29.35	634.74		7,010.11	102	20	546.16	6,948.06	6,948.06
FCV-121-IN	1,000.00	J-2038	29.35	634.74		5,123.42	J-3017	5.76	583.29	4,063.52	4,063.52
FCV-85-IN	1,000.00	J-2038	29.35	634.74		8,528.24	FCV-85-OUT	20	628.16	8,528.26	8,528.26
FCV-85-OUT	1,000.00	J-2038	29.35	634.74		1,002.12	J-2038	29.35	634.74		
J-102	1,010.00	J-2038	29.35	634.74		9,464.56	J-349	19.66	600.38	9,427.64	9,427.64
J-104	1,018.00	J-2038	29.35	634.74		9,459.26	J-349	19.57	600.18	9,412.64	9,412.64
J-105	1,008.28	J-2038	29.35	634.74		5,153.15	J-105	20	599.16	5,153.15	5,153.15
J-107	1,006.15	J-2038	29.35	634.74		8,817.89	J-392	13.52	611.2	8,068.75	8,068.75
J-110	1,008.28	J-2038	29.35	634.74		5,731.67	J-105	19.59	598.2	5,704.69	5,704.69
J-114	1,008.28	J-2038	29.35	634.74		5,949.88	J-105	19.26	597.45	5,900.11	5,900.11
J-115	1,008.28	J-2038	29.35	634.74		6,282.99	J-105	17.58	593.56	6,114.97	6,114.97
J-116	1,008.28	J-2038	29.35	634.74		2,241.29	J-116	20	554.16	2,241.29	2,241.29
J-117	1,008.28	J-2038	29.35	634.74		2,356.10	J-117	20	548.16	2,356.10	2,356.10
J-118	1,006.15	J-2038	29.35	634.74		9,563.76	J-392	13.1	610.23	8,702.40	8,702.40
J-121	1,001.74	J-2038	29.35	634.74		9,857.51	J-392	14.32	613.04	9,108.44	9,108.44
J-122	1,006.15	J-2038	29.35	634.74		10,547.03	J-392	13.08	610.18	9,590.77	9,590.77
J-123	1,030.00	J-2038	29.35	634.74		10,424.54	J-105	9.11	574.02	9,311.45	9,311.45
J-124	1,008.28	J-2038	29.35	634.74		8,242.94	J-105	13.35	583.81	7,670.00	7,670.00
J-125	1,008.28	J-2038	29.35	634.74		7,903.89	J-105	14.57	586.61	7,447.19	7,447.19
J-134	1,000.00	J-2038	29.35	634.74		10,805.70	J-59	18.7	601.16	10,642.32	10,642.32
J-135	1,000.00	J-2038	29.35	634.74		10,544.31	J-135	20	601.16	10,544.34	10,544.34
J-139	1,003.33	J-2038	29.35	634.74		4,094.44	J-139	20	626.16	4,094.44	4,094.44
J-140	1,003.33	J-2038	29.35	634.74		4,147.25	J-2010	19.52	635.06	4,125.58	4,125.58
J-141	1,000.00	J-2038	29.35	634.74		8,657.97	J-141	20	626.16	8,657.99	8,657.99
J-142	1,000.00	J-2038	29.35	634.74		8,654.22	J-142	20	626.16	8,654.24	8,654.24
J-145	1,004.98	J-2038	29.35	634.73		5,857.00	J-644	0.46	491.05	4,677.98	4,677.98
J-149	1,003.33	J-2038	29.35	634.74		5,449.66	J-149	20	583.16	5,449.67	5,449.67
J-150	1,004.86	J-2038	29.35	634.73		1,423.85	J-150	20	246.16	1,423.85	1,423.85

J-151	1,006.15	J-2038	29.35	634.74		8,925.28	J-151	20	626.16	8,925.30	8,925.30
J-155	1,003.33	J-2038	29.35	634.74		8,859.83	J-610	14.38	578.18	7,997.21	7,997.21
J-156	1,004.56	J-2038	29.35	634.73		2,614.33	J-156	20	411.16	2,614.33	2,614.33
J-158	1,003.33	J-2038	29.35	634.74		3,492.87	J-496	18.37	642.4	3,284.62	3,284.62
J-160	1,003.33	J-2038	29.35	634.74		4,215.40	J-2010	18.65	633.03	4,154.80	4,154.80
J-161	1,008.28	J-2038	29.35	634.74		7,184.57	J-161	20	588.16	7,184.57	7,184.57
J-163	1,003.33	J-2038	29.35	634.74		9,518.90	J-163	20	631.16	9,518.95	9,518.95
J-165	1,004.98	J-2038	29.35	634.73		8,536.55	PRV-341-OU	-3.7	500.46	6,416.83	6,416.83
J-167	1,004.56	J-2038	29.35	634.73		3,483.61	J-648	17.81	511.11	3,275.42	3,275.42
J-168	1,004.56	J-2038	29.3	634.61		3,657.18	J-168	20	420.16	3,657.18	3,657.18
J-169	1,004.98	J-2038	29.35	634.73		6,596.02	PRV-341-OU	17.41	549.18	6,329.92	6,329.92
J-170	1,004.98	J-2038	29.35	634.73		3,777.21	J-644	4.1	499.45	2,788.16	2,788.16
J-171	1,004.56	J-2038	29.33	634.69		5,937.45	J-173	16.08	429.9	5,701.57	5,701.57
J-172	1,004.98	J-2038	29.3	634.61		6,197.77	J-585	5.11	473.79	5,494.87	5,494.87
J-173	1,004.56	J-2038	29.33	634.69		4,804.17	J-173	20	438.96	4,804.17	4,804.17
J-174	1,004.56	J-2038	29.3	634.61		7,070.27	J-173	-12.73	363.41	6,029.06	6,029.06
J-176	1,004.56	J-2038	29.3	634.61		6,632.14	J-173	2.82	399.3	6,058.15	6,058.15
J-177	1,004.56	J-2038	29.3	634.61		4,521.23	J-177	20	394.16	4,521.23	4,521.23
J-178	1,004.56	J-2038	29.3	634.61		7,148.99	J-173	-13.48	361.69	6,080.76	6,080.76
J-179	1,004.56	J-2038	29.3	634.61		8,851.47	J-173	-21.63	342.88	6,353.88	6,353.88
J-180	1,004.98	J-2038	29.35	634.73		3,503.74	J-644	5.76	503.28	2,650.10	2,650.10
J-183	1,003.33	J-2038	29.35	634.74		4,138.81	56	18.31	643.25	3,875.18	3,875.18
J-1830	1,000.00	J-2038	29.3	634.61		6,192.51	J-1830	20	386.16	6,192.40	6,192.40
J-1832	1,000.00	J-2038	29.35	634.74		4,315.02	J-2010	16.51	628.09	4,162.81	4,162.81
J-1834	1,000.00	J-2038	29.35	634.74		4,335.59	J-2010	16.01	626.95	4,162.82	4,162.82
J-1836	1,000.00	J-2038	29.35	634.74		3,657.93	J-1836	20	628.16	3,657.93	3,657.93
J-184	1,004.98	J-2038	29.35	634.73		13,549.23	J-189	-2.84	499.45	9,912.01	9,912.01
J-1842	1,000.00	J-2038	29.35	634.74		5,537.79	J-3016	2.67	576.16	4,222.66	4,222.66
J-1844	1,000.00	J-2038	29.35	634.74		5,181.50	J-1844	20	628.16	5,181.50	5,181.50
J-1846	1,000.00	J-2038	29.35	634.74		2,951.86	J-1846	20	628.16	2,951.86	2,951.86
J-185	1,004.98	J-2038	29.35	634.73		12,736.99	J-189	1.16	508.67	9,654.69	9,654.69
J-1854	1,000.00	J-2038	29.35	634.74		8,106.41	J-618	17.43	584.24	7,719.26	7,719.26
J-1856	1,000.00	J-2038	29.35	634.74		4,039.29	J-1856	20	578.16	4,039.30	4,039.30
J-186	1,004.98	J-2038	29.35	634.73		11,751.77	J-189	2.13	510.92	8,631.66	8,631.66
J-1860	1,000.00	J-2038	29.35	634.74		1,504.24	J-1860	20	578.16	1,504.24	1,504.24
J-1862	1,000.00	J-2038	29.3	634.61		1,278.58	J-1862	20	361.16	1,278.58	1,278.58
J-1864	1,000.00	J-2038	29.35	634.74		10,077.97	J-618	8.62	563.89	8,545.26	8,545.26
J-1866	1,000.00	J-2038	29.35	634.74		10,250.19	J-618	7.26	560.77	8,598.34	8,598.34
J-1868	1,000.00	J-2038	29.35	634.74		3,443.77	J-1868	20	617.16	3,443.76	3,443.76
J-187	1,004.98	J-2038	29.35	634.73		11,852.36	J-189	3.18	513.35	8,940.45	8,940.45
J-1872	1,000.00	J-2038	29.35	634.74		5,086.44	J-191	19.11	619.11	4,989.40	4,989.40
J-189	1,004.98	J-2038	29.35	634.73		4,068.52	J-189	20	552.16	4,068.53	4,068.53
J-190	1,004.86	J-2038	29.35	634.74		4,910.84	J-431	-35.47	166.15		
J-191	1,003.33	J-2038	29.35	634.74		4,845.46	J-191	20	621.16	4,845.46	4,845.46
J-193	1,003.33	J-2038	29.35	634.74		8,722.99	J-193	20	621.16	8,723.02	8,723.02
J-194	1,003.33	J-2038	29.35	634.74		5,138.64	J-194	20	613.16	5,138.65	5,138.65
J-195	1,004.56	J-2038	29.35	634.73		2,095.18	J-195	20	386.16	2,095.18	2,095.18

J-197	1,002.49	J-2038	29.35	634.74		6,879.88	J-410	13.84	79.95	6,594.70	6,594.70
J-198	1,004.98	J-2038	29.35	634.73		5,821.48	J-198	20	466.16	5,821.49	5,821.49
J-199	1,004.98	J-2038	29.35	634.73		5,328.21	J-199	20	461.16	5,328.21	5,328.21
J-200	1,003.33	J-2038	29.35	634.74		5,294.87	56	9.81	623.64	3,875.18	3,875.18
J-2000	1,000.00	J-2038	29.35	634.74		4,725.88	J-3017	3.72	578.59	3,650.93	3,650.93
J-2004	1,000.00	J-2038	29.35	634.74		10,391.04	J-105	12.98	582.96	9,633.15	9,633.15
J-2009	1,000.00	J-2038	29.35	634.74		4,219.60	J-2010	18.35	632.35	4,146.10	4,146.10
J-201	1,003.33	J-2038	29.35	634.74		4,404.79	J-677	9.61	623.18	3,211.58	3,211.58
J-2010	1,000.00	J-2038	29.35	634.74		4,067.36	J-2010	20	636.16	4,067.39	4,067.39
J-2012	1,000.00	J-2038	29.35	634.74		4,207.58	J-2010	16.85	628.89	4,068.74	4,068.73
J-2013	1,000.00	J-2038	29.35	634.74		4,289.63	J-2010	14.88	624.35	4,069.05	4,069.05
J-2014	1,000.00	J-2038	29.35	634.74		4,279.82	J-2010	15.14	624.94	4,069.68	4,069.68
J-2015	1,000.00	J-2038	29.35	634.74		4,119.97	J-2016	18.44	625.56	4,053.97	4,053.97
J-2016	1,000.00	J-2038	29.35	634.74		4,038.98	J-2016	20	629.16	4,038.98	4,038.98
J-2019	1,000.00	J-2038	29.35	634.74		6,186.70	J-304	15.25	585.2	5,604.16	5,604.16
J-202	1,003.33	J-2038	29.35	634.74		3,080.75	J-497	19.86	646.84	3,063.27	3,063.27
J-2020	1,000.00	J-2038	29.35	634.73		8,198.41	PRV-341-OU	-4.72	498.11	6,098.04	6,098.04
J-2021	1,000.00	J-2038	29.35	634.73		5,899.28	J-2021	20	468.16	5,898.77	5,898.77
J-2022	1,000.00	J-2038	29.35	634.73		8,075.57	PRV-341-OU	-6.75	493.42	5,888.45	5,888.45
J-2023	1,000.00	J-2038	29.35	634.74		4,180.91	J-2010	19.4	634.77	4,153.73	4,153.73
J-2024	1,000.00	J-2038	29.35	634.74		4,249.84	J-2010	16.35	627.72	4,089.97	4,089.97
J-2025	1,000.00	J-2038	29.35	634.74		4,171.58	J-2010	18.53	632.76	4,105.61	4,105.61
J-2027	1,000.00	J-2038	29.35	634.74		4,199.67	J-2010	17.4	630.16	4,084.55	4,084.55
J-203	1,003.33	J-2038	29.35	634.74		8,674.25	J-203	20	626.16	8,674.28	8,674.28
J-2030	1,000.00	J-2038	29.35	634.74		4,134.39	J-2010	18.59	632.89	4,070.76	4,070.76
J-2031	1,000.00	J-2038	29.35	634.74		3,589.27	J-2031	20	626.16	3,589.26	3,589.26
J-2032	1,000.00	J-2038	29.35	634.73		5,924.03	PRV-341-OU	9.35	530.58	5,075.51	5,075.51
J-2033	1,000.00	J-2038	29.35	634.73		3,602.24	J-2033	20	451.16	3,601.43	3,601.43
J-2034	1,000.00	J-2038	29.35	634.73		6,838.10	PRV-341-OU	-4.05	499.66	5,075.51	5,075.51
J-2036	1,000.00	J-2038	29.35	634.74		6,292.78	J-2036	20	61.16	6,292.79	6,292.79
J-2037	1,000.00	J-2038	29.19	634.38	15,971.23	28,413.03	J-2038	3.92	576.05	15,970.82	15,970.82
J-2038	1,000.00	J-2038	29.02	633.97	6,994.35	6,994.35	J-2038	20	613.16	6,994.40	6,994.35
J-2039	1,000.00	J-2038	29.2	634.39	12,530.80	18,681.45	J-2038	10.21	590.57	12,531.43	12,530.80
J-204	1,003.33	J-2038	29.35	634.74		4,167.84	J-204	20	621.16	4,167.85	4,167.85
J-2040	1,000.00	J-2038	29.35	634.74		4,115.54	J-337	14.31	578.02	3,936.61	3,936.61
J-2041	1,000.00	J-2038	29.35	634.74		8,768.26	J-337	-206.77	67.8	3,375.05	3,375.05
J-2044	1,000.00	J-2038	29.11	634.18	8,869.45	21,978.75	J-2038	-18.6	524.08	8,869.62	8,869.45
J-2045	1,000.00	J-2038	29.11	634.18	8,912.33	22,012.61	J-2038	-18.31	524.74	8,912.51	8,912.33
J-2046	1,000.00	J-2038	29.11	634.18	8,897.94	22,001.14	J-2038	-18.41	524.52	8,898.12	8,897.94
J-2047	1,000.00	J-2038	29.15	634.27	10,137.55	14,467.26	J-2038	11.65	593.88	10,137.86	10,137.55
J-2048	1,000.00	J-2038	29.35	634.73	91,369.10	-65,740.25	J-824	30	409.24		91,369.10
J-2049	1,000.00	J-2038	29.35	634.74		221,438.27	J-2049	20.11	546.4	221,766.94	221,766.94
J-205	1,003.33	J-2038	29.35	634.74		16,101.46	J-720	15	634.63	13,607.23	13,607.23
J-2050	1,000.00	J-2038	29.35	634.74		5,784.85	J-2050	20	621.16	5,784.86	5,784.86
J-2051	1,000.00	J-2038	29.35	634.74		9,020.16	J-2051	20	641.16	9,020.21	9,020.21
J-2052	1,000.00	J-2038	29.35	634.74		5,669.56	J-2052	20	621.16	5,669.57	5,669.57
J-2053	1,000.00	J-2038	29.35	634.74		12,012.77	J-2053	20	641.16	12,012.90	12,012.90

J-2054	1,000.00	J-2038	29.35	634.74		10,301.36	J-2054	20	641.16	10,301.44	10,301.44
J-2055	1,000.00	J-2038	29.35	634.74		8,452.67	J-105	12.88	582.72	7,827.10	7,827.10
J-2056	1,000.00	J-2038	29.35	634.74		3,610.62	J-2056	20	581.16	3,610.62	3,610.62
J-2059	1,000.00	J-2038	29.35	634.74		6,704.91	J-2059	20	587.16	6,704.92	6,704.92
J-206	1,003.33	J-2038	29.35	634.74		15,044.16	J-206	20	621.16	15,044.29	15,044.29
J-2060	1,000.00	J-2038	29.35	634.74		5,163.07	J-2062	20	584.16	5,162.76	5,162.76
J-2061	1,000.00	J-2038	29.35	634.74		5,024.18	J-2061	20	584.16	5,024.18	5,024.18
J-2062	1,000.00	J-2038	29.35	634.74		4,152.54	J-2062	20	584.16	4,152.54	4,152.54
J-2063	1,000.00	J-2038	29.35	634.74		7,999.20	J-2063	20	581.16	8,058.39	8,058.39
J-2064	1,000.00	J-2038	29.35	634.74		8,284.13	J-610	17.74	585.95	7,862.63	7,862.63
J-2065	1,003.33	J-2038	29.35	634.74		4,811.05	J-3017	4.4	580.16	3,749.84	3,749.84
J-2067	1,000.00	J-2038	29.35	634.74		5,549.11	J-2067	20	586.16	5,549.11	5,549.11
J-2068	1,000.00	J-2038	29.35	634.74		9,838.02	J-105	9.25	574.35	8,793.76	8,793.76
J-2069	1,000.00	J-2038	29.35	634.74		3,396.39	J-2069	20	572.16	3,396.39	3,396.39
J-207	1,003.33	J-2038	29.35	634.74		18,983.03	J-207	20	621.16	18,983.33	18,983.33
J-2070	1,000.00	J-2038	29.35	634.74		8,997.77	J-2070	20	623.16	8,997.81	8,997.81
J-2072	1,000.00	J-2038	29.35	634.74		9,213.94	J-2072	20	623.16	9,213.97	9,213.97
J-2073	1,000.00	J-2038	29.35	634.74		9,071.87	J-2073	20	634.16	9,071.91	9,071.91
J-2074	1,000.00	J-2038	29.35	634.74		6,031.71	J-2074	20	622.16	6,031.72	6,031.72
J-2075	1,000.00	J-2038	29.35	634.74		7,123.80	J-2075	20	623.16	7,123.82	7,123.82
J-2076	1,000.00	J-2038	29.35	634.74		7,317.28	J-2076	20	621.16	7,317.30	7,317.30
J-2077	1,000.00	J-2038	29.35	634.74		8,352.52	J-304	-1.33	546.93	6,129.15	6,129.15
J-2078	1,000.00	J-2038	29.35	634.74		8,438.09	J-304	-0.89	547.94	6,282.47	6,282.47
J-2079	1,000.00	J-2038	29.35	634.74		2,292.28	J-431	-13.8	216.15		
J-208	1,003.33	J-2038	29.35	634.74		87,966.04	56	6.66	616.37	61,073.89	61,073.89
J-2080	1,000.00	J-2038	29.35	634.74		3,933.36	J-431	-33.41	170.88		
J-2081	1,000.00	J-2038	29.35	634.74		2,946.25	J-431	-19.82	202.27		
J-2082	1,000.00	J-2038	29.35	634.74		1,480.55	J-431	10.37	271.92		
J-2084	1,000.00	J-2038	29.35	634.73		2,598.57	J-2084	20	201.16	2,598.57	2,598.57
J-2085	1,000.00	J-2038	29.35	634.74		4,764.85	J-2085	20	586.16	4,764.85	4,764.85
J-2086	1,000.00	J-2038	29.35	634.74		6,910.52	J-401	18.72	162.2	6,809.82	6,809.82
J-2087	1,000.00	J-2038	29.35	634.74		2,364.86	J-431	-5.46	235.4		
J-2088	1,000.00	J-2038	29.35	634.73		2,561.23	J-2088	20	158.16	2,561.23	2,561.23
J-2089	1,000.00	J-2038	29.35	634.74		2,846.03	J-431	-10.12	224.66		
J-209	1,003.33	J-2038	29.35	634.74		17,296.19	J-209	20	639.16	17,296.55	17,296.55
J-210	1,003.33	J-2038	29.35	634.74		14,633.59	J-210	20	616.16	14,633.72	14,633.72
J-212	1,003.33	J-2038	29.35	634.74		14,616.89	J-299	17.88	638.27	13,638.90	13,638.90
J-213	1,003.33	J-2038	29.35	634.74		20,667.15	J-213	20	638.16	20,667.73	20,667.73
J-215	1,003.33	J-2038	29.35	634.74		9,751.97	J-215	20	616.16	9,752.01	9,752.01
J-216	1,003.33	J-2038	29.35	634.74		9,134.84	J-216	20	616.16	9,134.88	9,134.88
J-217	1,003.33	J-2038	29.35	634.74		3,851.56	J-217	20	621.16	3,851.56	3,851.56
J-218	1,003.33	J-2038	29.35	634.74		12,217.04	J-299	17.23	636.77	11,167.37	11,167.37
J-219	1,003.33	J-2038	29.35	634.74		9,013.06	J-219	20	641.16	9,013.11	9,013.11
J-220	1,003.33	J-2038	29.35	634.74		7,701.91	J-220	20	641.16	7,701.94	7,701.94
J-221	1,003.33	J-2038	29.35	634.74		7,474.21	J-221	20	641.16	7,474.24	7,474.24
J-222	1,003.33	J-2038	29.35	634.74		5,727.92	J-222	20	621.16	5,727.93	5,727.93
J-223	3,003.33	J-2038	29.35	634.74		5,097.85	J-223	20	621.16	5,097.85	5,097.85

J-224	1,003.33	J-2038	29.35	634.74		5,180.41	J-224	20	621.16	5,180.42	5,180.42
J-225	1,003.33	J-2038	29.35	634.74		5,414.56	J-225	20	623.16	5,414.57	5,414.57
J-226	1,003.33	J-2038	29.35	634.74		10,799.68	J-219	16.96	634.14	9,829.79	9,829.79
J-227	1,003.33	J-2038	29.35	634.74		8,612.58	J-299	15.43	632.6	7,463.89	7,463.89
J-228	1,003.33	J-2038	29.35	634.74		8,474.71	J-228	20	624.16	8,474.73	8,474.73
J-229	1,003.33	J-2038	29.35	634.74		5,332.57	J-229	20	623.16	5,332.58	5,332.58
J-23	1,003.33	J-2038	29.35	634.74		4,135.02	J-2010	19.56	635.15	4,115.26	4,115.26
J-230	1,003.33	J-2038	29.35	634.74		8,562.01	J-299	18.97	640.78	8,262.83	8,262.83
J-231	1,003.33	J-2038	29.35	634.74		4,789.56	J-231	20	623.16	4,789.57	4,789.57
J-233	1,003.33	J-2038	29.35	634.74		7,679.87	J-233	20	623.16	7,679.90	7,679.90
J-234	1,003.33	J-2038	29.35	634.74		5,700.69	J-234	20	623.16	5,700.70	5,700.70
J-235	3,002.49	J-2038	29.35	634.74		6,310.03	J-235	20	61.16	6,310.03	6,310.03
J-236	1,002.49	J-2038	29.35	634.74		8,674.17	J-405	7.82	114.05	7,797.81	7,797.81
J-237	1,004.56	J-2038	29.35	634.73		2,205.58	J-237	20	291.16	2,205.58	2,205.58
J-238	1,004.86	J-2038	29.35	634.73		1,238.57	J-238	20	196.16	1,238.57	1,238.57
J-239	1,002.49	J-2038	29.35	634.74		8,809.61	J-239	20	158.16	8,809.63	8,809.63
J-240	1,004.98	J-2038	29.35	634.73		2,428.45	J-648	13.57	501.32	2,179.01	2,179.01
J-241	1,004.56	J-2038	29.35	634.73		4,065.38	J-648	10.52	494.27	3,439.83	3,439.83
J-242	1,004.56	J-2038	29.35	634.73		4,294.03	J-648	3.72	478.58	3,360.66	3,360.66
J-243	1,004.56	J-2038	29.35	634.73		4,497.52	J-648	6.77	485.63	3,916.56	3,916.56
J-244	1,004.56	J-2038	29.35	634.73		3,621.34	J-244	20	406.16	3,621.32	3,621.32
J-245	1,004.56	J-2038	29.35	634.73		3,654.16	J-245	20	416.16	3,654.15	3,654.15
J-248	1,004.56	J-2038	29.35	634.73		3,705.50	J-248	20	376.16	3,705.50	3,705.50
J-250	1,004.56	J-2038	29.35	634.73		5,421.98	PRV-250-IN	20	376.16	5,421.98	5,421.98
J-251	1,004.86	J-2038	29.35	634.73		2,748.10	J-251	20	371.16	2,748.10	2,748.10
J-253	1,004.98	J-2038	29.35	634.73		3,927.22	J-253	20	446.16	3,927.22	3,927.22
J-255	1,006.15	J-2038	29.35	634.74		7,965.16	J-255	20	586.16	7,965.17	7,965.17
J-258	1,004.56	J-2038	29.35	634.73		1,924.72	J-258	20	342.16	1,924.72	1,924.72
J-261	1,003.33	J-2038	29.35	634.74		8,262.20	J-304	-1.85	545.72	5,964.31	5,964.31
J-262	1,004.98	J-2038	29.35	634.73		2,318.90	J-263	20	466.15	2,318.85	2,318.85
J-263	1,004.98	J-2038	29.35	634.73		1,910.51	J-263	20	466.16	1,910.51	1,910.51
J-264	1,004.98	J-2038	29.35	634.73		1,718.13	PRV-264-IN	20	446.16	1,718.13	1,718.13
J-265	1,004.56	J-2038	29.35	634.73		2,574.81	J-265	20	446.16	2,574.81	2,574.81
J-266	1,004.98	J-2038	29.3	634.61		8,687.73	J-273	11.61	536.8	8,001.05	8,001.05
J-267	1,003.33	J-2038	29.35	634.74		11,213.17	J-304	1.01	552.34	8,707.01	8,707.01
J-268	1,003.33	J-2038	29.35	634.74		7,768.53	J-268	20	546.16	7,768.54	7,768.54
J-269	1,003.33	J-2038	29.35	634.74		7,170.66	104	17.74	536.95	6,928.53	6,928.53
J-270	1,004.98	J-2038	29.3	634.61		7,185.57	J-273	14.25	542.9	6,734.65	6,734.65
J-271	1,004.98	J-2038	29.3	634.61		7,573.41	J-273	8.88	530.5	6,747.88	6,747.88
J-272	1,004.98	J-2038	29.3	634.61		6,581.24	J-272	20	536.16	6,581.25	6,581.25
J-273	1,004.98	J-2038	29.3	634.61		6,494.80	J-273	20	556.16	6,494.81	6,494.81
J-274	1,004.98	J-2038	29.3	634.61		7,122.02	J-273	14.25	542.88	6,670.96	6,670.96
J-275	1,004.98	J-2038	29.3	634.61		6,722.46	J-275	20	536.16	6,722.47	6,722.47
J-276	1,004.98	J-2038	29.3	634.61		6,470.08	PRV-600-OU	18.74	556.24	6,363.75	6,363.75
J-277	1,004.98	J-2038	29.3	634.61		6,673.14	PRV-600-OU	19.5	558.01	6,631.28	6,631.28
J-278	1,004.98	J-2038	29.3	634.61		6,672.03	J-273	19.6	555.24	6,639.05	6,639.05
J-279	1,004.98	J-2038	29.3	634.61		6,801.51	J-273	17.59	550.59	6,605.59	6,605.59

J-280	1,004.98	J-2038	29.3	634.61		7,319.38	J-273	12.81	539.57	6,762.02	6,762.02
J-281	1,004.56	J-2038	29.3	634.61		3,036.64	J-281	20	456.16	3,036.64	3,036.64
J-282	1,004.98	J-2038	29.3	634.61		5,748.81	PRV-282-OU	19.99	506.14		
J-283	1,004.86	J-2038	29.33	634.69		2,168.98	J-575	11.47	294.46	1,788.12	1,788.12
J-286	1,003.33	J-2038	29.35	634.74		7,388.85	J-616	16.06	580.07	6,885.88	6,885.88
J-287	1,003.33	J-2038	29.35	634.74		8,346.82	J-610	17.2	584.7	7,831.57	7,831.57
J-288	1,003.33	J-2038	29.35	634.74		4,139.93	56	17.08	640.42	3,712.37	3,712.37
J-289	1,003.33	J-2038	29.35	634.74		2,890.07	J-289	20	636.16	2,890.07	2,890.07
J-29	1,000.00	J-2038	29.35	634.74		9,951.51	J-1844	10.47	606.16	8,772.46	8,772.46
J-290	1,003.33	J-2038	29.35	634.74		2,361.65	J-290	20	636.16	2,361.65	2,361.65
J-291	1,003.33	J-2038	29.35	634.74		4,391.25	58	15.05	631.74	3,756.81	3,756.81
J-292	1,003.33	J-2038	29.35	634.74		4,377.01	54	15.04	631.71	3,743.26	3,743.26
J-293	1,003.33	J-2038	29.35	634.74		4,428.75	56	15.47	636.7	3,770.16	3,770.16
J-294	1,003.33	J-2038	29.35	634.74		4,351.96	56	16.18	638.33	3,787.71	3,787.71
J-295	1,003.33	J-2038	29.35	634.74		5,766.43	56	19.11	645.11	5,565.85	5,565.85
J-296	1,003.14	J-2038	29.35	634.74		5,902.65	J-296	20	636.16	5,902.67	5,902.67
J-297	1,003.14	J-2038	29.35	634.74		6,197.93	J-297	20	636.16	6,197.94	6,197.94
J-298	1,000.00	J-2038	29.35	634.74		26,351.35	J-298	20	661.16	26,352.29	26,352.29
J-299	1,003.33	J-2038	29.35	634.74		7,153.29	J-299	20	643.16	7,153.32	7,153.32
J-30	1,000.00	J-2038	29.35	634.74		10,023.64	J-1844	11.54	608.63	8,949.30	8,949.30
J-300	3,003.33	J-2038	29.35	634.74		4,318.34	J-2010	16.61	628.33	4,170.58	4,170.58
J-3004	1,000.00	J-3004	56.9	616.33	7,012.94	7,018.69	J-3004	20	531.16	7,018.69	7,012.94
J-3006	1,000.00	J-3006	57.23	617.08	7,113.40	7,117.18	J-3006	20	531.16	7,117.19	7,113.40
J-3009	1,000.00	J-2038	29.35	634.74		5,357.01	J-3009	20	61.16	5,357.00	5,357.00
J-301	1,003.33	J-2038	29.35	634.74		4,409.30	J-2010	19.51	635.03	4,388.38	4,388.38
J-3010	1,000.00	J-2038	29.35	634.74		2,683.81	J-3010	20	61.16	2,683.81	2,683.81
J-3011	1,000.00	J-2038	29.35	634.74		6,076.09	J-3011	20	61.16	6,076.09	6,076.09
J-3012	1,000.00	J-2038	29.35	634.74		4,010.50	J-3015	17.14	609.55	3,795.12	3,795.12
J-3013	1,003.33	J-2038	29.35	634.74		3,598.24	J-3015	17.56	610.52	3,431.69	3,431.69
J-3014	1,003.33	J-2038	29.35	634.74		3,646.42	J-3015	19.79	615.67	3,630.82	3,630.82
J-3015	1,000.00	J-2038	29.35	634.74		2,873.24	J-3015	20	616.16	2,873.24	2,873.24
J-3016	1,003.33	J-2038	29.35	634.74		2,728.86	J-3016	20	616.16	2,728.86	2,728.86
J-3017	1,000.00	J-2038	29.35	634.74		2,700.18	J-3017	20	616.16	2,700.18	2,700.18
J-3018	1,000.00	J-2038	29.35	634.74		3,253.21	J-3017	14.36	603.14	2,932.10	2,932.10
J-3019	1,003.33	J-2038	29.35	634.74		3,528.29	J-3017	14.53	603.53	3,189.51	3,189.51
J-302	1,003.33	J-2038	29.35	634.74		4,963.91	J-2010	16.03	626.99	4,806.07	4,806.07
J-3020	1,000.00	J-2038	29.35	634.74		4,739.95	J-3017	3.48	578.04	3,650.93	3,650.93
J-3022	1,000.00	J-2038	29.35	634.73		5,835.89	J-3023	17.59	538.6	5,584.69	5,584.69
J-3023	1,000.00	J-2038	29.35	634.73		4,320.08	J-3023	20	544.16	4,320.08	4,320.08
J-3024	1,000.00	J-2038	29.35	634.73		4,027.68	J-3024	20	553.16	4,027.68	4,027.68
J-3025	1,000.00	J-2038	29.35	634.73		7,734.42	J-3024	11.58	533.73	6,522.52	6,522.52
J-3026	1,000.00	J-2038	29.35	634.74		6,163.27	J-3026	20	120.16	6,163.27	6,163.27
J-3027	1,000.00	J-2038	29.35	634.74		5,910.05	J-3027	20	119.16	5,910.06	5,910.06
J-3028	1,004.56	J-2038	29.35	634.73		2,617.91	J-3028	20	275.16	2,617.91	2,617.91
J-3029	1,004.56	J-2038	29.35	634.73		2,587.76	J-3029	20	251.16	2,587.76	2,587.76
J-303	1,003.33	J-2038	29.35	634.74		5,532.88	J-304	19.59	595.22	5,483.55	5,483.55
J-3030	1,000.00	J-2038	29.35	634.73		2,538.05	J-3030	20	227.16	2,538.05	2,538.05

