CRYSTAL SPRINGS WATER DISTRICT
WATER MASTER PLAN

NOVEMBER 2015 – FINAL

Revised April 2016

PACE
An Engineering Services Company

CRYSTAL SPRINGS WATER DISTRICT

WATER MASTER PLAN

PROJECT NO. 14867

Completed by:

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EXECUTIVE SUMMARY

BACKGROUND AND NEED

Crystal Springs Water District owns and operates a water system that provides domestic water to an estimated year 2015 service population of 5,227 persons. The District is located in Hood River County and extends from the south east edge of the City of Hood River south for approximately 20 miles along Highway 35. The service area is primarily rural and agricultural, but also includes areas of significant commercial, industrial, and residential development. Water supply is obtained from a natural spring source located south of the District on the lower slopes of Mount Hood.

Master plans for the District were completed in 1963, 1991, and most recently in 2006. The 2006 Plan was completed just prior to the recent recession. The District would like to update its Plan to better reflect current conditions and District objectives. An updated master plan is needed that will meet Oregon Health Authority (OHA) master planning requirements as well as provide a current evaluation of the District's needs and a current capital improvements program (CIP) to address those needs.

PLANNING PERIOD

This Plan uses a 20 year planning period (through the year 2035).

POPULATION PROJECTIONS

Population projections for the Crystal Springs Water District are shown in Table E1. The *Hood River County Coordinated Population Forecast* uses a 0.8% AAGR for unincorporated Hood River County through the year 2035. Table E1 reflects the 0.8% AAGR.

Table E1: Population Forecast

Year	Population
2015	5,227
2020	5,440
2025	5,661
2030	5,891
2035	6,131

LEVEL OF SERVICE GOALS

"Level of service" ultimately refers to the quality of the water service provided to the customer, but the phrase also has implications for the District staff that are responsible for operating, maintaining, and administering the utility and for District officials who are ultimately responsible for the support and political will to champion the mission and needs of the utility. The provision of clean, healthy drinking water is one of the most important services a District provides and, consistent with this importance, the Crystal Springs Water District should and does endeavor to provide a relatively high level of service.

One of the primary objectives for a water system is the protection of public health and welfare. For utilizing and expanding a water system, it is also important to minimize adverse environmental impacts. Various agencies have promulgated rules that ultimately support these objectives and, at a minimum, every water system must comply with these rules and requirements.

GENERAL GOALS AND REQUIREMENTS

General level of service goals and requirements include:

- **Conveyance and delivery (goal):** adequate, consistent, and reliable delivery of water under all anticipated service conditions; capacity for system to deliver maximum day demand (MDD) plus fire flow (FF).
- **Pressurization (requirement):** a minimum of 20 psi system pressure must be maintained at all times (OAR 333-061-0025); customer services must have individual pressure reducing valves if system pressures exceed 80 psi. Generally, a goal of a minimum of 40 psi under normal (non-fire flow) conditions is preferable if practicably achievable. The 20 psi minimum system pressure requirement extends to the customer water meter.
- **Water quality (requirements):** comply with all Oregon Health Authority (OHA) requirements (see Section 3.11.1 for discussion). Water quality also includes aesthetic considerations that may or may not be related to specific regulatory concerns. Efforts to maintain or improve the aesthetic quality of the water provided is a goal consistent with the provision of a high level of service.
- **Fire protection (goal):** provide fire protection consistent with Insurance Services Office (ISO), Oregon Fire Code, and local fire department requirements, recommendations, and standards.
- **Reliability (goals):** reliability as a goal is the ability of the water system and District staff to avoid or circumvent problems that adversely impact system performance. Reliability is enhanced by routine and timely maintenance and replacement, good design and construction, providing adequate water supply, providing alternate or backup facilities or equipment, and having a contingency plan for efficiently handling specific problems.

RECENT METERED (CUSTOMER) WATER USAGE

Metered water usage for the period January 2009 to December 2014 is presented in summary form in Table E2. Residential water usage averaged 298,485 gallons in 2014, an average of 57.6 gallons per capita per day (gpcd). Since water for irrigation purposes is provided by separate irrigation districts, the residential water provided by the Crystal Springs Water District is primarily used for domestic purposes. Water usage for single family residential domestic purposes is typically 50-70 gallons per day (gpd), so residential usage in the District is not excessive.

Table E2: Metered Customer Usage Summary

Year	Average Usage		Monthly Usage				Maximum Monthly to Average Ratio
			Maximum		Minimum		
	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)	
2009	526,940	366	685,344	476	443,197	308	1.30
2010	536,433	373	680,295	472	483,148	336	1.27
2011	521,386	362	615,197	427	455,000	316	1.18
2012	489,055	340	567,852	394	435,852	303	1.16
2013	508,619	353	600,574	417	430,098	299	1.18
2014	534,236	371	595,311	413	465,803	323	1.11
2009-2014	519,445	361	624,096	433	452,183	314	1.20

RECENT PRODUCTION AND UNACCOUNTED–FOR WATER

District staff historically did not track water that was used but not metered, nor did they estimate and track water that was lost through identified leaks. Overflows at the reservoirs are part of the historic and current means of regulating system pressure in the District's system and, as currently configured, essential for its overall operation. The overflows are metered: there is an overflow flowmeter on the overflow line at the Pine Grove Reservoir and an inlet and an outlet flowmeter on the Booth Hill. Strictly speaking, the overflows are quantified system uses and not lost or wasted water. Table E3 includes the overflow quantities and uses a water balance calculation to determine the unaccounted-for water. OAR 690-086-0150 (4)(e) requires a regularly scheduled and systematic leak detection program if an annual water audit indicates that leakage exceeds 10 percent.

Table E3 includes recent estimates of unaccounted-for water. Recent unaccounted-for water is approximately 23 - 38% of production water.

Table E3: Year 2014 Reservoir Overflow and Unaccounted-for Water

Month	Intake Production	Metered Usage	Booth Hill Overflow	Pine Grove Overflow	Unaccounted-for Water
a. gallons per day (gpd)					
January	1,701,618	493,356	632,151	151,104	425,007
February	1,696,392	493,356	605,612	141,988	455,436
March	1,717,470	498,852	618,117	152,855	447,646
April	1,737,502	498,852	627,933	132,398	478,319
May	1,756,086	595,311	660,113	104,312	396,351
June	1,808,885	595,311	566,181	91,349	556,044
July	1,832,395	458,290	546,970	136,880	690,255
August	1,889,401	458,290	612,355	118,843	699,913
September	1,814,310	591,230	637,186	117,930	467,964
October	1,729,093	591,230	626,623	121,037	390,203
November	1,801,335	568,279	615,336	133,659	484,061
December	1,741,942	568,279	630,235	130,471	412,957
b. gallons per minute (gpm)					
January	1,182	343	439	105	295
February	1,178	343	421	99	316
March	1,193	346	429	106	311
April	1,207	346	436	92	332
May	1,220	413	458	72	275
June	1,256	413	393	63	386
July	1,272	318	380	95	479
August	1,312	318	425	83	486
September	1,260	411	442	82	325
October	1,201	411	435	84	271
November	1,251	395	427	93	336
December	1,210	395	438	91	287
c. as percentage of production water					
January	100.0	29.0	37.2	8.9	25.0
February	100.0	29.1	35.7	8.4	26.8
March	100.0	29.0	36.0	8.9	26.1
April	100.0	28.7	36.1	7.6	27.5
May	100.0	33.9	37.6	5.9	22.6
June	100.0	32.9	31.3	5.1	30.7
July	100.0	25.0	29.9	7.5	37.7
August	100.0	24.3	32.4	6.3	37.0
September	100.0	32.6	35.1	6.5	25.8
October	100.0	34.2	36.2	7.0	22.6
November	100.0	31.5	34.2	7.4	26.9
December	100.0	32.6	36.2	7.5	23.7

PROJECTED WATER DEMAND

Projected customer water demands for the Crystal Springs water system are shown in Table E4. All parameters noted, except peak hour demand, increase by 0.8% per year for general planning purposes and represent an average over the planning period. Actual system growth may be much more rapid, or slower, at times and as such could impact timing of critical improvements.

Table E4: Projected Customer Water Demands

Year	Population	EDUs	Water Demands			
			Average	Max. Month	Max. Day	Peak Hour
			gallons per day x 1,000			
2014	5,186	3,557	530	690	910	1,540
2015	5,277	3,585	540	700	920	1,550
2020	5,440	3,731	560	730	950	1,610
2025	5,661	3,883	580	760	990	1,670
2030	5,891	4,040	610	790	1,030	1,730
2035	6,131	4,204	630	820	1,070	1,800
			gallons per minute (gpm)			
2014	5,186	3,557	370	480	630	1,070
2015	5,277	3,585	370	490	640	1,080
2020	5,440	3,731	390	510	660	1,120
2025	5,661	3,883	400	530	690	1,160
2030	5,891	4,040	420	550	720	1,200
2035	6,131	4,204	440	570	750	1,250

All water demand figures rounded.

PROJECTED WATER SYSTEM PRODUCTION DEMAND

Projected water system demands for the system as a whole including customer usage, reservoir overflows, and unaccounted-for water are shown in Table E5. Peak hour demands may be met by a combination of waters from storage and production water from the intake. The 2035 maximum day demand is 1,600 gpm. This is less than the minimum monthly spring flow noted in Table 5.3 (1,960 gpm).

Table E5: Projected Water System Demands[1]

Year	Water Demands			
	Average	Max. Month	Max. Day	Peak Hour
	gallons per day x 1,000			
2014	1,770	1,930	2,140	2,770
2015	1,770	1,930	2,150	2,780
2020	1,800	1,960	2,190	2,840
2025	1,820	1,990	2,230	2,900
2030	1,840	2,020	2,270	2,970
2035	1,870	2,060	2,310	3,040
	gallons per minute (gpm)			
2014	1,230	1,340	1,490	1,920
2015	1,230	1,340	1,490	1,930
2020	1,250	1,360	1,520	1,970
2025	1,260	1,380	1,550	2,010
2030	1,280	1,410	1,570	2,060
2035	1,300	1,430	1,600	2,110

[1] *Projected customer demand plus annual averages for: Booth Hill overflow of 584,510 gpd, Pine Grove overflow of 120,375 gpd and unaccounted-for water of 441,556 gpd.*

All figures rounded.

WATER SOURCE AND WATER RIGHTS

The District's current and only water source is Crystal Spring, which is located at elevation 2,425 feet in Weygandt Canyon on the northeast side of Mount Hood. Evidence from water rights applications and permits suggest the source was first developed in the early 1930s.

Water from the spring is collected by perforated pipe located under talus slopes that direct most of the water to the concrete spring box that includes the inlet to the District's 14-inch transmission main and an overflow. The spring collection system and intake was substantially reconstructed in 1996 following damage caused by high streamflow associated with severe weather

Available spring flows are well above projected year 2035 maximum day water system demand of 1,600 gpm; consequently there are no capacity issues with the source.

District water rights total 7.15 cfs (3,209 gpm); however, only 1.0 cfs (449 gpm) has been certificated. Permit 29377 has been extended to October 1, 2028 and will require action prior to that date to either develop the right or seek another extension. Permit 34196 has been extended to October 1, 2058 and will not require attention within the 20-year planning period.

WATER QUALITY AND TREATMENT

The current source water (Crystal Springs) has been classified as groundwater by OHA; consequently, filtration is not required. Water quality is generally excellent with all chemical concentrations well within regulated maximum contaminant limits. Most of the tested-for chemicals result in no detections. Treatment is currently limited to disinfection.

The District is in compliance with all water quality related regulatory requirements. The District's last OHA Water System Survey (May 9, 2013) noted that "No significant deficiencies or rule violations were identified." The system was also designated as an "outstanding performer" and as a result the next system survey will be conducted in 5 years (2018) rather than in the usual 3 years.

STORAGE RESERVOIRS

Crystal Springs Water District has two existing ground-level, treated water reservoirs: Booth Hill Reservoir (700,000 gallons) and Pine Grove Reservoir (400,000 gallons). The reservoirs were recently (November 2014) cleaned and inspected and are in very good condition with few deficiencies. The deficiencies can be addressed as part of general water system maintenance.

Additional reservoir capacity (1.3 million gallons) is recommended. The recommended storage volume is consistent with prior master plans; however, the methodology varies somewhat. The current recommendation uses a fire reserve based on 3,000 gpm for three hours in accordance with current fire code standards.

Previous District Master Plans proposed two new reservoirs: a new 500,000 gallon reservoir south of Kollas road and west of Odell Creek, and a new 800,000 gallon reservoir off Cooper Spur Road near Evans Creek Drive. These have been renamed in this Water Master Plan Update as "West Side Reservoir" and "South Reservoir" respectively. Site locations for

the two reservoirs are currently being identified by District staff and, while in the general areas identified in the previous plans, some of the locations considered do not necessarily correspond to the more site specific names used in the previous plans.

TRANSMISSION AND DISTRIBUTION

The water system includes approximately 136 miles of main and is a fairly complex mix of dendritic (characterized by deadend lines) and looped mains. Some of the looping is via very small diameter lines.