J-3031	1,000.00	J-2038	29.35	634.73		2,620.39	J-3029	16.81	243.79	2,583.20	2,583.20
J-3032	1,002.49	J-2038	29.35	634.74		4,460.33	J-3032	20	135.16	4,460.33	4,460.33
J-3033	1,002.49	J-2038	29.35	634.74		4,374.10	J-3033	20	115.16	4,374.10	4,374.10
J-3034	1,001.30	J-2038	29.35	634.74		4,445.50	J-3034	20	93.16	4,445.50	4,445.50
J-3035	1,000.00	J-2038	29.35	634.74		4,705.47	J-3034	18.12	88.81	4,644.71	4,644.71
J-3036	1,000.00	J-2038	29.35	634.74		4,758.85	J-3034	17.66	87.77	4,683.10	4,683.10
J-3037	1,000.00	J-2038	29.35	634.74		4,790.09	J-3048	19.03	55.16	4,763.11	4,763.11
J-3038	1,000.00	J-2038	29.35	634.74		4,733.02	J-3048	19.03	55.16	4,706.33	4,706.33
J-304	1,003.33	J-2038	29.35	634.74		5,474.45	J-304	20	596.16	5,474.47	5,474.47
J-3040	1,000.00	J-2038	29.35	634.74		4,680.11	J-3048	19.09	55.3	4,655.36	4,655.36
J-3041	1,000.00	J-2038	29.35	634.74		4,574.74	J-3041	20	55.16	4,574.74	4,574.74
J-3043	1,000.00	J-2038	29.35	634.74		4,720.16	J-3048	19.26	55.7	4,699.91	4,699.91
J-3044	1,000.00	J-2038	29.35	634.74		4,679.82	J-3048	19.11	55.35	4,655.70	4,655.70
J-3045	1,000.00	J-2038	29.35	634.74		4,659.63	J-3045	20	55.16	4,659.63	4,659.63
J-3047	1,000.00	J-2038	29.35	634.74		4,351.25	J-3048	19.89	57.16	4,348.48	4,348.48
J-3048	1,000.00	J-2038	29.35	634.74		4,316.39	J-3048	20	57.41	4,316.39	4,316.39
J-3049	1,000.00	J-2038	29.35	634.74		4,370.32	J-3049	20	55.56	4,370.32	4,370.32
J-305	1,003.33	J-2038	29.35	634.74		6,951.01	J-304	7.49	567.3	5,607.49	5,607.49
J-3050	1,000.00	J-2038	29.35	634.74		4,374.27	J-3050	20	55.36	4,374.27	4,374.27
J-3051	1,002.49	J-2038	29.35	634.74		4,358.07	J-3048	19.92	57.23	4,356.13	4,356.13
J-3053	1,000.00	J-2038	29.35	634.74		8,792.51	J-105	13.1	583.22	8,160.49	8,160.49
J-3054	1,000.00	J-2038	29.35	634.74		7,868.23	J-3054	20	565.16	7,868.24	7,868.24
J-3057	1,000.00	J-2038	29.35	634.74		17,722.78	J-105	-128.76	255.84	8,109.88	8,109.88
J-3058	1,000.00	J-2038	29.35	634.74		8,035.76	74	18.66	631.07	7,865.74	7,865.74
J-3059	1,000.00	J-2038	29.3	634.61		6,428.87	J-3059	20	456.16	6,428.88	6,428.87
J-306	1,003.33	J-2038	29.35	634.74		5,181.83	J-306	20	581.16	5,181.83	5,181.83
J-307	1,003.33	J-2038	29.35	634.74		4,789.72	J-307	20	587.16	4,789.73	4,789.73
J-308	1,003.33	J-2038	29.35	634.74		4,295.71	J-1860	20	578.16	4,295.69	4,295.69
J-309	1,003.33	J-2038	29.35	634.74		4,712.71	J-309	20	593.16	4,712.72	4,712.72
J-310	1,003.33	J-2038	29.35	634.74		4,725.21	J-309	19.66	592.37	4,712.72	4,712.72
J-311	1,003.33	J-2038	29.35	634.74		4,999.17	J-309	11.76	574.14	4,712.72	4,712.72
J-312	1,003.33	J-2038	29.35	634.74		4,157.90	J-312	20	546.16	4,157.91	4,157.91
J-313	1,003.33	J-2038	29.35	634.74		2,983.33	J-313	20	579.16	2,983.32	2,983.32
J-314	1,003.33	J-2038	29.35	634.74		5,102.29	J-2010	17.1	629.47	4,986.76	4,986.76
J-315	1,003.33	J-2038	29.35	634.74		3,874.18	J-315	20	590.16	3,874.19	3,874.19
J-316	1,003.33	J-2038	29.35	634.74		3,127.17	J-316	20	496.16	3,127.17	3,127.17
J-317	1,003.33	J-2038	29.35	634.74		4,167.86	J-318	19.33	609.61	4,143.07	4,143.06
J-318	1,003.33	J-2038	29.35	634.74		3,906.33	J-318	20	611.16	3,906.35	3,906.35
J-319	1,003.33	J-2038	29.35	634.74		4,211.30	J-2010	18.79	633.37	4,157.06	4,157.06
J-32	1,000.00	J-2038	29.35	634.74		11,432.68	J-32	20	613.16	11,432.72	11,432.72
J-320	1,003.33	J-2038	29.35	634.74		4,219.00	J-2010	18.44	632.57	4,149.49	4,149.49
J-321	1,003.33	J-2038	29.35	634.74		4,172.83	J-2010	19.64	635.32	4,156.43	4,156.43
J-322	3,003.33	J-2038	29.35	634.74		4,096.56	J-323	20	624.16	4,096.56	4,096.56
J-323	1,003.33	J-2038	29.35	634.74		4,011.78	J-323	20	624.16	4,011.84	4,011.84
J-324	1,003.33	J-2038	29.35	634.74		4,462.83	J-334	19.65	623.35	4,422.74	4,422.74
J-325	1,003.33	J-2038	29.35	634.74		4,161.21	J-334	19.61	623.26	4,097.50	4,097.50
J-326	1,003.33	J-2038	29.35	634.74		4,427.03	J-326	20	588.16	4,427.04	4,427.04

J-327	1,003.33	J-2038	29.35	634.74		4,304.36	J-2010	16.84	628.86	4,166.15	4,166.15
J-328	1,003.33	J-2038	29.35	634.74		3,824.02	J-337	13.97	577.24	3,633.83	3,633.83
J-329	1,003.33	J-2038	29.35	634.74		3,325.85	J-329	20	517.16	3,325.85	3,325.85
J-33	1,025.00	J-2038	29.35	634.74		12,421.18	J-33	20	610.16	12,421.23	12,421.23
J-330	1,003.33	J-2038	29.35	634.74		3,074.74	J-330	20	548.16	3,074.74	3,074.73
J-331	1,003.33	J-2038	29.35	634.74		4,129.51	J-334	19.46	622.91	4,060.39	4,060.39
J-332	1,003.33	J-2038	29.35	634.74		4,511.03	J-334	14.5	611.47	4,055.72	4,055.72
J-333	1,003.33	J-2038	29.35	634.74		4,094.33	J-334	18.79	621.37	4,044.82	4,044.82
J-334	1,003.33	J-2038	29.35	634.74		4,016.52	J-334	20	624.16	4,016.56	4,016.56
J-335	1,003.33	J-2038	29.35	634.74		3,971.43	J-335	20	617.16	3,971.48	3,971.48
J-336	1,003.33	J-2038	29.35	634.74		4,023.62	J-336	20	617.16	4,023.62	4,023.62
J-337	1,003.33	J-2038	29.35	634.74		3,213.22	J-337	20	591.16	3,213.22	3,213.22
J-338	1,003.33	J-2038	29.35	634.74		3,747.68	J-337	14.32	578.06	3,567.85	3,567.85
J-339	1,003.33	J-2038	29.35	634.74		4,011.09	J-340	15.23	588.16	3,851.90	3,851.90
J-34	1,170.00	J-2038	29.35	634.74		59,433.05	J-34	20.01	656.17	59,442.71	59,442.71
J-340	1,003.33	J-2038	29.35	634.74		1,689.78	J-340	20	599.16	1,689.78	1,689.78
J-341	1,008.42	J-2038	29.35	634.74		3,816.18	PRV-341-IN	13.07	539.16	3,641.48	3,641.48
J-342	1,003.33	J-2038	29.35	634.74		3,099.35	J-344	18.27	578.16	3,044.55	3,044.55
J-343	1,003.33	J-2038	29.35	634.74		2,941.91	J-344	17.32	575.98	2,856.31	2,856.31
J-344	1,003.33	J-2038	29.35	634.74		2,563.76	J-344	20	582.16	2,563.75	2,563.75
J-345	1,003.33	J-2038	29.35	634.74		11,271.74	J-345	20	627.16	11,271.81	11,271.81
J-349	1,000.00	J-2038	29.35	634.74		7,779.77	J-349	20	601.16	7,779.78	7,779.78
J-35	1,028.00	J-2038	29.35	634.74		52,206.79	J-35	20.01	652.17	52,212.96	52,212.96
J-350	1,000.00	J-2038	29.35	634.74		10,304.20	J-105	11.07	578.54	9,375.38	9,375.38
J-351	1,000.00	J-2038	29.35	634.74		9,883.73	J-105	16.52	591.12	9,508.00	9,508.00
J-352	1,000.00	J-2038	29.35	634.74		8,336.88	J-352	20	586.16	8,336.89	8,336.89
J-353	1,000.00	J-2038	29.35	634.74		10,036.24	J-105	13.54	584.24	9,358.97	9,358.97
J-354	1,000.00	J-2038	29.35	634.74		10,088.48	J-105	10.49	577.21	9,127.03	9,127.03
J-355	1,006.15	J-2038	29.35	634.74		8,563.36	J-355	20	536.16	8,563.37	8,563.37
J-356	1,006.15	J-2038	29.35	634.74		7,493.49	J-356	20	586.16	7,493.50	7,493.50
J-357	1,008.28	J-2038	29.35	634.74		9,194.21	J-105	6.93	569	8,044.56	8,044.56
J-358	1,004.98	J-2038	29.35	634.73		6,138.61	J-358	20	466.16	6,138.61	6,138.61
J-359	1,008.28	J-2038	29.35	634.74		2,416.65	J-359	20	546.16	2,416.65	2,416.65
J-36	1,009.00	J-2038	29.35	634.74		59,551.46	J-35	12.72	635.36	52,293.62	52,293.61
J-360	1,008.28	J-2038	29.35	634.74		1,823.87	J-360	20	566.16	1,823.87	1,823.87
J-362	1,000.00	J-2038	29.35	634.74		12,540.49	J-362	20	606.16	12,540.54	12,540.54
J-37	1,012.00	J-2038	29.35	634.74		41,257.18	J-37	20	640.17	41,259.73	41,259.73
J-377	1,006.15	J-2038	29.35	634.74		14,351.41	J-377	20	656.16	14,351.55	14,351.55
J-38	1,012.00	J-2038	29.35	634.74		43,488.92	J-37	17.09	633.44	41,492.77	41,492.77
J-380	1,008.28	J-2038	29.35	634.74		2,524.87	J-381	20	556.15	2,524.85	2,524.85
J-381	1,008.28	J-2038	29.35	634.74		1,897.30	J-381	20	556.16	1,897.30	1,897.30
J-382	1,011.78	J-2038	29.35	634.74		8,718.25	74	19.16	632.21	8,600.73	8,600.73
J-383	1,011.78	J-2038	29.35	634.74		8,501.70	74	19.53	633.07	8,437.31	8,437.31
J-384	1,011.78	J-2038	29.35	634.74		7,967.26	J-384	20	626.16	7,967.27	7,967.27
J-385	1,011.78	J-2038	29.35	634.74		8,152.77	J-385	20	626.16	8,152.79	8,152.79
J-386	1,011.78	J-2038	29.35	634.74		8,763.90	78	19.68	633.42	8,718.75	8,718.74
J-387	1,011.78	J-2038	29.35	634.74		8,363.87	J-387	20	626.16	8,363.89	8,363.89

J-388	1,011.78	J-2038	29.35	634.74		8,151.38	J-388	20	626.16	8,151.40	8,151.40
J-389	1,006.15	J-2038	29.35	634.74		8,145.78	J-389	20	626.16	8,145.80	8,145.80
J-39	1,041.00	J-2038	29.35	634.74		35,818.86	J-39	20	613.16	35,820.07	35,820.07
J-392	1,006.15	J-2038	29.35	634.74		7,927.07	J-392	20	626.16	7,927.09	7,927.09
J-393	1,003.33	J-2038	29.35	634.74		2,113.28	J-393	20	521.16	2,113.27	2,113.27
J-394	1,004.98	J-2038	29.35	634.73		3,405.75	J-394	20	456.16	3,405.75	3,405.75
J-395	1,004.98	J-2038	29.35	634.73		5,318.40	J-644	13.86	521.99	4,902.94	4,902.94
J-396	1,004.98	J-2038	29.35	634.73		5,526.31	J-396	20	456.16	5,526.32	5,526.32
J-397	1,004.98	J-2038	29.35	634.73		5,663.55	J-397	20	451.16	5,663.55	5,663.55
J-398	1,003.33	J-2038	29.35	634.74		11,214.55	J-304	-1.91	545.59	8,687.81	8,687.81
J-399	1,000.00	J-2038	29.35	634.74		4,892.53	J-399	20	296.16	4,892.52	4,892.52
J-400	1,004.86	J-2038	29.35	634.74		4,871.96	J-431	-32.19	173.72		
J-401	1,002.49	J-2038	29.35	634.74		4,719.54	J-401	20	165.16	4,719.53	4,719.53
J-402	1,002.49	J-2038	29.35	634.74		7,100.71	J-401	18.8	162.39	7,003.57	7,003.57
J-403	1,002.49	J-2038	29.35	634.74		4,244.43	J-403	20	154.16	4,244.43	4,244.43
J-404	1,002.49	J-2038	29.35	634.74		4,040.16	J-404	20	144.16	4,040.15	4,040.15
J-405	1,002.49	J-2038	29.35	634.74		3,836.37	J-405	20	142.16	3,836.37	3,836.37
J-406	1,002.49	J-2038	29.35	634.74		8,772.34	J-405	5.55	108.8	7,747.52	7,747.52
J-407	1,002.49	J-2038	29.35	634.74		9,112.16	J-405	7.98	114.42	8,206.99	8,206.99
J-408	1,002.49	J-2038	29.35	634.74		8,919.67	J-403	14.81	142.18	8,467.92	8,467.92
J-409	1,002.49	J-2038	29.35	634.74		6,346.02	J-3009	20	61.16	6,346.02	6,346.02
J-410	1,002.49	J-2038	29.35	634.74		6,496.49	J-410	20	94.16	6,496.49	6,496.49
J-411	1,002.49	J-2038	29.35	634.74		7,162.09	J-411	20	117.16	7,162.10	7,162.10
J-412	1,002.49	J-2038	29.35	634.74		3,997.48	J-425	-0.37	117.16	3,192.62	3,192.62
J-413	3,002.49	J-2038	29.35	634.74		6,519.55	J-425	20	164.16	6,519.49	6,519.49
J-414	1,002.49	J-2038	29.35	634.74		2,609.85	J-414	20	138.16	2,609.86	2,609.86
J-415	1,002.49	J-2038	29.35	634.74		2,394.51	J-415	20	142.16	2,394.51	2,394.51
J-416	1,002.49	J-2038	29.35	634.74		9,864.28	J-421	15.04	181.72	9,120.93	9,120.93
J-417	1,003.33	J-2038	29.35	634.74		9,152.55	J-304	4.17	559.63	7,606.34	7,606.34
J-418	1,002.49	J-2038	29.35	634.74		8,852.80	J-401	18.53	161.75	8,712.63	8,712.63
J-419	1,002.49	J-2038	29.35	634.74		7,610.82	J-401	18.3	161.24	7,473.06	7,473.06
J-420	1,002.49	J-2038	29.35	634.74		5,083.03	J-420	20	167.16	5,083.03	5,083.03
J-421	1,002.49	J-2038	29.35	634.74		9,052.80	J-421	20	193.16	9,052.82	9,052.82
J-423	1,002.49	J-2038	29.35	634.74		3,786.94	J-423	20	83.16	3,786.94	3,786.94
J-424	1,002.49	J-2038	29.35	634.74		3,674.67	J-424	20	88.16	3,674.67	3,674.67
J-425	1,002.49	J-2038	29.35	634.74		2,490.63	J-425	20	164.16	2,490.63	2,490.63
J-426	1,002.49	J-2038	29.35	634.74		3,099.78	J-425	8.8	138.31	2,705.13	2,705.13
J-427	1,002.49	J-2038	29.35	634.74		4,125.56	J-427	20	181.16	4,125.56	4,125.56
J-428	1,002.49	J-2038	29.35	634.74		4,341.69	J-428	20	174.16	4,341.70	4,341.70
J-430	1,004.86	J-2038	29.35	634.74		1,485.41	J-431	-0.8	246.15		
J-431	1,004.86	J-431	7.35	264.96	881.31	881.32	J-431	20	294.16	881.32	881.31
J-433	1,003.33	J-2038	29.35	634.74		9,596.31	J-610	11.95	572.58	8,471.99	8,471.99
J-434	1,003.33	J-2038	29.35	634.74		7,929.80	J-434	20	546.16	7,929.81	7,929.81
J-435	1,003.33	J-2038	29.34	634.71		8,785.86	J-273	16.95	549.11	8,517.91	8,517.91
J-436	1,003.33	J-2038	29.35	634.74		8,475.13	J-304	0.91	552.09	6,526.23	6,526.23
J-437	1,003.33	J-2038	29.35	634.74		9,274.62	J-304	-1.12	547.41	7,175.63	7,175.63
J-438	1,008.28	J-2038	29.35	634.74		7,085.37	J-105	19.5	598.01	7,045.12	7,045.12

J-439	1,008.28	J-2038	29.35	634.74		5,212.38	J-439	20	580.16	5,212.38	5,212.38
J-440	1,008.28	J-2038	29.35	634.74		7,392.24	J-105	17.93	594.38	7,221.35	7,221.35
J-441	1,008.28	J-2038	29.35	634.74		9,140.28	J-105	19.16	597.22	9,052.98	9,052.98
J-442	1,008.28	J-2038	29.35	634.74		8,132.78	J-445	16.16	553.3	7,877.29	7,877.29
J-443	1,008.28	J-2038	29.35	634.74		4,862.52	J-443	20	545.16	4,862.52	4,862.52
J-444	1,008.28	J-2038	29.35	634.74		8,037.57	J-445	15.9	552.7	7,768.85	7,768.85
J-445	1,008.28	J-2038	29.35	634.74		5,491.70	J-445	20	562.16	5,491.71	5,491.71
J-446	1,008.28	J-2038	29.35	634.74		7,879.98	J-445	18.39	558.44	7,773.39	7,773.39
J-447	1,008.28	J-2038	29.35	634.74		7,904.14	J-447	20	554.16	7,904.14	7,904.14
J-448	1,000.00	J-2038	29.35	634.74		9,697.40	J-105	7.18	569.57	8,502.53	8,502.53
J-449	1,008.28	J-2038	29.35	634.74		8,959.24	J-449	20	576.16	8,959.25	8,959.25
J-450	1,008.28	J-2038	29.35	634.74		3,010.18	J-450	20	570.16	3,010.18	3,010.18
J-451	1,008.28	J-2038	29.35	634.74		7,635.19	J-451	20	551.16	7,635.20	7,635.20
J-452	1,008.28	J-2038	29.35	634.74		9,565.20	J-105	4.46	563.29	8,186.57	8,186.57
J-453	1,008.28	J-2038	29.35	634.74		7,843.04	J-455	16.05	557.03	7,582.31	7,582.31
J-454	1,008.28	J-2038	29.35	634.74		7,277.32	J-455	15.67	556.16	7,014.20	7,014.20
J-455	1,008.28	J-2038	29.35	634.74		6,195.14	J-455	20	566.16	6,195.15	6,195.15
J-456	1,008.28	J-2038	29.35	634.74		7,940.97	J-455	19.06	564	7,876.03	7,876.03
J-457	1,008.28	J-2038	29.35	634.74		8,259.33	J-105	18.43	595.55	8,113.62	8,113.62
J-458	1,008.28	J-2038	29.35	634.74		6,504.56	J-458	20	568.16	6,504.57	6,504.57
J-459	1,008.28	J-2038	29.35	634.74		8,850.45	J-105	9.53	574.99	7,932.33	7,932.33
J-46	1,000.00	J-2038	29.35	634.74		10,152.95	J-141	11.51	606.56	9,075.33	9,075.33
J-460	1,008.28	J-2038	29.35	634.74		3,820.19	J-460	20	568.16	3,820.19	3,820.19
J-467	1,004.98	J-2038	29.35	634.73		7,995.89	PRV-341-OU	-7.41	491.9	5,794.47	5,794.47
J-470	1,004.86	J-2038	29.3	634.61		7,678.84	J-273	7.39	527.05	6,751.60	6,751.60
J-471	1,004.86	J-2038	29.3	634.61		8,158.69	J-273	0.03	510.08	6,751.60	6,751.60
J-472	1,004.56	J-2038	29.3	634.61		10,925.81	J-173	-4.27	382.95	6,353.88	6,353.88
J-474	1,004.56	J-2038	29.3	634.61		8,286.35	J-173	-14.62	359.07	6,353.88	6,353.88
J-483	1,004.98	J-2038	29.35	634.73		3,306.40	J-483	20	406.16	3,306.40	3,306.40
J-484	1,004.56	J-2038	29.35	634.73		4,434.91	J-484	20	396.16	4,434.91	4,434.91
J-485	1,004.98	J-2038	29.35	634.73		7,001.51	J-485	20	436.16	7,001.51	7,001.51
J-486	1,004.98	J-2038	29.35	634.73		7,727.87	J-486	20	458.16	7,727.87	7,727.87
J-487	1,004.98	J-2038	29.35	634.73		7,028.61	J-487	20	466.16	7,028.61	7,028.61
J-488	1,004.98	J-2038	29.35	634.73		4,973.74	J-488	20	431.16	4,973.75	4,973.75
J-492	1,003.33	J-2038	29.35	634.74		7,076.36	118	14.74	574.01	6,593.79	6,593.79
J-496	1,003.33	J-2038	29.35	634.74		3,248.37	J-496	20	646.16	3,248.37	3,248.37
J-497	1,003.33	J-2038	29.35	634.74		2,025.85	J-497	20	647.16	2,025.85	2,025.85
J-500	1,004.98	J-2038	29.35	634.73		17,479.79	J-2010	5.05	601.65		
J-501	1,004.98	J-2038	29.35	634.73		15,873.04	J-189	-2.51	500.21	12,017.22	12,017.22
J-502	1,004.98	J-2038	29.35	634.73		12,524.11	J-3024	6.16	521.23	10,301.30	10,301.30
J-503	1,004.98	J-2038	29.35	634.73		11,196.27	J-3024	12.5	535.84	9,837.58	9,837.58
J-504	1,004.98	J-2038	29.35	634.73		7,507.06	J-504	20	447.16	7,507.06	7,507.06
J-505	1,004.98	J-2038	29.35	634.73		10,363.29	J-505	20	449.16	10,363.30	10,363.30
J-506	1,004.98	J-2038	29.35	634.73		5,902.41	J-506	20	431.16	5,902.41	5,902.41
J-507	1,004.98	J-2038	29.35	634.73		4,433.59	J-507	20	407.16	4,433.59	4,433.59
J-508	1,004.56	J-2038	29.35	634.73		5,517.01	J-508	20	385.16	5,517.01	5,517.01
J-509	1,004.86	J-2038	29.35	634.73		1,382.02	J-509	20	366.16	1,382.02	1,382.02

J-510	1,004.86	J-2038	29.35	634.73		3,147.22	J-509	-15.08	285.19	2,463.52	2,463.52
J-511	1,004.98	J-2038	29.35	634.73		10,774.61	J-505	19.63	448.3	10,704.00	10,704.00
J-512	1,004.98	J-2038	29.34	634.72		7,302.99	J-512	20	462.16	7,302.21	7,302.21
J-513	1,004.98	J-2038	29.34	634.72		9,150.30	J-513	20	544.16	9,150.58	9,150.58
J-514	1,004.98	J-2038	29.34	634.72		10,615.96	PRV-308-IN	9.5	553.94		
J-515	1,004.98	J-2038	29.34	634.72		6,670.43	J-515	20	517.16	6,659.74	6,659.74
J-516	3,004.98	J-2038	29.34	634.71		4,856.75	J-516	20	458.16	4,856.75	4,856.75
J-517	1,004.98	J-2038	29.34	634.72		7,553.56	J-517	20	467.16	7,544.52	7,544.52
J-518	1,004.98	J-2038	29.34	634.72		6,987.75	J-518	20	463.16	6,987.75	6,987.75
J-519	1,004.98	J-2038	29.34	634.72		6,944.13	J-519	20	441.16	6,944.14	6,944.14
J-52	1,024.00	J-2038	29.35	634.74		66,735.35	J-52	20.01	664.18	66,751.30	66,751.30
J-520	1,004.98	J-2038	29.34	634.72		6,760.26	J-520	20	446.16	6,760.26	6,760.26
J-521	1,004.98	J-2038	29.35	634.73		5,250.50	J-521	20	442.16	5,250.51	5,250.51
J-522	1,004.98	J-2038	29.35	634.73		5,191.98	J-522	20	449.16	5,191.98	5,191.98
J-523	1,004.98	J-2038	29.35	634.73		3,950.34	J-523	20	448.16	3,950.35	3,950.35
J-524	1,004.98	J-2038	29.35	634.73		7,442.89	J-263	18.2	461.99	7,323.07	7,323.07
J-525	1,004.98	J-2038	29.35	634.73		3,782.80	PRV-525-IN	20	414.16	3,782.80	3,782.80
J-526	1,004.56	J-2038	29.35	634.73		3,509.42	J-528	13.62	435.43	3,278.40	3,278.40
J-527	1,004.56	J-2038	29.35	634.73		3,117.26	J-528	17.91	445.33	3,042.97	3,042.97
J-528	1,004.56	J-2038	29.35	634.73		2,686.03	J-528	20	450.16	2,686.04	2,686.04
J-529	1,004.56	J-2038	29.35	634.73		2,805.45	J-265	19.9	445.93	2,802.20	2,802.20
J-530	1,004.56	J-2038	29.35	634.73		2,720.62	J-530	20	411.16	2,720.62	2,720.62
J-531	1,004.56	J-2038	29.35	634.73		2,707.09	J-531	20	398.16	2,707.09	2,707.09
J-532	1,004.56	J-2038	29.35	634.73		2,741.30	J-532	20	386.16	2,741.30	2,741.30
J-533	1,004.56	J-2038	29.35	634.73		2,363.54	J-533	20	374.16	2,363.54	2,363.54
J-534	1,004.56	J-2038	29.35	634.73		3,050.54	J-528	13.22	434.52	2,823.74	2,823.74
J-535	1,004.56	J-2038	29.35	634.73		3,212.12	J-528	8.46	423.52	2,835.92	2,835.92
J-536	1,004.56	J-2038	29.35	634.73		3,138.35	J-528	11.6	430.76	2,860.10	2,860.10
J-537	1,004.56	J-2038	29.35	634.73		3,003.90	J-528	14.44	437.33	2,816.62	2,816.62
J-538	1,004.56	J-2038	29.35	634.73		2,079.91	J-538	20	355.16	2,079.91	2,079.91
J-539	1,004.86	J-2038	29.35	634.73		2,173.25	86	16.95	351.13	2,117.47	2,117.47
J-540	1,004.86	J-2038	29.35	634.73		2,022.79	J-540	20	336.16	2,022.79	2,022.79
J-541	1,004.86	J-2038	29.35	634.73		1,826.75	J-541	20	298.16	1,826.75	1,826.75
J-542	1,004.86	J-2038	29.35	634.73		1,880.95	J-542	20	301.16	1,880.95	1,880.95
J-543	1,004.86	J-2038	29.35	634.73		1,798.42	J-543	20	318.16	1,798.42	1,798.42
J-544	1,004.86	J-2038	29.35	634.73		1,484.07	J-544	20	221.16	1,484.12	1,484.12
J-545	1,003.33	J-2038	29.34	634.71		8,823.33	J-273	14.61	543.71	8,362.00	8,362.00
J-546	1,004.98	J-2038	29.3	634.61		9,605.69	J-273	-3.06	502.94	7,882.87	7,882.87
J-547	1,004.98	J-2038	29.3	634.61		6,048.90	J-547	20	466.16	6,048.95	6,048.94
J-548	1,004.98	J-2038	29.3	634.61		4,402.99	J-548	20	421.16	4,402.99	4,402.99
J-549	1,004.98	J-2038	29.3	634.61		3,112.46	J-550	19.13	506.16	3,079.02	3,079.02
J-55	1,077.00	J-2038	29.35	634.74		7,972.88	J-55	20	591.16	7,972.89	7,972.89
J-550	1,004.98	J-2038	29.3	634.61		2,979.96	J-550	20	508.16	2,979.96	2,979.96
J-551	1,004.98	J-2038	29.3	634.61		3,476.78	J-550	5.81	475.4	2,979.96	2,979.96
J-552	1,004.98	J-2038	29.3	634.61		3,246.47	J-550	12.63	491.14	2,979.96	2,979.96
J-553	1,004.98	J-2038	29.3	634.61		8,157.57	J-273	13.04	540.1	7,599.28	7,599.28
J-554	1,004.98	J-2038	29.3	634.61		7,967.35	J-273	11.85	537.35	7,351.50	7,351.50

J-555	1,004.98	J-2038	29.3	634.61		5,889.26	J-555	20	526.16	5,889.31	5,889.31
J-556	1,004.98	J-2038	29.3	634.61		2,158.23	J-556	20	497.16	2,158.23	2,158.23
J-557	1,004.98	J-2038	29.3	634.61		1,722.69	J-557	20	486.16	1,722.69	1,722.69
J-558	1,004.98	J-2038	29.3	634.61		5,603.85	J-558	20	522.16	5,603.82	5,603.82
J-559	1,004.98	J-2038	29.3	634.61		3,875.45	J-559	20	526.16	3,875.45	3,875.45
J-560	1,004.98	J-2038	29.3	634.61		6,070.29	J-560	20	526.16	6,070.32	6,070.32
J-561	1,004.98	J-2038	29.3	634.61		5,418.86	J-561	20	532.16	5,418.85	5,418.85
J-562	1,004.98	J-2038	29.3	634.61		5,815.59	J-562	20	536.16	5,815.58	5,815.58
J-563	1,004.98	J-2038	29.3	634.61		7,558.26	J-273	14.27	542.94	7,118.17	7,118.17
J-564	1,004.98	J-2038	29.3	634.61		7,544.34	J-273	13.15	540.35	7,018.70	7,018.70
J-565	1,004.98	J-2038	29.3	634.61		7,077.27	J-273	16.5	548.07	6,797.11	6,797.11
J-566	1,004.98	J-2038	29.3	634.61		6,304.08	J-566	20	552.16	6,304.09	6,304.09
J-567	1,004.98	J-2038	29.3	634.61		5,136.37	J-568	19.67	528.4	5,116.48	5,116.48
J-568	1,004.98	J-2038	29.3	634.61		4,529.45	J-568	20	529.16	4,529.45	4,529.45
J-569	1,004.56	J-2038	29.3	634.61		3,433.97	J-569	20	455.16	3,433.97	3,433.97
J-570	1,004.56	J-2038	29.3	634.61		3,532.53	J-570	20	369.16	3,532.53	3,532.53
J-571	1,004.56	J-2038	29.3	634.61		3,248.11	J-571	20	365.16	3,249.36	3,249.36
J-572	1,004.56	J-2038	29.3	634.61		3,204.68	J-1862	2.67	321.16	2,827.95	2,827.95
J-573	1,004.86	J-2038	29.33	634.69		2,378.18	J-573	20	307.16	2,378.18	2,378.18
J-575	1,004.86	J-575	28.81	334.48	1,377.06	1,377.04	J-575	20	314.16	1,377.04	1,377.04
J-576	1,004.86	J-2038	29.33	634.69		2,815.73	J-575	4.13	277.54	2,049.14	2,049.14
J-577	1,004.86	J-2038	29.33	634.69		3,089.91	J-575	10.53	292.3	2,493.32	2,493.32
J-578	1,004.86	J-2038	29.33	634.69		1,805.15	J-578	20	311.16	1,805.15	1,805.15
J-579	1,004.86	J-2038	29.33	634.69		2,770.57	J-575	17.97	309.46	2,625.39	2,625.39
J-580	1,004.86	J-2038	29.3	634.61		7,725.95	J-273	6.76	525.6	6,757.79	6,757.79
J-582	1,004.56	J-2038	29.3	634.61		3,547.96	J-1862	19.83	360.76	3,544.91	3,544.91
J-583	1,004.56	J-2038	29.3	634.61		8,894.83	J-173	-30.8	321.71	6,353.88	6,353.88
J-584	1,004.98	J-2038	29.3	634.61		6,014.94	J-585	9.22	483.27	5,494.87	5,494.87
J-585	1,004.98	J-2038	29.3	634.61		5,428.68	J-585	20	508.16	5,428.67	5,428.67
J-586	1,004.98	J-2038	29.3	634.61		5,498.57	J-586	20	509.16	5,498.57	5,498.57
J-587	1,004.98	J-2038	29.3	634.61		5,694.16	J-589	18.39	518.43	5,601.85	5,601.85
J-588	1,004.56	J-2038	29.3	634.61		7,840.73	J-173	-3.17	385.49	6,349.81	6,349.81
J-589	1,004.98	J-2038	29.3	634.61		5,545.35	J-589	20	522.16	5,545.28	5,545.28
J-59	1,006.15	J-2038	29.35	634.74		3,277.44	J-59	20	604.16	3,277.44	3,277.44
J-590	1,004.98	J-2038	29.3	634.61		6,700.28	J-590	20	529.16	6,700.28	6,700.28
J-591	1,004.98	J-2038	29.3	634.61		6,840.36	J-273	18.56	552.84	6,722.78	6,722.78
J-592	1,004.98	J-2038	29.3	634.61		7,076.44	J-273	15.54	545.86	6,722.43	6,722.43
J-593	1,004.98	J-2038	29.3	634.61		6,824.10	J-273	18.75	553.28	6,721.79	6,721.79
J-594	1,004.98	J-2038	29.3	634.61		6,897.28	J-273	17.87	551.23	6,724.10	6,724.10
J-595	1,004.98	J-2038	29.3	634.61		6,418.39	J-595	20	537.16	6,418.39	6,418.39
J-596	1,004.98	J-2038	29.3	634.61		6,643.40	J-596	20	536.16	6,643.40	6,643.40
J-597	1,004.98	J-2038	29.3	634.61		6,281.77	J-597	20	532.16	6,281.81	6,281.81
J-598	1,004.98	J-2038	29.3	634.61		3,890.66	J-598	20	534.16	3,890.66	3,890.66
J-599	1,003.33	J-2038	29.3	634.61		6,311.15	PRV-600-OU	14.48	546.43	5,906.48	5,906.48
J-600	1,003.33	J-2038	29.35	634.74		8,118.38	J-618	17.37	584.1	7,722.59	7,722.59
J-601	1,003.33	J-2038	29.35	634.74		8,101.91	J-618	17.02	583.28	7,640.05	7,640.05
J-602	1,003.33	J-2038	29.35	634.74		7,968.90	J-602	20	563.16	7,968.90	7,968.90

J-603	1,003.33	J-2038	29.35	634.74		9,097.05	J-618	14.96	578.53	8,386.04	8,386.04
J-604	1,003.33	J-2038	29.35	634.74		8,037.67	J-618	15.94	580.8	7,381.61	7,381.61
J-605	1,003.33	J-2038	29.35	634.74		8,055.07	J-618	15.08	578.8	7,260.16	7,260.16
J-606	1,003.33	J-2038	29.35	634.74		7,007.45	J-606	20	583.16	7,010.79	7,010.79
J-607	1,003.33	J-2038	29.35	634.74		6,758.62	J-607	20	588.16	6,758.59	6,758.59
J-608	1,003.33	J-2038	29.35	634.74		7,054.50	J-610	18.21	587.04	6,905.58	6,905.58
J-609	1,003.33	J-2038	29.35	634.74		8,167.16	J-609	20	580.16	8,167.17	8,167.17
J-610	1,003.33	J-2038	29.35	634.74		6,857.58	J-610	20	591.16	6,855.81	6,855.81
J-611	1,003.33	J-2038	29.35	634.74		6,667.98	J-2067	18.1	581.78	6,428.02	6,428.02
J-612	1,003.33	J-2038	29.35	634.74		6,591.19	J-2067	19.59	585.21	6,537.90	6,537.90
J-613	1,003.33	J-2038	29.35	634.74		5,396.86	J-614	20	589.16	5,396.87	5,396.87
J-614	1,003.33	J-2038	29.35	634.74		3,836.98	J-614	20	589.16	3,836.98	3,836.98
J-615	1,003.33	J-2038	29.35	634.74		4,429.95	J-614	20	589.16	4,429.95	4,429.95
J-616	1,003.33	J-2038	29.35	634.74		5,832.27	J-616	20	589.16	5,832.27	5,832.27
J-617	5,503.33	J-617	22.16	592.15	5,792.10	5,792.49	J-617	20	587.16	5,792.49	5,792.10
J-618	1,003.33	J-2038	29.35	634.74		5,512.56	J-618	20	590.16	5,512.56	5,512.56
J-619	1,003.33	J-2038	29.35	634.74		5,638.78	J-619	20	580.16	5,638.78	5,638.78
J-62	1,006.15	J-2038	29.35	634.74		20,649.65	J-377	17.2	649.7	19,481.61	19,481.61
J-620	1,004.98	J-2038	29.35	634.73		2,057.66	J-620	20	516.16	2,057.66	2,057.66
J-621	1,004.98	J-2038	29.35	634.73		8,087.56	J-621	20	464.16	8,087.57	8,087.57
J-622	1,004.98	J-2038	29.35	634.73		8,283.77	J-622	20	456.16	8,283.78	8,283.78
J-623	1,004.98	J-2038	29.35	634.73		7,424.52	J-625	19.85	444.82	7,415.71	7,415.71
J-624	1,004.98	J-2038	29.35	634.73		4,845.80	J-624	20	458.16	4,845.81	4,845.81
J-625	1,004.98	J-2038	29.35	634.73		5,655.09	J-625	20	445.16	5,655.10	5,655.10
J-626	1,004.98	J-2038	29.35	634.73		5,521.03	J-626	20	440.16	5,521.03	5,521.03
J-627	1,004.98	J-2038	29.35	634.73		5,463.29	J-627	20	442.16	5,463.29	5,463.29
J-628	1,004.98	J-2038	29.35	634.73		4,553.18	J-628	20	445.16	4,553.18	4,553.18
J-629	1,004.98	J-2038	29.35	634.73		3,174.81	J-629	20	444.16	3,174.81	3,174.81
J-630	1,004.98	J-2038	29.35	634.73		2,717.05	J-630	20	438.16	2,717.05	2,717.05
J-631	1,004.98	J-2038	29.35	634.73		9,551.58	PRV-341-OU	-3.71	500.45	7,202.62	7,202.62
J-632	1,004.98	J-2038	29.35	634.73		10,982.70	PRV-341-OU	-1.37	505.85	8,498.57	8,498.57
J-633	1,004.98	J-2038	29.35	634.73		12,606.32	PRV-341-OU	-0.2	508.54	9,775.89	9,775.88
J-634	3,004.98	J-2038	29.34	634.71		7,345.30	PRV-341-OU	-12.04	481.21	5,089.79	5,089.79
J-635	1,008.42	J-2038	29.35	634.73		6,377.86	PRV-341-OU	3.02	515.97	5,080.58	5,080.58
J-636	1,004.98	J-2038	29.35	634.73		7,660.18	PRV-341-OU	-20.4	461.93	4,975.27	4,975.27
J-637	1,008.42	J-2038	29.35	634.73		3,853.35	J-637	20	453.16	3,853.06	3,853.06
J-638	1,004.56	J-2038	29.35	634.73		3,535.93	J-638	20	431.16	3,535.95	3,535.95
J-639	1,004.56	J-2038	29.35	634.73		3,822.56	J-245	18.75	413.28	3,787.90	3,787.90
J-640	3,004.98	J-644	27.62	553.74	3,820.30	4,570.45	J-644	5.45	502.59	3,818.52	3,818.52
J-641	1,004.98	J-2038	29.35	634.73		4,423.03	J-644	5.5	502.69	3,611.64	3,611.64
J-642	1,004.98	J-2038	29.35	634.73		2,600.87	J-644	16.88	528.95	2,412.35	2,412.35
J-643	1,004.98	J-2038	29.35	634.73		2,777.87	J-644	13.01	520.03	2,377.34	2,377.34
J-644	1,004.98	J-2038	29.35	634.73		1,957.45	J-644	20	536.16	1,957.45	1,957.45
J-645	1,004.98	J-2038	29.35	634.73		2,947.25	J-620	13.3	500.68	2,636.23	2,636.23
J-646	1,004.98	J-2038	29.35	634.73		2,147.01	J-646	20	513.16	2,147.01	2,147.01
J-647	1,004.98	J-2038	29.35	634.73		2,062.74	J-647	20	516.16	2,062.74	2,062.74
J-648	1,004.98	J-2038	29.35	634.73		2,064.29	J-648	20	516.16	2,064.29	2,064.29

J-649	1,004.98	J-2038	29.35	634.73		2,202.10	J-648	19.05	513.97	2,163.95	2,163.95
J-650	1,008.42	J-2038	29.35	634.73		3,512.81	J-648	-3.76	461.31	2,547.74	2,547.74
J-651	1,004.98	J-2038	29.35	634.73		3,035.10	J-648	-0.12	469.72	2,283.53	2,283.53
J-652	1,004.56	J-2038	29.35	634.73		3,951.33	J-648	13.66	501.53	3,456.23	3,456.23
J-653	1,004.56	J-2038	29.35	634.73		4,080.06	J-648	12.36	498.52	3,692.66	3,692.66
J-654	1,004.56	J-2038	29.35	634.73		3,993.86	J-648	16.23	507.46	3,806.88	3,806.88
J-655	1,004.56	J-2038	29.35	634.73		4,691.20	J-648	1.32	473.05	3,892.20	3,892.20
J-656	1,004.56	J-2038	29.35	634.73		2,086.00	J-656	20	326.16	2,086.00	2,086.00
J-657	1,004.56	J-2038	29.35	634.73		1,511.85	J-657	20	278.16	1,511.85	1,511.85
J-658	1,004.56	J-2038	29.35	634.73		4,239.21	J-648	4.83	481.15	3,331.98	3,331.98
J-659	1,004.56	J-2038	29.35	634.73		4,261.63	J-648	3.89	478.98	3,302.48	3,302.48
J-660	1,004.56	J-2038	29.35	634.73		4,158.88	J-648	6.98	486.11	3,336.28	3,336.28
J-661	1,004.98	J-2038	29.35	634.73		2,834.04	J-648	1.84	474.26	2,179.01	2,179.01
J-662	1,004.98	J-2038	29.35	634.73		2,996.25	J-648	-3.28	462.43	2,179.01	2,179.01
J-663	1,004.98	J-2038	29.35	634.73		3,038.35	J-648	-3.81	461.2	2,197.64	2,197.64
J-664	1,004.98	J-2038	29.35	634.73		2,599.18	J-648	7.9	488.24	2,152.34	2,152.34
J-665	1,004.98	J-2038	29.35	634.73		2,644.09	J-648	4.56	480.53	2,098.82	2,098.82
J-666	1,004.98	J-2038	29.35	634.73		2,596.10	J-648	8.62	489.9	2,170.49	2,170.49
J-667	1,004.98	J-2038	29.35	634.73		2,464.17	J-648	12.62	499.14	2,179.70	2,179.70
J-668	1,004.56	J-2038	29.35	634.73		4,036.78	J-648	9.44	491.78	3,275.42	3,275.42
J-669	1,004.56	J-2038	29.35	634.73		3,918.57	J-648	12.42	498.66	3,275.42	3,275.42
J-670	1,004.56	J-2038	29.35	634.73		1,812.82	J-670	20	388.16	1,812.82	1,812.82
J-671	1,004.56	J-2038	29.35	634.73		3,444.93	J-648	18.23	512.07	3,275.42	3,275.42
J-672	1,004.56	J-2038	29.35	634.73		3,461.31	J-648	18.05	511.66	3,275.42	3,275.42
J-673	1,004.56	J-2038	29.35	634.73		3,290.44	J-648	19.85	515.8	3,275.42	3,275.42
J-674	1,004.56	J-2038	29.35	634.73		2,683.81	J-237	20	291.15	2,683.75	2,683.75
J-677	1,003.33	J-2038	29.35	634.74		3,027.50	J-677	20	647.16	3,027.51	3,027.51
J-678	1,003.33	J-2038	29.35	634.74		2,981.06	J-678	20	645.16	2,981.06	2,981.06
J-68	1,009.00	J-2038	29.35	634.74		7,055.79	J-68	20	604.16	7,055.80	7,055.80
J-685	1,003.33	J-2038	29.35	634.74		5,394.30	J-685	20	586.16	5,394.34	5,394.34
J-686	1,004.56	J-2038	29.3	634.61		1,902.14	J-686	20	499.16	1,902.15	1,902.15
J-687	1,004.86	J-2038	29.3	634.61		194,681.98	PRV-284-IN	-14,585.89	-33,417.33		
J-700	1,004.56	J-2038	29.3	634.61		64,094.11	J-3059	2,023.15	5,079.17	6,569.85	6,569.85
J-701	1,003.33	J-2038	29.35	634.74		10,293.60	J-610	6.36	559.68	8,500.79	8,500.79
J-702	1,003.33	J-2038	29.35	634.74		8,914.02	J-610	15.86	581.61	8,317.40	8,317.40
J-703	1,003.33	J-2038	29.35	634.74		8,704.65	J-610	16.25	582.49	8,127.60	8,127.60
J-704	1,003.33	J-2038	29.35	634.74		8,406.36	J-610	19.74	590.55	8,364.84	8,364.84
J-705	1,003.33	J-2038	29.35	634.74		8,629.12	118	6.03	553.91	6,997.52	6,997.52
J-706	1,003.33	J-2038	29.35	634.74		8,084.11	118	11.08	565.56	6,961.02	6,961.02
J-707	1,003.33	J-2038	29.35	634.74		7,084.32	118	18.12	581.81	6,921.52	6,921.52
J-708	1,003.33	J-2038	29.35	634.74		6,857.76	J-708	20	580.16	6,731.65	6,731.65
J-709	1,003.33	J-2038	29.35	634.74		7,416.13	118	10.59	564.44	6,554.48	6,554.48
J-711	1,003.33	J-2038	29.35	634.74		7,143.97	118	13.53	571.23	6,579.94	6,579.94
J-712	1,004.56	J-2038	29.35	634.73		3,832.82	J-648	13.82	501.9	3,275.42	3,275.42
J-713	1,004.56	J-2038	29.35	634.73		2,878.80	J-713	20	406.16	2,878.80	2,878.80
J-714	1,004.56	J-2038	29.35	634.73		4,671.57	J-648	-6.14	455.83	3,395.48	3,395.48
J-715	1,004.56	J-2038	29.35	634.73		4,814.04	J-648	-8.4	450.61	3,535.20	3,535.20

J-716	1,004.56	J-2038	29.35	634.73		4,681.02	J-648	-3.51	461.9	3,647.23	3,647.23
J-717	1,004.56	J-2038	29.35	634.73		4,929.90	J-648	-5.54	457.21	3,869.17	3,869.17
J-718	1,003.33	J-2038	29.35	634.74		11,755.58	J-718	20	636.16	11,755.68	11,755.68
J-719	1,004.56	J-2038	29.35	634.73		4,154.46	J-648	6.74	485.55	3,305.18	3,305.18
J-72	1,008.00	J-2038	29.35	634.74		7,212.42	J-72	20	603.16	7,212.43	7,212.43
J-720	1,003.33	J-2038	29.35	634.74		10,372.21	J-720	20	646.16	10,372.31	10,372.31
J-721	1,003.33	J-2038	29.34	634.71		10,181.60	PRV-308-IN	14.65	565.81		
J-722	1,003.33	J-2038	29.35	634.74		14,022.13	J-722	20	636.16	14,022.30	14,022.30
J-723	1,003.33	J-2038	29.35	634.74		39,215.22	J-723	20	641.17	39,219.59	39,219.59
J-724	1,003.33	J-2038	29.35	634.74		13,173.20	J-724	20	641.16	13,173.37	13,173.37
J-726	18,003.33	J-2038	29.35	634.74		86,231.31	56	15.34	636.39	73,598.66	73,598.66
J-727	1,004.56	J-2038	29.35	634.73		4,382.81	J-648	0.49	471.13	3,290.07	3,290.07
J-728	1,004.56	J-2038	29.35	634.73		5,628.43	J-728	20	396.16	5,628.42	5,628.42
J-74	1,008.00	J-2038	29.35	634.74		7,117.34	J-74	20	615.16	7,117.35	7,117.35
J-78	1,024.00	J-2038	29.35	634.74		16,481.32	J-377	15.35	645.44	15,007.20	15,007.20
J-79	1,015.00	J-2038	29.35	634.74		7,384.60	J-79	20	616.16	7,384.61	7,384.61
J-802	1,000.00	J-2038	29.3	634.61		5,460.73	J-802	20	536.16	5,460.68	5,460.68
J-803	1,003.33	J-2038	29.35	634.74		6,622.47	J-803	20	587.16	6,622.48	6,622.48
J-804	1,000.00	J-2038	29.35	634.74		2,937.28	J-804	20	628.16	2,937.28	2,937.28
J-806	1,000.00	J-806	66.62	345.75	1,832.85	1,832.79	J-806	20	238.16	1,832.79	1,832.79
J-808	1,000.00	J-806	71.76	357.61	2,108.34	2,206.18	J-806	13.93	224.16	2,108.22	2,108.22
J-810	1,000.00	J-810	65.99	377.29	2,678.60	2,678.23	J-810	20	271.16	2,678.23	2,678.23
J-812	1,000.00	J-812	25	397.7	3,595.43	632,147.50	J-812	20.86	388.13	3,595.51	3,595.43
J-814	1,000.00	J-2038	29.3	634.61		6,770.39	J-273	19.35	554.66	6,716.81	6,716.81
J-815	1,003.33	J-2038	29.35	634.74		8,373.36	J-618	17.82	585.13	8,042.98	8,042.98
J-816	1,003.33	J-2038	29.35	634.74		8,715.36	J-618	14	576.31	7,885.64	7,885.64
J-818	1,000.00	J-2038	29.35	634.73		4,252.00	J-648	13.09	500.2	3,938.38	3,938.38
J-820	1,000.00	J-2038	29.35	634.73		4,387.96	J-648	8.43	489.45	3,880.01	3,880.01
J-824	1,000.00	J-824	24.96	397.6	3,244.39	947,274.38	J-824	19.38	384.72	3,244.44	3,244.39
J-826	1,008.28	J-2038	29.35	634.74		7,002.56	J-105	16.14	590.24	6,709.40	6,709.40
J-827	1,008.28	J-2038	29.35	634.74		6,257.34	J-827	20	587.16	6,257.34	6,257.34
J-828	1,008.28	J-2038	29.35	634.74		6,118.81	J-828	20	575.16	6,118.81	6,118.81
J-829	1,008.28	J-2038	29.35	634.74		6,011.20	J-829	20	566.16	6,011.20	6,011.20
J-830	1,008.28	J-2038	29.35	634.74		5,724.44	J-830	20	580.16	5,724.44	5,724.44
J-831	1,008.28	J-2038	29.35	634.74		4,800.64	J-831	20	578.16	4,800.65	4,800.65
J-832	1,008.28	J-2038	29.35	634.74		4,379.88	J-832	20	576.16	4,379.88	4,379.88
J-833	1,008.28	J-2038	29.35	634.74		4,295.18	J-833	20	574.16	4,295.18	4,295.18
J-834	1,008.28	J-2038	29.35	634.74		4,324.98	J-834	20	574.16	4,324.98	4,324.98
J-842	1,008.28	J-2038	29.35	634.74		2,626.49	J-848	19.55	560.13	2,616.69	2,616.69
J-843	1,008.28	J-2038	29.35	634.74		2,810.95	J-848	19.17	559.24	2,791.55	2,791.55
J-845	1,008.28	J-2038	29.35	634.74		3,206.07	J-845	20	554.16	3,206.07	3,206.07
J-846	1,008.28	J-2038	29.35	634.74		3,493.36	J-846	20	561.16	3,493.36	3,493.36
J-847	1,008.28	J-2038	29.35	634.74		3,230.40	J-848	19.02	558.89	3,203.92	3,203.92
J-848	1,008.28	J-2038	29.35	634.74		2,394.18	J-848	20	561.16	2,394.18	2,394.18
J-85	1,003.33	J-2038	29.35	634.74		8,540.31	FCV-85-OUT	20	628.16	8,540.33	8,540.33
J-850	1,000.00	J-2038	29.35	634.74		1,233.40	J-431	13.07	278.15	1,142.17	1,142.17
J-86	1,006.15	J-2038	29.35	634.74		8,417.52	J-86	20	604.16	8,417.54	8,417.54

J-87	1,006.15	J-2038	29.35	634.74		7,973.87	J-87	20	594.16	7,973.88	7,973.88
J-88	1,006.15	J-2038	29.35	634.74		7,586.99	J-88	20	595.16	7,587.00	7,587.00
J-89	1,006.15	J-2038	29.35	634.74		7,675.06	J-89	20	622.16	7,675.08	7,675.08
J-90	1,024.00	J-2038	29.35	634.74		15,566.01	J-151	17.3	619.94	14,984.40	14,984.40
PRV-172-IN	1,000.00	J-2038	29.3	634.61		6,191.55	J-585	5.14	473.85	5,489.89	5,489.89
PRV-172-OUT	1,000.00	J-2038	29.33	634.69		5,876.12	J-173	17.87	434.05	5,745.30	5,745.30
PRV-1-IN	1,000.00	J-2038	29.3	634.61		6,441.40	PRV-600-OU	15.13	547.91	6,075.87	6,075.87
PRV-1-OUT	1,000.00	J-2038	29.3	634.61		6,450.90	PRV-600-OU	15.9	549.69	6,139.05	6,139.05
PRV-238-OUT	1,000.00	J-2038	29.35	634.74		2,192.11	PRV-238-OU	20	196.16	2,184.75	2,184.75
PRV-240-IN	1,000.00	J-2038	29.35	634.73		2,422.62	J-648	13.6	501.38	2,174.03	2,174.03
PRV-240-OUT	1,000.00	J-2038	29.35	634.73		4,071.17	J-648	7.66	487.67	3,202.62	3,202.62
PRV-248-IN	1,000.00	J-2038	29.35	634.73		3,697.08	PRV-248-IN	20	376.16	3,697.08	3,697.08
PRV-250-IN	1,004.56	J-2038	29.35	634.73		5,414.81	PRV-250-IN	20	376.16	5,414.81	5,414.81
PRV-250-OUT	1,004.86	J-2038	29.35	634.73		2,807.60	PRV-250-OU	20	376.16	2,807.60	2,807.60
PRV-258-IN	1,000.00	J-2038	29.35	634.73		1,919.51	PRV-258-IN	20	342.16	1,919.51	1,919.51
PRV-258-OUT	1,000.00	J-2038	29.35	634.73		2,155.28	PRV-258-OU	20	342.16	2,154.97	2,154.97
PRV-261-IN	1,000.00	J-2038	29.35	634.74		8,153.28	J-304	-0.81	548.13	5,960.98	5,960.98
PRV-264-IN	1,004.98	J-2038	29.35	634.73		1,717.66	PRV-264-IN	20	446.16	1,717.66	1,717.66
PRV-264-OUT	1,004.56	J-2038	29.35	634.73		2,528.63	PRV-264-OU	20	446.16	2,528.67	2,528.67
PRV-281-IN	1,000.00	J-2038	29.3	634.61		2,912.23	PRV-281-IN	20	456.16	2,912.23	2,912.23
PRV-281-OUT	1,000.00	J-2038	29.3	634.61		3,402.21	PRV-572-OU	-1,375,986.00	-3,175,321.75		
PRV-282-IN	1,000.00	J-2038	29.3	634.61		5,731.32	PRV-282-OU	19.99	506.14		
PRV-282-OUT	1,000.00	J-2038	29.3	634.61		2,076.31	PRV-282-OU	20	506.16	2,066.98	2,066.98
PRV-284-IN	1,000.00	J-2038	29.3	634.61		2,980.14	PRV-284-IN	20	291.16	2,980.14	2,980.14
PRV-284-OUT	1,000.00	J-2038	29.3	634.61		#####	PRV-284-OU	86.06	443.62	2,414.04	2,414.04
PRV-308-IN	1,003.33	J-2038	29.35	634.74		1,532.72	J-1860	20	578.16	1,532.72	1,532.72
PRV-341-IN	1,000.00	J-2038	29.35	634.74		3,630.43	PRV-341-IN	20	555.16	3,630.43	3,630.43
PRV-341-OUT	1,000.00	J-2038	29.35	634.73		4,574.95	PRV-341-OU	20	555.16	4,574.96	4,574.96
PRV-393-IN	1,000.00	J-2038	29.35	634.74		2,109.44	PRV-393-IN	20	521.16	2,109.42	2,109.42
PRV-393-OUT	1,000.00	J-2038	29.35	634.73		1,869.67	PRV-393-OU	20	516.16	1,869.67	1,869.67
PRV-400-IN	1,000.00	J-2038	29.35	634.74		4,867.32	J-431	-32.18	173.73		

PRV-472- IN	1,000.00	J-2038	29.3	634.61		8,338.92	J-173	-15.83	356.26	6,349.33	6,349.33
PRV-472- OUT	1,000.00	J-2038	29.3	634.61		7,857.70	J-273	4.63	520.7	6,749.34	6,749.34
PRV-483- IN	1,000.00	J-2038	29.35	634.73		3,299.72	PRV-483-IN	20	406.16	3,299.72	3,299.72
PRV-483- OUT	1,000.00	J-2038	29.35	634.73		4,094.71	PRV-483-OU	20	406.16	4,094.71	4,094.71
PRV-507- IN	1,000.00	J-2038	29.35	634.73		4,424.66	PRV-507-IN	20	407.16	4,424.66	4,424.66
PRV-507- OUT	1,000.00	J-2038	29.35	634.73		5,465.71	PRV-507-OU	20	407.16	5,465.71	5,465.71
PRV-525- IN	1,004.98	J-2038	29.35	634.73		3,779.14	PRV-525-IN	20	414.16	3,779.14	3,779.14
PRV-572- OUT	1,000.00	J-2038	29.33	634.69		2,781.61	PRV-572-OU	20	321.16	2,781.61	2,781.61
PRV-591- IN	1,000.00	J-2038	29.3	634.61		6,834.74	J-273	18.57	552.86	6,717.80	6,717.80
PRV-600- IN	1,000.00	J-2038	29.35	634.74		7,426.13	PRV-600-IN	20	559.16	7,397.75	7,397.75
PRV-600- OUT	1,000.00	J-2038	29.3	634.61		5,682.43	PRV-600-OU	20	559.16	5,682.41	5,682.41
PRV-609- IN	1,000.00	J-2038	29.35	634.74		8,164.53	PRV-609-IN	20	580.16	8,164.54	8,164.54
PRV-609- OUT	1,000.00	J-2038	29.35	634.74		8,228.40	J-610	19.29	589.51	8,041.64	8,041.64
PRV-635- OUT	1,000.00	J-2038	29.35	634.73		3,874.86	PRV-635-OU	20	453.16	3,874.77	3,874.77
PRV-650- OUT	1,000.00	J-2038	29.35	634.73		3,736.86	J-648	15.89	506.66	3,347.52	3,347.52

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
10	1,005.35	J-2038	29.34	634.72		3,185.92	J-156	-5.59	352.11	2,599.20	2,599.20
100	1,003.91	J-2038	29.35	634.74		6,904.44	100	20	542.16	6,904.45	6,904.45
102	1,003.91	J-2038	29.35	634.74		3,311.22	102	20	546.16	3,311.22	3,311.22
104	1,003.91	J-2038	29.35	634.74		6,134.36	104	20	542.16	6,134.37	6,134.37
106	1,003.91	J-2038	29.35	634.74		8,302.16	J-304	1.9	554.38	6,515.66	6,515.66
108	1,003.91	J-2038	29.35	634.74		6,557.32	118	17.01	579.26	6,316.92	6,316.92
110	1,003.91	J-2038	29.35	634.74		6,218.19	118	19.6	585.24	6,040.14	6,040.14
112	1,003.91	J-2038	29.35	634.74		6,106.99	118	17.23	579.76	5,699.46	5,699.46
114	1,003.91	J-2038	29.35	634.74		4,513.68	114	20	571.16	4,513.69	4,513.69
116	1,003.91	J-2038	29.35	634.74		6,169.95	118	16.24	577.47	5,651.59	5,651.59
118	1,003.91	J-2038	29.35	634.74		4,293.62	118	20	586.16	4,293.62	4,293.62
12	1,005.35	J-2038	29.34	634.72		2,873.53	J-156	8.65	384.97	2,599.20	2,599.20
120	1,003.91	J-2038	29.35	634.74		6,683.09	118	17.13	579.54	6,455.15	6,455.15
122	1,000.00	J-2038	29.3	634.61		2,939.37	122	20	528.16	2,939.37	2,939.37
124	1,000.00	J-2038	29.3	634.61		3,275.45	124	20	531.16	3,275.45	3,275.45
128	1,000.00	J-2038	29.35	634.74		5,160.01	128	20	551.16	5,160.01	5,160.01
130	1,000.00	J-2038	29.35	634.74		6,192.06	128	20	551.16	6,192.07	6,192.07
14	1,005.35	J-2038	29.34	634.72		2,815.96	J-156	11.12	390.67	2,599.20	2,599.20
140	1,000.00	J-2038	29.34	634.72		3,382.85	J-713	-1.7	356.08	2,854.52	2,854.52
16	1,005.35	J-2038	29.34	634.72		2,186.51	16	20	236.16	2,186.51	2,186.51
18	1,005.35	J-2038	29.34	634.72		4,204.34	J-648	4.2	479.7	3,298.83	3,298.83
20	1,005.35	J-2038	29.34	634.72		4,013.39	J-648	10.06	493.21	3,364.06	3,364.06
22	1,005.35	J-2038	29.34	634.72		3,977.13	22	20	391.16	3,977.13	3,977.13
24	1,005.35	J-2038	29.34	634.72		3,744.47	24	20	399.16	3,744.56	3,744.56
26	1,005.71	J-2038	29.3	634.61		3,897.55	J-575	16.65	306.42	3,575.48	3,575.48
28	1,005.71	J-2038	29.3	634.61		4,037.80	J-575	18.45	310.59	3,873.39	3,873.39
30	1,005.85	J-2038	29.3	634.61		6,623.76	J-273	19.32	554.58	6,567.68	6,567.68
32	1,005.85	J-2038	29.3	634.61		6,575.11	32	20	546.16	6,575.12	6,575.12
34	1,005.85	J-2038	29.3	634.61		6,584.40	34	20	539.16	6,584.40	6,584.40
36	1,005.85	J-2038	29.3	634.61		6,690.16	J-273	18.92	553.67	6,601.94	6,601.94
38	1,005.85	J-2038	29.3	634.61		6,976.37	J-273	15.26	545.22	6,602.64	6,602.64
40	1,005.85	J-2038	29.3	634.61		6,261.37	40	20	541.16	6,261.38	6,261.38
42	1,005.85	J-2038	29.3	634.61		5,811.44	42	20	536.16	5,811.30	5,811.30
44	1,003.91	J-2038	29.35	634.74		5,255.80	44	20	580.16	5,255.80	5,255.80
46	1,003.91	J-2038	29.35	634.74		5,223.57	46	20	579.16	5,223.17	5,223.17
48	1,003.91	J-2038	29.35	634.74		6,505.57	48	20	578.16	6,502.54	6,502.54
50	1,000.00	J-2038	29.35	634.74		10,329.81	J-105	14.21	585.79	9,690.93	9,690.93
52	1,003.91	J-2038	29.35	634.74		3,425.17	52	20	643.16	3,425.17	3,425.17
54	1,003.91	J-2038	29.35	634.74		3,597.43	54	20	643.16	3,597.44	3,597.44
56	1,003.91	J-2038	29.35	634.74		3,436.85	56	20	647.16	3,436.85	3,436.85
58	1,003.91	J-2038	29.35	634.74		3,635.77	58	20	643.16	3,635.78	3,635.78
60	1,003.91	J-2038	29.35	634.74		2,903.67	66	20	641.16	2,903.65	2,903.65
62	1,003.91	J-2038	29.35	634.74		2,560.78	66	20	641.16	2,560.78	2,560.78

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
64	1,003.91	J-2038	29.35	634.74		2,323.95	66	20	641.16	2,323.95	2,323.95
66	1,003.91	J-2038	29.35	634.74		2,121.74	66	20	641.16	2,121.74	2,121.74
68	1,013.83	J-2038	29.35	634.74		8,731.12	74	16.3	625.62	8,241.49	8,241.49
70	1,013.83	J-2038	29.35	634.74		8,470.92	74	16.51	626.11	8,021.80	8,021.80
72	1,013.83	J-2038	29.35	634.74		7,509.38	72	20	626.16	7,509.40	7,509.40
74	1,013.83	J-2038	29.35	634.74		7,555.40	74	20	634.16	7,555.42	7,555.42
76	1,013.05	J-2038	29.35	634.74		6,425.94	76	20	626.16	6,425.95	6,425.95
78	1,013.05	J-2038	29.35	634.74		7,170.71	78	20	634.16	7,170.72	7,170.72
80	1,005.35	J-2038	29.34	634.72		1,994.70	80	20	380.16	1,994.70	1,994.70
82	1,005.71	J-2038	29.34	634.72		2,080.77	86	19.5	357	2,071.68	2,071.68
84	1,000.00	J-2038	29.34	634.72		2,046.50	80	17.23	373.77	1,989.35	1,989.35
86	1,000.00	J-2038	29.34	634.72		2,047.28	86	20	358.16	2,047.28	2,047.28
88	1,005.35	J-2038	29.34	634.72		1,506.64	88	20	295.16	1,506.64	1,506.64
90	1,005.35	J-2038	29.34	634.72		1,562.95	88	20	295.16	1,562.94	1,562.94
92	1,000.00	J-2038	29.34	634.72		4,024.18	J-648	7.78	487.96	3,208.80	3,208.80
94	1,000.00	J-2038	29.34	634.72		2,128.54	94	20	415.16	2,128.54	2,128.54
96	1,003.91	J-2038	29.35	634.74		7,339.22	J-304	11.63	576.85	6,355.28	6,355.28
98	1,003.91	J-2038	29.35	634.74		6,882.69	102	20	546.16	6,882.68	6,882.68
FCV-121-IN	1,000.00	J-2038	29.35	634.74		5,117.62	J-3017	5.75	583.26	4,056.92	4,056.92
FCV-85-IN	1,000.00	J-2038	29.35	634.74		8,465.10	FCV-85-OUT	20	628.16	8,465.12	8,465.12
FCV-85-OUT	1,000.00	J-2038	29.35	634.74		1,002.12	J-2038	29.35	634.74		
J-102	1,010.00	J-2038	29.35	634.74		9,382.67	J-349	19.66	600.38	9,345.55	9,345.55
J-104	1,018.00	J-2038	29.35	634.74		9,377.62	J-349	19.57	600.17	9,330.93	9,330.93
J-105	1,009.73	J-2038	29.35	634.74		5,111.84	J-105	20	599.16	5,111.84	5,111.84
J-107	1,006.15	J-2038	29.35	634.74		8,757.42	J-392	13.51	611.17	8,006.45	8,006.45
J-110	1,009.73	J-2038	29.35	634.74		5,682.16	J-105	19.58	598.18	5,654.69	5,654.69
J-114	1,009.73	J-2038	29.35	634.74		5,897.40	J-105	19.25	597.43	5,846.92	5,846.92
J-115	1,009.73	J-2038	29.35	634.74		6,227.35	J-105	17.56	593.53	6,058.44	6,058.44
J-116	1,009.73	J-2038	29.35	634.74		2,231.19	J-116	20	554.16	2,231.20	2,231.20
J-117	1,009.73	J-2038	29.35	634.74		2,345.47	J-117	20	548.16	2,345.47	2,345.47
J-118	1,006.15	J-2038	29.35	634.74		9,500.83	J-392	13.04	610.08	8,631.93	8,631.93
J-121	1,001.74	J-2038	29.35	634.74		9,791.66	J-392	14.24	612.85	9,032.32	9,032.32
J-122	1,006.15	J-2038	29.35	634.74		10,476.79	J-392	12.98	609.95	9,507.68	9,507.68
J-123	1,030.00	J-2038	29.35	634.74		10,340.38	J-105	9.06	573.91	9,223.13	9,223.13
J-124	1,009.73	J-2038	29.35	634.74		8,171.19	J-105	13.25	583.58	7,590.03	7,590.03
J-125	1,009.73	J-2038	29.35	634.74		7,834.50	J-105	14.47	586.38	7,369.59	7,369.59
J-134	1,000.00	J-2038	29.35	634.74		10,731.61	J-59	18.7	601.16	10,568.20	10,568.20
J-135	1,000.00	J-2038	29.35	634.74		10,473.17	J-135	20	601.16	10,473.20	10,473.20
J-139	1,003.91	J-2038	29.35	634.74		4,052.28	J-139	20	626.16	4,052.28	4,052.28
J-140	1,003.91	J-2038	29.35	634.74		4,104.23	J-2010	19.46	634.9	4,079.56	4,079.56
J-141	1,000.00	J-2038	29.35	634.74		8,609.69	J-141	20	626.16	8,609.71	8,609.71