In 2014 there were 2,189 water meters, 1,749 of which were residential. According to District spreadsheet data, there are 42 pressure reducing valve and/or pressure relief valve vaults, and 481 hydrants.

Because of the District's varying topography and the magnitude of elevation differences, the water system is currently divided into ten pressure zones and service areas. In most cases, the pressure zones are connected via pressure reducing valves (PRV); however, in some cases, headloss in smaller diameter pipe is used to "reduce" the pressure between two otherwise separated zones.

System pressures vary from approximately 50 psi to 280 psi. In general, areas with high pressures (on the order of 80 psi or more) have individual pressure reducing valves on the service lines. A few lines may have service connections that approach the regulatory minimum pressure (as measured at the customer's meter) of 20 psi.

An assessment of Crystal Springs Water District transmission and distribution system, and resulting improvement recommendations, were based on map review, review of previous plan recommendations and implemented projects, fire flow needs, modelling, and information from staff on system operation and problem areas. Recommendations are included in the capital improvement plan.

Unaccounted-for water losses currently total 23 - 38% and indicate that the water system has excessive losses. Normally leak detection would be recommended; however, reducing the losses through leaks would likely increase the overflows at the reservoirs. The District is currently evaluating the feasibility of eliminating the overflows. Elimination of the overflows

should be followed with system-wide leak detection. Follow up replacement of leak-prone lines should also reduce water losses as well as O&M costs associated with emergency main repairs.

SCADA AND TELEMETRY

The system does not have SCADA or telemetry. Flowmeter readings at the source and two reservoirs are observed and recorded daily by staff. Collected data is entered manually into spreadsheets at the District office. There are no alarms.

CAPITAL IMPROVEMENTS

Recommended capital improvements are summarized in Table 7.1 and shown in Figure 7.1. (A copy of Table 7.1 and Figure 7.1 are included at the end of the executive summary). Table 7.1 includes (referenced) Section and Figure numbers – where projects are described or shown in more detail.

All projects should include a pre-design element that verifies any critical project requirement or data need such as key elevations, pipe size/material/location, operational characteristics, etc.

OPERATION AND MAINTENANCE (O&M)

Most of the recommended capital improvements will not result in increased O&M costs; however, O&M costs are subject to inflationary pressures, so annual increases are typically required. Budgets and water rates are typically adjusted to take recent or anticipated changes into account; however, system deficiencies that have not been addressed can increase O&M costs. This may occur in ways and to an extent not easily foreseen; and may take the form of emergency (overtime) call outs and extra cost, interim measures that may be needed until the problem can be addressed correctly, and un-budgeted emergency projects of potentially significant expense. Over time, such costs can add significantly to the overall utility budget.

Recommended O&M activities for the distribution system include:

- Valve exercising (once per year on main lines and once every 3-4 years on other lines).
- Hydrant exercising (once per year) and repairs as needed.
- Periodic flushing of dead-end lines.

WATER RATES

District rates are based on a base monthly service charge according to meter size. Base charges range from $6.25 for a ¾" meter to $360.50 for a 10" meter. To the base charge is added water usage rate of $5.50 per 1,000 gallons for all water used. Some water meters are on lines that are for standby fire protection. These accounts are charged an additional monthly fee of $4.25 per inch diameter of the associated service line. Water rates are typically increased annually to keep pace with inflation.

For the fiscal year ending June 30, 2014, total rate revenue from monthly billings was $1,098,960. Based on 3,557 EDUs, the average monthly billing was $25.75 per equivalent dwelling unit (EDU). Funding agencies often evaluate a community's rates based on a monthly single-family residential billing associated with 7,500 gallons of usage; for Crystal Springs, this billing would be $47.50.

The General Fund budgets appear healthy with substantial reserves and significant allocations for capital improvements. The last water rate study for the District was prepared in 1991. A new rate study is recommended. Estimated cost for a new rate study is $40,000.

CURRENT SYSTEM DEVELOPMENT CHARGE (SDC)

The District's current Water SDCs for a standard residential or small commercial water meter (3/4") is $4,240 (effective July 1, 2014). District SDCs are updated annually to keep pace with inflation. SDCs were last reviewed in detail in 1991 by Economic Resource Associates, Inc. SDCs utilize an approved capital improvements plan as the basis for the SDC cost computation. As SDCs are based in part on anticipated project costs, the District should consider revising the SDC after the Water Master Plan has been adopted. Estimated cost for a water SDC update is $20,000.

CAPITAL IMPROVEMENT FINANCE

Major capital improvements are often too expensive to fund exclusively with accumulated reserves. Such projects may be economically financed through programs offered by various State and Federal agencies, or a mix of public and local financing. The following discussion identifies potential sources of that funding.

CAPITAL IMPROVEMENT RATE IMPACTS

Table 8.6 includes debt service and rate impacts on a per EDU basis for projects funded through the programs identified in Section 8.5.2, plus a computation using a 6.5% interest rate. Very large projects often require funding through multiple sources; rate impacts for multiple funding sources are simply added together.

Note: Table E6 is for general planning purposes only. Actual interest rates, terms, and availability of funds through any given source may vary and are not locked in until an offer of funding is accepted by the District.

Table E6: Debt Service and Rate Impacts (per EDU basis)

	Annual Debt Service	Monthly Per EDU Rate Increase	Annual Debt Service	Monthly Per EDU Rate Increase	Annual Debt Service	Monthly Per EDU Rate Increase	Annual Debt Service	Monthly Per EDU Rate Increase
Interest Rate (%):	3.51		2.81		3.51		6.5	
Term (years):	25		20		25		25	
Reserve (%):	10							
EDUS:		3,557		3,557		3,557		3,557
Loan Total($)								
$100,000	$6,681.39	$0.16	$6,604.05	$0.15	$6,073.99	$0.14	$8,198.15	$0.19
$200,000	$13,362.78	$0.31	$13,208.10	$0.31	$12,147.98	$0.28	$16,396.30	$0.38
$300,000	$20,044.17	$0.47	$19,812.16	$0.46	$18,221.97	$0.43	$24,594.44	$0.58
$400,000	$26,725.56	$0.63	$26,416.21	$0.62	$24,295.96	$0.57	$32,792.59	$0.77
$500,000	$33,406.95	$0.78	$33,020.26	$0.77	$30,369.95	$0.71	$40,990.74	$0.96
$600,000	$40,088.34	$0.94	$39,624.31	$0.93	$36,443.94	$0.85	$49,188.89	$1.15
$700,000	$46,769.73	$1.10	$46,228.37	$1.08	$42,517.93	$1.00	$57,387.04	$1.34
$800,000	$53,451.11	$1.25	$52,832.42	$1.24	$48,591.92	$1.14	$65,585.18	$1.54
$900,000	$60,132.50	$1.41	$59,436.47	$1.39	$54,665.91	$1.28	$73,783.33	$1.73
$1,000,000	$66,813.89	$1.57	$66,040.52	$1.55	$60,739.90	$1.42	$81,981.48	$1.92
$2,000,000	$133,627.79	$3.13	$132,081.05	$3.09	$121,479.81	$2.85	$163,962.96	$3.84
$3,000,000	$200,441.68	$4.70	$198,121.57	$4.64	$182,219.71	$4.27	$245,944.44	$5.76
$4,000,000	$267,255.57	$6.26	$264,162.10	$6.19	$242,959.61	$5.69	$327,925.92	$7.68
$5,000,000	$334,069.47	$7.83	$330,202.62	$7.74	$303,699.52	$7.12	$409,907.41	$9.60

8.7 CAPITAL IMPROVEMENT IMPLEMENTATION

Capital improvements can be implemented over the planning period according to the nature of the projects, the relative prioritization of the project, and other financial and practical considerations that the District may have. Several of the projects are high priority and should be addressed as soon as practicable. Because of the high costs, funding agency participation may be needed. If the District decides to pursue agency assistance, then once

the District has determined which projects to include, the District should contact IFA to set up a One-Stop Meeting in Salem to discuss potential project funding. Representatives of potential funding agencies attend the meeting and can assist in developing an optimal funding approach.

Table 7.1: Crystal Springs Water District CIP (All costs in current dollars) | **Reference May 2015 ENR CCI:** 10036 | **Current ENR CCI: (May 2015)** 10036 | **Crystal Springs Water System Master Plan 2015** | **Distribution Improvements**

Unit Costs May 2015 ($/LF)	Project Priority	Project Reference Number	Project Name (Description)	New Diameter (in.)	Length (LF)	Unit Cost ($/LF)	Construction Cost ($)	Total Cost ($)	Implementation (LF and Total Cost) 2015 (LF)	2015 ($)	2016 (LF)	2016 ($)	2017 (LF)	2017 ($)	2018 (LF)	2018 ($)	2019 (LF)	2019 ($)	2020-25 (LF)	2020-25 ($)	2026-35 (LF)	2026-35 ($)	CIP Totals Length (LF)	CIP Totals Cost ($)
180	L	2	**Dog River to Cooper Spur**	12	**9,200**	$180	$1,656,000	**$2,401,200**		$0		$0		$0		$0		$0		$0	9,200	$2,401,200	9,200	$2,401,200
			Replaces 6,200 LF of existing 2" and 5" lines and adds 3,000 LF of new main.																					
180	L	3	**Cooper Spur Evans Creek to Culberton**	12	**6,000**	$180	$1,080,000	**$1,566,000**		$0		$0		$0		$0		$0		$0	6,000	$1,566,000	6,000	$1,566,000
			Replaces existing 2" and 4" lines to improve redundancy and fire flows in the south part of the District.																					
140	H	4	**Culbertson to Cooper Spur**	6	**500**	$140	$70,000	**$101,500**	500	$101,500		$0		$0		$0		$0		$0		$0	500	$101,500
			New line to complete loop.																					
180	L	5	**Cooper Spur - Culbertson to Baseline**	12	**5,400**	$180	$972,000	**$1,409,400**		$0		$0		$0		$0		$0		$0	5,400	$1,409,400	5,400	$1,409,400
			Replaces existing 4" line to improve redundancy and fire flows in the south part of the District.																					
180	M	6	**Baseline Dr. - West of Tollbridge**	12	**7,500**	$180	$1,350,000	**$1,957,500**		$0		$0		$0		$0		$0	7,500	$1,957,500		$0	7,500	$1,957,500
			Replaces existing 2", 4", and 6" lines and adds 2,000 LF of new main.																					
150	L	7	**Allen Road - Baseline to Woodworth**	8	**8,000**	$150	$1,200,000	**$1,740,000**		$0		$0		$0		$0		$0		$0	8,000	$1,740,000	8,000	$1,740,000
			Replaces existing 4" line to improve redundancy and fire flows in the south part of the District.																					
150	L	8	**Trout Creek Ridge Road**	8	**10,600**	$150	$1,590,000	**$2,305,500**		$0		$0		$0		$0		$0		$0	10,600	$2,305,500	10,600	$2,305,500
			Replaces existing 4" line to improve redundancy and fire flows to the Trout Creek area.																					
140	H	9	**Sperry Road Loop**	6	**5,300**	$140	$742,000	**$1,075,900**	5,300	$1,075,900		$0		$0		$0		$0		$0		$0	5,300	$1,075,900
			Replaces existing 2" and 4" lines to improve fire flows to the Trout Creek area.																					
150	M	10	**Highway 35 near Hillcrest**	8	**6,800**	$150	$1,020,000	**$1,479,000**		$0		$0		$0		$0		$0	6,800	$1,479,000		$0	6,800	$1,479,000
			Replaces existing 4" line and adds 700 LF of new main.																					
150	L	11	**Neal Creek/ Booth Hill Road**	8	**6,900**	$150	$1,035,000	**$1,500,750**		$0		$0		$0		$0		$0		$0	6,900	$1,500,750	6,900	$1,500,750
			Replaces existing 4" and 6" lines and adds 3,300 LF of new main.																					
150	H	12	**Highway 35 and Endow Dr.**	8	**2,000**	$150	$300,000	**$435,000**	2,000	$435,000		$0		$0		$0		$0		$0		$0	2,000	$435,000
			Replaces existing 4" along Highway 35 to complete improvements and address fire flow deficiencies in Odell.																					
180	M	13	**Booth Hill to Odell**	12	**12,700**	$180	$2,286,000	**$3,314,700**		$0		$0		$0		$0		$0	12,700	$3,314,700		$0	12,700	$3,314,700
			Replaces existing 8" line to improve fire flow capability.																					
165	H	14	**Centralvale Road - Hwy 35 to WyEast**	10	**5,500**	$165	$907,500	**$1,315,875**	5,500	$1,315,875		$0		$0		$0		$0		$0		$0	5,500	$1,315,875
			Replaces existing 4" line to improve local hydraulics and improve flow to Odell and the proposed West side Reservoir.																					
165	H	15	**WyEast Road - Centralvale to Sylvester**	10	**2,700**	$165	$445,500	**$645,975**	2,700	$645,975		$0		$0		$0		$0		$0		$0	2,700	$645,975
			Replaces existing 4" line to improve local hydraulics and improve flow to Odell and the proposed West side Reservoir.																					
165	L	16	**WyEast Road - Sylvester to Lippman**	10	**4,800**	$165	$792,000	**$1,148,400**		$0		$0		$0		$0		$0		$0	4,800	$1,148,400	4,800	$1,148,400
			Replaces existing 4" line to improve flows to Odell.																					
175	H	17	**Sylvester Road to West Side Reservoir**	10	**5,500**	$175	$962,500	**$1,395,625**	5,500	$1,395,625		$0		$0		$0		$0		$0		$0	5,500	$1,395,625
			Replaces existing 1", 2", and 4" lines and adds 1,000 LF of new main and adds a new PRV station to supply the proposed West Side Reservoir.																					
150	L	19	**Lippman road**	8	**3,400**	$150	$510,000	**$739,500**		$0		$0		$0		$0		$0		$0	3,400	$739,500	3,400	$739,500
			Replaces existing 2" line and adds 1,400 LF of new main to increase fire flows to the west side of Odell.																					
180	M	20	**Davis Drive**	12	**2,900**	$180	$522,000	**$756,900**		$0		$0		$0		$0		$0	2,900	$756,900		$0	2,900	$756,900
			Replaces existing 8" line along Davis Drive in Odell to provide higher fireflow through industrial area.																					
180	H	21	**Stadelman Drive**	10	**3,400**	$180	$612,000	**$887,400**	3,400	$887,400		$0		$0		$0		$0		$0		$0	3,400	$887,400
			Replaces 1" and 6" lines and adds 1,400 LF of new pipe and PRV in Neal Creek Mill Industrial Area to loop system and provide fire flow.																					
150	L	22	**Lingren Road - Davis to Ehrck Hill**	8	**4,000**	$150	$600,000	**$870,000**		$0		$0		$0		$0		$0		$0	4,000	$870,000	4,000	$870,000
			Replaces existing 6" line to improve hydraulics and add redundancy.																					
150	L	23	**Ehrck Hill to Dethman Ridge**	8	**11,800**	$150	$1,770,000	**$2,566,500**		$0		$0		$0		$0		$0		$0	11,800	$2,566,500	11,800	$2,566,500
			Replaces existing 4" and 6" lines along Ehrck Hil, Lingren, and Dethman Ridge Road to add redundancy.																					
150	M	24	**Thomsen Road to Fir Mountain**	8	**9,800**	$150	$1,470,000	**$2,131,500**		$0		$0		$0		$0		$0	9,800	$2,131,500		$0	9,800	$2,131,500
			Replaces existing 4" and 6" lines to provide higher flows to Pine Grove and the north part of the water system.																					
155	M	25	**Fir Mountain to Pine Grove**	8	**9,800**	$155	$1,519,000	**$2,202,550**		$0		$0		$0		$0		$0	9,800	$2,202,550		$0	9,800	$2,202,550
			Replaces existing 4" lines to provide higher flows to Pine Grove and the north part of the District. Also adds a PRV station.																					
150	M	26	**East Side Road - South**	8	**18,000**	$150	$2,700,000	**$3,915,000**		$0		$0		$0		$0		$0	18,000	$3,915,000		$0	18,000	$3,915,000
			Replaces existing line from Fir Mountain to Old Dalles to improve fire flows in the north part of the District.																					
150	L	27	**Pine Grove to Paasch Drive**	8	**8,800**	$150	$1,320,000	**$1,914,000**		$0		$0		$0		$0		$0		$0	8,800	$1,914,000	8,800	$1,914,000
			Replaces existing 3/4", 3", and 4" lines and adds 5,500 LF of new main to improve fire flow and redundancy in the north part of the District.																					
150	L	28	**East Side Road - North**	8	**11,200**	$150	$1,680,000	**$2,436,000**		$0		$0		$0		$0		$0		$0	11,200	$2,436,000	11,200	$2,436,000
			Replaces existing 6" line to provide fire flow in the north part of the District.																					
150	H	29	**Neal Creek - Hwy 35 to Thomsen**	8	**4,300**	$150	$645,000	**$935,250**	4,300	$935,250		$0		$0		$0		$0		$0		$0	4,300	$935,250
			Replaces existing 3" line and adds 2,000 LF of new main to replace aged pipe and connects loop to Highway 35.																					
150	M	30	**Odell Hwy - Wyeast to Web**	8	**2,800**	$150	$420,000	**$609,000**		$0		$0		$0		$0		$0	2,800	$609,000		$0	2,800	$609,000
			New line to complete loop and improve fire flow.																					
			Distribution Totals		**189,600**		**$30,176,500**	**$43,755,925**	**29,200**	**$6,792,525**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**70,300**	**$16,366,150**	**90,100**	**$20,597,250**	**189,600**	**$43,755,925**