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-142	1,000.00	J-2038	29.35	634.74		8,603.19	J-142	20	626.16	8,603.21	8,603.21
J-145	1,005.85	J-2038	29.34	634.72		5,807.18	J-644	0.07	490.17	4,597.59	4,597.59
J-149	1,003.91	J-2038	29.35	634.74		5,391.25	J-149	20	583.16	5,391.26	5,391.26
J-150	1,005.71	J-2038	29.34	634.72		1,423.00	J-150	20	246.16	1,423.00	1,423.00
J-151	1,006.15	J-2038	29.35	634.74		8,891.18	J-151	20	626.16	8,891.20	8,891.20
J-155	1,003.91	J-2038	29.35	634.74		8,705.22	J-610	14.18	577.72	7,847.66	7,847.66
J-156	1,005.35	J-2038	29.34	634.72		2,599.20	J-156	20	411.16	2,599.20	2,599.20
J-158	1,003.91	J-2038	29.35	634.74		3,480.63	J-496	18.37	642.4	3,272.24	3,272.24
J-160	1,003.91	J-2038	29.35	634.74		4,170.75	J-2010	18.6	632.93	4,108.18	4,108.18
J-161	1,009.73	J-2038	29.35	634.74		7,121.85	J-161	20	588.16	7,121.86	7,121.86
J-163	1,003.91	J-2038	29.35	634.74		9,504.90	J-163	20	631.16	9,504.95	9,504.95
J-165	1,005.85	J-2038	29.34	634.72		8,474.75	PRV-341-OU	-3.82	500.19	6,289.58	6,289.58
J-167	1,005.35	J-2038	29.34	634.72		3,455.99	J-648	17.45	510.27	3,214.15	3,214.15
J-168	1,005.35	J-2038	29.3	634.61		3,655.20	J-168	20	420.16	3,655.20	3,655.20
J-169	1,005.85	J-2038	29.34	634.72		6,557.12	PRV-341-OU	16.95	548.11	6,208.61	6,208.61
J-170	1,005.85	J-2038	29.34	634.72		3,753.97	J-644	4	499.24	2,761.27	2,761.27
J-171	1,005.35	J-2038	29.3	634.61		5,908.48	J-173	16.05	429.84	5,672.32	5,672.32
J-172	1,005.85	J-2038	29.3	634.61		6,153.02	J-585	4.8	473.08	5,443.45	5,443.45
J-173	1,005.35	J-2038	29.3	634.61		4,786.52	J-173	20	438.96	4,786.53	4,786.53
J-174	1,005.35	J-2038	29.3	634.61		7,014.09	J-173	-12.81	363.23	5,975.44	5,975.44
J-176	1,005.35	J-2038	29.3	634.61		6,577.84	J-173	2.73	399.1	6,003.84	6,003.84
J-177	1,005.35	J-2038	29.3	634.61		4,513.55	J-177	20	394.16	4,513.55	4,513.55
J-178	1,005.35	J-2038	29.3	634.61		7,072.54	J-173	-13.56	361.51	6,025.88	6,025.88
J-179	1,005.35	J-2038	29.3	634.61		8,385.91	J-173	-24.94	335.24	6,293.23	6,293.23
J-180	1,005.85	J-2038	29.34	634.72		3,481.34	J-644	5.71	503.18	2,625.57	2,625.57
J-183	1,003.91	J-2038	29.35	634.74		4,127.14	56	18.28	643.18	3,858.71	3,858.71
J-1830	1,000.00	J-2038	29.3	634.61		6,155.24	J-1830	20	386.16	6,155.22	6,155.22
J-1832	1,000.00	J-2038	29.35	634.74		4,268.80	J-2010	16.48	628.04	4,115.49	4,115.49
J-1834	1,000.00	J-2038	29.35	634.74		4,288.97	J-2010	16	626.92	4,115.50	4,115.50
J-1836	1,000.00	J-2038	29.35	634.74		3,648.71	J-1836	20	628.16	3,648.72	3,648.72
J-184	1,005.85	J-2038	29.34	634.72		13,396.42	J-189	-2.91	499.29	9,854.32	9,854.32
J-1842	1,000.00	J-2038	29.35	634.74		5,531.36	J-3016	2.67	576.16	4,216.05	4,216.05
J-1844	1,000.00	J-2038	29.35	634.74		5,165.08	J-1844	20	628.16	5,165.08	5,165.08
J-1846	1,000.00	J-2038	29.35	634.74		2,945.64	J-1846	20	628.16	2,945.64	2,945.64
J-185	1,005.85	J-2038	29.34	634.72		12,599.69	J-189	1.09	508.52	9,600.16	9,600.16
J-1854	1,000.00	J-2038	29.35	634.74		7,983.06	J-618	17.14	583.55	7,555.16	7,555.16
J-1856	1,000.00	J-2038	29.35	634.74		4,010.43	J-1856	20	578.16	4,010.43	4,010.43
J-186	1,005.85	J-2038	29.34	634.72		11,611.02	J-189	2.07	510.78	8,589.20	8,589.20
J-1860	1,000.00	J-2038	29.35	634.74		1,495.38	J-1860	20	578.16	1,495.38	1,495.38
J-1862	1,000.00	J-2038	29.3	634.61		1,278.15	J-1862	20	361.16	1,278.15	1,278.15
J-1864	1,000.00	J-2038	29.35	634.74		9,929.42	J-618	8.22	562.97	8,347.87	8,347.87
J-1866	1,000.00	J-2038	29.35	634.74		10,100.54	J-618	6.85	559.82	8,397.64	8,397.64
J-1868	1,000.00	J-2038	29.35	634.74		3,416.46	J-1868	20	617.16	3,416.46	3,416.46

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-187	1,005.85	J-2038	29.34	634.72		11,734.17	J-189	3.14	513.25	8,894.21	8,894.21
J-1872	1,000.00	J-2038	29.35	634.74		5,079.47	J-191	19.1	619.09	4,981.63	4,981.63
J-189	1,005.85	J-2038	29.34	634.72		4,045.02	J-189	20	552.16	4,044.08	4,044.08
J-190	1,005.71	J-2038	29.35	634.74		4,905.48	J-431	-35.47	166.14		
J-191	1,003.91	J-2038	29.35	634.74		4,838.67	J-191	20	621.16	4,838.67	4,838.67
J-193	1,003.91	J-2038	29.35	634.74		8,710.87	J-193	20	621.16	8,710.90	8,710.90
J-194	1,003.91	J-2038	29.35	634.74		5,132.26	J-194	20	613.16	5,132.26	5,132.26
J-195	1,005.35	J-2038	29.34	634.72		2,091.20	J-195	20	386.16	2,091.20	2,091.20
J-197	1,002.92	J-2038	29.35	634.74		6,873.04	J-410	13.83	79.92	6,587.39	6,587.39
J-198	1,005.85	J-2038	29.34	634.72		5,793.79	J-198	20	466.16	5,793.01	5,793.01
J-199	1,005.85	J-2038	29.34	634.72		5,305.41	J-199	20	461.16	5,305.42	5,305.42
J-200	1,003.91	J-2038	29.35	634.74		5,279.85	56	9.8	623.61	3,858.71	3,858.71
J-2000	1,000.00	J-2038	29.35	634.74		4,721.66	J-3017	3.69	578.53	3,645.10	3,645.10
J-2004	1,000.00	J-2038	29.35	634.74		10,313.99	J-105	12.81	582.57	9,538.56	9,538.56
J-2009	1,000.00	J-2038	29.35	634.74		4,172.74	J-2010	18.35	632.34	4,099.09	4,099.09
J-201	1,003.91	J-2038	29.35	634.74		4,393.12	J-677	9.61	623.18	3,199.39	3,199.39
J-2010	1,000.00	J-2038	29.35	634.74		4,021.88	J-2010	20	636.16	4,021.91	4,021.91
J-2012	1,000.00	J-2038	29.35	634.74		4,165.13	J-2010	16.78	628.72	4,023.23	4,023.23
J-2013	1,000.00	J-2038	29.35	634.74		4,247.46	J-2010	14.8	624.16	4,023.53	4,023.53
J-2014	1,000.00	J-2038	29.35	634.74		4,237.85	J-2010	15.05	624.74	4,024.16	4,024.16
J-2015	1,000.00	J-2038	29.35	634.74		4,077.93	J-2016	18.43	625.54	4,011.50	4,011.50
J-2016	1,000.00	J-2038	29.35	634.74		3,996.81	J-2016	20	629.16	3,996.81	3,996.81
J-2019	1,000.00	J-2038	29.35	634.74		6,127.32	J-304	15.1	584.86	5,529.00	5,529.00
J-202	1,003.91	J-2038	29.35	634.74		3,070.01	J-497	19.86	646.83	3,052.12	3,052.12
J-2020	1,000.00	J-2038	29.34	634.72		8,136.80	PRV-341-OU	-4.83	497.84	5,979.06	5,979.06
J-2021	1,000.00	J-2038	29.34	634.72		5,861.87	J-2021	20	468.16	5,854.90	5,854.90
J-2022	1,000.00	J-2038	29.34	634.72		8,013.74	PRV-341-OU	-6.83	493.24	5,777.00	5,777.00
J-2023	1,000.00	J-2038	29.35	634.74		4,135.53	J-2010	19.36	634.67	4,106.48	4,106.48
J-2024	1,000.00	J-2038	29.35	634.74		4,204.53	J-2010	16.33	627.69	4,044.04	4,044.04
J-2025	1,000.00	J-2038	29.35	634.74		4,127.29	J-2010	18.48	632.66	4,059.35	4,059.35
J-2027	1,000.00	J-2038	29.35	634.74		4,153.90	J-2010	17.4	630.16	4,038.73	4,038.73
J-203	1,003.91	J-2038	29.35	634.74		8,662.55	J-203	20	626.16	8,662.58	8,662.58
J-2030	1,000.00	J-2038	29.35	634.74		4,091.42	J-2010	18.53	632.76	4,025.21	4,025.21
J-2031	1,000.00	J-2038	29.35	634.74		3,557.75	J-2031	20	626.16	3,557.74	3,557.74
J-2032	1,000.00	J-2038	29.34	634.72		5,876.11	PRV-341-OU	9.03	529.84	4,989.60	4,989.60
J-2033	1,000.00	J-2038	29.34	634.72		3,570.42	J-2033	20	451.16	3,570.54	3,570.54
J-2034	1,000.00	J-2038	29.34	634.72		6,779.85	PRV-341-OU	-4.13	499.48	4,989.60	4,989.60
J-2036	1,000.00	J-2038	29.35	634.74		6,287.26	J-2036	20	61.16	6,287.27	6,287.27
J-2037	1,000.00	J-2038	29.19	634.37	15,945.72	28,407.81	J-2038	3.92	576.05	15,945.07	15,945.07
J-2038	1,000.00	J-2038	29.01	633.96	6,988.77	6,988.77	J-2038	20	613.16	6,988.82	6,988.77
J-2039	1,000.00	J-2038	29.19	634.38	12,518.81	18,678.54	J-2038	10.19	590.53	12,519.48	12,518.81
J-204	1,003.91	J-2038	29.35	634.74		4,162.83	J-204	20	621.16	4,162.84	4,162.84
J-2040	1,000.00	J-2038	29.35	634.74		4,087.41	J-337	14.11	577.56	3,903.02	3,903.02

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-2041	1,000.00	J-2038	29.35	634.74		8,741.20	J-337	-206.82	67.68	3,352.14	3,352.14
J-2044	1,000.00	J-2038	29.1	634.16	8,861.36	21,972.25	J-2038	-18.63	524.01	8,861.55	8,861.36
J-2045	1,000.00	J-2038	29.1	634.17	8,904.19	22,005.92	J-2038	-18.34	524.67	8,904.39	8,904.19
J-2046	1,000.00	J-2038	29.1	634.17	8,889.82	21,994.52	J-2038	-18.44	524.45	8,890.01	8,889.82
J-2047	1,000.00	J-2038	29.14	634.26	10,128.04	14,464.07	J-2038	11.63	593.85	10,128.37	10,128.04
J-2048	1,000.00	J-2038	29.34	634.72	91,298.16	-65,740.25	J-824	30	409.24		91,298.15
J-2049	1,000.00	J-2038	29.35	634.74		221,438.27	J-2049	20.11	546.4	221,766.94	221,766.94
J-205	1,003.91	J-2038	29.35	634.74		16,082.74	J-720	14.99	634.59	13,582.05	13,582.05
J-2050	1,000.00	J-2038	29.35	634.74		5,775.21	J-2050	20	621.16	5,775.22	5,775.22
J-2051	1,000.00	J-2038	29.35	634.74		9,001.93	J-2051	20	641.16	9,001.99	9,001.99
J-2052	1,000.00	J-2038	29.35	634.74		5,660.11	J-2052	20	621.16	5,660.12	5,660.12
J-2053	1,000.00	J-2038	29.35	634.74		12,012.77	J-2053	20	641.16	12,012.90	12,012.90
J-2054	1,000.00	J-2038	29.35	634.74		10,301.36	J-2054	20	641.16	10,301.44	10,301.44
J-2055	1,000.00	J-2038	29.35	634.74		8,377.34	J-105	12.79	582.52	7,744.55	7,744.55
J-2056	1,000.00	J-2038	29.35	634.74		3,593.58	J-2056	20	581.16	3,593.58	3,593.58
J-2059	1,000.00	J-2038	29.35	634.74		6,538.93	J-2059	20	587.16	6,536.61	6,536.61
J-206	1,003.91	J-2038	29.35	634.74		14,967.34	J-206	20	621.16	14,967.47	14,967.47
J-2060	1,000.00	J-2038	29.35	634.74		5,114.11	J-2062	20	584.16	5,114.11	5,114.11
J-2061	1,000.00	J-2038	29.35	634.74		4,977.87	J-2061	20	584.16	4,977.87	4,977.87
J-2062	1,000.00	J-2038	29.35	634.74		4,122.30	J-2062	20	584.16	4,122.30	4,122.30
J-2063	1,000.00	J-2038	29.35	634.74		7,916.33	J-2063	20	581.16	7,997.00	7,997.00
J-2064	1,000.00	J-2038	29.35	634.74		8,144.23	J-610	17.61	585.64	7,717.76	7,717.76
J-2065	1,003.91	J-2038	29.35	634.74		4,806.78	J-3017	4.39	580.12	3,744.38	3,744.38
J-2067	1,000.00	J-2038	29.35	634.74		5,486.47	J-2067	20	586.16	5,486.47	5,486.47
J-2068	1,000.00	J-2038	29.35	634.74		9,756.78	J-105	9.16	574.15	8,704.51	8,704.51
J-2069	1,000.00	J-2038	29.35	634.74		3,383.26	J-2069	20	572.16	3,383.26	3,383.26
J-207	1,003.91	J-2038	29.35	634.74		18,932.13	J-207	20	621.16	18,932.43	18,932.43
J-2070	1,000.00	J-2038	29.35	634.74		8,983.85	J-2070	20	623.16	8,983.88	8,983.88
J-2072	1,000.00	J-2038	29.35	634.74		9,199.45	J-2072	20	623.16	9,199.49	9,199.49
J-2073	1,000.00	J-2038	29.35	634.74		9,055.95	J-2073	20	634.16	9,056.00	9,056.00
J-2074	1,000.00	J-2038	29.35	634.74		6,025.50	J-2074	20	622.16	6,025.51	6,025.51
J-2075	1,000.00	J-2038	29.35	634.74		7,115.19	J-2075	20	623.16	7,115.21	7,115.21
J-2076	1,000.00	J-2038	29.35	634.74		7,308.31	J-2076	20	621.16	7,308.33	7,308.33
J-2077	1,000.00	J-2038	29.35	634.74		8,245.30	J-304	-1.38	546.82	6,040.44	6,040.44
J-2078	1,000.00	J-2038	29.35	634.74		8,328.24	J-304	-0.95	547.8	6,186.89	6,186.89
J-2079	1,000.00	J-2038	29.35	634.74		2,288.85	J-431	-13.8	216.14		
J-208	1,003.91	J-2038	29.35	634.74		87,855.39	56	6.64	616.33	60,929.62	60,929.62
J-2080	1,000.00	J-2038	29.35	634.74		3,928.49	J-431	-33.44	170.82		
J-2081	1,000.00	J-2038	29.35	634.74		2,942.25	J-431	-19.83	202.24		
J-2082	1,000.00	J-2038	29.35	634.74		1,477.16	J-431	10.29	271.74		
J-2084	1,000.00	J-2038	29.34	634.72		2,591.71	J-2084	20	201.16	2,591.69	2,591.69
J-2085	1,000.00	J-2038	29.35	634.74		4,722.45	J-2085	20	586.16	4,722.45	4,722.45
J-2086	1,000.00	J-2038	29.35	634.74		6,899.89	J-401	18.71	162.19	6,798.64	6,798.64

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-2087	1,000.00	J-2038	29.35	634.74		2,363.01	J-431	-5.49	235.34		
J-2088	1,000.00	J-2038	29.34	634.72		2,555.44	J-2088	20	158.16	2,555.44	2,555.44
J-2089	1,000.00	J-2038	29.35	634.74		2,843.85	J-431	-10.17	224.54		
J-209	1,003.91	J-2038	29.35	634.74		17,266.29	J-209	20	639.16	17,266.65	17,266.65
J-210	1,003.91	J-2038	29.35	634.74		14,617.35	J-210	20	616.16	14,617.48	14,617.48
J-212	1,003.91	J-2038	29.35	634.74		14,596.13	J-299	17.84	638.17	13,599.89	13,599.89
J-213	1,003.91	J-2038	29.35	634.74		20,632.64	J-213	20	638.16	20,633.23	20,633.23
J-215	1,003.91	J-2038	29.35	634.74		9,739.82	J-215	20	616.16	9,739.86	9,739.86
J-216	1,003.91	J-2038	29.35	634.74		9,123.99	J-216	20	616.16	9,124.02	9,124.02
J-217	1,003.91	J-2038	29.35	634.74		3,849.20	J-217	20	621.16	3,849.20	3,849.20
J-218	1,003.91	J-2038	29.35	634.74		12,197.81	J-299	17.2	636.7	11,138.40	11,138.40
J-219	1,003.91	J-2038	29.35	634.74		8,995.70	J-219	20	641.16	8,995.75	8,995.75
J-220	1,003.91	J-2038	29.35	634.74		7,688.50	J-220	20	641.16	7,688.54	7,688.54
J-221	1,003.91	J-2038	29.35	634.74		7,459.93	J-221	20	641.16	7,459.96	7,459.96
J-222	1,003.91	J-2038	29.35	634.74		5,718.90	J-222	20	621.16	5,718.91	5,718.91
J-223	3,003.91	J-2038	29.35	634.74		5,090.41	J-223	20	621.16	5,090.42	5,090.42
J-224	1,003.91	J-2038	29.35	634.74		5,174.40	J-224	20	621.16	5,174.41	5,174.41
J-225	1,003.91	J-2038	29.35	634.74		5,409.17	J-225	20	623.16	5,409.18	5,409.18
J-226	1,003.91	J-2038	29.35	634.74		10,782.92	J-219	16.94	634.1	9,808.63	9,808.63
J-227	1,003.91	J-2038	29.35	634.74		8,601.14	J-299	15.42	632.58	7,450.64	7,450.64
J-228	1,003.91	J-2038	29.35	634.74		8,463.65	J-228	20	624.16	8,463.67	8,463.67
J-229	1,003.91	J-2038	29.35	634.74		5,328.17	J-229	20	623.16	5,328.18	5,328.18
J-23	1,003.91	J-2038	29.35	634.74		4,091.67	J-2010	19.51	635.03	4,069.46	4,069.46
J-230	1,003.91	J-2038	29.35	634.74		8,550.41	J-299	18.95	640.74	8,246.47	8,246.47
J-231	1,003.91	J-2038	29.35	634.74		4,784.43	J-231	20	623.16	4,784.43	4,784.43
J-233	1,003.91	J-2038	29.35	634.74		7,670.26	J-233	20	623.16	7,670.29	7,670.29
J-234	1,003.91	J-2038	29.35	634.74		5,695.27	J-234	20	623.16	5,695.28	5,695.28
J-235	3,002.92	J-2038	29.35	634.73		6,304.91	J-235	20	61.16	6,304.91	6,304.91
J-236	1,002.92	J-2038	29.35	634.74		8,663.84	J-405	7.79	113.98	7,785.18	7,785.18
J-237	1,005.35	J-2038	29.34	634.72		2,200.30	J-237	20	291.16	2,200.31	2,200.31
J-238	1,005.71	J-2038	29.34	634.72		1,238.14	J-238	20	196.16	1,238.14	1,238.14
J-239	1,002.92	J-2038	29.35	634.74		8,795.45	J-239	20	158.16	8,795.47	8,795.47
J-240	1,005.85	J-2038	29.34	634.72		2,418.79	J-648	13.32	500.74	2,160.30	2,160.30
J-241	1,005.35	J-2038	29.34	634.72		4,008.48	J-648	10.1	493.32	3,375.66	3,375.66
J-242	1,005.35	J-2038	29.34	634.72		4,241.54	J-648	3.21	477.41	3,297.44	3,297.44
J-243	1,005.35	J-2038	29.34	634.72		4,457.39	J-648	6.03	483.92	3,834.32	3,834.32
J-244	1,005.35	J-2038	29.34	634.72		3,609.49	J-244	20	406.16	3,609.63	3,609.63
J-245	1,005.35	J-2038	29.34	634.72		3,640.95	J-245	20	416.16	3,640.97	3,640.97
J-248	1,005.35	J-2038	29.34	634.72		3,704.26	J-248	20	376.16	3,704.26	3,704.26
J-250	1,005.35	J-2038	29.34	634.72		5,404.07	PRV-250-IN	20	376.16	5,404.07	5,404.07
J-251	1,005.71	J-2038	29.34	634.72		2,745.44	J-251	20	371.16	2,745.44	2,745.44
J-253	1,005.85	J-2038	29.34	634.72		3,911.54	J-253	20	446.16	3,911.54	3,911.54
J-255	1,006.15	J-2038	29.35	634.74		7,938.39	J-255	20	586.16	7,938.40	7,938.40

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-258	1,005.35	J-2038	29.34	634.72		1,920.11	PRV-258-IN	20	342.16	1,920.12	1,920.12
J-261	1,003.91	J-2038	29.35	634.74		8,158.32	J-304	-1.89	545.63	5,881.05	5,881.05
J-262	1,005.85	J-2038	29.34	634.72		2,305.92	J-263	20	466.15	2,305.73	2,305.73
J-263	1,005.85	J-2038	29.34	634.72		1,900.68	J-263	20	466.16	1,900.62	1,900.62
J-264	1,005.85	J-2038	29.34	634.72		1,710.67	PRV-264-IN	20	446.16	1,710.67	1,710.67
J-265	1,005.35	J-2038	29.34	634.72		2,556.31	J-265	20	446.16	2,556.22	2,556.22
J-266	1,005.85	J-2038	29.3	634.61		8,552.35	J-273	11.3	536.07	7,840.36	7,840.36
J-267	1,003.91	J-2038	29.35	634.74		11,036.89	J-304	0.7	551.61	8,490.46	8,490.45
J-268	1,003.91	J-2038	29.35	634.74		7,668.35	J-268	20	546.16	7,668.36	7,668.36
J-269	1,003.91	J-2038	29.35	634.74		7,071.14	104	17.74	536.93	6,866.11	6,866.11
J-270	1,005.85	J-2038	29.3	634.61		7,069.67	J-273	14.18	542.73	6,615.01	6,615.01
J-271	1,005.85	J-2038	29.3	634.61		7,447.99	J-273	8.83	530.38	6,627.73	6,627.73
J-272	1,005.85	J-2038	29.3	634.61		6,485.91	J-272	20	536.16	6,485.91	6,485.91
J-273	1,005.85	J-2038	29.3	634.61		6,384.50	J-273	20	556.16	6,384.50	6,384.50
J-274	1,005.85	J-2038	29.3	634.61		7,009.30	J-273	14.16	542.69	6,553.74	6,553.74
J-275	1,005.85	J-2038	29.3	634.61		6,623.03	J-275	20	536.16	6,623.03	6,623.03
J-276	1,005.85	J-2038	29.3	634.61		6,373.78	PRV-600-OU	18.66	556.06	6,261.70	6,261.70
J-277	1,005.85	J-2038	29.3	634.61		6,567.63	PRV-600-OU	19.41	557.79	6,517.96	6,517.96
J-278	1,005.85	J-2038	29.3	634.61		6,565.51	J-273	19.49	554.97	6,523.26	6,523.25
J-279	1,005.85	J-2038	29.3	634.61		6,690.76	J-273	17.53	550.45	6,491.21	6,491.21
J-280	1,005.85	J-2038	29.3	634.61		7,199.92	J-273	12.77	539.47	6,641.33	6,641.33
J-281	1,005.35	J-2038	29.3	634.61		3,033.80	J-281	20	456.16	3,033.80	3,033.80
J-282	1,005.85	J-2038	29.3	634.61		5,693.73	PRV-282-OU	19.99	506.14		
J-283	1,005.71	J-2038	29.33	634.69		2,165.83	J-575	11.44	294.4	1,783.89	1,783.89
J-286	1,003.91	J-2038	29.35	634.74		7,271.74	J-616	16.01	579.95	6,688.64	6,688.64
J-287	1,003.91	J-2038	29.35	634.74		8,206.19	J-610	17.08	584.41	7,688.53	7,688.53
J-288	1,003.91	J-2038	29.35	634.74		4,126.34	56	17.07	640.39	3,696.81	3,696.81
J-289	1,003.91	J-2038	29.35	634.74		2,882.58	J-289	20	636.16	2,882.58	2,882.58
J-29	1,000.00	J-2038	29.35	634.74		9,911.20	J-1844	10.47	606.16	8,731.73	8,731.73
J-290	1,003.91	J-2038	29.35	634.74		2,356.45	J-290	20	636.16	2,356.45	2,356.45
J-291	1,003.91	J-2038	29.35	634.74		4,377.44	58	15.05	631.74	3,742.65	3,742.65
J-292	1,003.91	J-2038	29.35	634.74		4,363.23	54	15.04	631.71	3,729.23	3,729.23
J-293	1,003.91	J-2038	29.35	634.74		4,414.75	56	15.46	636.68	3,754.38	3,754.38
J-294	1,003.91	J-2038	29.35	634.74		4,337.26	56	16.17	638.31	3,771.65	3,771.65
J-295	1,003.91	J-2038	29.35	634.74		5,750.17	56	19.08	645.04	5,542.26	5,542.26
J-296	1,003.69	J-2038	29.35	634.74		5,892.88	J-296	20	636.16	5,892.90	5,892.90
J-297	1,003.69	J-2038	29.35	634.74		6,187.87	J-297	20	636.16	6,187.88	6,187.88
J-298	1,000.00	J-2038	29.35	634.74		26,284.96	J-298	20	661.16	26,285.89	26,285.89
J-299	1,003.91	J-2038	29.35	634.74		7,141.36	J-299	20	643.16	7,141.39	7,141.39
J-30	1,000.00	J-2038	29.35	634.74		9,984.22	J-1844	11.52	608.58	8,907.29	8,907.29
J-300	3,003.91	J-2038	29.35	634.74		4,271.73	J-2010	16.61	628.32	4,123.74	4,123.74
J-3004	1,000.00	J-3004	56.69	615.84	7,010.38	7,010.38	J-3004	20	531.16	7,010.39	7,010.38
J-3006	1,000.00	J-3006	57.03	616.62	7,103.47	7,109.22	J-3006	20	531.16	7,109.23	7,103.47

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-3009	1,000.00	J-2038	29.35	634.74		5,352.88	J-3009	20	61.16	5,352.88	5,352.88
J-301	1,003.91	J-2038	29.35	634.74		4,361.15	J-2010	19.45	634.9	4,337.69	4,337.69
J-3010	1,000.00	J-2038	29.35	634.74		2,682.76	J-3010	20	61.16	2,682.76	2,682.76
J-3011	1,000.00	J-2038	29.35	634.74		6,070.89	J-3011	20	61.16	6,070.89	6,070.89
J-3012	1,000.00	J-2038	29.35	634.74		4,004.95	J-3015	17.13	609.54	3,789.11	3,789.11
J-3013	1,003.91	J-2038	29.35	634.74		3,593.98	J-3015	17.55	610.51	3,427.04	3,427.04
J-3014	1,003.91	J-2038	29.35	634.74		3,642.84	J-3015	19.77	615.62	3,625.68	3,625.68
J-3015	1,000.00	J-2038	29.35	634.74		2,869.40	J-3015	20	616.16	2,869.40	2,869.40
J-3016	1,003.91	J-2038	29.35	634.74		2,725.85	J-3016	20	616.16	2,725.85	2,725.85
J-3017	1,000.00	J-2038	29.35	634.74		2,696.67	J-3017	20	616.16	2,696.67	2,696.67
J-3018	1,000.00	J-2038	29.35	634.74		3,249.66	J-3017	14.35	603.11	2,928.01	2,928.01
J-3019	1,003.91	J-2038	29.35	634.74		3,525.04	J-3017	14.51	603.5	3,185.36	3,185.36
J-302	1,003.91	J-2038	29.35	634.74		4,912.49	J-2010	15.86	626.61	4,747.86	4,747.86
J-3020	1,000.00	J-2038	29.35	634.74		4,735.37	J-3017	3.46	577.99	3,645.10	3,645.10
J-3022	1,000.00	J-2038	29.34	634.72		5,809.83	J-3023	17.51	538.41	5,548.31	5,548.31
J-3023	1,000.00	J-2038	29.34	634.72		4,297.86	J-3023	20	544.16	4,296.67	4,296.67
J-3024	1,000.00	J-2038	29.34	634.72		4,004.64	J-3024	20	553.16	4,003.49	4,003.49
J-3025	1,000.00	J-2038	29.34	634.72		7,718.42	J-3024	11.54	533.64	6,469.67	6,469.67
J-3026	1,000.00	J-2038	29.35	634.74		6,155.93	J-3026	20	120.16	6,155.94	6,155.94
J-3027	1,000.00	J-2038	29.35	634.74		5,904.14	J-3027	20	119.16	5,904.15	5,904.14
J-3028	1,005.35	J-2038	29.34	634.72		2,607.97	J-3028	20	275.16	2,607.97	2,607.97
J-3029	1,005.35	J-2038	29.34	634.72		2,579.78	J-3029	20	251.16	2,579.78	2,579.78
J-303	1,003.91	J-2038	29.35	634.74		5,463.06	J-304	19.57	595.16	5,409.81	5,409.81
J-3030	1,000.00	J-2038	29.34	634.72		2,530.29	J-3030	20	227.16	2,530.29	2,530.29
J-3031	1,000.00	J-2038	29.34	634.72		2,610.86	J-3029	16.76	243.69	2,574.43	2,574.43
J-3032	1,002.92	J-2038	29.35	634.74		4,455.94	J-3032	20	135.16	4,455.94	4,455.94
J-3033	1,002.92	J-2038	29.35	634.74		4,370.32	J-3033	20	115.16	4,370.32	4,370.32
J-3034	1,001.30	J-2038	29.35	634.74		4,441.65	J-3034	20	93.16	4,441.65	4,441.65
J-3035	1,000.00	J-2038	29.35	634.74		4,701.62	J-3034	18.11	88.78	4,640.54	4,640.54
J-3036	1,000.00	J-2038	29.35	634.74		4,754.99	J-3034	17.65	87.74	4,678.87	4,678.87
J-3037	1,000.00	J-2038	29.35	634.74		4,786.35	J-3048	19.03	55.16	4,759.37	4,759.37
J-3038	1,000.00	J-2038	29.35	634.74		4,729.34	J-3048	19.03	55.16	4,702.65	4,702.65
J-304	1,003.91	J-2038	29.35	634.74		5,400.79	J-304	20	596.16	5,400.80	5,400.80
J-3040	1,000.00	J-2038	29.35	634.74		4,676.50	J-3048	19.09	55.3	4,651.74	4,651.74
J-3041	1,000.00	J-2038	29.35	634.74		4,571.27	J-3041	20	55.16	4,571.27	4,571.27
J-3043	1,000.00	J-2038	29.35	634.74		4,716.50	J-3048	19.26	55.7	4,696.24	4,696.24
J-3044	1,000.00	J-2038	29.35	634.74		4,676.22	J-3048	19.11	55.35	4,652.08	4,652.08
J-3045	1,000.00	J-2038	29.35	634.74		4,656.06	J-3045	20	55.16	4,656.06	4,656.06
J-3047	1,000.00	J-2038	29.35	634.74		4,348.02	J-3048	19.89	57.16	4,345.25	4,345.25
J-3048	1,000.00	J-2038	29.35	634.74		4,313.21	J-3048	20	57.41	4,313.21	4,313.21
J-3049	1,000.00	J-2038	29.35	634.74		4,367.09	J-3049	20	55.56	4,367.10	4,367.10
J-305	1,003.91	J-2038	29.35	634.74		6,928.65	J-304	7.48	567.27	5,532.91	5,532.91
J-3050	1,000.00	J-2038	29.35	634.74		4,371.04	J-3050	20	55.36	4,371.04	4,371.04

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-3051	1,002.92	J-2038	29.35	634.74		4,355.28	J-3048	19.92	57.23	4,353.32	4,353.32
J-3053	1,000.00	J-2038	29.35	634.74		8,723.27	J-105	12.93	582.84	8,076.68	8,076.68
J-3054	1,000.00	J-2038	29.35	634.74		7,810.53	J-3054	20	565.16	7,810.54	7,810.54
J-3057	1,000.00	J-2038	29.35	634.74		17,668.04	J-105	-129.32	254.54	8,027.20	8,027.20
J-3058	1,000.00	J-2038	29.35	634.74		7,989.27	74	18.57	630.85	7,807.20	7,807.20
J-3059	1,000.00	J-2038	29.3	634.61		3,829.10	PRV-341-IN	-285.75	-150.47		
J-306	1,003.91	J-2038	29.35	634.74		5,132.51	J-306	20	581.16	5,132.47	5,132.47
J-307	1,003.91	J-2038	29.35	634.74		4,745.71	J-307	20	587.16	4,745.71	4,745.71
J-308	1,003.91	J-2038	29.35	634.74		4,262.87	J-1860	20	578.16	4,262.84	4,262.84
J-309	1,003.91	J-2038	29.35	634.74		4,668.25	J-309	20	593.16	4,668.25	4,668.25
J-310	1,003.91	J-2038	29.35	634.74		4,684.66	J-309	19.55	592.12	4,668.25	4,668.25
J-311	1,003.91	J-2038	29.35	634.74		4,960.79	J-309	11.57	573.7	4,668.25	4,668.25
J-312	1,003.91	J-2038	29.35	634.74		4,132.06	J-312	20	546.16	4,132.06	4,132.06
J-313	1,003.91	J-2038	29.35	634.74		2,973.45	J-313	20	579.16	2,973.45	2,973.45
J-314	1,003.91	J-2038	29.35	634.74		5,049.73	J-2010	16.88	628.95	4,925.10	4,925.10
J-315	1,003.91	J-2038	29.35	634.74		3,845.13	J-315	20	590.16	3,845.14	3,845.14
J-316	1,003.91	J-2038	29.35	634.74		3,119.01	J-316	20	496.16	3,119.01	3,119.01
J-317	1,003.91	J-2038	29.35	634.74		4,130.31	J-318	19.28	609.49	4,103.70	4,103.70
J-318	1,003.91	J-2038	29.35	634.74		3,871.54	J-318	20	611.16	3,871.57	3,871.57
J-319	1,003.91	J-2038	29.35	634.74		4,165.96	J-2010	18.76	633.3	4,110.39	4,110.39
J-32	1,000.00	J-2038	29.35	634.74		11,400.41	J-32	20	613.16	11,400.44	11,400.44
J-320	1,003.91	J-2038	29.35	634.74		4,176.03	J-2010	18.36	632.38	4,102.97	4,102.97
J-321	1,003.91	J-2038	29.35	634.74		4,128.53	J-2010	19.59	635.2	4,109.73	4,109.73
J-322	3,003.91	J-2038	29.35	634.74		4,053.96	J-323	20	624.16	4,053.96	4,053.96
J-323	1,003.91	J-2038	29.35	634.74		3,970.87	J-323	20	624.16	3,970.92	3,970.92
J-324	1,003.91	J-2038	29.35	634.74		4,414.30	J-334	19.48	622.97	4,354.48	4,354.48
J-325	1,003.91	J-2038	29.35	634.74		4,113.49	J-334	19.45	622.88	4,054.40	4,054.40
J-326	1,003.91	J-2038	29.35	634.74		4,387.57	J-326	20	588.16	4,387.57	4,387.57
J-327	1,003.91	J-2038	29.35	634.74		4,258.27	J-2010	16.83	628.83	4,119.41	4,119.41
J-328	1,003.91	J-2038	29.35	634.74		3,806.25	J-337	13.62	576.44	3,606.59	3,606.59
J-329	1,003.91	J-2038	29.35	634.74		3,312.30	J-329	20	517.16	3,312.30	3,312.30
J-33	1,025.00	J-2038	29.35	634.74		12,389.89	J-33	20	610.16	12,389.94	12,389.94
J-330	1,003.91	J-2038	29.35	634.74		3,063.17	J-330	20	548.16	3,063.17	3,063.17
J-331	1,003.91	J-2038	29.35	634.74		4,096.41	J-334	19.23	622.39	4,017.99	4,017.99
J-332	1,003.91	J-2038	29.35	634.74		4,461.62	J-334	14.41	611.25	4,013.40	4,013.40
J-333	1,003.91	J-2038	29.35	634.74		4,054.01	J-334	18.75	621.27	4,002.72	4,002.72
J-334	1,003.91	J-2038	29.35	634.74		3,974.96	J-334	20	624.16	3,975.01	3,975.01
J-335	1,003.91	J-2038	29.35	634.74		3,932.65	J-335	20	617.16	3,932.70	3,932.70
J-336	1,003.91	J-2038	29.35	634.74		3,985.70	J-336	20	617.16	3,985.70	3,985.70
J-337	1,003.91	J-2038	29.35	634.74		3,194.31	J-337	20	591.16	3,194.31	3,194.31
J-338	1,003.91	J-2038	29.35	634.74		3,729.02	J-337	14.05	577.42	3,541.86	3,541.86
J-339	1,003.91	J-2038	29.35	634.74		3,977.89	J-340	15.23	588.16	3,819.20	3,819.20
J-34	1,170.00	J-2038	29.35	634.74		59,344.51	J-34	20.01	656.17	59,354.14	59,354.14

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-340	1,003.91	J-2038	29.35	634.74		1,678.57	J-340	20	599.16	1,678.57	1,678.57
J-341	1,009.89	J-2038	29.35	634.74		3,794.42	PRV-341-IN	13.07	539.16	3,620.61	3,620.61
J-342	1,003.91	J-2038	29.35	634.74		3,084.02	J-344	18.27	578.16	3,029.85	3,029.85
J-343	1,003.91	J-2038	29.35	634.74		2,930.75	J-344	17.29	575.91	2,845.47	2,845.47
J-344	1,003.91	J-2038	29.35	634.74		2,557.69	J-344	20	582.16	2,557.68	2,557.68
J-345	1,003.91	J-2038	29.35	634.74		11,252.62	J-345	20	627.16	11,252.69	11,252.69
J-349	1,000.00	J-2038	29.35	634.74		7,721.30	J-349	20	601.16	7,721.32	7,721.32
J-35	1,028.00	J-2038	29.35	634.74		52,137.01	J-35	20.01	652.17	52,143.16	52,143.16
J-350	1,000.00	J-2038	29.35	634.74		10,221.14	J-105	11.02	578.42	9,287.45	9,287.45
J-351	1,000.00	J-2038	29.35	634.74		9,802.68	J-105	16.44	590.94	9,418.85	9,418.85
J-352	1,000.00	J-2038	29.35	634.74		8,276.62	J-352	20	586.16	8,276.63	8,276.63
J-353	1,000.00	J-2038	29.35	634.74		9,956.87	J-105	13.46	584.07	9,271.81	9,271.81
J-354	1,000.00	J-2038	29.35	634.74		10,004.76	J-105	10.44	577.1	9,038.57	9,038.57
J-355	1,006.15	J-2038	29.35	634.74		8,513.03	J-355	20	536.16	8,513.04	8,513.04
J-356	1,006.15	J-2038	29.35	634.74		7,428.98	J-356	20	586.16	7,428.99	7,428.99
J-357	1,009.73	J-2038	29.35	634.74		9,116.82	J-105	6.88	568.87	7,962.57	7,962.57
J-358	1,005.85	J-2038	29.34	634.72		6,112.55	J-358	20	466.16	6,112.56	6,112.56
J-359	1,009.73	J-2038	29.35	634.74		2,405.79	J-359	20	546.16	2,405.79	2,405.79
J-36	1,009.00	J-2038	29.35	634.74		59,491.42	J-35	12.71	635.33	52,223.13	52,223.13
J-360	1,009.73	J-2038	29.35	634.74		1,817.59	J-360	20	566.16	1,817.59	1,817.59
J-362	1,000.00	J-2038	29.35	634.74		12,480.23	J-362	20	606.16	12,480.28	12,480.28
J-37	1,012.00	J-2038	29.35	634.74		41,215.96	J-37	20	640.17	41,218.50	41,218.50
J-377	1,006.15	J-2038	29.35	634.74		14,286.64	J-377	20	656.16	14,286.78	14,286.78
J-38	1,012.00	J-2038	29.35	634.74		43,455.09	J-37	17.08	633.42	41,451.74	41,451.74
J-380	1,009.73	J-2038	29.35	634.74		2,512.74	J-381	20	556.15	2,512.71	2,512.71
J-381	1,009.73	J-2038	29.35	634.74		1,889.92	J-381	20	556.16	1,889.92	1,889.92
J-382	1,013.83	J-2038	29.35	634.74		8,658.29	74	19.12	632.14	8,536.07	8,536.07
J-383	1,013.83	J-2038	29.35	634.74		8,443.88	74	19.49	632.99	8,374.21	8,374.21
J-384	1,013.83	J-2038	29.35	634.74		7,916.54	J-384	20	626.16	7,916.56	7,916.56
J-385	1,013.83	J-2038	29.35	634.74		8,098.87	J-385	20	626.16	8,098.89	8,098.89
J-386	1,013.83	J-2038	29.35	634.74		8,706.55	78	19.61	633.26	8,651.41	8,651.41
J-387	1,013.83	J-2038	29.35	634.74		8,307.57	J-387	20	626.16	8,307.59	8,307.59
J-388	1,013.83	J-2038	29.35	634.74		8,097.54	J-388	20	626.16	8,097.56	8,097.56
J-389	1,006.15	J-2038	29.35	634.74		8,085.03	J-389	20	626.16	8,085.05	8,085.05
J-39	1,041.00	J-2038	29.35	634.74		35,792.05	J-39	20	613.16	35,793.27	35,793.27
J-392	1,006.15	J-2038	29.35	634.74		7,866.51	J-392	20	626.16	7,866.53	7,866.53
J-393	1,003.91	J-2038	29.35	634.74		2,106.93	J-393	20	521.16	2,106.93	2,106.93
J-394	1,005.85	J-2038	29.34	634.72		3,393.19	J-394	20	456.16	3,392.96	3,392.96
J-395	1,005.85	J-2038	29.34	634.72		5,276.80	J-644	13.3	520.69	4,819.22	4,819.22
J-396	1,005.85	J-2038	29.34	634.72		5,502.29	J-396	20	456.16	5,502.29	5,502.29
J-397	1,005.85	J-2038	29.34	634.72		5,639.21	J-397	20	451.16	5,638.50	5,638.50
J-398	1,003.91	J-2038	29.35	634.74		11,043.86	J-304	-2.16	545.01	8,470.57	8,470.57
J-399	1,000.00	J-2038	29.35	634.74		4,889.13	J-399	20	296.16	4,889.13	4,889.13

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-400	1,005.71	J-2038	29.35	634.74		4,866.50	J-431	-32.19	173.71		
J-401	1,002.92	J-2038	29.35	634.74		4,713.75	J-401	20	165.16	4,713.74	4,713.74
J-402	1,002.92	J-2038	29.35	634.74		7,090.08	J-401	18.79	162.38	6,992.33	6,992.33
J-403	1,002.92	J-2038	29.35	634.74		4,240.33	J-403	20	154.16	4,240.34	4,240.34
J-404	1,002.92	J-2038	29.35	634.74		4,036.61	J-404	20	144.16	4,036.61	4,036.61
J-405	1,002.92	J-2038	29.35	634.74		3,833.20	J-405	20	142.16	3,833.20	3,833.20
J-406	1,002.92	J-2038	29.35	634.74		8,760.86	J-405	5.53	108.77	7,735.03	7,735.03
J-407	1,002.92	J-2038	29.35	634.74		9,099.38	J-405	7.97	114.4	8,193.36	8,193.36
J-408	1,002.92	J-2038	29.35	634.74		8,906.11	J-403	14.79	142.14	8,452.65	8,452.64
J-409	1,002.92	J-2038	29.35	634.74		6,340.83	J-3009	20	61.16	6,340.83	6,340.83
J-410	1,002.92	J-2038	29.35	634.74		6,489.38	J-410	20	94.16	6,489.39	6,489.39
J-411	1,002.92	J-2038	29.35	634.74		7,152.78	J-411	20	117.16	7,152.79	7,152.79
J-412	1,002.92	J-2038	29.35	634.74		3,993.19	J-425	-0.37	117.16	3,188.34	3,188.34
J-413	3,002.92	J-2038	29.35	634.73		6,509.45	J-425	19.98	164.1	6,507.54	6,507.53
J-414	1,002.92	J-2038	29.35	634.74		2,607.24	J-414	20	138.16	2,607.24	2,607.24
J-415	1,002.92	J-2038	29.35	634.74		2,392.19	J-415	20	142.16	2,392.19	2,392.19
J-416	1,002.92	J-2038	29.35	634.74		9,847.65	J-421	15.03	181.7	9,102.94	9,102.94
J-417	1,003.91	J-2038	29.35	634.74		9,015.89	J-304	4.05	559.34	7,465.27	7,465.27
J-418	1,002.92	J-2038	29.35	634.74		8,837.80	J-401	18.51	161.71	8,695.68	8,695.68
J-419	1,002.92	J-2038	29.35	634.74		7,598.47	J-401	18.29	161.22	7,459.80	7,459.80
J-420	1,002.92	J-2038	29.35	634.74		5,077.06	J-420	20	167.16	5,077.07	5,077.07
J-421	1,002.92	J-2038	29.35	634.74		9,034.93	J-421	20	193.16	9,034.96	9,034.96
J-423	1,002.92	J-2038	29.35	634.74		3,784.23	J-423	20	83.16	3,784.23	3,784.23
J-424	1,002.92	J-2038	29.35	634.74		3,671.88	J-424	20	88.16	3,671.88	3,671.88
J-425	1,002.92	J-2038	29.35	634.74		2,487.66	J-425	20	164.16	2,487.66	2,487.66
J-426	1,002.92	J-2038	29.35	634.74		3,096.56	J-425	8.79	138.28	2,701.59	2,701.59
J-427	1,002.92	J-2038	29.35	634.74		4,121.40	J-427	20	181.16	4,121.39	4,121.39
J-428	1,002.92	J-2038	29.35	634.74		4,337.11	J-428	20	174.16	4,337.11	4,337.11
J-430	1,005.71	J-2038	29.35	634.74		1,482.87	J-431	-0.8	246.15		
J-431	1,005.71	J-431	7.22	264.65	880.91	880.92	J-431	20	294.16	880.92	880.91
J-433	1,003.91	J-2038	29.35	634.74		9,448.57	J-610	11.66	571.92	8,284.11	8,284.11
J-434	1,003.91	J-2038	29.35	634.74		7,837.55	J-434	20	546.16	7,837.56	7,837.56
J-435	1,003.91	J-2038	29.3	634.61		8,643.95	J-273	16.56	548.22	8,342.11	8,342.11
J-436	1,003.91	J-2038	29.35	634.74		8,363.70	J-304	0.81	551.88	6,421.43	6,421.43
J-437	1,003.91	J-2038	29.35	634.74		9,146.97	J-304	-1.23	547.15	7,050.52	7,050.52
J-438	1,009.73	J-2038	29.35	634.74		7,021.49	J-105	19.41	597.79	6,973.60	6,973.60
J-439	1,009.73	J-2038	29.35	634.74		5,178.21	J-439	20	580.16	5,178.21	5,178.21
J-440	1,009.73	J-2038	29.35	634.74		7,328.00	J-105	17.81	594.11	7,147.38	7,147.38
J-441	1,009.73	J-2038	29.35	634.74		9,084.74	J-105	18.84	596.47	8,963.58	8,963.58
J-442	1,009.73	J-2038	29.35	634.74		8,082.60	J-445	16.11	553.19	7,823.78	7,823.78
J-443	1,009.73	J-2038	29.35	634.74		4,842.60	J-443	20	545.16	4,842.60	4,842.60
J-444	1,009.73	J-2038	29.35	634.74		7,987.35	J-445	15.87	552.63	7,716.69	7,716.69
J-445	1,009.73	J-2038	29.35	634.74		5,463.94	J-445	20	562.16	5,463.95	5,463.95

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-446	1,009.73	J-2038	29.35	634.74		7,829.44	J-445	18.36	558.38	7,721.19	7,721.19
J-447	1,009.73	J-2038	29.35	634.74		7,853.31	J-445	19.97	562.08	7,851.07	7,851.07
J-448	1,000.00	J-2038	29.35	634.74		9,617.10	J-105	7.1	569.38	8,415.12	8,415.12
J-449	1,009.73	J-2038	29.35	634.74		8,891.88	J-449	20	576.16	8,891.89	8,891.89
J-450	1,009.73	J-2038	29.35	634.74		3,000.86	J-450	20	570.16	3,000.86	3,000.86
J-451	1,009.73	J-2038	29.35	634.74		7,586.78	J-451	20	551.16	7,586.78	7,586.78
J-452	1,009.73	J-2038	29.35	634.74		9,487.29	J-105	4.39	563.14	8,103.33	8,103.33
J-453	1,009.73	J-2038	29.35	634.74		7,788.38	J-455	16.04	557.01	7,527.17	7,527.17
J-454	1,009.73	J-2038	29.35	634.74		7,229.39	J-455	15.67	556.16	6,966.23	6,966.23
J-455	1,009.73	J-2038	29.35	634.74		6,156.82	J-455	20	566.16	6,156.83	6,156.83
J-456	1,009.73	J-2038	29.35	634.74		7,883.16	J-455	19.04	563.95	7,816.93	7,816.93
J-457	1,009.73	J-2038	29.35	634.74		8,194.32	J-105	18.24	595.1	8,030.63	8,030.63
J-458	1,009.73	J-2038	29.35	634.74		6,462.48	J-458	20	568.16	6,462.48	6,462.48
J-459	1,009.73	J-2038	29.35	634.74		8,774.86	J-105	9.46	574.82	7,850.69	7,850.69
J-46	1,000.00	J-2038	29.35	634.74		10,108.62	J-141	11.44	606.41	9,023.04	9,023.04
J-460	1,009.73	J-2038	29.35	634.74		3,795.94	J-460	20	568.16	3,795.94	3,795.94
J-467	1,005.85	J-2038	29.34	634.72		7,935.02	PRV-341-OU	-7.48	491.75	5,687.10	5,687.10
J-470	1,005.71	J-2038	29.3	634.61		7,636.42	J-273	6.21	524.33	6,634.72	6,634.72
J-471	1,005.71	J-2038	29.3	634.61		8,111.45	J-273	-1.19	507.25	6,634.72	6,634.72
J-472	1,005.35	J-2038	29.3	634.61		8,262.69	J-173	-17.6	352.18	6,293.23	6,293.23
J-474	1,005.35	J-2038	29.3	634.61		8,232.58	J-173	-15.06	358.05	6,293.23	6,293.23
J-483	1,005.85	J-2038	29.34	634.72		3,297.81	J-483	20	406.16	3,297.66	3,297.66
J-484	1,005.35	J-2038	29.34	634.72		4,422.14	J-484	20	396.16	4,421.91	4,421.91
J-485	1,005.85	J-2038	29.34	634.72		6,986.23	J-485	20	436.16	6,985.79	6,985.79
J-486	1,005.85	J-2038	29.34	634.72		7,707.49	J-486	20	458.16	7,706.84	7,706.84
J-487	1,005.85	J-2038	29.34	634.72		7,011.68	J-487	20	466.16	7,011.14	7,011.14
J-488	1,005.85	J-2038	29.34	634.72		4,955.22	J-488	20	431.16	4,954.81	4,954.81
J-492	1,003.91	J-2038	29.35	634.74		6,909.16	118	14.49	573.44	6,419.90	6,419.90
J-496	1,003.91	J-2038	29.35	634.74		3,236.24	J-496	20	646.16	3,236.24	3,236.24
J-497	1,003.91	J-2038	29.35	634.74		2,020.62	J-497	20	647.16	2,020.62	2,020.62
J-500	1,005.85	J-2038	29.34	634.72		17,251.10	J-2010	3.68	598.5		
J-501	1,005.85	J-2038	29.34	634.72		15,668.16	J-189	-2.75	499.65	11,810.61	11,810.61
J-502	1,005.85	J-2038	29.34	634.72		12,349.83	J-3024	6	520.84	10,153.60	10,153.60
J-503	1,005.85	J-2038	29.34	634.71		11,048.08	J-3024	12.38	535.57	9,695.74	9,695.74
J-504	1,005.85	J-2038	29.34	634.72		7,483.57	J-504	20	447.16	7,483.39	7,483.39
J-505	1,005.85	J-2038	29.34	634.72		10,282.97	J-505	20	449.16	10,283.05	10,283.05
J-506	1,005.85	J-2038	29.34	634.72		5,877.69	J-506	20	431.16	5,876.98	5,876.98
J-507	1,005.85	J-2038	29.34	634.72		4,420.06	J-507	20	407.16	4,420.06	4,420.06
J-508	1,005.35	J-2038	29.34	634.72		5,496.61	J-508	20	385.16	5,496.62	5,496.62
J-509	1,005.71	J-2038	29.34	634.72		1,381.55	J-509	20	366.16	1,381.55	1,381.55
J-510	1,005.71	J-2038	29.34	634.72		3,145.40	J-509	-15.13	285.09	2,460.94	2,460.94
J-511	1,005.85	J-2038	29.34	634.72		10,667.29	J-2010	20.08	636.35		
J-512	1,005.85	J-2038	29.34	634.71		7,280.49	J-512	20	462.16	7,279.72	7,279.72

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-513	1,005.85	J-2038	29.34	634.71		9,041.23	J-513	20	544.16	9,010.95	9,010.95
J-514	1,005.85	J-2038	29.34	634.71		10,442.74	PRV-308-IN	9.28	553.42	9,154.24	9,154.24
J-515	1,005.85	J-2038	29.34	634.71		6,641.88	J-515	20	517.16	6,630.41	6,630.41
J-516	3,005.85	J-2038	29.3	634.61		4,851.12	J-516	20	458.16	4,851.08	4,851.08
J-517	1,005.85	J-2038	29.34	634.71		7,524.20	J-517	20	467.16	7,514.60	7,514.60
J-518	1,005.85	J-2038	29.34	634.71		6,967.85	J-518	20	463.16	6,967.10	6,967.10
J-519	1,005.85	J-2038	29.34	634.71		6,926.47	J-519	20	441.16	6,925.83	6,925.83
J-52	1,024.00	J-2038	29.35	634.74		66,634.66	J-52	20.01	664.18	66,650.56	66,650.56
J-520	1,005.85	J-2038	29.34	634.71		6,739.70	J-520	20	446.16	6,739.10	6,739.10
J-521	1,005.85	J-2038	29.34	634.71		5,229.25	J-521	20	442.16	5,228.32	5,228.32
J-522	1,005.85	J-2038	29.34	634.72		5,165.15	J-522	20	449.16	5,164.34	5,164.34
J-523	1,005.85	J-2038	29.34	634.72		3,931.40	J-523	20	448.16	3,930.92	3,930.92
J-524	1,005.85	J-2038	29.34	634.72		7,409.75	J-263	18.05	461.67	7,277.71	7,277.71
J-525	1,005.85	J-2038	29.34	634.72		3,771.26	PRV-525-IN	20	414.16	3,770.94	3,770.94
J-526	1,005.35	J-2038	29.34	634.72		3,482.61	J-528	13.47	435.08	3,246.21	3,246.21
J-527	1,005.35	J-2038	29.34	634.72		3,093.10	J-528	17.78	445.02	3,014.16	3,014.16
J-528	1,005.35	J-2038	29.34	634.72		2,663.01	J-528	20	450.16	2,662.90	2,662.90
J-529	1,005.35	J-2038	29.34	634.72		2,783.07	J-265	19.86	445.84	2,778.59	2,778.59
J-530	1,005.35	J-2038	29.34	634.72		2,702.37	J-530	20	411.16	2,702.29	2,702.29
J-531	1,005.35	J-2038	29.34	634.72		2,689.93	J-531	20	398.16	2,689.85	2,689.85
J-532	1,005.35	J-2038	29.34	634.72		2,724.40	J-532	20	386.16	2,724.32	2,724.32
J-533	1,005.35	J-2038	29.34	634.72		2,353.79	J-533	20	374.16	2,353.76	2,353.76
J-534	1,005.35	J-2038	29.34	634.72		3,032.83	J-528	12.97	433.94	2,798.24	2,798.24
J-535	1,005.35	J-2038	29.34	634.72		3,194.06	J-528	8.2	422.93	2,810.21	2,810.21
J-536	1,005.35	J-2038	29.34	634.72		3,120.41	J-528	11.34	430.18	2,834.43	2,834.43
J-537	1,005.35	J-2038	29.34	634.72		2,986.06	J-528	14.2	436.78	2,791.28	2,791.28
J-538	1,005.35	J-2038	29.34	634.72		2,074.13	J-538	20	355.16	2,074.13	2,074.13
J-539	1,005.71	J-2038	29.34	634.72		2,165.25	86	16.93	351.06	2,109.05	2,109.05
J-540	1,005.71	J-2038	29.34	634.72		2,015.65	J-540	20	336.16	2,015.65	2,015.65
J-541	1,005.71	J-2038	29.34	634.72		1,821.94	J-541	20	298.16	1,821.94	1,821.94
J-542	1,005.71	J-2038	29.34	634.72		1,875.59	J-542	20	301.16	1,875.59	1,875.59
J-543	1,005.71	J-2038	29.34	634.72		1,793.08	J-543	20	318.16	1,793.08	1,793.08
J-544	1,005.71	J-2038	29.34	634.72		1,483.34	J-544	20	221.16	1,483.36	1,483.36
J-545	1,003.91	J-2038	29.3	634.61		8,683.36	J-273	14.24	542.85	8,190.56	8,190.56
J-546	1,005.85	J-2038	29.3	634.61		9,470.68	J-273	-3.37	502.22	7,725.66	7,725.66
J-547	1,005.85	J-2038	29.3	634.61		6,010.61	J-547	20	466.16	6,010.61	6,010.61
J-548	1,005.85	J-2038	29.3	634.61		4,398.51	J-548	20	421.16	4,398.51	4,398.51
J-549	1,005.85	J-2038	29.3	634.61		3,107.73	J-550	19.13	506.16	3,074.34	3,074.34
J-55	1,077.00	J-2038	29.35	634.74		7,958.99	J-55	20	591.16	7,959.00	7,959.00
J-550	1,005.85	J-2038	29.3	634.61		2,975.63	J-550	20	508.16	2,975.63	2,975.63
J-551	1,005.85	J-2038	29.3	634.61		3,473.06	J-550	5.77	475.32	2,975.63	2,975.63
J-552	1,005.85	J-2038	29.3	634.61		3,242.93	J-550	12.59	491.06	2,975.63	2,975.63
J-553	1,005.85	J-2038	29.3	634.61		8,027.15	J-273	12.81	539.56	7,447.63	7,447.63

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-554	1,005.85	J-2038	29.3	634.61		7,840.00	J-273	11.68	536.95	7,209.27	7,209.27
J-555	1,005.85	J-2038	29.3	634.61		5,827.18	J-555	20	526.16	5,827.17	5,827.17
J-556	1,005.85	J-2038	29.3	634.61		2,151.73	J-556	20	497.16	2,151.73	2,151.73
J-557	1,005.85	J-2038	29.3	634.61		1,719.44	J-557	20	486.16	1,719.44	1,719.44
J-558	1,005.85	J-2038	29.3	634.61		5,551.38	J-558	20	522.16	5,551.36	5,551.36
J-559	1,005.85	J-2038	29.3	634.61		3,867.53	J-559	20	526.16	3,867.53	3,867.53
J-560	1,005.85	J-2038	29.3	634.61		5,996.29	J-560	20	526.16	5,996.39	5,996.39
J-561	1,005.85	J-2038	29.3	634.61		5,367.32	J-561	20	532.16	5,367.29	5,367.29
J-562	1,005.85	J-2038	29.3	634.61		5,748.51	J-562	20	536.16	5,748.50	5,748.50
J-563	1,005.85	J-2038	29.3	634.61		7,427.69	J-273	14.13	542.61	6,984.96	6,984.96
J-564	1,005.85	J-2038	29.3	634.61		7,414.83	J-273	13.03	540.06	6,889.09	6,889.09
J-565	1,005.85	J-2038	29.3	634.61		6,956.51	J-273	16.47	548.01	6,675.04	6,675.04
J-566	1,005.85	J-2038	29.3	634.61		6,204.07	J-566	20	552.16	6,204.08	6,204.08
J-567	1,005.85	J-2038	29.3	634.61		5,092.67	J-568	19.64	528.32	5,070.93	5,070.93
J-568	1,005.85	J-2038	29.3	634.61		4,516.37	J-568	20	529.16	4,516.37	4,516.37
J-569	1,005.35	J-2038	29.3	634.61		3,427.04	J-569	20	455.16	3,427.04	3,427.04
J-570	1,005.35	J-2038	29.3	634.61		3,527.19	J-570	20	369.16	3,527.19	3,527.19
J-571	1,005.35	J-2038	29.3	634.61		3,244.84	J-571	20	365.16	3,244.84	3,244.84
J-572	1,005.35	J-2038	29.3	634.61		3,201.13	J-1862	2.67	321.16	2,826.73	2,826.73
J-573	1,005.71	J-2038	29.33	634.69		2,374.10	J-573	20	307.16	2,374.10	2,374.10
J-575	1,005.71	J-575	28.74	334.33	1,374.65	1,374.64	J-575	20	314.16	1,374.64	1,374.64
J-576	1,005.71	J-2038	29.33	634.69		2,813.61	J-575	4.06	277.36	2,043.70	2,043.70
J-577	1,005.71	J-2038	29.33	634.69		3,087.55	J-575	10.44	292.09	2,485.90	2,485.90
J-578	1,005.71	J-2038	29.33	634.69		1,801.84	J-578	20	311.16	1,801.84	1,801.84
J-579	1,005.71	J-2038	29.33	634.69		2,767.77	J-575	17.89	309.3	2,617.48	2,617.48
J-580	1,005.71	J-2038	29.3	634.61		7,680.50	J-273	5.6	522.93	6,639.88	6,639.88
J-582	1,005.35	J-2038	29.3	634.61		3,543.74	J-1862	19.75	360.58	3,539.35	3,539.35
J-583	1,005.35	J-2038	29.3	634.61		8,830.00	J-173	-31.14	320.93	6,293.23	6,293.23
J-584	1,005.85	J-2038	29.3	634.61		5,964.54	J-585	9.07	482.94	5,443.45	5,443.45
J-585	1,005.85	J-2038	29.3	634.61		5,379.09	J-585	20	508.16	5,379.09	5,379.09
J-586	1,005.85	J-2038	29.3	634.61		5,446.67	J-586	20	509.16	5,446.67	5,446.67
J-587	1,005.85	J-2038	29.3	634.61		5,637.49	J-589	18.3	518.24	5,541.58	5,541.58
J-588	1,005.35	J-2038	29.3	634.61		7,790.59	J-173	-3.67	384.33	6,290.79	6,290.79
J-589	1,005.85	J-2038	29.3	634.61		5,486.77	J-589	20	522.16	5,486.76	5,486.76
J-59	1,006.15	J-2038	29.35	634.74		3,267.99	J-59	20	604.16	3,267.99	3,267.99
J-590	1,005.85	J-2038	29.3	634.61		6,602.75	J-590	20	529.16	6,602.76	6,602.76
J-591	1,005.85	J-2038	29.3	634.61		6,736.60	J-273	18.36	552.38	6,603.60	6,603.60
J-592	1,005.85	J-2038	29.3	634.61		6,965.68	J-273	15.41	545.56	6,603.26	6,603.26
J-593	1,005.85	J-2038	29.3	634.61		6,724.26	J-273	18.51	552.71	6,602.64	6,602.64
J-594	1,005.85	J-2038	29.3	634.61		6,784.70	J-273	17.77	551.02	6,604.88	6,604.88
J-595	1,005.85	J-2038	29.3	634.61		6,325.04	J-595	20	537.16	6,325.05	6,325.05
J-596	1,005.85	J-2038	29.3	634.61		6,543.40	J-596	20	536.16	6,543.41	6,543.41
J-597	1,005.85	J-2038	29.3	634.61		6,196.75	J-597	20	532.16	6,196.76	6,196.76