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Miscellaneous

Constr. Costs May 2015 ($)	Total Costs May 2015 ($)	Project Priority	Project Name (Description)	Plan Section # Reference	ENR Ratio	Construction Cost ($)	Total Cost ($)	Implementation (% and Total Cost) 2015 (%)	2015 ($)	2016 (%)	2016 ($)	2017 (%)	2017 ($)	2018 (%)	2018 ($)	2019 (%)	2019 ($)	2020-25 (%)	2020-25 ($)	2026-35 (%)	2026-35 ($)	CIP Totals (%)	Cost ($)
$1,125,000	$1,651,000	L	**South Reservoir**	**6.7.2.2**	1.000	$1,125,000	$1,651,000		$0		$0		$0		$0		$0		$0	100	$1,651,000	100	$1,651,000
			Nominal 800,000 gallon reservoir and 1,000 LF 12" of new main supplying it, located at south end of the District. Provides storage for the system as a whole and provides storage for areas above Booth Hill Reservoir that currently have no storage.																				
$1,601,000	$2,341,000	H	**West Side Reservoir**	**6.7.2.2**	1.000	$1,601,000	$2,341,000	100	$2,341,000		$0		$0		$0		$0		$0		$0	100	$2,341,000
			Nominal 500,000 gallon reservoir located west of Odell and 5,200 LF 12" line replaces 3,000 LF existing 1", 2", and 4" lines and adds 2,200 LF of new main along Lippman Road. Provides general storage for system and specifically provides for nearby industrial fire flow needs.																				
	$40,000	H	**Water Rate Study**	**8.2.3**	1.000	$0	$40,000	100	$40,000		$0		$0		$0		$0		$0		$0	100	$40,000
			Prepare a new water rate study.																				
	$20,000	H	**System Development Charge Study**	**8.3**	1.000	$0	$20,000	100	$20,000		$0		$0		$0		$0		$0		$0	100	$20,000
			Prepare a new water SDC study and methodology.																				
	$70,000	M	**Water Master Plan Update**	**6.8.1**	1.000	$0	$70,000		$0		$0		$0		$0		$0	100	$70,000		$0	100	$70,000
			Periodic update of Plan. Actual budget should be adjusted as needed to reflect theanticipated level of effort required.																				
			Miscellaneous Totals			**$2,726,000**	**$4,122,000**		**$2,401,000**		**$0**		**$0**		**$0**		**$0**		**$70,000**		**$1,651,000**		**$4,122,000**
			CIP Total			**$32,902,500**	**$47,877,925**		**$9,193,525**		**$0**		**$0**		**$0**		**$0**		**$16,436,150**		**$22,248,250**		**$47,877,925**

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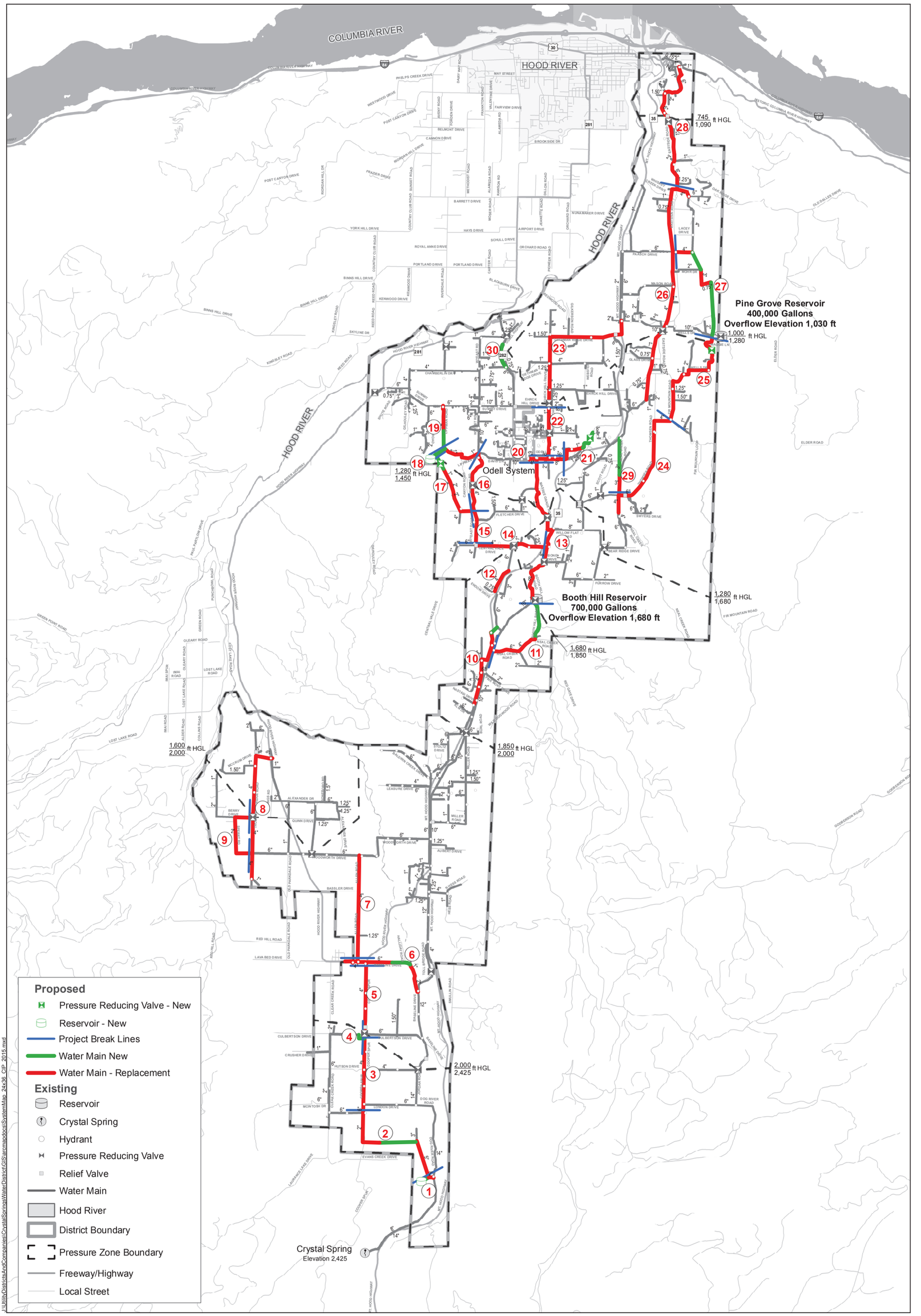

Figure 7.1
Crystal Springs Water District
Capital Improvement Projects

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SECTION 1 | INTRODUCTION

1.1 BACKGROUND AND NEED

Crystal Springs Water District owns and operates a water system that provides domestic water to an estimated year 2015 service population of 5,227 persons. The District is located in Hood River County and extends from the edge of the City of Hood River south for approximately 20 miles along Highway 35. The service area is primarily rural and agricultural, but also includes areas of significant commercial, industrial, and residential development. Water supply is obtained from a natural spring source located south of the District on the lower slopes of Mount Hood.

The Crystal Springs Water Company was formed in 1930 and dissolved in 1963 when it was reorganized as the Crystal Springs Water District. Master plans for the District were completed in 1963, 1991, and most recently in 2006.

The 2006 Plan was completed just prior to the recent recession. The District would like to update its Plan to better reflect current conditions and District objectives. An updated master plan is needed that will meet Oregon Health Authority (OHA) master planning requirements as well as provide a current evaluation of the District's needs and a current capital improvements program (CIP) to address those needs.

1.2 PURPOSE AND SCOPE

This Water Master Plan Update is intended to provide the Crystal Springs Water District with a comprehensive planning document consistent with State requirements. A key objective is the development of an updated CIP.

The scope of work for this Plan includes all elements (per OAR 333-061-0060(5) Master plans) required for State approval. A Water Management and Conservation Plan was not included in the scope of work.

1.3 PLANNING PERIOD

This Plan uses a 20 year planning period (through the year 2035).

1.4 AUTHORIZATION AND FUNDING

Crystal Springs Water District authorized PACE Engineers, Inc. to prepare this Water System Master Plan Update on December 22, 2014. This project has been funded entirely by the Crystal Springs Water District.

SECTION 2 | AREA CHARACTERISTICS

2.1 PLANNING AREA

2.1.1 Crystal Springs Water District

Crystal Springs Water District's water system currently serves the area within the District's boundary and this constitutes the primary planning area. The Odell Water Company is included insofar as its service area overlaps part of Crystal Springs'; however, it is an independent water system and not covered in this Plan. Service in some areas of Odell is based on which district owns the main on any given street. Areas outside the District boundary are also included for planning purposes insofar as they relate to the District's water supply or to potential future expansions of the District's service area. The service area boundary is shown on the water system map, Figure 3.1.

2.1.2 Other Water Service Agencies

There are two other water companies which serve domestic water and three companies which serve irrigation water within the boundaries of the Crystal Springs Water District. However, in the legal description for the Water District, the Parkdale Water Company has been excluded from the boundaries and therefore is not formally a part of the District, even though the boundaries totally encompass Parkdale. Therefore, if Parkdale is ever to be served by Crystal Springs at some future date, it will need to be annexed to the District.

Currently, the Odell Water Company serves the community of Odell. However, no formal boundaries between Crystal Springs and the Odell Water Company exist. Most of the boundaries have been agreed on informally and are based primarily on the locations of waterlines owned by the Odell Water Company at the time of the formation of the Crystal Springs Water District.

The Middle Fork Irrigation Company, East Fork Irrigation Company, and the Mount Hood Irrigation District provide irrigation water for farming and residential use, including gardens and lawn sprinkling, within the District. In the vicinity of Parkdale, the irrigation company also provides some fire protection through connection of fire hydrants to the high pressure irrigation line. Because of the ready availability of

irrigation waters, Crystal Springs Water District does not experience the high summer time peak demands one might normally expect of a domestic water system.

2.2 PHYSICAL CHARACTERISTICS

2.2.1 Landscape and Topography

The District can generally be described as including much of the eastern part of the Hood River Valley. Topography is highly varied, but in general, the land slopes gradually upward from the north (near the City of Hood River at elevation 100 feet) to the south (Parkdale at elevation 1,740 feet) and higher (elevation 2,450 feet at the District's spring source). The recharge area for the spring source extends upwards on Mount Hood and may extend to an elevation of approximately 7,300 feet. Higher elevation hills border the District and have influenced the service area boundaries based on the feasibility of providing water service. There are numerous springs, streams, and small impoundments throughout the District. The area is distinctly rural and important agricultural area well known for pears and other tree fruits. Higher hills within the District, or bordering the District, are generally forested and sparsely settled. The spring recharge area is forested and is fed in part from melting snow and glaciers high up on Mount Hood.

2.2.2 Climate

Crystal Springs Water District is located in a transition zone between drier eastern Oregon and wetter western Oregon. The District is large enough to exhibit some climate differences within its own boundaries. Climate data for the City of Hood River, located adjacent to the northern end of the District, and Parkdale, located toward the southern end of the District, are shown in Table 2.1.

Table 2.1: Local Climate Data

	City of Hood River	Parkdale
Elevation (feet)	100	1,740
Average Temperature (°F)		
January	33.1	31.1
August	66.0	59.0
Annual	50.5	46.1
Average Precipitation (in.)		
January	5.4	10.3
August	0.6	Trace
Annual	30.8	45.8
Average Snowfall (in.)		
Maximum	84.0	133.7
Minimum	1.7	12.4
Average	35.1	76.8

The recharge area of Crystal Springs' source extends up the northeast side of Mount Hood; annual precipitation totals increase with elevation: approximately 55 inches at the spring (elevation 2,450 feet) to 135 inches at elevation 7,300 feet.

2.2.3 Natural Hazards

Hood River County's 2012 *Natural Hazard Mitigation Plan* includes detailed discussions of natural hazards in the area and is available on the County's website. The Plan notes that wildfires are the number one concern followed by severe storms, floods, drought, earthquakes, landslides, and, to a much lesser extent, volcanic events and tornados. All of these have some potential for affecting the Crystal Springs Water District. From the Water District's standpoint, the actual magnitude of the event is not as relevant as the specific location of its occurrence. In particular, events affecting the source and supply system could compromise water service for the entire District.

Flooding has caused notable damage in the District on several occasions. On December 25, 1980, a debris dam on Polallie Creek collapsed sending a large volume of water and debris downstream to the East Fork of Hood River. Approximately 3,100 lineal feet of main, ranging from 4-inch to 14-inch, was destroyed. In 1996, heavy rainfall combined with unseasonably warm temperatures and associated snowmelt resulted in excessively high flow in Crystal Springs Creek that caused considerable damage to the District's water supply infrastructure necessitating comprehensive repairs and improvements.

Drought is a natural hazard commonly associated with reduced water supplies. However, ordinary droughts in the area have tended to be manageable; a larger concern may be related to the potential impacts of climate change. According to the Oregon Climate Change Research Institute, warmer temperatures have been responsible for a 34% reduction in glacier surface area on Mt. Hood between the years 1907 and 2004. Also, a 2007 study[1] of glacial contributions to streamflow in the Upper Middle Fork Hood River predicted, based on modeling, a 31.3% reduction in late summer glacial runoff by year 2059. In terms of natural hazards, and to the extent that snow and glacier melt contribute to the District's water source, climate change may constitute one the most serious threats to the Crystal Springs Water District.

2.3 SOCIO-ECONOMIC CHARACTERISTICS

2.3.1 Selected Demographic Characteristics

Selected population and housing demographic characteristics for areas in and around the Crystal Springs Water District are included in Table 2.2 from Census 2010. Data is included for Parkdale CCD, Parkdale CDP, Odell CCD, and Odell CDP. CCD is an abbreviation for "Census County Division" that refers to a subdivision of a county, for Census purposes, that has been delineated by the Census Bureau in coordination with state and local governments. CDP is an abbreviation for "Census Designated Place" to reflect a concentrated population in an unincorporated area for Census purposes. As discussed in Section 2.1, Odell and Parkdale have independent water systems which are not part of CSWD's service area. These two areas are approximated by Parkdale CDP and Odell CDP; the two areas are also included in Parkdale CCD and Odell CCD respectively. Demographic characteristics of the Crystal Springs Water District are approximated by subtracting the Parkdale CDP and Odell CDP numbers from the combined total for Parkdale CCD plus Odell CCD. This calculation is reflected in the estimated total for the Crystal Springs Water District (CSWD) shown in Table 2.2. This is an estimate only since CSWD does serve parts of Odell CDP. What might be an under-count for CSWD is balanced by the fact that some houses within the Odell CCD and Parkdale CCD are on wells.

[1] *"Contributions of Glacier Melt to Upper Hood River Streamflow and Implications of Climate Change", Nolin and Phillippe, OSU February 15, 2007.*

Table 2.2: 2010 Census Demographic Characteristics

Characteristic	Parkdale CCD	Parkdale CDP	Odell CCD	Odell CDP	CSWD (est.)[1]
Population					
Total	1,986	311	5,667	2,255	5,087
In households[2]:	1,666	298	5,421	2,244	4,545
Median age (years):	37.2	36.3	35.4	31.2	-
65 years and over (%):	10.37	6.43	10.89	8.87	11.85
Housing					
Housing units (total):	738	118	2,015	686	1,949
Occupied:	617	104	1,813	660	1,666
Vacant:	121	14	202	26	283
Owner occupied:	386	69	1,235	532	1,020
Renter occupied:	231	35	578	128	646
Persons per household:	2.70	2.87	2.99	3.40	2.73
Persons per housing unit:	2.69	2.64	2.81	3.29	2.61

[1] *Crystal Springs Water District estimate based on: (Odell CCD - Odell CDP)+(Parkdale CCD - Parkdale CDP).*

[2] *"Household" refers to occupied housing units.*

2.3.2 Population and Housing

2.3.2.1 Historic Population and Housing

Previous estimates of District population are limited and generally associated with comprehensive water system planning efforts. In 1963, when the District was first formed, the population connected to the water system was estimated to be approximately 2,500 people. In 1990, the Crystal Springs Water District was estimated to be serving approximately 4,500 people, according to the 1991 Water System Analysis. An estimate of 5,250 persons for 2003 was developed in the 2006 Water Master Plan.

Decennial census population and housing figures for the areas described in Section 2.3.1 above are presented in Table 2.3. Data for Hood River County and the City of Hood River is also included. In general, population growth has been concentrated in areas of higher density, specifically City of Hood River, Odell CDP, and Parkdale CDP. County, Odell CCD, and Parkdale CCD figures are also higher, reflecting the inclusion of the population centers previously mentioned. Population growth in Crystal Springs Water District is nominal for the period 2000 to 2010, with an average annual growth rate (AAGR) of 0.03 %. Housing increased in CSWD

during this same period (2000 – 2010) at an AAGR of 1.37 %. In general, housing growth out-paced population growth in all the listed areas, except Odell CDP. This relationship is also reflected in the reduction in the average number of persons per housing unit. While there is a trend for decreasing household size (average household size has decreased in the U.S. from 4.5 persons per household (pph) in 1900 to 2.6 pph in 1990 and 2000), the magnitude of change between 2000 and 2010 in the Table 2.3 data suggests more localized effects of the recent recession.

Table 2.3: Local Historic Population and Housing Data

	Census 1990		Census 2000		Census 2010		Average Annual Growth Rate (%)					
											Person per Housing Unit	
Area Description	Population	Housing Units	Population	Housing Units	Population	Housing Units	Population '99-'00	Population '00-'10	Housing '90-'00	Housing '00-'10	2000	2010
Hood River County	16,903	7,569	20,411	7,818	22,346	9,271	1.90	0.91	1.41	1.72	2.61	2.41
City of Hood River	4,632	2,272	5,831	2,645	7,167	3,473	2.33	2.08	2.21	2.76	2.20	2.06
Odell CCD	4,381	1,872	5,222	1,753	5,667	2,015	1.77	0.82	1.30	1.40	2.98	2.81
Odell CDP	(X)	(X)	1,849	594	2,255	686	(X)	2.00	(X)	1.45	3.11	3.29
Parkdale CCD	1,687	861	1,966	634	1,986	738	1.54	0.10	0.82	1.53	3.10	2.69
Parkdale CDP	(X)	(X)	266	92	311	118	(X)	1.58	(X)	2.52	2.89	2.64
Odell/Parkdale (CSWD)[1]	4,500	(X)	**5,073**	**1,701**	**5,087**	**1,949**	1.21	**0.03**	0.61	**1.37**	2.98	**2.61**
Odell CCD + Parkdale CCD	6,068	2,733	7,188	2,387	7,653	2,753	1.71	0.63	1.17	1.44	3.01	2.78

[1] *(Odell CCD - Odell CDP)+(Parkdale CCD - Parkdale CDP); the 1990 population figure of 4,500 is an estimate from the District's 1991 Water System Analysis.*

2.3.2.2 Recent (2014) Population and Housing Estimate

The estimated 2014 population of the Crystal Springs Water District was based on a review of the District's detailed billing records for the year 2014 plus discussions with staff regarding the number of housing units associated with specific developments. The District does not keep detailed records of customer-related information and does not indicate if there is more than one housing unit on a service connection or if a housing unit is associated with a farm or commercial connection; consequently, the following determination is more of an estimate rather than precisely determined number. The estimate for 2014 is a population of 5,186 persons and 1,987 housing units. The housing unit total for 2014 is 38 (0.5% AAGR) more than the 2010 estimate of 1949 housing units in Table 2.3, suggesting that the methodology for

estimating District housing and population characteristics is accurate enough for general planning purposes.

Table 2.4: 2014 Estimated Housing and Population

Description	Housing Units	Population (@ 2.61 pphu[1])
Single family residential connections	1,744	4,552
Hood Hollow Mobile Park	31	81
East Hill Homeowners Association	8	21
Fir Mountain Water Association	6	16
Odell Mobile Home Park	198	517
Total	**1,987**	**5,186**

[1]*Persons per housing unit (pphu).*

Official population figures are for residents only and do not include consideration of visitors and seasonal occupants such as farm workers.

2.3.2.3 Current Year (2015) Population

The current year (2015) population estimate is 5,227 persons. This is based on the 2014 figure plus growth at 0.8% (see Section 2.3.2.4 for discussion).

2.3.2.4 Population Projections

Population projections for the Crystal Springs Water District are shown in Table 2.5. The *Hood River County Coordinated Population Forecast* was adopted by Hood River County Ordinance #292 on October 20, 2008. The forecast uses a 0.8% AAGR for unincorporated Hood River County through the year 2035. Table 2.4 reflects the 0.8% AAGR.

Table 2.5: Population Forecast[1]

Year	Population
2014	5,186
2015	5,227
2016	5,269
2017	5,311
2018	5,354
2019	5,397
2020	5,440
2021	5,483
2022	5,527
2023	5,572
2024	5,616
2025	5,661
2026	5,706
2027	5,752
2028	5,798
2029	5,844
2030	5,891
2031	5,938
2032	5,986
2033	6,034
2034	6,082
2035	6,131

[1] *Persons per housing unit (pphu).*

The total projected year 2035 population is 6,131 persons based on an average annual growth rate of 0.80%. This represents an increase in 945 persons during the planning period. If the District returns to its pre-recession housing occupancy of 2.98 persons per housing unit, approximately 735 persons could be accommodated without any new housing construction. It is believed that sufficient buildable lands exist within the District to accommodate the anticipated growth.