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-598	1,005.85	J-2038	29.3	634.61		3,879.78	J-598	20	534.16	3,879.78	3,879.78
J-599	1,003.91	J-2038	29.3	634.61		6,218.47	PRV-600-OU	14.45	546.35	5,813.06	5,813.06
J-600	1,003.91	J-2038	29.35	634.74		7,995.31	J-618	17.08	583.41	7,559.07	7,559.07
J-601	1,003.91	J-2038	29.35	634.74		7,967.45	J-618	16.82	582.81	7,489.37	7,489.37
J-602	1,003.91	J-2038	29.35	634.74		7,851.10	J-602	20	563.16	7,851.11	7,851.11
J-603	1,003.91	J-2038	29.35	634.74		8,966.87	J-618	14.55	577.59	8,200.13	8,200.13
J-604	1,003.91	J-2038	29.35	634.74		7,905.03	J-618	15.77	580.4	7,239.94	7,239.94
J-605	1,003.91	J-2038	29.35	634.74		7,919.99	J-618	14.95	578.49	7,122.95	7,122.95
J-606	1,003.91	J-2038	29.35	634.74		6,832.31	J-606	20	583.16	6,835.49	6,835.49
J-607	1,003.91	J-2038	29.35	634.74		6,567.86	J-607	20	588.16	6,565.17	6,565.17
J-608	1,003.91	J-2038	29.35	634.74		6,877.95	J-610	18.12	586.83	6,701.06	6,701.06
J-609	1,003.91	J-2038	29.35	634.74		8,052.86	J-609	20	580.16	8,052.88	8,052.88
J-610	1,003.91	J-2038	29.35	634.74		6,661.13	J-610	20	591.16	6,658.14	6,658.14
J-611	1,003.91	J-2038	29.35	634.74		6,536.26	J-2067	18.05	581.65	6,347.38	6,347.38
J-612	1,003.91	J-2038	29.35	634.74		6,493.86	J-2067	19.5	585.01	6,453.45	6,453.45
J-613	1,003.91	J-2038	29.35	634.74		5,331.45	J-614	20	589.16	5,331.45	5,331.45
J-614	1,003.91	J-2038	29.35	634.74		3,811.20	J-614	20	589.16	3,811.20	3,811.20
J-615	1,003.91	J-2038	29.35	634.74		4,393.27	J-614	20	589.16	4,393.28	4,393.27
J-616	1,003.91	J-2038	29.35	634.74		5,762.05	J-616	20	589.16	5,762.01	5,762.01
J-617	5,503.91	J-617	21.66	590.98	5,725.55	5,725.50	J-617	20	587.16	5,725.50	5,725.50
J-618	1,003.91	J-2038	29.35	634.74		5,446.80	J-618	20	590.16	5,446.80	5,446.80
J-619	1,003.91	J-2038	29.35	634.74		5,581.56	J-619	20	580.16	5,581.57	5,581.57
J-62	1,006.15	J-2038	29.35	634.74		20,586.44	J-377	17.16	649.61	19,402.19	19,402.19
J-620	1,005.85	J-2038	29.34	634.72		2,041.11	J-620	20	516.16	2,041.11	2,041.11
J-621	1,005.85	J-2038	29.34	634.72		8,063.21	J-621	20	464.16	8,062.31	8,062.31
J-622	1,005.85	J-2038	29.34	634.72		8,258.17	J-622	20	456.16	8,257.31	8,257.31
J-623	1,005.85	J-2038	29.34	634.72		7,404.48	J-625	19.77	444.64	7,390.19	7,390.19
J-624	1,005.85	J-2038	29.34	634.72		4,822.31	J-624	20	458.16	4,821.79	4,821.79
J-625	1,005.85	J-2038	29.34	634.72		5,627.49	J-625	20	445.16	5,627.49	5,627.49
J-626	1,005.85	J-2038	29.34	634.72		5,511.35	J-626	20	440.16	5,511.13	5,511.13
J-627	1,005.85	J-2038	29.34	634.72		5,453.94	J-627	20	442.16	5,453.73	5,453.73
J-628	1,005.85	J-2038	29.34	634.72		4,546.61	J-628	20	445.16	4,546.49	4,546.49
J-629	1,005.85	J-2038	29.34	634.72		3,162.11	J-629	20	444.16	3,161.98	3,161.98
J-630	1,005.85	J-2038	29.34	634.72		2,707.65	J-630	20	438.16	2,707.57	2,707.57
J-631	1,005.85	J-2038	29.34	634.72		9,489.04	PRV-341-OU	-3.85	500.11	7,051.29	7,051.29
J-632	1,005.85	J-2038	29.34	634.72		10,918.45	PRV-341-OU	-1.54	505.46	8,307.57	8,307.57
J-633	1,005.85	J-2038	29.34	634.72		12,439.31	PRV-341-OU	-0.84	507.06	9,547.00	9,547.00
J-634	3,005.85	J-2038	29.34	634.71		7,284.31	PRV-341-OU	-12	481.3	5,004.66	5,004.66
J-635	1,009.89	J-2038	29.34	634.72		6,321.60	PRV-341-OU	2.88	515.65	4,996.22	4,996.22
J-636	1,005.85	J-2038	29.34	634.72		7,604.02	PRV-341-OU	-20.35	462.03	4,894.16	4,894.16
J-637	1,009.89	J-2038	29.34	634.72		3,828.37	J-637	20	453.16	3,827.02	3,827.02
J-638	1,005.35	J-2038	29.34	634.72		3,525.48	J-638	20	431.16	3,525.56	3,525.56
J-639	1,005.35	J-2038	29.34	634.72		3,789.68	J-245	18.68	413.1	3,759.08	3,759.08

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-640	3,005.85	J-644	27.26	552.9	3,767.42	4,535.00	J-644	5.05	501.65	3,767.42	3,767.42
J-641	1,005.85	J-2038	29.34	634.72		4,389.01	J-644	5.11	501.8	3,571.80	3,571.80
J-642	1,005.85	J-2038	29.34	634.72		2,581.55	J-644	16.85	528.89	2,391.78	2,391.77
J-643	1,005.85	J-2038	29.34	634.72		2,757.81	J-644	13.01	520.02	2,357.30	2,357.30
J-644	1,005.85	J-2038	29.34	634.72		1,944.37	J-644	20	536.16	1,944.37	1,944.37
J-645	1,005.85	J-2038	29.34	634.72		2,925.95	J-620	13.23	500.54	2,612.35	2,612.35
J-646	1,005.85	J-2038	29.34	634.72		2,131.08	J-646	20	513.16	2,131.08	2,131.08
J-647	1,005.85	J-2038	29.34	634.72		2,046.00	J-647	20	516.16	2,046.00	2,046.00
J-648	1,005.85	J-2038	29.34	634.72		2,047.51	J-648	20	516.16	2,047.51	2,047.51
J-649	1,005.85	J-2038	29.34	634.72		2,185.28	J-648	19	513.86	2,145.38	2,145.38
J-650	1,009.89	J-2038	29.34	634.72		3,492.57	J-648	-3.83	461.15	2,525.33	2,525.33
J-651	1,005.85	J-2038	29.34	634.72		3,016.40	J-648	-0.18	469.58	2,263.28	2,263.28
J-652	1,005.35	J-2038	29.34	634.72		3,896.93	J-648	13.19	500.43	3,392.36	3,392.36
J-653	1,005.35	J-2038	29.34	634.72		4,031.37	J-648	11.7	497.01	3,625.54	3,625.54
J-654	1,005.35	J-2038	29.34	634.72		3,951.54	J-648	15.4	505.54	3,738.70	3,738.70
J-655	1,005.35	J-2038	29.34	634.72		4,650.00	J-648	0.56	471.3	3,810.50	3,810.50
J-656	1,005.35	J-2038	29.34	634.72		2,082.47	J-656	20	326.16	2,082.47	2,082.47
J-657	1,005.35	J-2038	29.34	634.72		1,509.72	J-657	20	278.16	1,509.72	1,509.72
J-658	1,005.35	J-2038	29.34	634.72		4,181.96	J-648	4.45	480.28	3,269.45	3,269.45
J-659	1,005.35	J-2038	29.34	634.72		4,204.40	J-648	3.52	478.13	3,240.68	3,240.68
J-660	1,005.35	J-2038	29.34	634.72		4,111.15	J-648	6.35	484.65	3,273.70	3,273.70
J-661	1,005.85	J-2038	29.34	634.72		2,820.55	J-648	1.67	473.85	2,160.29	2,160.29
J-662	1,005.85	J-2038	29.34	634.72		2,980.44	J-648	-3.39	462.17	2,160.30	2,160.30
J-663	1,005.85	J-2038	29.34	634.72		3,021.27	J-648	-3.89	461.01	2,178.63	2,178.63
J-664	1,005.85	J-2038	29.34	634.72		2,585.39	J-648	7.76	487.91	2,134.06	2,134.06
J-665	1,005.85	J-2038	29.34	634.72		2,628.88	J-648	4.48	480.34	2,081.45	2,081.45
J-666	1,005.85	J-2038	29.34	634.72		2,580.13	J-648	8.54	489.7	2,151.87	2,151.87
J-667	1,005.85	J-2038	29.34	634.72		2,448.28	J-648	12.54	498.94	2,160.95	2,160.95
J-668	1,005.35	J-2038	29.34	634.72		3,985.67	J-648	8.9	490.55	3,214.15	3,214.15
J-669	1,005.35	J-2038	29.34	634.72		3,868.41	J-648	11.86	497.37	3,214.15	3,214.15
J-670	1,005.35	J-2038	29.34	634.72		1,810.45	J-670	20	388.16	1,810.45	1,810.45
J-671	1,005.35	J-2038	29.34	634.72		3,417.07	J-648	17.87	511.25	3,214.15	3,214.15
J-672	1,005.35	J-2038	29.34	634.72		3,431.63	J-648	17.72	510.88	3,214.15	3,214.15
J-673	1,005.35	J-2038	29.34	634.72		3,263.63	J-648	19.49	514.99	3,214.15	3,214.15
J-674	1,005.35	J-2038	29.34	634.72		2,671.83	J-237	19.99	291.14	2,671.75	2,671.75
J-677	1,003.91	J-2038	29.35	634.74		3,016.64	J-677	20	647.16	3,016.64	3,016.64
J-678	1,003.91	J-2038	29.35	634.74		2,972.15	J-678	20	645.16	2,972.16	2,972.16
J-68	1,009.00	J-2038	29.35	634.74		7,037.29	J-68	20	604.16	7,037.29	7,037.29
J-685	1,003.91	J-2038	29.35	634.74		5,332.89	J-685	20	586.16	5,332.91	5,332.91
J-686	1,005.35	J-2038	29.3	634.61		1,893.93	J-686	20	499.16	1,893.93	1,893.93
J-687	1,005.71	J-2038	29.3	634.61		#####	J-273	5,702,394.00	#####	6,634.72	6,634.72
J-700	1,005.35	J-2038	29.3	634.61		6,785.11	J-3059	12.72	439.36	6,502.64	6,502.64
J-701	1,003.91	J-2038	29.35	634.74		10,140.67	J-610	6.07	559	8,302.16	8,302.16

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-702	1,003.91	J-2038	29.35	634.74		8,769.88	J-610	15.63	581.07	8,140.72	8,140.72
J-703	1,003.91	J-2038	29.35	634.74		8,542.76	J-610	16	581.93	7,960.60	7,960.60
J-704	1,003.91	J-2038	29.35	634.74		8,280.78	J-618	19.29	588.52	8,182.41	8,182.41
J-705	1,003.91	J-2038	29.35	634.74		8,503.89	118	5.9	553.61	6,808.77	6,808.77
J-706	1,003.91	J-2038	29.35	634.74		7,967.21	118	10.91	565.18	6,771.79	6,771.79
J-707	1,003.91	J-2038	29.35	634.74		7,014.91	118	18.06	581.68	6,733.74	6,733.74
J-708	1,003.91	J-2038	29.35	634.74		6,565.13	118	19.96	586.08	6,560.50	6,560.50
J-709	1,003.91	J-2038	29.35	634.74		7,317.19	118	10.5	564.23	6,382.57	6,382.57
J-711	1,003.91	J-2038	29.35	634.74		7,043.63	118	13.36	570.82	6,406.36	6,406.36
J-712	1,005.35	J-2038	29.34	634.72		3,795.17	J-648	13.35	500.81	3,214.15	3,214.15
J-713	1,005.35	J-2038	29.34	634.72		2,859.88	J-713	20	406.16	2,859.88	2,859.88
J-714	1,005.35	J-2038	29.34	634.72		4,619.23	J-648	-6.63	454.7	3,331.43	3,331.43
J-715	1,005.35	J-2038	29.34	634.72		4,763.10	J-648	-8.84	449.6	3,468.22	3,468.22
J-716	1,005.35	J-2038	29.34	634.72		4,628.37	J-648	-4.03	460.7	3,577.52	3,577.52
J-717	1,005.35	J-2038	29.34	634.72		4,883.91	J-648	-6.32	455.42	3,787.99	3,787.99
J-718	1,003.91	J-2038	29.35	634.74		11,746.02	J-718	20	636.16	11,746.13	11,746.13
J-719	1,005.35	J-2038	29.34	634.72		4,115.63	J-648	5.88	483.58	3,243.25	3,243.25
J-72	1,008.00	J-2038	29.35	634.74		7,190.42	J-72	20	603.16	7,190.43	7,190.43
J-720	1,003.91	J-2038	29.35	634.74		10,356.09	J-720	20	646.16	10,356.18	10,356.18
J-721	1,003.91	J-2038	29.34	634.71		10,006.07	J-1860	14.39	565.21	9,282.66	9,282.66
J-722	1,003.91	J-2038	29.35	634.74		14,011.18	J-722	20	636.16	14,011.36	14,011.36
J-723	1,003.91	J-2038	29.35	634.74		39,181.67	J-723	20	641.17	39,186.03	39,186.03
J-724	1,003.91	J-2038	29.35	634.74		13,155.30	J-724	20	641.16	13,155.46	13,155.46
J-726	18,003.91	J-2038	29.35	634.74		86,120.53	56	15.32	636.35	73,443.64	73,443.64
J-727	1,005.35	J-2038	29.34	634.72		4,327.45	J-648	0.08	470.18	3,228.50	3,228.50
J-728	1,005.35	J-2038	29.34	634.72		5,606.66	J-728	20	396.16	5,606.98	5,606.98
J-74	1,008.00	J-2038	29.35	634.74		7,089.20	J-74	20	615.16	7,089.21	7,089.21
J-78	1,024.00	J-2038	29.35	634.74		16,416.00	J-377	15.35	645.43	14,940.97	14,940.97
J-79	1,015.00	J-2038	29.35	634.74		7,351.86	J-79	20	616.16	7,351.87	7,351.87
J-802	1,000.00	J-2038	29.3	634.61		5,405.54	J-802	20	536.16	5,405.53	5,405.53
J-803	1,003.91	J-2038	29.35	634.74		6,507.49	J-803	20	587.16	6,508.24	6,508.24
J-804	1,000.00	J-2038	29.35	634.74		2,931.10	J-804	20	628.16	2,931.10	2,931.10
J-806	1,000.00	J-806	66.62	345.75	1,832.85	1,832.79	J-806	20	238.16	1,832.79	1,832.79
J-808	1,000.00	J-806	71.76	357.61	2,108.34	2,206.18	J-806	13.93	224.16	2,108.22	2,108.22
J-810	1,000.00	J-810	65.99	377.29	2,678.60	2,678.23	J-810	20	271.16	2,678.23	2,678.23
J-812	1,000.00	J-812	25	397.7	3,592.77	#####	J-812	19.87	385.85	3,592.83	3,592.77
J-814	1,000.00	J-2038	29.3	634.61		6,723.11	J-273	18.45	552.57	6,596.79	6,596.79
J-815	1,003.91	J-2038	29.35	634.74		8,260.02	J-618	17.39	584.14	7,868.91	7,868.91
J-816	1,003.91	J-2038	29.35	634.74		8,595.75	J-618	13.61	575.41	7,716.83	7,716.83
J-818	1,000.00	J-2038	29.34	634.72		4,215.83	J-648	12.29	498.37	3,854.78	3,854.78
J-820	1,000.00	J-2038	29.34	634.72		4,350.57	J-648	7.63	487.6	3,797.43	3,797.43
J-824	1,000.00	J-824	24.96	397.6	3,243.83	#####	J-824	3,517.00	8,456.79	3,243.88	3,243.83
J-826	1,009.73	J-2038	29.35	634.74		6,937.63	J-105	16.13	590.21	6,643.56	6,643.56

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
J-827	1,009.73	J-2038	29.35	634.74		6,202.82	J-827	20	587.16	6,202.83	6,202.83
J-828	1,009.73	J-2038	29.35	634.74		6,070.41	J-828	20	575.16	6,070.41	6,070.41
J-829	1,009.73	J-2038	29.35	634.74		5,966.92	J-829	20	566.16	5,966.92	5,966.92
J-830	1,009.73	J-2038	29.35	634.74		5,680.02	J-830	20	580.16	5,680.03	5,680.03
J-831	1,009.73	J-2038	29.35	634.74		4,768.26	J-831	20	578.16	4,768.27	4,768.27
J-832	1,009.73	J-2038	29.35	634.74		4,352.60	J-832	20	576.16	4,352.60	4,352.60
J-833	1,009.73	J-2038	29.35	634.74		4,269.30	J-833	20	574.16	4,269.30	4,269.30
J-834	1,009.73	J-2038	29.35	634.74		4,299.20	J-834	20	574.16	4,299.20	4,299.20
J-842	1,009.73	J-2038	29.35	634.74		2,612.82	J-848	19.54	560.1	2,602.80	2,602.80
J-843	1,009.73	J-2038	29.35	634.74		2,795.82	J-848	19.15	559.2	2,775.98	2,775.98
J-845	1,009.73	J-2038	29.35	634.74		3,188.05	J-845	20	554.16	3,188.05	3,188.05
J-846	1,009.73	J-2038	29.35	634.74		3,472.26	J-846	20	561.16	3,472.26	3,472.26
J-847	1,009.73	J-2038	29.35	634.74		3,211.94	J-848	18.98	558.8	3,184.47	3,184.47
J-848	1,009.73	J-2038	29.35	634.74		2,382.49	J-848	20	561.16	2,382.49	2,382.49
J-85	1,003.91	J-2038	29.35	634.74		8,477.64	FCV-85-OUT	20	628.16	8,477.66	8,477.66
J-850	1,000.00	J-2038	29.35	634.74		1,231.94	J-431	13.07	278.15	1,140.70	1,140.70
J-86	1,006.15	J-2038	29.35	634.74		8,375.22	J-86	20	604.16	8,375.23	8,375.23
J-87	1,006.15	J-2038	29.35	634.74		7,942.75	J-87	20	594.16	7,942.76	7,942.76
J-88	1,006.15	J-2038	29.35	634.74		7,561.90	J-88	20	595.16	7,561.91	7,561.91
J-89	1,006.15	J-2038	29.35	634.74		7,647.89	J-89	20	622.16	7,647.90	7,647.90
J-90	1,024.00	J-2038	29.35	634.74		15,498.27	J-151	17.27	619.85	14,909.13	14,909.13
PRV-172-IN	1,000.00	J-2038	29.3	634.61		6,145.94	J-585	4.83	473.14	5,437.60	5,437.60
PRV-172-OUT	1,000.00	J-2038	29.3	634.61		5,847.11	J-173	17.84	433.96	5,714.75	5,714.75
PRV-1-IN	1,000.00	J-2038	29.3	634.61		6,349.18	PRV-600-OU	15.11	547.87	5,973.93	5,973.93
PRV-1-OUT	1,000.00	J-2038	29.3	634.61		6,357.82	PRV-600-OU	15.86	549.61	6,034.07	6,034.07
PRV-238-OUT	1,000.00	J-2038	29.35	634.73		2,182.92	PRV-238-OU	20	196.16	2,182.93	2,182.93
PRV-240-IN	1,000.00	J-2038	29.34	634.72		2,412.10	J-648	13.34	500.79	2,154.45	2,154.45
PRV-240-OUT	1,000.00	J-2038	29.34	634.72		4,017.86	J-648	7.18	486.57	3,142.58	3,142.58
PRV-248-IN	1,000.00	J-2038	29.34	634.72		3,695.05	PRV-248-IN	20	376.16	3,695.05	3,695.05
PRV-250-IN	1,005.35	J-2038	29.34	634.72		5,396.95	PRV-250-IN	20	376.16	5,396.95	5,396.95
PRV-250-OUT	1,005.71	J-2038	29.34	634.72		2,804.84	PRV-250-OU	20	376.16	2,804.84	2,804.84
PRV-258-IN	1,000.00	J-2038	29.34	634.72		1,914.11	PRV-258-IN	20	342.16	1,914.11	1,914.11

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
PRV-258-OUT	1,000.00	J-2038	29.34	634.72		#####	PRV-258-OU	-10,292.26	-23,457.19	2,146.45	2,146.45
PRV-261-IN	1,000.00	J-2038	29.35	634.74		8,051.87	J-304	-0.87	547.99	5,877.14	5,877.14
PRV-264-IN	1,005.85	J-2038	29.34	634.72		1,710.21	PRV-264-IN	20	446.16	1,710.21	1,710.21
PRV-264-OUT	1,005.35	J-2038	29.34	634.72		2,512.53	PRV-264-OU	20	446.16	2,512.54	2,512.54
PRV-281-IN	1,000.00	J-2038	29.3	634.61		2,908.94	PRV-281-IN	20	456.16	2,908.94	2,908.94
PRV-281-OUT	1,000.00	J-2038	29.3	634.61		3,421.25	PRV-281-OU	20	456.16	3,421.26	3,421.26
PRV-282-IN	1,000.00	J-2038	29.3	634.61		5,675.68	PRV-282-OU	19.99	506.14		
PRV-282-OUT	1,000.00	J-2038	29.3	634.61		2,062.92	PRV-282-OU	20	506.16	2,065.85	2,065.85
PRV-284-IN	1,000.00	J-2038	29.3	634.61		2,977.66	PRV-284-IN	20	291.16	2,978.04	2,978.04
PRV-284-OUT	1,000.00	J-2038	29.3	634.61		2,413.57	PRV-284-OU	20	291.16	2,413.57	2,413.57
PRV-308-IN	1,003.91	J-2038	29.35	634.74		1,524.40	PRV-308-IN	20	578.16	1,524.40	1,524.40
PRV-341-IN	1,000.00	J-2038	29.35	634.74		3,608.13	PRV-341-IN	20	555.16	3,608.13	3,608.13
PRV-341-OUT	1,000.00	J-2038	29.34	634.72		4,503.53	PRV-341-OU	20	555.16	4,503.53	4,503.53
PRV-393-IN	1,000.00	J-2038	29.35	634.74		2,102.50	PRV-393-IN	20	521.16	2,102.50	2,102.50
PRV-393-OUT	1,000.00	J-2038	29.34	634.72		1,855.32	PRV-393-OU	20	516.16	1,855.32	1,855.32
PRV-400-IN	1,000.00	J-2038	29.35	634.74		4,861.02	J-431	-32.18	173.73		
PRV-472-IN	1,000.00	J-2038	29.3	634.61		8,288.06	J-173	-16.36	355.03	6,287.88	6,287.88
PRV-472-OUT	1,000.00	J-2038	29.3	634.61		7,807.42	J-273	3.51	518.1	6,623.14	6,623.14
PRV-483-IN	1,000.00	J-2038	29.34	634.72		3,290.27	PRV-483-IN	20	406.16	3,290.12	3,290.12
PRV-483-OUT	1,000.00	J-2038	29.34	634.72		4,085.76	PRV-483-OU	20	406.16	4,085.61	4,085.61
PRV-507-IN	1,000.00	J-2038	29.34	634.72		4,410.28	PRV-507-IN	20	407.16	4,410.28	4,410.28
PRV-507-OUT	1,000.00	J-2038	29.34	634.72		5,444.66	PRV-507-OU	20	407.16	5,444.24	5,444.24
PRV-525-IN	1,005.85	J-2038	29.34	634.72		3,767.61	PRV-525-IN	20	414.16	3,767.30	3,767.30

ID	Total Demand (gpm)	Critical Fire Node ID	Critical Fire Node Pressure (psi)	Critical Fire Node Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Available Node ID	Critical Available Node Pressure (psi)	Critical Available Node Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
PRV-572-OUT	1,000.00	J-2038	29.33	634.69		2,776.81	PRV-572-OU	20	321.16	2,776.81	2,776.81
PRV-591-IN	1,000.00	J-2038	29.3	634.61		6,730.13	J-273	18.37	552.4	6,597.75	6,597.75
PRV-600-IN	1,000.00	J-2038	29.35	634.74		7,310.56	PRV-600-IN	20	559.16	7,310.54	7,310.54
PRV-600-OUT	1,000.00	J-2038	29.3	634.61		5,598.45	PRV-600-OU	20	559.16	5,598.44	5,598.44
PRV-609-IN	1,000.00	J-2038	29.35	634.74		8,049.53	PRV-609-IN	20	580.16	8,049.55	8,049.55
PRV-609-OUT	1,000.00	J-2038	29.35	634.74		8,103.05	J-610	19.06	588.99	7,891.16	7,891.16
PRV-635-OUT	1,000.00	J-2038	29.34	634.72		3,847.55	PRV-635-OU	20	453.16	3,847.54	3,847.54
PRV-650-OUT	1,000.00	J-2038	29.34	634.72		3,701.75	J-648	15.6	506	3,286.00	3,286.00

## **APPENDIX K**

### **CAPITAL IMPROVEMENT PLAN COST ESTIMATES**

**ASSUMPTIONS FOR COST ESTIMATES**

Tax rate	9.5 %				
Contingency	20 %				
Engineering and Administrative Costs	30 %				
Mobilization, Cleanup and Demobilization	8% of subtotal without tax and contingency (round to \$1000)				
4-inch DI Water Pipe, Including Fittings	N/A	=UNIT PRICE			
6-inch DI Water Pipe, Including Fittings	\$ 80	=UNIT PRICE			
8-inch DI Water Pipe, Including Fittings	\$ 100	=UNIT PRICE			
12-inch DI Water Pipe, Including Fittings	\$ 120	=UNIT PRICE			
16-inch DI Water Pipe, Including Fittings	\$ 150	=UNIT PRICE			
24-inch DI Water Pipe, Including Fittings	\$ -	=UNIT PRICE			
Locate Existing Utilities	2% of subtotal without mobilization, tax and contingency (round to \$1000)				
Erosion Control	2% of subtotal without mobilization, tax and contingency (round to \$1000)				
Additional Pipe Fittings (LBS)	4 -inch	0.08 * Pipe Length=LBS (Round to 50 LBS)			
Additional Pipe Fittings (LBS)	6 -inch	0.12 * Pipe Length=LBS (Round to 50 LBS)			
Additional Pipe Fittings (LBS)	8 -inch	0.45 * Pipe Length=LBS (Round to 50 LBS)			
Additional Pipe Fittings (LBS)	12 -inch	0.50 * Pipe Length=LBS (Round to 50 LBS)			
Additional Pipe Fittings (LBS)	16 -inch	0.60 * Pipe Length=LBS (Round to 50 LBS)			
UNIT PRICE	\$ 4.00	PER LB			
Trench Safety Systems	\$ 2.00	per LF of Pipe Length			
4-inch Gate Valves	EA	2	Every	300 feet	
6-inch Gate Valves	\$ 1,200	EA	2	Every	300 feet
8-inch Gate Valves	\$ 1,500	EA	2	Every	300 feet
12-inch Gate Valves	\$ 2,500	EA	2	Every	300 feet
16-inch Gate Valves	\$ 10,000	EA	2	Every	600 feet
18-inch Butterfly Valves	N/A	EA	2	Every	600 feet
24-inch Butterfly Valves		EA	2	Every	600 feet
8-inch Tapping Tee & Valve	\$ 5,000	EA			
Hydrant Assembly	\$ 6,000	EA	Every	400 feet	
TRENCH WIDTH	PIPE SIZE	WIDTH (ft)			
	4	2.5			
	6	2.5			
	8	3.0			
	12	3.5			
	16	4.0			
	18	4.5			
LANE WIDTH	WIDTH (ft)	12.0			
	MATL DEPTH (feet)	UNT WEIGHT (TN/CY)	EXTRA MATL FACTOR	FRACTION OF LENGTH	PRODUCT
Gravel Backfill	4.00	1.8	1.1	1.00	0.293 * Trench Width = TN/LF
Cost per TN	\$ 20.00				
CDF	4.00	1.0	1.1	1.00	0.163 * Trench Width = CY/LF
Cost per CY	\$ 200.00				
Foundation Gravel	0.50	1.8	1.1	0.50	0.018 * Trench Width = TN/LF
Cost per TN	\$ 35.00				
HMA Cl. 1/2 PG 64-22	0.50	1.80	1.1	1.00	0.037 * Lane Width = TN/LF
Cost per TN	\$ 140.00				
Sawcutting	\$ 3.00 = Cost per LF of sawcutting				
Crushed Surfacing, Top Course	0.17	1.8	1.1	1.00	0.012 * Lane Width = TN/LF
Cost per TN	\$ 25.00				
Connections to Existing System	\$ 3,000 EA				
3/4" Service Connections, complete	\$ 1,200 EA				
Traffic Control	\$ 120	EA	16	HRS per	300 feet

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
TRANSMISSION SYSTEM IMPROVEMENT T-1  
Paine Field Transmission Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	\$ 149,000	\$ 149,000
2	16-inch DI Water Pipe, Including Fittings and Restrained Joints	900 LF	\$ 150	\$ 135,000
3	Locate Existing Utilities	LUMP SUM	\$ 37,000	\$ 37,000
4	Erosion Control	LUMP SUM	\$ 36,000	\$ 36,000
5	Additional Pipe Fittings	500 LB	\$ 4.00	\$ 2,000
6	Trench Safety Systems	LUMP SUM	\$ 1,800	\$ 1,800
7	16-inch Gate Valves	4 EA	\$ 10,000	\$ 40,000
8	Fire Hydrants	2 EA	\$ 6,000	\$ 12,000
9	Gravel Backfill	1,060 TN	\$ 20	\$ 21,200
10	Foundation Gravel	70 TN	\$ 35	\$ 2,450
11	HMA Cl. 1/2 PG 64-22	400 TN	\$ 140	\$ 56,000
12	Sawcutting	1,800 LF	\$ 3	\$ 5,400
13	Crushed Surfacing, Top Course	60 TN	\$ 25	\$ 1,500
14	Connections to Existing System	2 EA	\$ 3,000	\$ 6,000
15	Traffic Control	48 HRS	\$ 120	\$ 5,760
16	Directional Drill 18-inch OD HDPE	1,500 LF	\$ 1,000	\$ 1,500,000
	Subtotal.....			\$ 2,011,110
	Tax rate (9.5%).....			191,055
	Subtotal:.....			\$ 2,202,165
	Contingency (20%).....			\$ 440,835
	TOTAL ESTIMATED CONSTRUCTION COST:.....			\$ 2,643,000
	Engineering and Administrative Costs (30%):.....			\$ 792,900
	TOTAL ESTIMATED PROJECT COST:.....			\$ 3,436,000

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
DISTRIBUTION SYSTEM IMPROVEMENT D-1  
5th Street Water Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	1	LS	\$ 70,000	\$ 70,000
2	Minor Changes	1	LS	\$ 5,000	\$ 5,000
3	Erosion/Water Pollution Control	1	LS	\$ 4,000	\$ 4,000
4	Locate Existing Utilities	1	LS	\$ 3,000	\$ 3,000
5	Clearing and Grubbing	1	LS	\$ 2,000	\$ 2,000
6	Removal of Structure and Obstruction	1	LS	\$ 3,000	\$ 3,000
7	Temporary Traffic Control	1	LS	\$ 15,000	\$ 15,000
8	HMA Cl. 1/2" PG 64-22, Trench Repair	600	TN	\$ 110	\$ 66,000
9	Temporary HMA Cl. 1/2" PG 64-22	50	TN	\$ 150.00	\$ 7,500
10	Crushed Surfacing Top Course (CSTC)	100	TN	\$ 24	\$ 2,400
11	Crushed Surfacing Base Course (CSBC)	100	TN	\$ 24	\$ 2,400
12	Bank Run Gravel for Trench Backfill	2,500	TN	\$ 20	\$ 50,000
13	Control Density Fill (CDF)	50	CY	\$ 200	\$ 10,000
14	DI Water Pipe, 8 in. Diam.	350	LF	\$ 100	\$ 35,000
15	DI Water Pipe, 12 in. Diam.	2,100	LF	\$ 120	\$ 252,000
16	Additional Fittings	500	LB	\$ 3	\$ 1,500
17	Removal of Unsuitable Material (Trench)	200	CY	\$ 75	\$ 15,000
18	Trench Excavation Safety Systems	1	LS	\$ 3,000	\$ 3,000
19	Gate Valves, 6 In.	1	EA	\$ 1,000	\$ 1,000
20	Gate Valves, 8 In.	1	EA	\$ 1,200	\$ 1,200
21	Gate Valves, 12 In.	4	EA	\$ 1,500	\$ 6,000
22	Connection to Existing System	1	EA	\$ 3,000	\$ 3,000
23	Tapping Sleeve and Valve Assembly 8 In.	2	EA	\$ 2,800	\$ 5,600
24	Tapping Sleeve and Valve Assembly 12 In.	1	EA	\$ 3,200	\$ 3,200

25	Jack and Bore 24-inch Diameter Steel Casing	140 LF	\$ 300	\$ 42,000
26	Sawcutting	1,200 LF	\$ 3	\$ 3,600
27	Mukilteo Blvd. Master Meter Mechanical	1 LS	\$ 7,000	\$ 7,000
28	Lamar Drive Vault Mechanical	1 LS	\$ 4,000	\$ 4,000
29	PRV Vault	1 LS	\$ 90,000	\$ 90,000
30	Electrical	1 LS	\$ 20,000	\$ 20,000
31	SCADA	1 LS	\$ 35,000	\$ 35,000
32	General Restoration	1 LS	5000	5000
	Subtotal.....			\$ 773,400
	Contingency (10%)			<u>77,340</u>
	Subtotal:.....			\$ 850,740
	Sales Tax (9.5%)			<u>\$ 80,820</u>
	TOTAL ESTIMATED CONSTRUCTION COST:.....			\$ 931,600
	Construction Management (12%)			\$ 111,800
	TOTAL ESTIMATED PROJECT COST:.....			<u>\$ 1,050,000</u>
	ENR CCI, Seattle = 10398.24, June 2015			

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
DISTRIBUTION SYSTEM IMPROVEMENT D-2  
Lamar Drive and Debreton Lane Water Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	\$ 39,000	\$ 39,000
2	8-inch DI Water Pipe, Including Fittings	1,850 LF	\$ 100	\$ 185,000
3	Locate Existing Utilities	LUMP SUM	\$ 9,000	\$ 9,000
4	Erosion Control	LUMP SUM	\$ 9,000	\$ 9,000
5	Additional Pipe Fittings	800 LB	\$ 4.00	\$ 3,200
6	Trench Safety Systems	LUMP SUM	\$ 3,700	\$ 3,700
7	8-inch Gate Valves	12 EA	\$ 1,500	\$ 18,000
8	Fire Hydrants	5 EA	\$ 6,000	\$ 30,000
9	Gravel Backfill	1,630 TN	\$ 20	\$ 32,600
10	CDF	30 CY	\$ 200	\$ 6,000
11	Foundation Gravel	100 TN	\$ 35	\$ 3,500
12	HMA Cl. 1/2 PG 64-22	810 TN	\$ 140	\$ 113,400
13	Sawcutting	3,700 LF	\$ 3	\$ 11,100
14	Crushed Surfacing, Top Course	120 TN	\$ 25	\$ 3,000
15	Connections to Existing System	3 EA	\$ 3,000	\$ 9,000
16	3/4" Service Connections, complete	28 EA	\$ 1,200	\$ 33,600
17	Traffic Control	100 HRS	\$ 120	\$ 12,000
	Subtotal.....			\$ 521,100
	Tax rate (9.5%).....			49,505
	Subtotal:.....			\$ 570,605
	Contingency (20%).....			\$ 114,396
	TOTAL ESTIMATED CONSTRUCTION COST:.....			\$ 685,000
	Engineering and Administrative Costs (30%):.....			\$ 205,500
	TOTAL ESTIMATED PROJECT COST:.....			\$ 891,000