An ultimate buildout calculation based on zoning is not feasible since actual densities – particularly in the exclusive farm zone – are much greater than the current code allows (based on acreage only considerations). A buildable lands inventory would be needed to more accurately determine the extent of

developable land within the District; a buildable lands inventory was not part of the scope of work for this Master Plan.

2.3.3 Land Use

2.3.3.1 Current Land Use and Zoning

Agriculture is the dominant land use in the Crystal Springs Water District, with most of the land zoned for exclusive farm use. Orchards predominate and the area is an important and well-known producer of pears and other tree fruits. Residential development is primarily rural, but some medium density residential development is also present. Forest land and use within the District are relatively limited; however, forest land is extensive in the areas surrounding the District. The south end of the District is adjacent to the Mount Hood National Forest. The north end of the District borders the City of Hood River, a source of goods, services, and employment that supplements those available within the District.

A detailed zoning map is available through Hood River County's website Online Parcel Viewer which can be located through a Google query. The County's website also provides detailed information on each zoning classification.

2.3.3.2 Future Development

Crystal Springs Water District is relatively large so new development or redevelopment is ongoing. Because of the rural nature of much of the District, infrastructure in some areas is lacking or may be insufficient for a proposed development; consequently, each proposed new development needs to be evaluated to determine how it impacts the system and if the system is capable of meeting the service requirements. For small developments, this evaluation is straightforward and may be determinable through map review and District staff's knowledge of the system; for larger developments, more sophisticated evaluation, including modelling and capital improvement planning, may be needed.

The Port of Hood River is planning to develop 8+ acres located adjacent to Highway 35 and Neal Mill Creek Road. Anticipated development may require two 4-inch meters and four to six 2-inch meters and industrial fire

flow capabilities (3,000+ gpm for three hours). The project is currently in the planning phase and the District is evaluating water system requirements to accommodate the development.

SECTION 3 | EXISTING WATER SYSTEM

3.1 INTRODUCTION

The Crystal Springs Water District owns and operates a municipal water system that currently provides service to areas within the District boundary. In 2014, there were 2,189 metered water connections, 1,749 of which were residential.

The water system dates back to the early 1930s. The Crystal Springs Water Company's water permit application (No. 9831, June 30, 1930) proposed that a small (8 feet by 10 feet) concrete collection box be constructed on Crystal Spring for a service area population estimated in the permit at 2,500 persons in 1930 with projected growth to 5,000 persons in 1940. The Crystal Springs Water Company was reorganized as the Crystal Springs Water District on October 2, 1963. The District completed its first comprehensive water system plan 1963 and followed up with a water permit application (No. 29377, January 22, 1964) that proposed a collection system at the spring that consisted of two 12-inch perforated collector pipes with a concrete control box and a 14-inch effluent pipe, overflow, and drain. In addition, the permit called for 65,700 feet of 14-inch transmission main from the spring to Booth Hill reservoir. (Service area population at that time was estimated at 3,050 persons.) Water permit application (No. 34196, March 3, 1969) notes the work completed in 1967 – 1968 to include: headworks, new storage reservoir, 60,000 feet of pipelines; and that work under contract for completion by September 1969 included a new storage reservoir (Pine Grove) and 125,000 feet of new pipe. (Service area population at that time was estimated at 3,950 persons.)

The District completed another comprehensive water system plan (Water System Analysis, Lee Engineering, Inc., March 1991 (revised February 1992)) that proposed many system improvements including source (disinfection), storage, and transmission/distribution pipeline additions or replacements, some of which were constructed in the following years.

The spring box/inlet/control structure was rebuilt following flood damage sustained during the severe weather of winter 1996.

Planning efforts in 2000 and 2006 identified additional main and pressure zone modifications (by means of of additional pressure control valves) that were implemented largely by District staff.

Perhaps the most unique feature of the Crystal Springs Water District is that the entire system, including two reservoirs and multiple pressure zones, operates off gravity. Spring flow through the system is continuous and water overflows continually at both reservoirs. In so doing, headloss in the variously sized pipelines and pressure reducing valves is manipulated to balance local pressures and allow service without recourse to pump stations and telemetry.

Section 3 inventories and describes elements of the existing water system in the subsections that follow. The existing water system is shown in Figure 3.1. Photographs of selected water system components are included at the back of Section 3.

3.2 MAPPING AND DOCUMENTATION

Mapping and system documentation for this plan were obtained primarily from the District's GIS, prior water master plan, District provided maps and documents, supplemented with staff interviews and limited site visits. Water system documentation in some areas is relatively limited; consequently, the District's mapping should be considered a work in progress. Elevation data is from a variety of sources and may not be on the same datum. Accuracy of the mapping and elevation data is assumed to be sufficient for general planning purposes; however, critical elements and elevations should be verified prior to, or as part of, any design work.

3.3 SOURCE

3.3.1 Water Rights

Water rights are regulated by the Oregon Water Resources Department (OWRD). OWRD maintains extensive records; copies of permits and certificates are readily available through their website (http://www.oregon.gov/owrd/). For convenience, copies are included in the Appendices.

3.3.1.1 Crystal Springs Water District Water Rights

Water rights for the Crystal Springs Water District are summarized in Table 3.1. Copies of permits and certificates are included in Appendix 3.1.

Table 3.1: Water Rights

Source/Type[1]	Permit No.	Certificate No.	Priority Date	Quantity
Crystal Spring (S)	9831	10115	6/30/1930	1.0 cfs
Crystal Spring (S)	29377		1/22/1964	2.65 cfs
Crystal Spring (S)	34196		3/03/1969	3.5 cfs

[1] *Source type: (S) Surface Water, (G) Groundwater, (R) Reservoir*

All of the District's water rights are being utilized. Permit 29377 has been extended to October 1, 2028; permit 34196 has been extended to October 1, 2058.

3.3.1.2 Local Instream Water Rights

Crystal Spring is a tributary of the East Fork Hood River. Local instream water rights that relate to utilization of the spring source are shown in Table 3.2. The listed instream water right is junior to all of the District's water rights and also includes the wording "This instream water right shall not have priority over human and livestock consumption, municipal use or water legally released from storage. Copies of the instream water right are included in Appendix 3.2.

Table 3.2: Local Instream Water Rights

	East Fork Hood River
Certificate No.	68457
Priority Date	11/3/1983
Flow (cfs)	
October 1- December 31	150
January 1 – March 31	100
April 1 – June 30	150
July 1 – September 30	100

3.3.2 Historic Sources

No reference to other (historic) sources was found in the information provided by the District and no other water rights were listed for the District in the Oregon Water Resource Department online water rights database.

3.3.3 Current Source

The District's current and only water source is Crystal Spring, which is located at elevation 2,425 feet in Weygandt Canyon on the northeast side of Mount Hood, approximately 1,000 feet west of Highway 35. Evidence from water rights applications and permits suggest the source was first developed in the early 1930s.

Geologic and hydrologic studies of the spring and recharge area were conducted by: CH_2M in 1963, Lee Engineering in 1991, AGI Technologies in 1994, Mark Yinger Associates in 2002, and ODHS in 2003. The District has copies of all the listed studies.

Topography in Weygandt Canyon varies from gently sloping to very steep with side slopes from 5% to as steep as 90%. The elevation range is from 2,425 feet at the intake to 4,800 feet at the upper end of the canyon. Yinger identifies one potential recharge area that extends to 7,300 feet in elevation among other recharge area delineations discussed. Geology of the area is complex, so while the general recharge area is known, delineations of that area to date are not definitive.

Vegetation varies from new growth, trees, grasses, and shrubs in logged areas to dense overstory of evergreens containing Mountain Hemlock, Western Red Cedar, Spruce, Noble Fir, Western Larch, Western Hemlock, and Douglas Fir. The understory consists primarily of blue huckleberry, princess pine, service berry, and rhododendron. Ground cover consists primarily of pyrola, trailing twin flower, bunchberry, bear grass, bed grass, and other grasses planted following past clear-cut operations and used mostly for erosion control.

Precipitation is estimated to vary from 55-inches to 135-inches per year. The mean annual soil temperature is estimated at about 42° F, which corresponds to the relatively constant water temperature of the spring.

There is no discernible river channel within Weygandt Canyon upstream of the spring. Organic litter throughout the canyon consists primarily of decomposing needles and twigs from Mountain Hemlock, larch, and fir. The litter varies in thickness from 4-inches to 12-inches and provides an excellent filter for surface water which drains through the canyon.

Spring flow is strongly correlated with mean monthly air temperature; Yinger notes that 37% of the variation in spring flow can be attributed to air temperature alone. Yinger also notes a poor correlation between effective monthly precipitation (from elevations below 4,400 feet) and spring flow suggest that the "true zone of contribution" may extend to higher elevations with lingering summer snowpacks. Nevertheless, ODHS notes that the lack of well-developed surface runoff channels in the zone of contribution suggests that much of the precipitation infiltrates directly into the soil.

Mean annual flows in Crystal Springs as measured by Lee Engineering were: 2.89 mgd (million gallons per day) in 1988, 3.03 mgd in 1989, and 2.56 mgd in 1990. The Lee figures were based on combining metered intake flow with flow calculations of water bypassing over the weir in the intake structure, and as such, would not include spring water that bypassed the intake system – to the extent that this is occurring. CH_2M measured 3.95 mgd for the period August 1962 to August 1963. The CH_2M measurement was based on a weir constructed across Crystal Springs Creek plus metered flow (0.72 mgd) diverted to the intake. Year 2014 spring flows averaged 3.57 mgd using the Lee 1988-1990 methodology. The maximum monthly flow in 2014 was 4.31 mgd in April.

Water from the spring is collected by perforated pipe located under talus slopes that direct most of the water to the concrete spring box that includes the inlet to the District's 14-inch transmission main and an overflow. The spring collection system and intake was substantially reconstructed in 1996 following damage caused by high streamflow associated with severe weather. The spring collection area was covered with a large concrete cap that includes a stormwater/debris channel to help control unusually high storm flows and protect the subsurface collection system and associated structures.

The Oregon Health Authority – Drinking Water Program (*Source Water Assessment Report*, ODHS 2003) considers the aquifer that feeds the spring "to be highly sensitive due to the shallow unconfined nature of the aquifer, the occurrence of cobbles, boulders and gravel within the aquifer, the presence of fractured bedrock being exposed at the outflow point, the low specific conductance …" They also note the

highly permeable soil covering in the northern half of the capture zone and the susceptibility to microbial contamination.

3.4 TREATMENT

The current source water has been classified as groundwater by OHA; consequently, filtration is not required. Treatment is currently limited to disinfection. The District uses an onsite disinfection system located in a building adjacent to the spring site. A 0.8% sodium hypochlorite solution is generated onsite from salt and stored in 170 gallon tanks. The solution is fed into the system by a flow-paced metering pump which adjusts the dosing rate to match flow in the transmission main to the water system. Dosing is 0.8 mg/l and the chlorine residual at the first customer is reported to be 0.34-0.38 mg/l. At 1,200 gpm, there is 28.8 minutes of contact time in the 14-inch main prior to the first customer located 4,325 feet from the source.

The treatment building includes the chemical generation, storage, and feed components; electrical panels; flowmeter, turbidimeter, chlorine analyzer, and a standby power generator.

3.5 STORAGE RESERVOIRS

Crystal Springs Water District has two existing ground-level, treated water reservoirs. These are described individually in the following subsections.

3.5.1 Booth Hill Reservoir

Location:	South of Odell off Booth Hill Road
Volume:	700,000 gallons
Construction Date:	1968
Material:	Concrete
Overflow elevation (approx.):	1,680 feet
Height (to overflow):	24 feet
Diameter:	75 feet
Telemetry and control:	
Telemetry:	None
Level control/settings:	None
Alarms:	None
Flowmeter:	On inlet and outlet

Comments. The reservoir was last cleaned and inspected on November 3, 2014. The reservoir was in general noted to be in good condition with inlet, outlet, and overflow piping noted as being in fair condition. Recommendations included: install a safety climb on the exterior ladder, install a gasket on the access hatch, and implement epoxy repairs on the inside of the tank (estimated one day of work).

3.5.2 Pine Grove Reservoir

Location:	East of Pine Grove off Wells Drive
Volume:	400,000 gallons
Construction Date:	1968
Material:	Concrete
Overflow elevation (approx.):	1,030 feet
Height (to overflow):	16 feet
Diameter:	60 feet
Telemetry and control:	
Telemetry:	None
Level control/settings:	None
Alarms:	None
Flowmeter:	On overflow

Comments. The reservoir was last cleaned and inspected on November 3, 2014. The reservoir was in general noted to be in good condition with the common inlet/outlet, overflow piping, and interior ladder noted as being in fair condition. Recommendations included: install a safety climb on the exterior ladder, and implement epoxy repairs on the inside of the tank (estimated one day of work).

3.6 PUMP STATIONS

Current system operation is entirely by gravity; there are no pump stations in the system. Very high system pressures in some parts of the District allow development on nearby hillsides without the need for booster pumping.

3.7 TRANSMISSION AND DISTRIBUTION

Mains in the District range up to 14-inch diameter. Main material is primarily cast iron, ductile iron, and "steam grade" steel boiler pipe, but some PVC pipe is present in lower

pressure areas. The District has standardized on ductile iron class 52 pipe for all new main construction. Service lines include a large variety of sizes and materials; however, the District has standardized on copper for all new construction of service lines 2-inch in diameter and smaller. The distinction between main and service lateral is blurred in the District where very high system pressures allow for adequate system flows through small diameter pipe that would be typically thought of as being suitable for service line only use. The District has many "mains" that are ¾" in diameter from several hundred feet to almost 1,500 feet in length. Table 3.3 includes a breakdown of main lengths for the various materials and diameters present. The information is based on the District's GIS database.

Table 3.3: District Water Main Characteristics

Diameter (in.)	Length (feet)	% of Total
0.75	14,458	2.0
1.00	83,331	11.6
1.25	20,974	2.9
1.50	18,517	2.6
2.00	74,296	10.4
2.50	346	0.0
3.00	7,745	1.1
4.00	159,173	22.2
5.00	2,892	0.4
6.00	211,867	29.6
8.00	38,922	5.4
10.00	36,638	5.1
12.00	22,329	3.1
14.00	24,892	3.5
Total	**716,380**	**100.0**

Material	Length (feet)	% of Total
Cast Iron	249,868	34.9
Copper	17,037	2.4
Ductile Iron	191,873	26.8
Galvanized	15,960	2.2
PEX	8,173	1.1
PVC	88,075	12.3
"Steam Grade"[1]	90,698	12.7
Not Identified	54,696	7.6
Total	**716,380**	**100.0**

[1]Steel boiler pipe.

The system is a fairly complex mix of dendritic (characterized by deadend lines) and looped mains. Some of the looping is via very small diameter lines.

In 2014 there were 2,189 water meters, 1,749 of which were residential. According to District spreadsheet data, there are 42 pressure reducing valve and/or pressure relief valve vaults, and 481 hydrants.

A map of the water system is provided as Figure 3.1. A recent list of pressure reducing valves is included in Appendix 3.3; recent hydrant lists are included in Appendix 3.4.

3.8 SERVICE AREAS AND PRESSURE ZONES

Because of the District's varying topography and the magnitude of elevation differences, the water system is currently divided into ten pressure zones and service areas.

In most cases, the pressure zones are connected via pressure reducing valves (PRV); however, in some cases, headloss in smaller diameter pipe is used to "reduce" the pressure between two otherwise separated zones.

System pressures vary from approximately 50 psi to 280 psi. In general, areas with high pressures (on the order of 80 psi or more) have individual pressure reducing valves on the service lines. A few lines may have service connections that approach the regulatory minimum pressure (as measured at the customer's meter) of 20 psi.

The approximate areal extent of the service areas (pressure zones) is shown in Figure 3.1.

3.9 SCADA AND TELEMETRY

The system does not have SCADA or telemetry. Flowmeter readings at the source and two reservoirs are observed and recorded daily by staff. Collected data is entered manually into spreadsheets at the District office. There are no alarms.

3.10 WATER DEMAND

Water use and water demands are discussed in detail in Section 5. Current annual average water demand, as measured at the intake flowmeter, is 1,770,000 gpd.

3.11 WATER QUALITY AND REGULATORY STATUS

3.11.1 Regulatory Overview

Drinking water quality is regulated at the federal level through the 1974 Safe Drinking Water Act and subsequent amendments. States have the flexibility to develop more stringent requirements in addition to the minimum established by the federal regulations. In Oregon, the Oregon Health Authority - Drinking Water Program (OHA) is responsible for administering federal and state regulations of public water systems. Oregon Administrative Rules (OAR) Chapter 333 Division 61 includes the rules for public water

systems. The complete rules and related data and materials are available directly through OHA's website: http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Pages/index.asx or through an internet search: "OHA drinking water program".

3.11.2 Water Quality

Water quality discussed in this section is based on recent data from the spring source as sampled from appropriate locations in the water system. Data is from OHA and Crystal Springs Water District records.

Water quality is generally excellent with all chemical concentrations well within regulated maximum contaminant limits (MCLs). Most of the tested-for chemicals result in no detections. Detected constituents in recent years include the following:

Nitrates. For the period reviewed (September 17, 2002 – November 20, 2014), there were 17 samples – three samples with detectable concentrations. The highest concentration was 1.02 mg/l (August 6, 2013); the average for the three samples was 0.38 mg/l. MCL for Nitrate is 10 mg/l.

Radionuclides. A Radium Combined concentration of 0.70 pCi/l was measured in December 2012. MCL for Radium Combined is 5 pCi/l.

Disinfection Byproducts. This includes Total Trihalomethanes (TTHM) and Haloacetic Acids (HAA5). For the most recent period reviewed (August 5, 2004 – September 18, 2014), there were no detections of HAA5 in five samples from the District's distribution system. For TTHM, in the most recent period reviewed (November 2006 – September 2013), there were six samples with four detections. The highest concentration was 0.0045 mg/l (August 5, 2004) and the average for the four samples was 0.0032 mg/l. MCL for TTHM is 0.080 mg/l.

Lead and Copper. Results for 2014 testing of 20 samples: 12 detections for lead with an average detection of 0.0039 mg/l and a high of 0.01 mg/l; 20 detections for copper with an average detection of 0.1927 mg/l and a high of 0.318 mg/l. The action level for Lead is 0.015 mg/l. The action level for Copper is 1.3 mg/l.

Barium. Results for testing on September 14, 2007 indicate 0.0012 mg/l for Barium. MCL for Barium is 2 mg/l.

The District's Source Water Assessment Report, ODHS 2003, notes that "Temperature and specific conductance measurements suggest a very stable system, with a temperature of 42°F and a specific conductance of 40-41 µS/cm". In 2014, turbidity averaged 0.11 NTUs, with the highest reading of the year being 0.98 NTUs.

3.11.3 Regulatory Status

The District is in compliance with all water quality related regulatory requirements. OHA classified the spring as groundwater so only disinfection is practiced. The District's last OHA Water System Survey (May 9, 2013) noted that "No significant deficiencies or rule violations were identified." The system was also designated as an "outstanding performer" and as a result the next system survey will be conducted in 5 years (2018) rather than in the usual 3 years.

Booth Hill Reservoir

Concrete Spring Cap and High Flow Channel

Disinfection Building (left); Intake Structure (middle right); Concrete Spring Cap (lower right)

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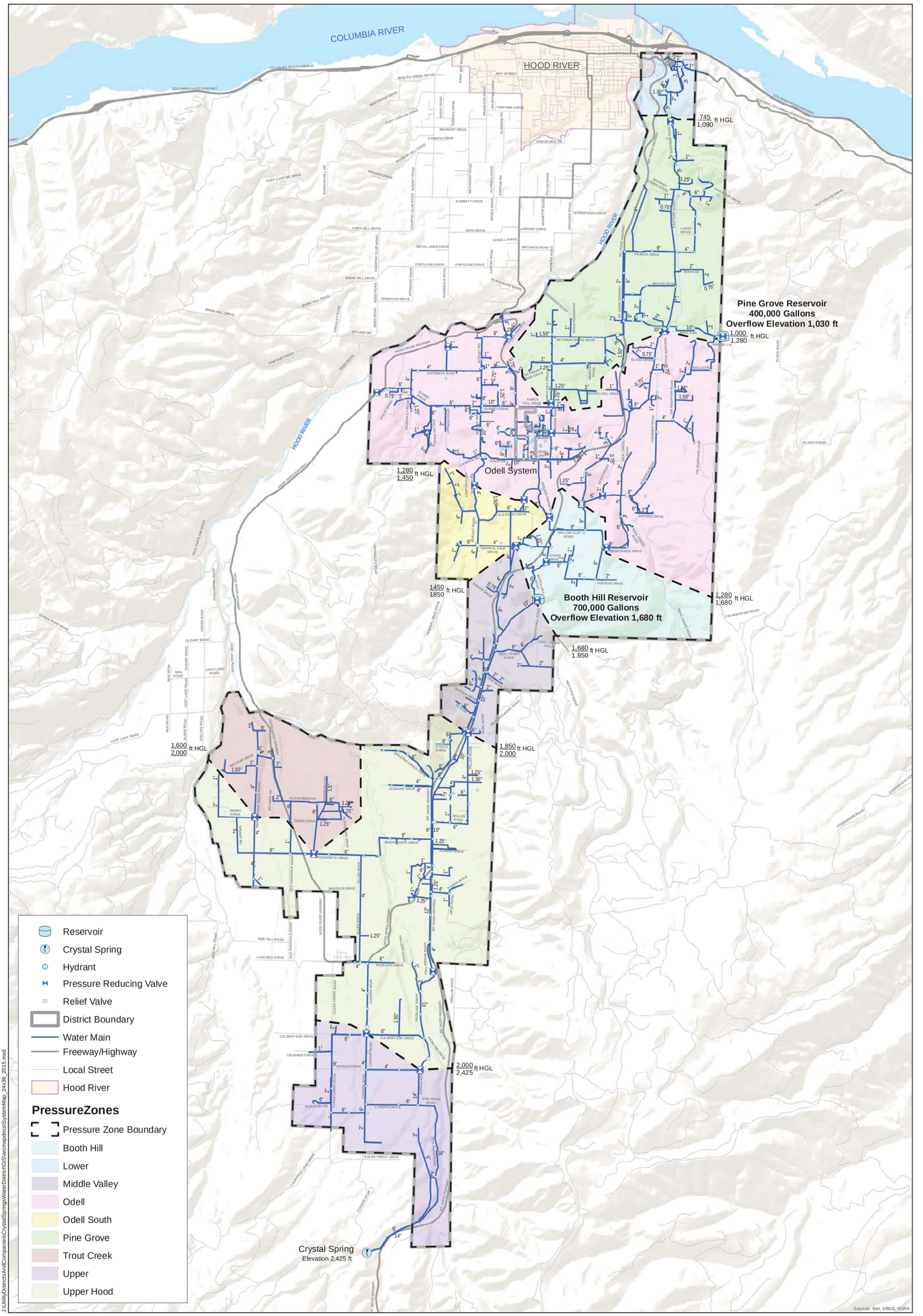

Figure 3.1
Existing Water System Map
Crystal Springs Water District

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SECTION 4 | LEVEL OF SERVICE GOALS

4.1 INTRODUCTION

"Level of service" ultimately refers to the quality of the water service provided to the customer, but the phrase also has implications for the District staff that are responsible for operating, maintaining, and administering the utility and for District officials who are ultimately responsible for the support and political will to champion the mission and needs of the utility. The provision of clean, healthy drinking water is one of the most important services a District provides and, consistent with this importance, the Crystal Springs Water District should and does endeavor to provide a relatively high level of service.

One of the primary objectives for a water system is the protection of public health and welfare. For utilizing and expanding a water system, it is also important to minimize adverse environmental impacts. Various agencies have promulgated rules that ultimately support these objectives and, at a minimum, every water system must comply with these rules and requirements.

4.2 GENERAL GOALS AND REQUIREMENTS

General level of service goals and requirements include:

- **Conveyance and delivery (goal):** adequate, consistent, and reliable delivery of water under all anticipated service conditions; capacity for system to deliver maximum day demand (MDD) plus fire flow (FF).
- **Pressurization (requirement):** a minimum of 20 psi system pressure must be maintained at all times (OAR 333-061-0025); customer services must have individual pressure reducing valves if system pressures exceed 80 psi. Generally, a goal of a minimum of 40 psi under normal (non-fire flow) conditions is preferable if practicably achievable. The 20 psi minimum system pressure requirement extends to the customer water meter.
- **Water quality (requirements):** comply with all Oregon Health Authority (OHA) requirements (see Section 3.11.1 for discussion). Water quality also includes aesthetic considerations that may or may not be related to specific regulatory concerns. Efforts to maintain or improve the aesthetic quality of the water provided is a goal consistent with the provision of a high level of service.

- **Fire protection (goal):** provide fire protection consistent with American Water Works Association (AWWA), Insurance Services Office (ISO), Oregon Fire Code, and local fire department requirements, recommendations, and standards.
- **Reliability (goals):** reliability as a goal is the ability of the water system and District staff to avoid or circumvent problems that adversely impact system performance. Reliability is enhanced by routine and timely maintenance and replacement, good design and construction, providing adequate water supply, providing alternate or backup facilities or equipment, and having a contingency plan for efficiently handling specific problems.

4.3 SPECIFIC GOALS

4.3.1 Water Supply

The water supply components (spring collection, intake, treatment, and transmission) should be sized to provide the maximum daily demand (MDD) within a 24-hour period. Sizing should also incorporate consideration of the planning period, design life, economics, and plans for future utilization and demands.

4.3.2 Treatment

In addition to meeting current regulatory requirements, treatment recommendations should consider and potentially incorporate, or facilitate incorporation in the future, measures to address anticipated regulatory changes (if applicable).