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
DISTRIBUTION SYSTEM IMPROVEMENT D-3  
62nd Place Water Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	\$ 22,000	\$ 22,000
2	8-inch DI Water Pipe, Including Fittings	1,050 LF	\$ 100	\$ 105,000
3	Locate Existing Utilities	LUMP SUM	\$ 5,000	\$ 5,000
4	Erosion Control	LUMP SUM	\$ 5,000	\$ 5,000
5	Additional Pipe Fittings	500 LB	\$ 4.00	\$ 2,000
6	Trench Safety Systems	LUMP SUM	\$ 2,100	\$ 2,100
7	8-inch Gate Valves	6 EA	\$ 1,500	\$ 9,000
8	Fire Hydrants	3 EA	\$ 6,000	\$ 18,000
9	Gravel Backfill	920 TN	\$ 20	\$ 18,400
10	CDF	20 CY	\$ 200	\$ 4,000
11	Foundation Gravel	60 TN	\$ 35	\$ 2,100
12	HMA Cl. 1/2 PG 64-22	460 TN	\$ 140	\$ 64,400
13	Sawcutting	2,100 LF	\$ 3	\$ 6,300
14	Crushed Surfacing, Top Course	70 TN	\$ 25	\$ 1,750
15	Connections to Existing System	3 EA	\$ 3,000	\$ 9,000
16	3/4" Service Connections, complete	14 EA	\$ 1,200	\$ 16,800
17	Traffic Control	84 HRS	\$ 120	\$ 10,080
	Subtotal.....			\$ 300,930
	Tax rate (9.5%).....			28,588
	Subtotal:.....			\$ 329,518
	Contingency (20%).....			65,482
	TOTAL ESTIMATED CONSTRUCTION COST:.....			\$ 395,000
	Engineering and Administrative Costs (30%):.....			\$ 118,500
	TOTAL ESTIMATED PROJECT COST:.....			\$ 514,000

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
DISTRIBUTION SYSTEM IMPROVEMENT D-4  
Washington Avenue Water Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	\$ 33,000	\$ 33,000
2	8-inch DI Water Pipe, Including Fittings	1,600 LF	\$ 100	\$ 160,000
3	Locate Existing Utilities	LUMP SUM	\$ 8,000	\$ 8,000
4	Erosion Control	LUMP SUM	\$ 8,000	\$ 8,000
5	Additional Pipe Fittings	700 LB	\$ 4.00	\$ 2,800
6	Trench Safety Systems	LUMP SUM	\$ 3,200	\$ 3,200
7	8-inch Gate Valves	10 EA	\$ 1,500	\$ 15,000
8	Fire Hydrants	5 EA	\$ 6,000	\$ 30,000
9	Gravel Backfill	1,410 TN	\$ 20	\$ 28,200
10	CDF	- CY	\$ 200	\$ -
11	Foundation Gravel	90 TN	\$ 35	\$ 3,150
12	HMA Cl. 1/2 PG 64-22	700 TN	\$ 140	\$ 98,000
13	Sawcutting	3,200 LF	\$ 3	\$ 9,600
14	Crushed Surfacing, Top Course	100 TN	\$ 25	\$ 2,500
15	Connections to Existing System	2 EA	\$ 3,000	\$ 6,000
16	3/4" Service Connections, complete	27 EA	\$ 1,200	\$ 32,400
17	Traffic Control	84 HRS	\$ 120	\$ 10,080
Subtotal.....				\$ 449,930
Tax rate (9.5%).....				<u>42,743</u>
Subtotal:.....				\$ 492,673
Contingency (20%).....				<u>98,327</u>
TOTAL ESTIMATED CONSTRUCTION COST:.....				\$ 591,000
Engineering and Administrative Costs (30%):.....				<u>\$ 177,300</u>
TOTAL ESTIMATED PROJECT COST:.....				<u><u>\$ 768,000</u></u>

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
DISTRIBUTION SYSTEM IMPROVEMENT D-5  
Possession View Place Water Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	\$ 22,000	\$ 22,000
2	8-inch DI Water Pipe, Including Fittings	1,050 LF	\$ 100	\$ 105,000
3	Locate Existing Utilities	LUMP SUM	\$ 5,000	\$ 5,000
4	Erosion Control	LUMP SUM	\$ 5,000	\$ 5,000
5	Additional Pipe Fittings	500 LB	\$ 4.00	\$ 2,000
6	Trench Safety Systems	LUMP SUM	\$ 2,100	\$ 2,100
7	8-inch Gate Valves	6 EA	\$ 1,500	\$ 9,000
8	Fire Hydrants	2 EA	\$ 6,000	\$ 12,000
9	Gravel Backfill	920 TN	\$ 20	\$ 18,400
10	CDF	20 CY	\$ 200	\$ 4,000
11	Foundation Gravel	60 TN	\$ 35	\$ 2,100
12	HMA Cl. 1/2 PG 64-22	460 TN	\$ 140	\$ 64,400
13	Sawcutting	2,100 LF	\$ 3	\$ 6,300
14	Crushed Surfacing, Top Course	70 TN	\$ 25	\$ 1,750
15	Connections to Existing System	3 EA	\$ 3,000	\$ 9,000
16	3/4" Service Connections, complete	19 EA	\$ 1,200	\$ 22,800
17	Traffic Control	56 HRS	\$ 120	\$ 6,720
	Subtotal.....			\$ 297,570
	Tax rate (9.5%).....			28,269
	Subtotal:.....			\$ 325,839
	Contingency (20%).....			\$ 65,161
	TOTAL ESTIMATED CONSTRUCTION COST:.....			\$ 391,000
	Engineering and Administrative Costs (30%):.....			\$ 117,300
	TOTAL ESTIMATED PROJECT COST:.....			\$ 508,000

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
DISTRIBUTION SYSTEM IMPROVEMENT D-6  
8th Street Water Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	\$ 8,000	\$ 8,000
2	8-inch DI Water Pipe, Including Fittings	300 LF	\$ 100	\$ 30,000
3	Locate Existing Utilities	LUMP SUM	\$ 2,000	\$ 2,000
4	Erosion Control	LUMP SUM	\$ 2,000	\$ 2,000
5	Additional Pipe Fittings	100 LB	\$ 4.00	\$ 400
6	Trench Safety Systems	LUMP SUM	\$ 600	\$ 600
7	8-inch Gate Valves	1 EA	\$ 1,500	\$ 1,500
8	8-inch Tapping Tee & Valve	1 EA	\$ 5,000	\$ 5,000
9	Fire Hydrants	1 EA	\$ 6,000	\$ 6,000
10	Gravel Backfill	260 TN	\$ 20	\$ 5,200
11	CDF	30 CY	\$ 200	\$ 6,000
12	Foundation Gravel	20 TN	\$ 35	\$ 700
13	HMA Cl. 1/2 PG 64-22	130 TN	\$ 140	\$ 18,200
14	Sawcutting	600 LF	\$ 3	\$ 1,800
15	Crushed Surfacing, Top Course	20 TN	\$ 25	\$ 500
16	Connections to Existing System	2 EA	\$ 3,000	\$ 6,000
17	3/4" Service Connections, complete	10 EA	\$ 1,200	\$ 12,000
18	Traffic Control	16 HRS	\$ 120	\$ 1,920
	Subtotal.....			\$ 107,820
	Tax rate (9.5%).....			10,243
	Subtotal:.....			\$ 118,063
	Contingency (20%).....			\$ 23,937
	TOTAL ESTIMATED CONSTRUCTION COST:.....			\$ 142,000
	Engineering and Administrative Costs (30%):.....			\$ 42,600
	TOTAL ESTIMATED PROJECT COST:.....			\$ 185,000

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
DISTRIBUTION SYSTEM IMPROVEMENT D-7  
10th Street Water Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	\$ 22,000	\$ 22,000
2	8-inch DI Water Pipe, Including Fittings	970 LF	\$ 100	\$ 97,000
3	Locate Existing Utilities	LUMP SUM	\$ 5,000	\$ 5,000
4	Erosion Control	LUMP SUM	\$ 5,000	\$ 5,000
5	Additional Pipe Fittings	400 LB	\$ 4.00	\$ 1,600
6	Trench Safety Systems	LUMP SUM	\$ 1,900	\$ 1,900
7	8-inch Gate Valves	6 EA	\$ 1,500	\$ 9,000
8	Fire Hydrants	3 EA	\$ 6,000	\$ 18,000
9	Gravel Backfill	850 TN	\$ 20	\$ 17,000
10	CDF	60 CY	\$ 200	\$ 12,000
11	Foundation Gravel	50 TN	\$ 35	\$ 1,750
12	HMA Cl. 1/2 PG 64-22	430 TN	\$ 140	\$ 60,200
13	Sawcutting	1,940 LF	\$ 3	\$ 5,820
14	Crushed Surfacing, Top Course	60 TN	\$ 25	\$ 1,500
15	Connections to Existing System	4 EA	\$ 3,000	\$ 12,000
16	3/4" Service Connections, complete	17 EA	\$ 1,200	\$ 20,400
17	Traffic Control	52 HRS	\$ 120	\$ 6,240
	Subtotal.....			\$ 296,410
	Tax rate (9.5%).....			28,159
	Subtotal:.....			\$ 324,569
	Contingency (20%).....			\$ 64,431
	TOTAL ESTIMATED CONSTRUCTION COST:.....			\$ 389,000
	Engineering and Administrative Costs (30%):.....			\$ 116,700
	TOTAL ESTIMATED PROJECT COST:.....			\$ 506,000

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
DISTRIBUTION SYSTEM IMPROVEMENT D-9  
102nd Place Water Main**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	\$ 6,000	\$ 6,000
2	8-inch DI Water Pipe, Including Fittings	200 LF	\$ 100	\$ 20,000
3	Locate Existing Utilities	LUMP SUM	\$ 2,000	\$ 2,000
4	Erosion Control	LUMP SUM	\$ 2,000	\$ 2,000
5	Additional Pipe Fittings	100 LB	\$ 4.00	\$ 400
6	Trench Safety Systems	LUMP SUM	\$ 400	\$ 400
7	8-inch Gate Valves	2 EA	\$ 1,500	\$ 3,000
8	Fire Hydrants	1 EA	\$ 6,000	\$ 6,000
9	Gravel Backfill	180 TN	\$ 20	\$ 3,600
10	CDF	10 CY	\$ 200	\$ 2,000
11	Foundation Gravel	10 TN	\$ 35	\$ 350
12	Asphalt Concrete Class B	130 SQ YD	\$ 140	\$ 18,200
13	Sawcutting	400 LF	\$ 3	\$ 1,200
14	Crushed Surfacing, Top Course	10 TN	\$ 25	\$ 250
15	Connections to Existing System	2 EA	\$ 3,000	\$ 6,000
16	3/4" Service Connections, complete	12 EA	\$ 1,200	\$ 14,400
17	Traffic Control	4 HRS	\$ 120	\$ 480
Subtotal.....				\$ 86,280
Tax rate (8.9%).....				7,679
Subtotal:.....				\$ 93,959
Contingency (20%).....				\$ 19,041
TOTAL ESTIMATED CONSTRUCTION COST:.....				\$ 113,000
Engineering and Administrative Costs (30%):.....				\$ 33,900
TOTAL ESTIMATED PROJECT COST:.....				\$ 147,000

ENR CCI, Seattle = 10398.24, June 2015

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
DISTRIBUTION SYSTEM IMPROVEMENT D-10  
Paine Field Upsizing**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	\$ 27,000	\$ 27,000
2	12-inch DI Water Pipe, Including Fittings	900 LF	\$ 120	\$ 108,000
3	Locate Existing Utilities	LUMP SUM	\$ 6,000	\$ 6,000
4	Erosion Control	LUMP SUM	\$ 6,000	\$ 6,000
5	Additional Pipe Fittings	500 LB	\$ 4.00	\$ 2,000
6	Trench Safety Systems	LUMP SUM	\$ 1,800	\$ 1,800
7	12-inch Gate Valves	10 EA	\$ 2,500	\$ 25,000
8	Fire Hydrants	3 EA	\$ 6,000	\$ 18,000
9	Gravel Backfill	920 TN	\$ 20	\$ 18,400
10	CDF	510 CY	\$ 200	\$ 102,000
11	Foundation Gravel	60 TN	\$ 35	\$ 2,100
12	HMA Cl. 1/2 PG 64-22	120 TN	\$ 140	\$ 16,800
13	Sawcutting	1,800 LF	\$ 3	\$ 5,400
14	Crushed Surfacing, Top Course	40 TN	\$ 25	\$ 1,000
15	Connections to Existing System	5 EA	\$ 3,000	\$ 15,000
16	Traffic Control	48 HRS	\$ 120	\$ 5,760
Subtotal.....				\$ 360,260
Tax rate (9.5%).....				34,225
Subtotal:.....				\$ 394,485
Contingency (20%).....				\$ 78,515
TOTAL ESTIMATED CONSTRUCTION COST:.....				\$ 473,000
Engineering and Administrative Costs (30%):.....				\$ 141,900
TOTAL ESTIMATED PROJECT COST:.....				\$ 615,000

ENR CCI, Seattle = 10398.24, June 2015

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
BOOSTER STATION IMPROVEMENT P-1  
Paine Field Booster Station Third Pump**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization	1	LS \$ 7,000	\$ 7,000
2	20 HP Jockey Pump	1	EA \$ 25,000	\$ 25,000
3	Swing Flex Check Valve - 8-inch	1	EA \$ 5,000	\$ 5,000
4	Gate Valve - 8-inch	2	EA \$ 3,000	\$ 6,000
5	Pressure Gauges	2	EA \$ 150	\$ 300
6	Miscellaneous Spools and Fittings	1	LS \$ 2,000	\$ 2,000
7	Housekeeping Pad	1	LS \$ 4,000	\$ 4,000
8	Electrical	1	LS \$ 20,000	\$ 20,000
9	SCADA and Telemetry	1	LS \$ 7,000	\$ 7,000
Subtotal.....				\$ 76,300
Tax rate (9.5%).....				7,249
Subtotal:.....				\$ 83,549
Contingency (20%):.....				\$ 16,452
TOTAL ESTIMATED CONSTRUCTION COST:.....				\$ 100,000
Engineering and Administrative Costs (30%):.....				\$ 30,000
TOTAL ESTIMATED PROJECT COST:.....				\$ 130,000

ENR CCI, Seattle = 10398.24, June 2015

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
BOOSTER STATION IMPROVEMENT P-2  
Conversion of 620 Reservoir Diesel Pump to Electric Power**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization and Demobilization	1 LS	\$ 10,000	\$ 10,000
2	100 HP Electric Motor	1 EA	\$ 40,000	\$ 40,000
3	Upgrade Electrical Service	1 LS	\$ 18,000	\$ 18,000
	Subtotal.....			\$ 68,000
	Tax rate (9.5%).....			<u>6,460</u>
	Subtotal:.....			\$ 74,460
	Contingency (20%):.....			<u>\$ 14,540</u>
	TOTAL ESTIMATED CONSTRUCTION COST:.....			<u>\$ 89,000</u>
	Engineering and Administrative Costs (30%):.....			<u>\$ 27,000</u>
	TOTAL ESTIMATED PROJECT COST:.....			<u><u>\$ 116,000</u></u>
	ENR CCI, Seattle = 10398.24, June 2015			

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
STORAGE IMPROVEMENT S-1  
Reservoir No. 4 Interior and Exterior Recoating**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>		<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization	1	LS	\$ 81,000	\$ 81,000
2	Interior Reservoir Prep and Recoating	1	LS	\$ 509,000	\$ 509,000
3	Exterior Reservoir Prep and Topcoating	1	LS	\$ 232,000	\$ 232,000
4	Mural	1	LS	\$ 50,000	\$ 50,000
5	Removal of Mill Scale	4000	SF	\$ 4	\$ 14,000
6	Surface Restoration	1	LS	\$ 3,000	\$ 3,000
Subtotal:.....					\$ 889,000
Contingency:.....					<u>\$ 342,265</u>
Subtotal.....					\$ 1,231,265
Tax rate (9.5%).....					\$ 116,970
TOTAL ESTIMATED CONSTRUCTION COST:.....					<u>\$ 1,348,235</u>
Design and Construction Management (13%)					\$ 175,271
TOTAL ESTIMATED PROJECT COST:.....					<u>\$ 1,525,000</u>
ENR CCI, Seattle = 10398.24, June 2015					

Notes:

- 1.) No containment is included in this cost estimate as it is typically not required for a topcoat.
- 2.) Mural costs are for a detailed, "signature" mural.

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
STORAGE IMPROVEMENT S-2  
Reservoir No. 1 Interior Recoating**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization and Demobilization	1 LS	\$ 15,000	\$ 15,000
2	Recoating	16,000 SQFT	\$ 12	\$ 192,000
	Subtotal.....			\$ 207,000
	Tax rate (9.5%).....			19,665
	Subtotal:.....			\$ 226,665
	Contingency (20%):.....			\$ 45,335
	TOTAL ESTIMATED CONSTRUCTION COST:.....			\$ 272,000
	Engineering and Administrative Costs (30%):.....			\$ 82,000
	TOTAL ESTIMATED PROJECT COST:.....			\$ 354,000

ENR CCI, Seattle = 10398.24, June 2015

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
STORAGE IMPROVEMENT S-3  
Reservoir No. 2 Exterior Recoating**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
1	Mobilization and Demobilization	1 LS	\$ 25,000	\$ 25,000
2	Recoating	24,500 SQFT	\$ 12	\$ 294,000
	Subtotal.....			\$ 319,000
	Tax rate (9.5%).....			30,305
	Subtotal:.....			\$ 349,305
	Contingency (20%):.....			\$ 69,695
	TOTAL ESTIMATED CONSTRUCTION COST:.....			\$ 419,000
	Engineering and Administrative Costs (30%):.....			\$ 126,000
	TOTAL ESTIMATED PROJECT COST:.....			\$ 545,000
	ENR CCI, Seattle = 10398.24, June 2015			

**MUKILTEO WATER AND WASTEWATER DISTRICT  
PRELIMINARY PROJECT COST ESTIMATE  
STORAGE IMPROVEMENT S-5  
Reservoir No. 5 Interior Recoating**

<u>NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT</u> <u>PRICE</u>	<u>AMOUNT</u>
1	Mobilization and Demobilization	1 LS	\$ 12,000	\$ 12,000
2	Interior Reservoir Prep and Recoat	1 LS	\$ 565,750	\$ 566,000
3	Exterior Reservoir Prep and Topcoat	1 LS	\$ 54,936	\$ 54,936
4	Removal of Mill Scale	4,000 SF	\$ 1	\$ 4,000
	Subtotal.....			\$ 636,936
	Tax rate (9.5%).....			<u>60,509</u>
	TOTAL ESTIMATED PROJECT COST:.....			\$ 700,000

ENR CCI, Seattle = 10398.24, June 2015

**APPENDIX L**

**CROSS-CONNECTION CONTROL PROGRAM  
CROSS-CONNECTION CONTROL RESOLUTION**



Mukilteo Water and Wastewater District  
7824 Mukilteo Speedway  
P O Box 260  
Mukilteo, WA 98275-0260  
425-355-3355 (Fax) 425-348-0645

## PREMISE ISOLATION CROSS-CONNECTION CONTROL PROGRAM

### Purpose:

The purpose of the Mukilteo Water and Wastewater District cross-connection control program shall be to protect the public water system, as defined in WAC 246-290-490 from contamination via cross-connections.

### General Policy:

It is the intention of this policy to provide for the permanent abatement or control of all cross-connections under the control of the Mukilteo Water and Wastewater District. Where it is officially, actually and/or economically unfeasible to find, eliminate or to permanently control all cross-connections of the consumer's water system, and when it is mandated by WAC 246-290-490 and/or deemed necessary by the District cross connection control specialist (District CCS), there shall be installed at the District water service connection an approved backflow prevention assembly commensurate with the assessed degree of hazard posed by the consumer's water system upon the public water supply.

### Code Authority and Enforcement:

The enforcement of this cross-connection control program in the area served by the District, will be in accordance with WAC 246-290-490, Cross-connection control, effective April 9, 1999, District Resolution No. A-1456 dated April 30, 2003 and the Mukilteo Water and Wastewater District Cross-Connection Control Program.

### General:

Except where specifically designated herein, all words used in this procedure shall carry their customary meanings. Words used in the present tense include the future, and plural includes the singular: The word "shall" is always mandatory; the word "may" denotes a use of discretion in making a decision.

### Definitions:

“Approved air gap” means a physical separation between the free flowing end of a potable water supply pipeline and the overflow rim of an open or nonpressurized receiving vessel. To be an air gap approved by the District, the separation must be at least:

- Twice the diameter of the supply piping measured vertically from the overflow rim of the receiving vessel, and in no case be less than one inch, when unaffected by vertical surfaces (sidewalls); and
- Three times the diameter of the supply piping, if the horizontal distance between the supply pipe and a vertical surface (sidewall) is less than or equal to three times the diameter of the supply pipe, or if the horizontal distance between the supply pipe and intersecting vertical surfaces (sidewalls) is less than or equal to four times the diameter of the supply pipe and in no case less than one and one-half inches.

“Approved atmospheric vacuum breaker” means an AVB of make, model, and size that is approved by the department. AVBs that appear on the current approved backflow prevention assemblies list developed by the University of Southern California Foundation for Cross-Connection and Hydraulic Research or that are listed or approved by other nationally recognized testing agencies (such as LAPMO, ANSI, or UL) acceptable to the local administrative authority are considered approved by the District.

“Approved backflow preventer” means an approved air gap, an approved backflow prevention assembly, or an approved AVB. The terms “approved backflow preventer,” “approved air gap,” or “approved backflow prevention assembly” refer only to those approved backflow preventers relied upon by the purveyor for the protection of the public water system. The requirements of WAC 246-290-490 do not apply to backflow preventers installed for other purposes.

“Approved backflow prevention assembly” means an RPBA, RPDA, DCVA, DCDA, PVBA, or SVBA of make, model, and size that is approved by the District. Assemblies that appear on the current approved backflow prevention assemblies list developed by the University of Southern California Foundation for Cross-Connection control and Hydraulic Research or other entity acceptable to the District are considered approved by the District.

“Assessment of risk” shall express the results of an evaluation of a health system, or plumbing hazard. The evaluation required in making a determination of the type of backflow preventer needed to isolate a specific cross connection (e.g., a plumbing fixture), or a group of cross connections contained within a facility or complex of facilities (e.g., a shopping mall) is comprised of the following steps:

- Determine the degree of potential health hazard risk to the public water system. (In assessing the purveyor’s risk of contamination of the public water system, if knowledge of the degree of hazard posed by a substance is not known, the purveyor must assume that it is high. Generally, almost all substances other than potable water are considered a health hazard of some degree).
- Determine the high or low probability that a cross-connection may occur.
  1. The probability increases that an existing cross-connection will go undetected as the complexity of a piping system increases.

2. Piping changes will create new cross-connections, or change the operating conditions from backsiphonage to backpressure conditions.
  3. A backflow preventer could be by-passed or removed from service.
  4. A substance could be changed or increase in strength.
  5. A substance may deteriorate, and thus become a health hazard.
  6. A substance, when combined with the chemicals in the potable water supply, or when exposed to certain piping material, may react and form a compound that poses a health hazard, such as CO<sub>2</sub> mixing with water to form carbonic acid that leaches copper from a service pipe.
  7. A substance, if it contains a bacteriological contaminant, could become a health hazard long after it enters the potable water supply, through bacteria re-growth.
- Determine the risk level acceptable to the purveyor, and
  - Determine the reliability required of the backflow preventer.

“Authorized agent” means any person who:

- Makes decisions regarding the operation and management of a public water system whether or not he or she is engaged in the physical operation of the system;
- Makes decisions whether to improve, expand, purchase, or sell the system; or
- Has discretion over the finances of the system.

“Backflow” means the undesirable reversal of flow of water or other substances through a cross-connection into the public water system or consumer’s potable water system.

“Backflow assembly tester” means a person holding a valid BAT certificate issued in accordance with chapter 246-292 WAC.

“Backpressure” means a pressure (caused by a pump, elevated tank or piping, boiler, or other means) on the consumer’s side of the service connection that is greater than the pressure provided by the public water system and which may cause backflow.

“Backsiphonage” means backflow due to a reduction in system pressure in the purveyor’s distribution system and/or consumer’s water system.

“Combination fire protection system” means a fire sprinkler system that:

- Is supplied only by the purveyor’s water;
- Does not have a fire department pumper connection; and
- Is constructed of approved potable water piping and materials that serve both the fire sprinkler system and the consumer’s potable water system.

“Consumer” means any person receiving water from a public water system from either the meter, or the point where the service line connects with the distribution system if no meter is present. For purposes of cross-connection control, “consumer” means the owner or operator of a water system connected to a public water system through a service connection.

“Consumer’s water system” as used in WAC 246-290-490, means any potable and/or industrial water system that begins at the public water system point of delivery; that is, at the immediate downstream side of the water meter, and is located on the consumer’s premises. The consumer’s water system includes all auxiliary sources of supply, storage, treatment, and distribution facilities, piping, plumbing, and fixtures under the control of the consumer.

“Contaminant” means a substance present in drinking water that may adversely affect the health of the consumer or the aesthetic qualities of the water.

“Cross-connection” means any actual or potential physical connection between a public water system or the consumer’s water system and any source of non-potable liquid, solid, or gas that could contaminate the potable water supply by backflow.

“Cross-connection control program” means the administrative and technical procedures the purveyor implements to protect the public water system from contamination via cross-connections as required in WAC 246-290-490.

“Cross-connection control specialist (CCS)” means a person holding a valid Washington State Cross-Connection Control Specialist certificate issued in accordance with chapter 246-292 WAC.

“Cross-connection control summary report” means the annual report required by the department that describes the status of the purveyor’s cross-connection control program.

“Department” means the Washington State Department of Health.

“Direct service connection” means a service hookup to a property that is contiguous to a water distribution main and where additional mains or extensions are not needed to provide service.

“Distribution system” means all piping components of a public water system that serve to convey water from transmission mains linked to source, storage and treatment facilities to the consumer excluding individual services.

“District” shall mean the Mukilteo Water and Wastewater District.

“Flow-through fire protection system” means a fire sprinkler system that:

- Is supplied only by the purveyor’s water;
- Does not have a fire department pumper connection;
- Is constructed of approved potable water piping and materials to which sprinkler heads are attached; and
- Terminates at a connection to a toilet or other plumbing fixture to prevent the water from becoming stagnant.

“General manager” shall mean the General Manager of the District. Any act in this procedure required or authorized by the General Manager may be done on his or her behalf by an authorized representative of the District.

“Health hazard” shall mean any condition, device, or practice in a water supply system and/or its operation that creates or may create, a danger to the health and well being of a customer.

“Health officer” means the health officer of the city, county, city-county health department or district, or an authorized representative.

“High health cross-connection hazard” means a cross-connection which could impair the quality of potable water and create an actual public health hazard through poisoning or spread of disease by sewage, industrial liquids or waste.

“In-premise protection” means a method of protecting the health of consumers served by the consumer’s potable water system, located within the property lines of the consumer’s premises by the installation of an approved air gap or backflow prevention assembly at the point of hazard, which is generally a plumbing fixture.

“Local administrative authority” means the local official, board, department, or agency authorized to administer and enforce the provisions of the Uniform Plumbing Code as adopted under chapter 19.27 RCW (WAC 51-46-0603).

“Low health cross-connection hazard” means a cross-connection that could cause an impairment of the quality of potable water to a degree that does not create a hazard to the public health, but does adversely and unreasonably affect the aesthetic qualities of such potable waters for domestic use.

“Potable” means water suitable for drinking by the public.

“Premise isolation” means a method of protecting a public water system by installation of approved air gaps or approved backflow prevention assemblies at or near the service connection or alternative location acceptable to the purveyor (at the point where the water purveyor no longer has legal jurisdiction and/or authority to control the water system) to isolate the consumer’s water system from the purveyor’s distribution system.

“Plumbing hazard” shall mean a cross-connection in a consumer’s potable water system that may permit backsiphonage in the event of a negative pressure in the supply line.

“Public water system” is defined and referenced under WAC 246-290-020.

“Purchased source” means water a purveyor purchases from a public water system not under the control of the purveyor for distribution to the purveyor’s consumers.

“Purveyor” means an agency, subdivision of the state, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, or person or other entity owning or operating a public water system. Purveyor also means the authorized agents of such entities.

“Regional public water supplier” means a water system that provides drinking water to one, or more, other public water systems.

“Resident” means an individual living in a dwelling unit served by a public water system.

“Service connection” means a connection to a public water system designed to provide potable water to a single-family residence, or other residential or nonresidential population.

“System hazard” shall mean a threat to the physical properties of the public or the consumer’s potable water system by a material not dangerous to health but aesthetically objectionable that would have a degrading effect on the quality of the potable water in the system.

“Unapproved auxiliary water supply” means a water supply (other than the purveyor’s water supply) on or available to the consumers premises that is either not approved for human consumption by the health agency having jurisdiction or is not otherwise acceptable to the purveyor.

“Used water” means water which has left the control of the purveyor.

“Water quality specialist” shall be that person employed by the District that is certified as a Washington State cross-connection control specialist and is qualified to administer the district cross-connection control program.

General Program References:

The District shall ensure that good engineering and public health protection practices are used in the administration of a cross-connection program. Department publications and the most recently published editions of references, such as, but not limited to, those listed below, may be used as guidance for cross-connection program administration:

*Manual of Cross-Connection Control* published by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (USC Manual); or

*Cross-Connection Control Manual, Accepted Procedure and Practice* published by the Pacific Northwest Section of the American Water Works Association (PNWS-AWWA Manual).

The following methods of cross-connection control are considered minimum protection at the water service connection at the property line:

1. The public water supply to any premise listed under WAC 246-290-490(4)(b)(i)(ii)(iii)(Table 9) shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

2. The public water supply to any premise on which material dangerous to health or toxic substances are stored or handled, and which, in the assessment of the District CCS poses a potential high health cross-connection hazard to the public water system, shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

3. The public water supply to any premise where entry is restricted so that inspection for cross-connections cannot be made with sufficient frequency or at sufficient short notice to assure that cross-connections do not exist shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

4. The public water supply to any premise having a repeated history of cross-connections being established or re-established, shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

5. The public water supply to any premise which has an unapproved auxiliary water supply on or available to the consumer's premises that is either not approved for human consumption by the health agency having jurisdiction or is not otherwise acceptable to the purveyor, and with no known cross-connections, shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

6. The public water supply to any premise which has internal cross-connections that are not correctable or which has complex plumbing arrangements that make it impractical to ascertain whether or not cross-connections exist, shall require an approved air gap separation or an approved reduced pressure backflow assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

7. The public water supply to any premise which has a heat exchanger or a solar hot water system shall require a risk assessment inspection by the District CCS to determine the level of backflow protection that may be required to be installed immediately downstream of the domestic water service connection, prior to any branch connections.

8. The public water supply to a fire system which will contain any chemical additives, including food-grade additives, shall require an approved reduced air gap separation or reduced pressure detector assembly installed immediately downstream of the public water service connection, prior to any branch connections.

9. The public water supply to a fire system with no chemical additives shall require an approved double check valve assembly or double check detector assembly installed immediately downstream of the public water service connection, prior to any branch connections.

10. The public water supply to any premise which poses a high probability of changes in the use of water by tenants, such as, but not limited to, shopping malls or strip malls, shall require an approved double check valve assembly installed immediately downstream of the domestic water service connection, prior to any branch connections.

11. The public water supply to any premise where cross-connections are unavoidable or not correctable, such as, but not limited to, tall buildings (over 30 feet), or water booster pump systems, shall require an approved double check valve assembly installed immediately downstream of the water service connection, prior to any branch connections.

12. The District in its sole discretion may allow the property owner to install a backflow preventer at an alternate location down stream of the water meter, provided that the property owner enters into an agreement with the District in the form attached hereto and incorporated by reference herein.

#### Coordination and delineation of responsibilities with local administrative authorities:

The control of cross-connections requires cooperation between the water purveyor, the local administrative authority, the health officer and the consumer.

- WAC 246-290-490(1)(d): The purveyor's responsibility for cross-connection control shall begin at the water supply source, include all the public water treatment, storage, and distribution facilities, and end at the point of delivery to the consumer's water system, which begins at the downstream end of the service connection or water meter located on the public right-of-way or utility-held easement.
- WAC 246-290-490(1)(e): Under the provisions of this section, purveyors are not responsible for eliminating or controlling cross-connections within the consumer's water system. Under chapter 19.27 RCW, the responsibility for cross-connections within the consumer's water system, i.e., within the property lines of the consumer's premises, falls under the jurisdiction of the local administrative authority.
- WAC 246-290-490(2)(d): The purveyor shall coordinate with the local administrative authority in all matters concerning cross-connection control. The purveyor shall document and describe such coordination, including delineation of responsibilities, in the written cross-connection control program required in (e) of this subsection.

The District CCS shall make available to all local administrative agencies the information maintained in the district cross-connection control program files upon request, which may include, but is not limited to: (1) a master list of all premises that have been isolated from the district water system in accordance with the district cross-connection control program; (2) information concerning any internal cross-connections that come to the attention of the district CCS during risk assessment evaluations of premises; and (3) notification of any termination of water service for failure to comply with the requirements of WAC 246-290-490, District Resolution Number A-1456, and/or the Mukilteo Water and Wastewater District Cross-Connection Control Program.

## Risk Assessment Survey:

A risk assessment survey for cross-connections and sanitary hazards requires a water use evaluation of new and existing buildings, structures, and grounds. The systematic evaluation shall be prioritized by risk to public health and shall be conducted as outlined below:

1. Upon application for a water service connection, the property owner (applicant) shall complete an application for district water service and a water usage questionnaire, which shall be reviewed by the District CCS. The District CCS shall make a determination of the risk posed to the public water system by the property owner's water system. The District CCS shall classify the water service connection as either a high health hazard or a low health hazard cross-connection, and shall specify the need and identify the type of backflow protection required (if applicable) for premise isolation backflow protection. When deemed necessary, the District CCS shall require a detailed plan and specification for the plumbing installation in order to facilitate risk-assessment review of the water use at the property.
2. The District CCS shall review all water system related plans and specifications to assess the following:
  - The actual or potential health hazard or contamination risk to the public water system
  - The complexity of any existing and/or proposed water piping system
  - The probability of occurrence of cross-connections within a property owner's water system
  - The determination of what cross-connections might constitute acceptable risks
  - The determination of the reliability required of any backflow prevention assembly utilized within a facility or mandated for premise isolation
  - The actual or potential use and/or availability of any unapproved auxiliary water supply systems
  - The storage and handling of material dangerous to health or toxic substances which, if introduced into the water system, would constitute a system, plumbing, or health hazard.

If, upon review, it is determined that any of these conditions will exist, the District CCS will advise the property owner in writing that such cross-connections exist. If the District CCS determines that the property owner's water system represents a potential health hazard risk to the district water system, such as, but not limited to, WAC 246-290-490(4)(b)(Table 9) facilities and/or systems, an approved backflow prevention assembly commensurate with the assessed degree of hazard shall be required for premise isolation at the water service connection, notwithstanding any point of hazard, point of use, or fixture protection existing within the property lines of the premises.