4.3.3 Fire Protection

Fire protection capabilities are typically based on the ability to deliver a minimum specified flow for a minimum specified duration. Recommended fire flows and durations for the Crystal Springs Water District are provided in Table 4.1.

Table 4.1: Fire Flow Goals

Land Use	Fire Flow Rate (gpm)	Fire Flow Duration (min.)	Equivalent Volume (gal.)
Residential			
Single Family/Duplex	1,000	60	60,000
Multi-Family	1,500	120	180,000
Commercial	2,000	120	240,000
Industrial	3,000	180	540,000

Actual fire flow requirements are building specific and alternatives may be developed to provide some of the requisite protection. Examples might include an engineered building sprinkler system or an onsite fire pump drawing from a surface water source. In some areas, typically small, peripheral service areas, fire protection may not be available via the water system. Fire protection to these areas is typically provided by a fire department equipped with tankers and other equipment for fighting rural fires. Appendix 4.1 includes current fire-flow requirements for buildings.

From a fire protection perspective, more fire flow capability is always better; however, no specified capability can guarantee protection from all fire-related scenarios.

Fire hydrant spacing for new construction should comply with requirements of the 2010 Oregon Fire Code (Appendix 4.1). The Crystal Springs Water District Design Standards (Appendix 4.2) includes additional provisions and details regarding hydrants and fire protection. District standards call for hydrant spacing of 500 feet in residential areas and 300 feet in commercial or industrial subdivisions.

4.3.4 Storage Reservoirs

Oregon has no requirement for the provision of finished water storage (reservoirs), but the State does have a requirement (OAR 333-061-0025) for maintaining a minimum system pressure of 20 psi at all times. Reservoirs are one of the most practical and economical means of meeting the pressurization requirement. For purposes of this water master plan, reservoir sizing is based on the standard design provision of three times the average daily flow plus fire flow reserve (3xADD+FF). Provision of needed storage capacity is best provided with two or more reservoirs (per service area) in order to facilitate service when one reservoir is off-line. Generally, more capacity is better from a reliability standpoint; however, too much capacity can result in lost chlorine residuals and formation of disinfection byproducts.

4.3.5 Pump Stations

Currently, the District has no pump stations. The following is applicable should the District add pump stations at a later date.

Pump stations (to service areas with reservoirs) should be designed to provide MDD with the largest pump out of service. Pump stations (to service areas without reservoirs) should provide PHD with the largest pump out of service. High service (fire) pumps may be

provided in cases where they are consistent with the fire protection goals and plans in the affected service area. Pump stations serving areas with no reservoirs or with inadequate reservoir capacity should be provided with emergency power generators (or designed to facilitate connection to a portable generator).

4.3.6 Transmission and Distribution

Transmission and distribution mains should be sized according to anticipated hydraulic requirements that may include the provision of fire flow. Normal line velocities are generally 5 feet per second (fps) or less to reduce headloss. Line velocities are typically higher during fire flow conditions. Reduction of headloss by increasing pipe diameter and reducing line velocities reduces pressure losses; consequently, proper sizing can improve fire flow capabilities. Systems designed to provide fire protection typically utilize an 8-inch minimum main size except for parts of a grid with lengths of less than 600 feet where 6-inch mains may be acceptable. AWWA and ISO do not recognize lines of less than 6-inch as providing fire protection.

Hydraulics, reliability, and water quality are generally enhanced with a "looped" water main configuration that minimizes the occurrence of single-feed or dead-end lines. Nevertheless, single-feed lines are commonly used for reservoir transmission mains and supply transmission mains. Dead-end mains should be avoided, but may be practicably unavoidable because of topography and existing development.

The Crystal Springs Water District Design Standards (Appendix 4.2) includes additional provisions and details regarding transmission and distribution improvements. The District has standardized on ductile iron class 52 pipe for mains and service lines larger than 2-inch in diameter, and has standardized on copper for services lines 2-inch and smaller.

4.3.7 Telemetry

Currently, the District has no telemetry. The following is applicable should the District add telemetry at a later date.

Telemetry should be considered for each key facility including intake flowmeter, treatment, pump stations (if applicable), and reservoirs. Telemetry provides alarm notification at a minimum. Important additional functions may include data acquisition and operational control.

4.4 DESIGN LIFE

Design life (or useful life) refers to the anticipated service life of an item or system component. Typical design life values are expressed in terms of "years of service" and reflect typical design, material, and construction standards associated with municipal water system infrastructure. Actual years of service may vary greatly according to the service demands and conditions – as well as the level of maintenance provided. Typical design lives, selected from *Asset management: A Handbook for Small Water Systems, September 2003 (EPA 816-R-03-016)*, are summarized below:

Wells and Springs	25-35 years
Intake Structures	35-45 years
Treatment and Chlorination Equipment	10-15 years
Storage Tanks (Reservoirs)	30-60 years
Pumps	10-15 years
Buildings	30-60 years
Electrical Systems	7-10 years
Computers	5 years
Transmission and Distribution Mains	35-40 years
Valves	35-40 years
Meters	10-15 years
Service Laterals	30-50 years
Hydrants	40-60 years

As a concept, "design life" is primarily used for planning and budgeting for replacement or significant rehabilitation. As such it is an important consideration in asset management. The values are only a starting point and should be adjusted and refined to reflect local conditions and experience.

4.5 DISTRICT STANDARDS

The Crystal Springs Water District Design Standards, dated May 2006, are included in Appendix 4.2. District Policies and Regulations, reprinted from the District's website, are included in Appendix 4.3. These standards and policies reflect the District's desire for a relatively high level of service from all new water system related construction within its

jurisdiction. District standards can also be used to specify makes and models in order to simplify operations and maintenance and the stocking of spare parts. In such cases, the specification of two or more makes/models will allow for competitive bidding.

4.6 CONFORMANCE AND IMPLEMENTATION

As a general guideline, water systems should be in conformance with the most current requirements and standards. However, as a practical matter many do not, simply because the requirements and guidelines have become more stringent over time. Many requirements – typically those associated with the Safe Drinking Water Act (SDWA) and Amendments and State (OHA) rules – do require immediate action to correct identified deficiencies. Other deficiencies, such as system configuration, material condition, or hydraulic deficiencies, may not trigger a regulatory mandate but still reflect a lower level of service because of compromised reliability or performance. The condition of mechanical and electrical components will also not typically trigger a regulatory mandate, but could cause severe problems or hardship to the District if failure occurs.

The promptness with which a community addresses known deficiencies and implements needed improvements is itself a measure of the level of service provided.

SECTION 5 | WATER DEMANDS ANALYSIS

5.1 INTRODUCTION

This section focuses on water demands and usage for the Crystal Springs Water District and includes water demand projections for future growth during the planning period.

Water demand analysis uses certain terms and abbreviations with considerable frequency. These terms are summarized below for convenience.

Average Daily Demand (ADD): total usage or production for the year divided by the number of days in the year.

Maximum Month Demand (MMD): total usage or production for the month with the highest total demand during the year, divided by the number of days in the month.

Maximum Day Demand (MDD): total usage or production for the day with the highest demand during the year. This may also be known or referred to as peak day demand.

Peak Hour Demand (PHD): total usage or production for the one-hour period with the highest demand during the year.

The demand parameters defined above are typically and variously expressed as:
Gallons per day (gpd)
Millions of gallons per day (mgd)
Gallons per capita per day (gpcd)

5.2 RECENT METERED (CUSTOMER) WATER USAGE

Metered water usage for the period January 2009 to December 2014 is presented in detail for customer billing categories in Table 5.1 and in summary form in Table 5.2. The District does not differentiate between customer classes such as residential, commercial, etc. as is commonly done elsewhere; nor does it track or retain such information. Customers are differentiated by meter size. Water rates are primarily based on actual usage (see Section 8.2); consequently, there has been little reason or incentive to utilize conventional categories of water consumption. Customer names are indicated on the District's detailed reports and review of these does allow estimates

of residential versus other uses by simply separating out those accounts with names that suggest something other than residential use. In addition, District staff were able to provide information on residential developments associated with larger (than ¾") meters. Residential water usage averaged 298,485 gallons in 2014, an average of 57.6 gpcd. Since water for irrigation purposes is provided by separate irrigation districts, the residential water provided by the Crystal Springs Water District is primarily used for domestic purposes. Water usage for single family residential domestic purposes is typically 50-70 gpd, so residential usage in the District is not excessive.

3/4" meter usage constitutes the bulk (66.8 percent) of total metered use. 1" meters (12.7 percent of total usage) and 2" meters (8.6 percent) are also well represented.

Total metered usage, based on a resident population of 5,186 persons in 2014, ranged from 88.4 gpcd (in July/August) to 114.8 gpcd (in May/June) with an annual average of 103.0 gpcd. A commonly used standard for estimating a community's water needs (for all uses: residential, commercial, industrial, etc.) is 100 gpcd based on the residential population. The District's usage is consistent with the standard.

There is not much variation in usage throughout the year, but in general, highest usage typically occurs in the fall and is probably associated with increased seasonal workers for the harvest, and usage associated with handling and processing the harvest. This is not true in all years – 2014 being one of them, where peak usage was in May/June. Table 5.2 shows the ratio of maximum month to annual average usage for the period 2009 to 2014. The ratio has declined relatively steadily from 1.30 in 2009 to 1.11 in 2011. The reason for this is not clear; nevertheless, the low maximum month to annual average does highlight that usage is relatively steady throughout the year.

Table 5.1: Metered Customer Usage Data

Usage (x1000 gallons) by Meter Size										
Year	**Period**	**"No Size"[1]**	**3/4"**	**1"**	**1.5"**	**2"**	**4"**	**6"**	**10"**	**Total**
2009	Jan. - Feb.	187	17,124	3,929	903	2,926	1,815	21	130	27,035
	Mar. - Apr.	234	21,175	4,321	752	3,615	1,085	6	39	31,227
	May - Jun.	246	18,058	4,228	956	3,807	505	0	39	27,839
	Jul. - Aug.	316	20,519	4,407	1,083	2,587	625	0	0	29,537
	Sep. - Oct.	481	27,928	5,693	485	3,978	3,240	1	0	41,806
	Nov. - Dec.	371	23,056	5,635	954	2,867	1,985	0	21	34,889
2010	Jan. - Feb.	389	19,271	4,555	913	2,666	2,510	0	0	30,304
	Mar. - Apr.	431	21,550	4,835	823	2,712	1,845	0	0	32,196
	May - Jun.	405	19,151	4,492	838	2,697	1,888	0	1	29,472
	Jul. - Aug.[2]	443	19,994	4,439	769	2,678	2,200	1	9	30,533
	Sep. - Oct.[3]	802	27,877	6,098	1,019	3,000	2,690	1	11	41,498
	Nov. - Dec.	558	21,089	5,062	624	2,456	2,005	0	1	31,795
2011	Jan. - Feb.	534	18,016	4,810	1,035	2,179	2,900	0	26	29,500
	Mar. - Apr.	490	19,179	4,670	924	3,573	2,635	0	0	31,471
	May - Jun.	424	17,648	4,240	794	2,149	2,500	0	0	27,755
	Jul. - Aug.	546	18,763	4,266	1,033	2,248	2,225	0	9	29,090
	Sep. - Oct.	878	21,387	5,026	1,032	2,858	3,745	0	37	34,963
	Nov. - Dec.	688	24,993	5,243	1,158	2,942	2,410	0	93	37,527
2012	Jan. - Feb.	484	17,446	3,946	1,020	2,110	1,710	0	232	26,948
	Mar. - Apr.	511	18,274	3,679	909	2,196	920	0	98	26,587
	May - Jun.	511	18,707	3,642	896	2,137	595	0	130	26,618
	Jul. - Aug.	634	20,357	4,139	834	2,465	650	0	78	29,157
	Sep. - Oct.	739	22,591	4,525	1,115	3,082	2,345	0	159	34,556
	Nov. - Dec.	705	22,442	5,172	929	2,892	2,170	0	329	34,639
2013	Jan. - Feb.	599	22,018	4,518	793	2,580	1,670	0	130	32,308
	Mar. - Apr.	574	18,163	4,167	624	2,069	510	0	129	26,236
	May - Jun.	641	18,883	3,854	1,023	2,321	570	0	134	27,426
	Jul. - Aug.	711	20,484	4,122	1,155	2,678	975	0	130	30,255
	Sep. - Oct.	849	24,494	4,607	1,474	3,066	2,125	0	20	36,635
	Nov. - Dec.	708	20,938	4,556	1,073	2,703	2,735	0	73	32,786
2014	Jan. - Feb.	1,004	18,171	4,109	1,173	2,520	2,125	0	6	29,108
	Mar. - Apr.	863	20,479	4,231	1,063	2,637	935	0	222	30,430
	May - Jun.	690	27,306	3,664	1,119	3,071	455	0	9	36,314
	Jul. - Aug.	871	19,111	3,784	1,260	2,703	675	0	10	28,414
	Sep. - Oct.	1,124	23,572	4,312	1,529	3,086	2,330	1	111	36,065
	Nov. - Dec.	1,205	21,615	4,668	1,460	2,663	2,990	0	64	34,665
2014	Total	5,757	130,254	24,768	7,604	16,680	9,510	1	422	194,996
2014	Average	16	357	68	21	46	26	0	1	534
2014	% of Total	3.0	66.8	12.7	3.9	8.6	4.9	0.0	0.2	100.0

[1] "No size" refers to new meters, recently installed, typically 3/4", whose size is not registered or communicated from the data collection to the billing program and printout.