During the construction phase of any new building, structure, or ground installation, a District cross-connection control specialist (District CCS) shall perform the required premise isolation cross-connection control inspection. Upon completing of the inspection, but prior to the establishment of a water service connection, the District CCS shall advise the property owner/authorized agent, that subject cross-connection control inspection has been made and advise if any additional backflow protection is required. The District CCS shall advise the property owner/authorized agent that it is the property owner's responsibility to have a Washington State certified backflow assembly tester (BAT) test the backflow assembly prior to use of the water service, and that annual testing is required thereafter.

Backflow protection for single family residences:

In premises backflow preventers may be utilized in accordance with WAC 246-290-490 Sections (2)(h) & (4)(c)(i)(ii).

Existing Buildings, Structures, and Grounds:

The District's previous cross-connection control program relied on fixture isolation by approved backflow prevention devices to protect the District's system. The District shall continue to require annual testing of those devices until the property is eventually isolated from the District's distribution system by an approved backflow prevention device.

The District CCS will evaluate all high health hazard premises, all commercial and/or industrial premises, all premises with fire systems, all premises with water systems using booster pumps, and all premises with buildings 30' or more in height to insure premise isolation protection has been provided at the water service connection. Premises to be evaluated will be selected in order from an established list prioritized by expected degree of health hazard and/or risk of contamination. Premises not on the established priority list that come to the attention of the District CCS, and upon evaluation are determined deficient in required premise isolation backflow protection, shall be brought into current compliance without regard to any established priority list. Inspections of residential properties will not be routinely conducted unless those properties pose a potential health hazard risk to the district water supply, and for any reason, come to the attention of the District CCS.

The initial evaluation shall proceed according to the following steps:

1. A priority list shall be established using existing water service records, telephone directory yellow page listings, and other resources as beneficial.
2. Beginning with the highest rated health hazard on the program's priority list, the District CCS will make a risk assessment evaluation of each

property for actual or potential cross-connections and/or any conditions that might tend to contaminate the district water system.

3. Upon completion of the risk assessment evaluation, the District CCS will determine whether or not premise isolation backflow protection will be required, and will determine the level of protection required commensurate with the assessed degree of hazard.
4. The District CCS will prepare a written report to the file system that will include, but is not limited to, the following:
  - a. A list of all cross-connections found, their location, and any optional methods of elimination or control.
  - b. Any applicable drawings, sketches, blueprints, or photos.
  - c. A summary of the findings, recommendations and requirements for corrective actions, and a time (normally a maximum of 90 days) in which the corrective action must be completed.
5. The District CCS shall notify the property owner/authorized agent, in writing, of the District's requirement for premise isolation backflow protection. The code enforcement letter shall include the requirements for corrective actions and a corrective action completion date. One copy of the completed letter shall reside in the District cross-connection control program jacket file for the facility.
6. On the corrective action completion date, the District CCS shall contact the property owner/authorized agent and ask if the corrective actions have been completed. If the corrective actions have been completed, the District CCS shall inspect each required premise isolation backflow assembly located at the District water service connections to the property. If the corrective actions are in progress but more time is required for completion, a new completion date may be set by the District CCS. If corrective actions have been disregarded, the District shall take appropriate corrective action within its authority, per WAC 246-290-490(2)(j)(i)(ii)(iii), District Resolution Number A-1456 and the District Cross-Connection Control Program, which may include, but is not limited to, denying or discontinuing water service to a consumer's premises until the cross-connection hazard is eliminated or controlled to the satisfaction of the District.
7. When all required actions have been completed, a copy of the completed required actions letter shall be placed in the cross-connection control file for the property, together with all copies of correspondence, notes, related documents and any completed backflow assembly test report forms.
8. Re-inspection of premise isolation for each premise found to be subject to this procedure shall be accomplished biannually, if possible, or more often

if the degree of hazard so indicates or whenever there is a change in the use of the premises.

Records and Reports:

Cross-Connection Control Program File System:

1. A separate jacket file shall be established by the District CCS, for each individual customer that requires the installation of a premise isolation backflow prevention assembly. A computer software database will be utilized for compiling and extracting information required for tracking compliance as well as Department of Health annual summary reporting.
2. The following information shall be maintained in each individual jacket file:
  - a. Copies of all correspondence with customer relative to cross-connection control
  - b. Copies of evaluation reports, complete with field drawings (if applicable)
  - c. Copies of all completed backflow assembly test report forms
  - d. Copies of all reports or correspondence pertaining to enforcement action, cross-connections, or backflow incidents.

**APPENDIX M**

**SEPA CHECKLIST  
DETERMINATION OF NON-SIGNIFICANCE**

## **SEPA ENVIRONMENTAL CHECKLIST**

### ***Purpose of checklist:***

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

### ***Instructions for applicants:***

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

### ***Instructions for Lead Agencies:***

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

### ***Use of checklist for nonproject proposals:***

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

## **A. Background**

### **1. Name of proposed project, if applicable:**

Mukilteo Water & Wastewater District Comprehensive Water System Plan

### **2. Name of applicant:**

Mukilteo Water & Wastewater District

### **3. Address and phone number of applicant and contact person:**

**Applicant:**

Mr. Jim Voetberg,  
General Manager  
7824 Mukilteo Speedway  
P.O. Box 260  
Mukilteo, Washington 98275  
(425) 355-3355 (phone)  
(425) 348-0645 (fax)

**Contact Person:**

Mr. Eric Delfel, P.E.,  
Project Manager  
Gray & Osborne, Inc.  
701 Dexter Avenue N. Suite 200  
Seattle, Washington 98109  
(206) 284-0860 (phone)  
(206) 280-3206 (fax)

**4. Date checklist prepared:**

November 2015

**5. Agency requesting checklist:**

Mukilteo Water and Wastewater District

**6. Proposed timing or schedule (including phasing, if applicable):**

Each project proposed in the Comprehensive Water System Plan will be completed on a project-specific basis. The recommendations will be proposed on the current ten-year and future 20-year planning periods.

**7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.**

This proposal is a non-project action, therefore the question does not apply.

**8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.**

- City of Everett Comprehensive Water Plan, 2014 Addendum by HDR Engineering, Inc.
- City of Mukilteo Comprehensive Plan, 2012 by City of Mukilteo
- City of Everett Comprehensive Plan, 2015 by City of Everett
- Snohomish County GMA Comprehensive Plan, December 2013 by Snohomish County Planning Commission
- Snohomish County Airport / Paine Field Master Plan Update, 2002 by Snohomish County Planning Division

**9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.**

None known.

**10. List any government approvals or permits that will be needed for your proposal, if known.**

- Mukilteo Water & Wasterwater District Board of Commissioners
- Snohomish County Health District
- Department of Health
- Snohomish County
- City of Everett – Consistency Checklist
- City of Mukilteo – Consistency Checklist

**11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)**

The proposed Comprehensive Water System Plan (Plan) is a planning document that meets the requirements of WAC 246-290.

**12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.**

The Mukilteo Water & Wastewater District water service area includes a portion of the City of Mukilteo, Snohomish County Airport, Paine Field and unincorporated areas of Snohomish County. See attached vicinity map.

**B. ENVIRONMENTAL ELEMENTS**

**1. Earth**

**a. General description of the site:**

(circle one): **Flat**, rolling, hilly, steep slopes, mountainous, other \_\_\_\_\_

The District encompasses a plateau that drops sharply to the Puget Sound shoreline. Several ravines cut into the plateau area.

**b. What is the steepest slope on the site (approximate percent slope)?**

The ravines that cut into the plateau and the bluffs along the shoreline have slopes of 40-50% in the steepest areas.

**c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in**

**removing any of these soils.**

The Soil Survey of Snohomish County Area, Washington (U.S. Department of Agriculture, 1987) maps the soils on the sites as Alderwood urban land complex. Consistent with the mapping designation, soils at the sites consists of Everett gravelly sandy loam, Alderwood gravelly sandy loam, and Alderwood-Everett gravelly sandy loam.

- d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.**

Steep slopes along the ravines in the western portion of the study area are subject to instability, particularly under seismic conditions.

- e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.**

Individual SEPA review will be performed on each proposed project.

- f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.**

Individual SEPA review will be performed on each proposed project.

- g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?**

To be determined on a project specific basis.

- h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:**

Construction specifications for proposed projects will require erosion control measures, varying according to site conditions.

## **2. Air**

- a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.**

Individual SEPA review will be performed on each proposed project.

- b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.**

None known.

- c. Proposed measures to reduce or control emissions or other impacts to air, if any:**

To be determined on a project specific basis. Construction area will be maintained dust free, and any roads utilized for construction access will be swept and washed to control dust.

### 3. Water

#### a. Surface Water:

- 1) **Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

The western half of the District is confined by Puget Sound. Several deep gullies contain streams that drain into Puget Sound. Few areas within the District's boundary are classified as wetlands.

- 2) **Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

To be determined on a project specific basis.

- 3) **Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

None anticipated; to be determined on a project specific basis.

- 4) **Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.**

No withdrawals or diversions are anticipated.

- 5) **Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

To be determined on a project specific basis.

- 6) **Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

None anticipated.

#### b. Ground Water:

- 1) **Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.**

None anticipated.

- 2) **Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

None anticipated. Sewer service is a requirement of service for new development within the District.

**c. Water runoff (including stormwater):**

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

To be determined on a project specific basis.

- 2) Could waste materials enter ground or surface waters? If so, generally describe.**

None anticipated.

- 3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.**

To be determined on a site specific basis.

**d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:**

Construction specifications for proposed projects will require the implementation of measures to control or eliminate surface, ground, and runoff water impacts, as per regulations.

**4. Plants**

**a. Check the types of vegetation found on the site:**

- deciduous tree: alder, maple, aspen, other
- evergreen tree: fir, cedar, pine, other
- shrubs
- grass
- pasture
- crop or grain
- Orchards, vineyards or other permanent crops.
- wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
- water plants: water lily, eelgrass, milfoil, other
- other types of vegetation

**b. What kind and amount of vegetation will be removed or altered?**

To be determined on a project specific basis.

**c. List threatened and endangered species known to be on or near the site.**

Eagles, Salmon.

- d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:**

To be determined on a project specific basis.

- e. List all noxious weeds and invasive species known to be on or near the site.**

To be determined on a project specific basis.

## 5. Animals

- a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.**

birds: **hawk, heron, eagle, songbirds**, other: **crows**  
mammals: **deer**, bear, elk, **beaver**, other: **coyote & squirrels**  
fish: bass, **salmon, trout, herring, shellfish**, other \_\_\_\_\_

- b. List any threatened and endangered species known to be on or near the site.**

Eagles have been seen frequently along the Puget Sound and have been spotted perched in trees within the District

- c. Is the site part of a migration route? If so, explain.**

Yes. The entire Puget Sound Region is within the Pacific Flyway for birds.

- d. Proposed measures to preserve or enhance wildlife, if any:**

To be determined on a project specific basis.

- e. List any invasive animal species known to be on or near the site.**

To be determined on a project specific basis.

## 6. Energy and Natural Resources

- a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.**

To be determined on a project specific basis.

- b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.**

No effects anticipated.

- c. **What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:**

To be determined on a project specific basis.

## 7. Environmental Health

- a. **Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.**

To be determined on a project specific basis.

- 1) **Describe any known or possible contamination at the site from present or past uses.**

To be determined on a project specific basis.

- 2) **Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.**

To be determined on a project specific basis.

- 3) **Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.**

To be determined on a project specific basis.

- 4) **Describe special emergency services that might be required.**

None anticipated. Mukilteo Fire Department, City of Everett Fire Department, Snohomish County Fire District No. 1, and Paine Field Fire Department are available in case of fire or construction related injury.

- 5) **Proposed measures to reduce or control environmental health hazards, if any:**

Observe industrial safety standards in design, construction, and operation of facilities.

## b. Noise

- 1) **What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

Ambient noise is primarily from traffic and will not affect the projects proposed in the Plan.

- 2) **What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.**

To be determined on a project specific basis.

- 3) **Proposed measures to reduce or control noise impacts, if any:**

To be determined on a project specific basis.

## 8. Land and Shoreline Use

- a. **What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.**

To be determined on a project specific basis.

- b. **Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?**

No.

- 1) **Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:**

To be determined on a project specific basis.

- c. **Describe any structures on the site.**

To be determined on a project specific basis.

- d. **Will any structures be demolished? If so, what?**

To be determined on a project specific basis.

- e. **What is the current zoning classification of the site?**

To be determined on a project specific basis. The zoning classifications vary with jurisdiction and location.

- f. **What is the current comprehensive plan designation of the site?**

To be determined on a project specific basis. The zoning classifications vary with jurisdiction and location as seen in Figure 2-2.

- g. **If applicable, what is the current shoreline master program designation of the site?**

To be determined on a project specific basis.

- h. Has any part of the site been classified as a critical area by the city or county? If so, specify.**

To be determined on a project specific basis.

- i. Approximately how many people would reside or work in the completed project?**

Sites within the District have been classified as “environmentally sensitive”. Each location will be evaluated on a project specific basis.

- j. Approximately how many people would the completed project displace?**

None anticipated

- k. Proposed measures to avoid or reduce displacement impacts, if any:**

To be determined on a project specific basis.

- L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:**

Proposed improvements would be consistent with City of Mukilteo, City of Everett, Snohomish County ordinances covering land use planning.

- M. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any:**

To be determined on a project specific basis.

## 9. Housing

- a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.**

None.

- b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.**

None.

- b. Proposed measures to reduce or control housing impacts, if any:**

Not applicable.

## 10. Aesthetics

- a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?**

To be determined on a project specific basis.

**b. What views in the immediate vicinity would be altered or obstructed?**

To be determined on a project specific basis.

**f. Proposed measures to reduce or control aesthetic impacts, if any:**

To be determined on a project specific basis.

**11. Light and Glare**

**a. What type of light or glare will the proposal produce? What time of day would it mainly occur?**

To be determined on a project specific basis.

**b. Could light or glare from the finished project be a safety hazard or interfere with views?**

To be determined on a project specific basis.

**c. What existing off-site sources of light or glare may affect your proposal?**

None.

**d. Proposed measures to reduce or control light and glare impacts, if any:**

None.

**12. Recreation**

**a. What designated and informal recreational opportunities are in the immediate vicinity?**

- Walter E. Hall Golf Course and Kash Memorial Park
- Harbor Pointe Golf Club
- Paine Field Gymnasium and Ball Field (YMCA)
- Mukilteo Little League Complex
- Rose Hill Tennis Courts
- Mukilteo 92<sup>nd</sup> Street Park
- Mukilteo Light House Park

**b. Would the proposed project displace any existing recreational uses? If so, describe.**

None.

**c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:**

None.

### 13. Historic and cultural preservation

- a. **Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe.**

To be determined on a project specific basis.

- b. **Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.**

To be determined on a project specific basis.

- c. **Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.**

To be determined on a project specific basis.

- c. **Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.**

To be determined on a project specific basis.

### 14. Transportation

- a. **Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.**

To be determined on a project specific basis.

- b. **Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?**

To be determined on a project specific basis.

- c. **How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?**

None.

- d. **Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).**

To be determined on a project specific basis.

- e. **Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

To be determined on a project specific basis.

- f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?**

None.

- g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.**

To be determined on a project specific basis.

- h. Proposed measures to reduce or control transportation impacts, if any:**

None.

#### **15. Public Services**

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.**

No.

- b. Proposed measures to reduce or control direct impacts on public services, if any.**

None.

#### **16. Utilities**

- a. Circle utilities currently available at the site:**

electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system,  
other fiber optics

- c. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.**

To be determined on a project specific basis.

### **C. Signature**

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: \_\_\_\_\_

Name of signee Eric Delfel, P.E.

Position and Agency/Organization Project Manager, Gray & Osborne, Inc.

Date Submitted: \_\_\_\_\_

## **D. Supplemental Sheet for Non-Project Actions**

### **1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?**

Mukilteo Water and Wastewater District's Comprehensive Water System Plan recommends capital improvements such as replacement of existing piping. All proposed projects will be completed in compliance with all state and federal regulations and the City and County ordinances. It is anticipated that these capital improvements will have no discharge to water, emissions to air, or production storage, or release of toxic or hazardous substances, and no production of noise, other than those produced temporarily by normal pipeline construction activities.

#### **Proposed measures to avoid or reduce such increases are:**

To be determined on a project specific basis.

### **2. How would the proposal be likely to affect plants, animals, fish, or marine life?**

No work will be performed in streams, lakes, or marine waters, therefore, no impacts would result to or marine life. Any urban runoff or erosion would be controlled at project-specific construction sites. The capital improvements recommended in the Comprehensive Water System Plan will be implemented in an existing urban environment, thus producing no impacts to animals whose habitats typically reside in rural settings

#### **Proposed measures to protect or conserve plants, animals, fish, or marine life are:**

For any construction project, individual SEPA documents will be prepared for each project. Impacts to plants, animals, fish, or marine life will be determined on a project-specific basis. Any landscape rehabilitation plan associated with project-specific construction will take into account the protection or replacement of important plant species.

### **3. How would the proposal be likely to deplete energy or natural resources?**

To be determined on a project specific basis.

#### **Proposed measures to protect or conserve energy and natural resources are:**

Specific project designs typically take into account energy-efficient pumps or pump stations, thereby reducing demand for energy resources.

**4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?**

The siting of public facilities such as transmission and distribution piping or reservoirs takes into account environmentally sensitive areas during the planning and design phases. Therefore, environmentally sensitive areas can either be mitigated or avoided all together. A SEPA document will be provided for each specific project.

**Proposed measures to protect such resources or to avoid or reduce impacts are:**

To be determined on a project specific basis.

**5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?**

Effects to land use will be determined on a project specific basis. However, it is not likely that any proposed projects will take place in and around shorelines. Each proposed project will be completed in compliance with all state, county, city, and federal regulations, including District resolutions.

**Proposed measures to avoid or reduce shoreline and land use impacts are:**

To be determined on a project specific basis.

**6. How would the proposal be likely to increase demands on transportation or public services and utilities?**

It is anticipated that the proposed projects will have minimal effects on transportation or public services and utilities. However, pipeline construction may have some temporary impacts on traffic flow, as transmission and distribution lines are typically within road rights-of-way.

**Proposed measures to reduce or respond to such demand(s) are:**

To be determined on a project-specific basis.

**7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.**

All proposed projects will be completed in compliance with all state and federal regulations and City ordinances.

**APPENDIX N**

**FUNDING SOURCE ALTERNATIVES**

## **FUNDING SOURCE ALTERNATIVES**

The District maintains three major funds that can be used to finance capital improvement projects, the water maintenance fund (W40), the capital improvement fund (W45), and the water capital improvement replacement fund (W47). However, several other funding source alternatives are available to the District for the financing of projects in the CIP. Such alternatives are a Public Works Trust Fund loan, Drinking Water State Revolving Fund loans, developer financing, revenue bonds, general facilities charges and Utility Local Improvement Districts (ULIDs).

### **PUBLIC WORKS TRUST FUND (PWTF)**

The Public Works Trust Fund is a revolving loan fund designed to help local governments finance public works projects through low-interest loans and technical assistance. The PWTF, established in 1985 by legislative action, offers loans substantially below market rates, payable over periods ranging up to 20 years.

Interest rates range from 0.5, 1.0, or 2.0 percent, with lower interest rates obtained by a higher local financial share. To qualify for a 2.0 percent loan an applicant must provide a minimum of 10 percent of project costs. A 20 percent local share qualifies the applicant for 1.0 percent interest rate, and a 30 percent local share qualifies for a 0.5 percent loan. The local share can be met with other state loan funds if community funds are utilized to pay back the loan. The useful life of the project determines the loan term, with a maximum of 20 years.

An applicant must have a long-term plan for financing its public works needs. Eligible public works projects include streets and roads, bridges, storm sewers, sanitary sewer collection and treatment systems, and domestic water. Loans are presently offered only for purposes of repair, replacement, rehabilitation, reconstruction, or improvement of existing eligible public works systems. Ineligible expenses include public works financing costs that arise from forecasted, speculative, or service area growth. Such costs do not make a project ineligible but must be excluded from the scope of the PWTF proposal.

Since substantially more trust fund dollars are requested than are available, local jurisdictions must compete for the available funds. The applications are carefully evaluated, and the Public Works Boards submits to the Legislature a prioritized list of those projects recommended receiving low-interest financing. The Legislature reviews the list and indicates its approval through the passage of an appropriation from the Public Works Assistance Account to cover the cost of the proposed loans. Once the Governor has signed the appropriation bill into law (an action that usually occurs by the following April), those local governments recommended to receive loans are offered a formal loan agreement with appropriate interest rates and terms as determined by the Public Works Board.

PWTF has three programs for Construction, Pre-Construction, and Planning. An applicant can apply for up to \$10 million under the Construction program, \$1 million for Pre-construction activities, and \$50,000 for planning. The Planning program differs in that the terms are 0.0 percent for a 6-year term, with no local match requirement. PWTF loan terms are summarized below:

<b>Construction and Pre-Construction:</b>	
<b>Local Match</b>	<b>Interest Rate/Term</b>
15%	0.5%, 20 years
10%	1.0%, 20 years
5%	1.5% 20 years
<b>Planning:</b>	
<b>Local Match</b>	<b>Interest Rate</b>
0%	0.0%, 6 years

The District is eligible for PWTF programs and has used PWTF to fund large projects in the past.

**DRINKING WATER STATE REVOLVING FUND (DWSRF)**

In 1996, Congress established the Drinking Water State Revolving Fund through the reauthorization of the federal Safe Drinking Water Act. The program is managed by both the Washington State Department of Health and the Washington State Public Works Board. The purpose of the program is to provide low-interest loans to assist publicly and privately owned water systems improve drinking water and protect public health.

Eligible publicly owned water systems include city and county governments, public utility districts, and special purpose districts. Privately owned systems are eligible as long as they are a Group A system.

Eligible projects include the following:

- Water systems that exceed health standards,
- Replacement of aging infrastructure,
- Acquisition of real property,
- Planning and design costs,
- Water conservation projects,
- Reservoirs (clear wells) that are part of a treatment process,
- Distribution reservoirs (finished water),
- Existing systems who chose to connect to a municipal system
- Upgrade to or creation of a Group A system.

Maximum award per single water system is \$3,000,000 and for combining systems an award of \$6,000,000 is available. DWSRF requires a 2 percent loan fee, but no local match. A summary of interest rates and loan terms follows:

<b>Applicant's Income Level</b>	<b>Interest Rate</b>	<b>Repayment Period</b>
Water system not financial distressed	2.5% Fixed	20 years or life of project, whichever is less
Water system in distressed county	1.5% Fixed	20 years or life of project, whichever is less
Income survey results demonstrates that 51% of the households are at 80% or below the county's median household income.	1.5% Fixed	20 years or life of project, whichever is less
Income survey results demonstrates that 51% of the households are at 50% or below the county's median household income.	0.0% Fixed	30 years or life of project, whichever is less

### **DEVELOPER FINANCING**

Developers typically fund the construction of extensions to the water system to property within new plats. The developer extensions are turned over to the District for operation and maintenance upon completion.

In some cases the developer may be required to construct facilities beyond those necessary for the development, in order to provide either extensions beyond the development or larger pipelines for the ultimate development of the water system. The District may reimburse the developer through either direct outlay or reimbursement agreements for the additional cost of those facilities, including increased size of pipelines over those required to serve the property under development. Compensation for oversizing is usually considered when a main larger than 8-inch is necessary to comply with the intent of the Water Comprehensive Plan. However, compensation is not considered for 12-inch lines required to provide fire flow to industrial areas.

### **REVENUE BONDS**

The most common source of funds for construction of major utility improvements is the sale of revenue bonds. These are tax-free bonds issued by a District. The major source of funds for debt service on revenue bonds is from monthly water service charges. In order to qualify to sell revenue bonds marketable to investors, the bonds typically have contractual provisions for the city to meet debt coverage requirements. The District must show that its annual net operating income (gross income less operation and maintenance expenses) must be equal to or greater than a factor, typically 1.2 – 1.4 times the annual debt service on all par debt. If a coverage factor has not been specified it will be determined at the time of any future bond issues.

## **GENERAL FACILITIES CHARGE**

In order to finance improvements of general benefit to a water utility, such as the District, a general facilities charge may be adopted. General facilities charges are usually established as one-time charges assessed against new water customers as a way to recover part or all of the cost of additional system capacity constructed for their use.

The general facilities charge or fee is deposited into a construction fund for construction of such facilities. The intent is that all new system customers will pay an equitable share of the cost of the system improvements needed to accommodate growth. Typical types of construction financed by the general facilities charge are general improvements that benefit the entire system, such as reservoirs, pump stations, transmission lines, water filtration plants, new sources of supply, and office and storage space.

## **UTILITY LOCAL IMPROVEMENT DISTRICTS (ULIDS)**

Another potential source of funds for improvements comes through the formation of Utility Local Improvement Districts (ULIDs) involving a special assessment made against properties benefiting by the improvements. ULID bonds are further backed by a legal claim to the revenues generated by the utility, similar to revenue bonds.

Typically, ULIDs are formed by the District at the written request (by petition) of the property owners within a specific section of the District service area. Upon the receipt of a sufficient number of signatures or petitions, and acceptance by the District commissioners, the local improvement area is formed, and designs are made for that particular area in accordance with the District's water system comprehensive plan. Each separate property in the ULID is assessed in accordance with the special benefits the property receives from the water system improvements. A District-wide ULID could form part of a financing package for large-scale capital projects such as water line extensions or replacements that benefit all residents in the service area. The assessment places a lien on the property that must be paid in full upon sale of the property. ULID participants have the option of paying their assessment immediately upon receipt, thereby reducing the portion of the costs financed by the ULID bonds.

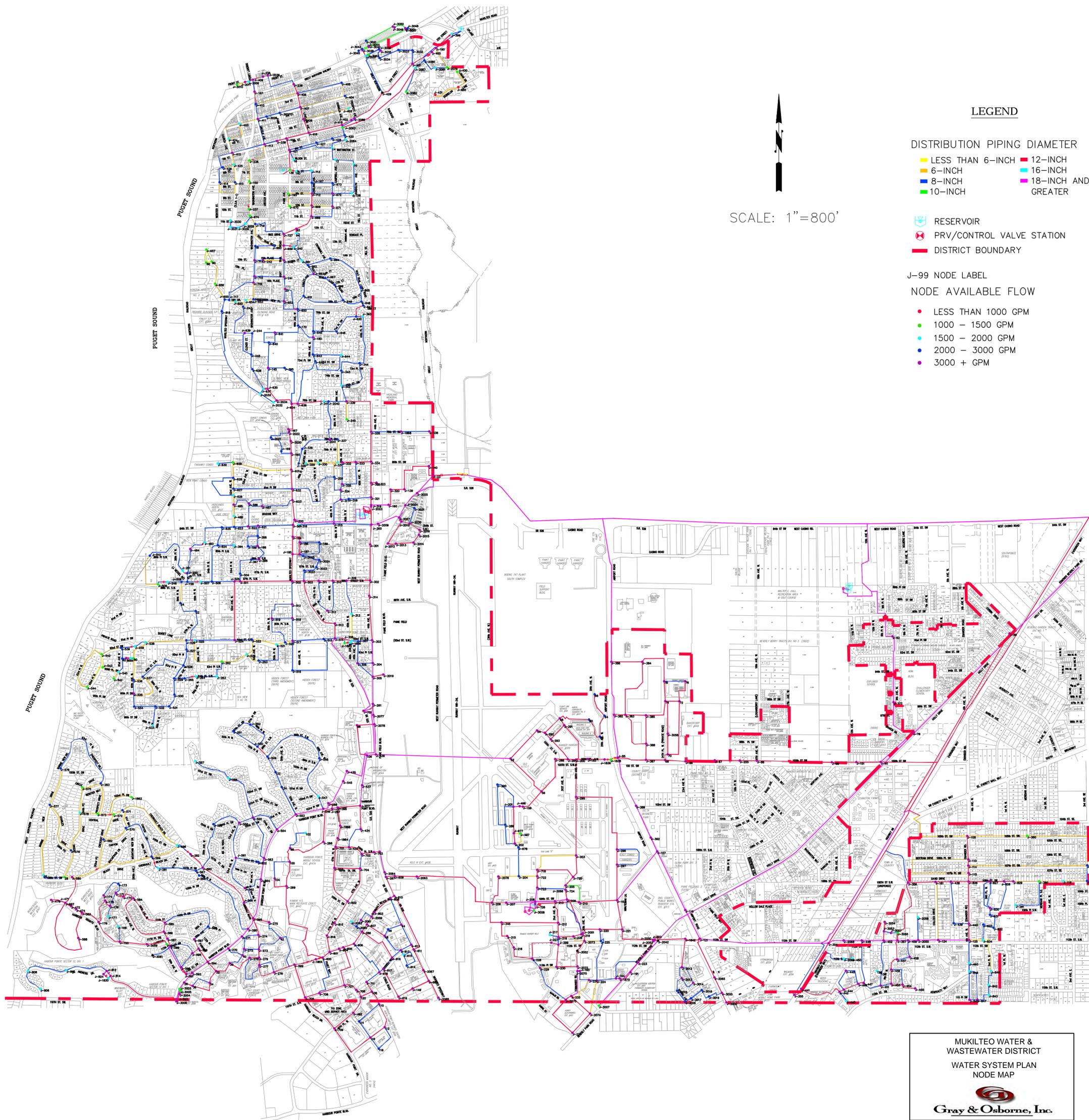
The advantages of ULID financing, as opposed to rate financing, to the property owner include:

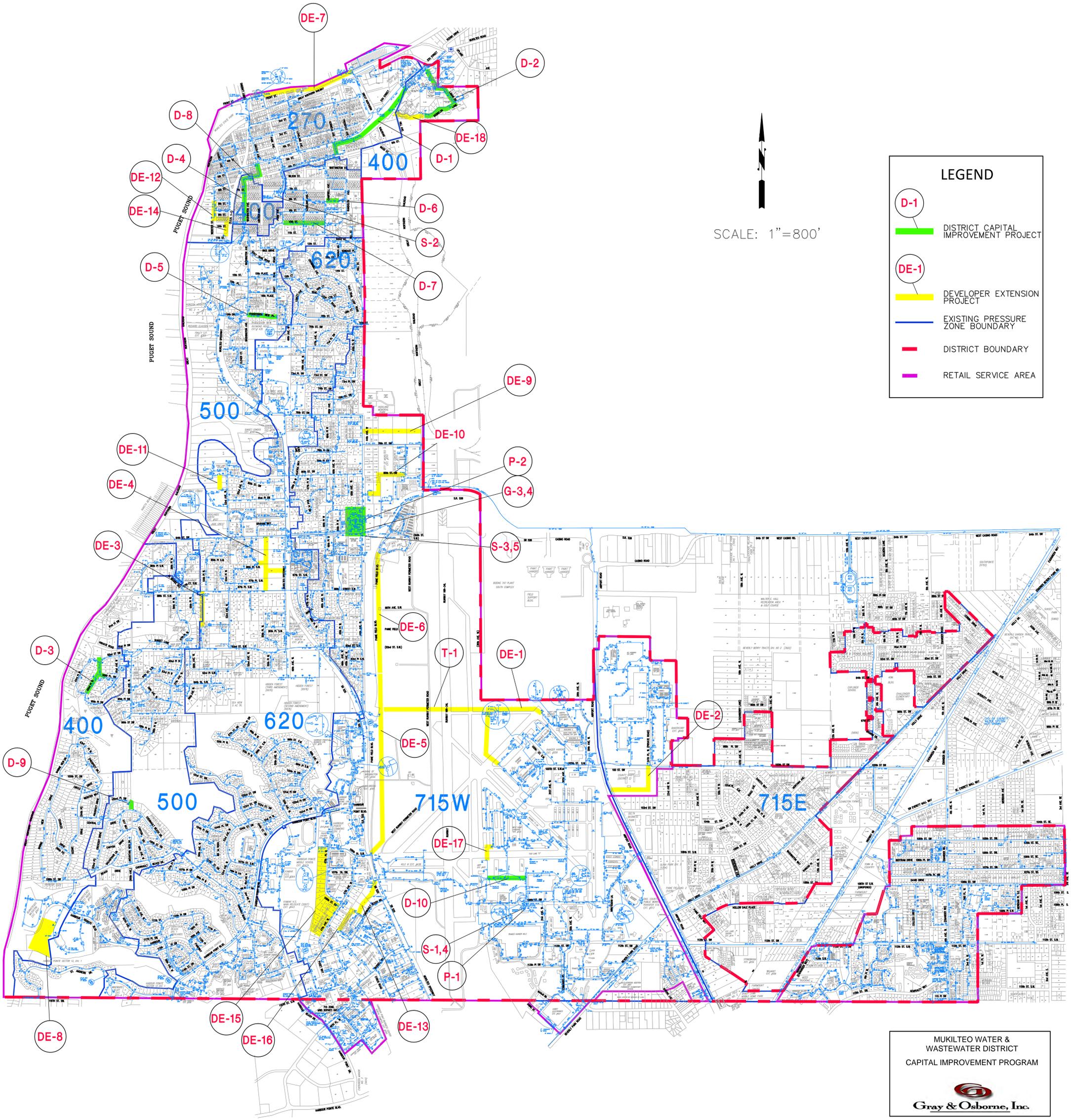
- The ability to avoid interest costs by early payment of assessments.
- If the ULID assessment is paid in installments, it may be eligible to be deducted from federal income taxes.

- Low-income senior citizens may be able to defer assessment payments until the property is sold.
- Some Community Block Grant funds are available to property owners with incomes near or below poverty level. Funds are available only to reduce assessments.

The major disadvantage to the ULID process is that it may be politically difficult to approve formation. The ULID process may be stopped if owners of 40 percent of the property area within the ULID boundary protest its formation. Also, there are significant legal and administrative costs associated with the ULID process, which increases total project costs by approximately 30 percent over other financing options.

**APPENDIX O**  
**COMMENT LETTERS**





**LEGEND**

- D-1 DISTRICT CAPITAL IMPROVEMENT PROJECT
- DE-1 DEVELOPER EXTENSION PROJECT
- EXISTING PRESSURE ZONE BOUNDARY
- DISTRICT BOUNDARY
- RETAIL SERVICE AREA

MUKILTEO WATER & WASTEWATER DISTRICT  
CAPITAL IMPROVEMENT PROGRAM

Gray & Osborne, Inc.