[2] Jul. – Aug. 2010 "2,200" for 4" meter is a guesstimate; actual number (101,972) is erroneous.

[3] Sep. – Oct. 2010 "3,000" for 2" meter is a guesstimate; actual number (94,153) is erroneous.

Table 5.2: Metered Customer Usage Summary

Year	Average Usage		Monthly Usage				Maximum Monthly to Average Ratio
			Maximum		Minimum		
	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)	
2009	526,940	366	685,344	476	443,197	308	1.30
2010	536,433	373	680,295	472	483,148	336	1.27
2011	521,386	362	615,197	427	455,000	316	1.18
2012	489,055	340	567,852	394	435,852	303	1.16
2013	508,619	353	600,574	417	430,098	299	1.18
2014	534,236	371	595,311	413	465,803	323	1.11
2009-2014	519,445	361	624,096	433	452,183	314	1.20

5.3 RECENT PRODUCTION DEMAND

Water supply to the District's system is via the intake at Crystal Spring. Monthly water production for calendar year 2014 is shown in Table 5.3 which is based on District data. There were some errors and inconsistencies in the data; corrections and minor modifications were employed as needed and the results are believed to be within a few percent of the real value and sufficiently accurate for general planning purposes. Production water totals are based on flowmeter totalizer readings that are recorded every several days. Totals are manually logged and the collected data is later entered into a District spreadsheet.

Spring flow in Table 5.3 is calculated as the metered intake production plus the weir overflow located at the intake structure. Weir overflow height in inches is recorded at the same time and with the same frequency as the flowmeter readings. The weir measurements are spot measurements; consequently, estimates of flow associated with the period since the last reading are estimated by using a formula that relates flow to weir overflow water depth and the assumption that flow is constant over that period. Since flow may not be constant, the overflow quantity is probably less precise than the flowmeter based quantity for the intake. Table 5.3 is set up as a water balance to assist with the determination of unaccounted-for water in Section 5.4. Actual metered customer usage is approximately 1/3 of the metered intake (production) water, with the balance consisting of overflow water at the reservoirs and unaccounted-for water. Intake (production) varied little throughout the year (2014) with a monthly average of 1,228 gpm, a February low of 1,178 gpm (95.9 % of average), and an August high of 1,312 gpm (106.8 % of average). This small

variation in monthly water production is a noted characteristic of the system and was discussed in previous master plans as far back as the 1963 Plan. The limited variation is attributed to the high proportion of the water that is unaccounted-for or is discharged via overflows at the reservoirs.

Table 5.3: Year 2014 Water Balance

Month	Spring Flow[1] (Minimum)	Intake Production	Weir Overflow	Metered Usage[2]	Reservoir Overflow and Unaccounted-for Water[3]
a. gallons per day (gpd)					
January	2,851,391	1,701,618	1,149,773	493,356	1,208,262
February	2,910,840	1,696,392	1,214,448	493,356	1,203,036
March	4,056,951	1,717,470	2,339,481	498,852	1,218,618
April	4,313,174	1,737,502	2,575,672	498,852	1,238,650
May	3,996,038	1,756,086	2,239,952	595,311	1,160,775
June	4,054,869	1,808,885	2,245,984	595,311	1,213,574
July	3,519,694	1,832,395	1,687,299	458,290	1,374,105
August	3,843,673	1,889,401	1,954,272	458,290	1,431,111
September	3,740,426	1,814,310	1,926,116	591,230	1,223,080
October	3,431,858	1,729,093	1,702,765	591,230	1,137,863
November	3,253,566	1,801,335	1,452,231	568,279	1,233,056
December	2,822,700	1,741,942	1,080,758	568,279	1,173,663
b. gallons per minute (gpm)					
January	1,980	1,182	798	343	839
February	2,021	1,178	843	343	835
March	2,817	1,193	1,625	346	846
April	2,995	1,207	1,789	346	860
May	2,775	1,220	1,556	413	806
June	2,816	1,256	1,560	413	843
July	2,444	1,272	1,172	318	954
August	2,669	1,312	1,357	318	994
September	2,598	1,260	1,338	411	849
October	2,383	1,201	1,182	411	790
November	2,259	1,251	1,008	395	856
December	1,960	1,210	751	395	815
c. as percentage of production water					
January	167.6	100.0	67.6	29.0	71.0
February	171.6	100.0	71.6	29.1	70.9
March	236.2	100.0	136.2	29.0	71.0
April	248.2	100.0	148.2	28.7	71.3
May	227.6	100.0	127.6	33.9	66.1
June	224.2	100.0	124.2	32.9	67.1
July	192.1	100.0	92.1	25.0	75.0
August	203.4	100.0	103.4	24.3	75.7
September	206.2	100.0	106.2	32.6	67.4
October	198.5	100.0	98.5	34.2	65.8
November	180.6	100.0	80.6	31.5	68.5
December	162.0	100.0	62.0	32.6	67.4

[1] *Sum of Intake plus measured Overflow; does not include flow that may bypass.*

[2] *Metered usage is based on bi-monthly meter readings - usage is averaged over the two months.*

[3] *Intake minus Metered Usage.*

5.4 UNACCOUNTED–FOR WATER

District staff do not track water that is used but not metered, nor do they estimate and track water that is lost through identified leaks. Overflows at the reservoirs are part of the historic and current means of regulating system pressure in the District's system and, as currently configured, essential for its overall operation. The overflows are metered: there is an overflow flowmeter (installed June 2013) on the overflow line at the Pine Grove Reservoir and an inlet and an outlet flowmeter on the Booth Hill reservoir (the overflow is computed as the difference between the two meters). Strictly speaking, the overflows are quantified system uses and not lost or wasted water. Table 5.4 includes the overflow quantities and uses a water balance calculation to determine the unaccounted-for water. Unaccounted-for water in the Crystal Springs Water District represents a combination of undocumented use (such as line or hydrant flushing), losses (that could be estimated) associated with major leaks that were discovered and repaired, and water lost through unknown leaks scattered throughout the system. A certain amount of loss is inevitable and depends on many factors such as total pipe length, water usage, and water pressure. OAR 690-086-0150 (4)(e) requires a regularly scheduled and systematic leak detection program if an annual water audit indicates that leakage exceeds 10 percent.

Table 5.4 includes recent estimates of unaccounted-for water. Recent unaccounted-for water is approximately 23 - 38% of production water.

Table 5.4: Year 2014 Reservoir Overflow and Unaccounted-for Water

Month	Intake Production	Metered Usage	Booth Hill Overflow	Pine Grove Overflow	Unaccounted-for Water
a. gallons per day (gpd)					
January	1,701,618	493,356	632,151	151,104	425,007
February	1,696,392	493,356	605,612	141,988	455,436
March	1,717,470	498,852	618,117	152,855	447,646
April	1,737,502	498,852	627,933	132,398	478,319
May	1,756,086	595,311	660,113	104,312	396,351
June	1,808,885	595,311	566,181	91,349	556,044
July	1,832,395	458,290	546,970	136,880	690,255
August	1,889,401	458,290	612,355	118,843	699,913
September	1,814,310	591,230	637,186	117,930	467,964
October	1,729,093	591,230	626,623	121,037	390,203
November	1,801,335	568,279	615,336	133,659	484,061
December	1,741,942	568,279	630,235	130,471	412,957

b. gallons per minute (gpm)					
January	1,182	343	439	105	295
February	1,178	343	421	99	316
March	1,193	346	429	106	311
April	1,207	346	436	92	332
May	1,220	413	458	72	275
June	1,256	413	393	63	386
July	1,272	318	380	95	479
August	1,312	318	425	83	486
September	1,260	411	442	82	325
October	1,201	411	435	84	271
November	1,251	395	427	93	336
December	1,210	395	438	91	287
c. as percentage of production water					
January	100.0	29.0	37.2	8.9	25.0
February	100.0	29.1	35.7	8.4	26.8
March	100.0	29.0	36.0	8.9	26.1
April	100.0	28.7	36.1	7.6	27.5
May	100.0	33.9	37.6	5.9	22.6
June	100.0	32.9	31.3	5.1	30.7
July	100.0	25.0	29.9	7.5	37.7
August	100.0	24.3	32.4	6.3	37.0
September	100.0	32.6	35.1	6.5	25.8
October	100.0	34.2	36.2	7.0	22.6
November	100.0	31.5	34.2	7.4	26.9
December	100.0	32.6	36.2	7.5	23.7

5.5 CURRENT WATER DEMANDS

Current (year 2015) water demands are conservatively estimated from recent (year 2014) metered customer data primarily to establish a basis for projecting future water demands. Average day demand (ADD) is estimated at 540,000 gpd. Maximum month demand (MMD) is estimated at 700,000 gpd based on a peaking factor of 1.3. Maximum day demand (MDD) is estimated at 920,000 gpd based on an estimated maximum day peaking factor of 1.7.

Demand parameters are often expressed in several different ways. One expression that may not be intuitively clear is the term "gallons per day per equivalent dwelling unit," abbreviated as gpd/EDU. Generally the term refers to the amount of water used by a typical residential unit in one day. Non-residential water consumption or demand can be characterized by dividing the non-residential use by the typical residential use to determine the number of residential equivalents. The total number of EDUs for a district

includes both the number of residential units and the number of residential equivalents (for the non-residential customers or uses). The actual methodology for calculating EDUs may vary from year to year and community to community. For Crystal Springs Water District in the year 2014:

Residential water usage = 298,485 gpd

Number of residential units = 1,987

gpd per residential unit = 150.2

Total metered usage = 534,236 gpd

Divide by 150.2 gpd/residential unit to get total EDUs = 3,557 EDUs

Year 2014 EDUs = 3,557

Year 2015 EDUs = 3,585 (based on estimated 0.8% growth)

Peak hourly demand (PHD) is estimated based on an empirical formula (source: *Water System Design Manual, Washington State Department of Health, 2001*):

PHD = (MDD/1440)[(C)(N)+F]+18
Where: PHD = Peak hourly demand (gpm)
C = Coefficient associated with ranges of EDUs
N = Number of EDUs
F = Factor associated with ranges of EDUs
MDD = Maximum day demand (gpd/EDU)

Current EDUs (equivalent dwelling units): 3,585
For a range of N (> 500): C = 1.6 and F = 225
MDD = 920,000 gpd/3,585 EDUs = 256.6 gpd/EDU
PHD = (256.6/1440)[(1.6)(3,585)+225]+18 = 1,080 gpm = 1,550,000 gpd

Estimated current (year 2015) customer water demand and associated peaking factors are summarized in Table 5.5.

Table 5.5: Estimated Current (Year 2015) Customer Water Demand

Parameter	(gpd)	Demand (gpcd)[1]	Demand (gpd/EDU)[2]	Demand Peaking Factor
ADD	540,000	102	150.2	1.0
MMD	700,000	133	195.3	1.3
MDD	920,000	174	256.6	1.5
PHD	1,550,000	294	432.4	2.9

[1] *5,277 persons.*
[2] *3,585 EDUs.*

5.6 WATER CONSERVATION

The District has not completed a water conservation and management plan, nor have they been required to complete one. The District does not have a conservation program; however, the District does have certain policies which encourage conservation. Use of water for irrigation purposes is prohibited. The District's rate structure encourages conservation since billings are primarily based on usage. Customers can benefit financially, through reduced billings, by implementing conservation measures that reduce their consumption.

District policies include the right to restrict water or give preference in the event of a water shortage. The District also reserves the right to refuse or discontinue water service to premises if there is wasteful or negligent water use that seriously affects the general service needs of the District.

At some point, the District may be required to complete a water management and conservation plan (prepared in accordance OAR 690-86-140 and submitted to the Oregon Water Resources Department). The requirement is often included as a condition on documents related to water rights.

For general planning purposes, no additional reductions in water demand or unaccounted-for water are incorporated into the projections for future water demand. Reduction or elimination of the reservoir overflows and reduction of unaccounted-for water would significantly reduce overall water system demand in terms of production water passing through the intake.

5.7 PROJECTED WATER SYSTEM GROWTH

Projected water system growth is anticipated to approximately match that of projected population growth. A 0.8 % average annual growth rate (AAGR) is used throughout. This growth does not include impacts of major changes to the water system that would occur if other districts (such as Odell or Parkdale) were assimilated, or if a large commercial or industrial facility with high water demands was developed in the District.

5.8 PROJECTED WATER DEMAND

5.8.1 Projected Customer Water Demand

Projected customer water demands for the Crystal Springs water system are shown in Table 5.6. All parameters noted, except PHD, increase by 0.8% per year for general planning purposes and represent an average over the planning period. Actual system growth may be much more rapid, or slower, at times and as such could impact timing of critical improvements. PHD is calculated according to the equation included in Section 5.5.

Table 5.6: Projected Customer Water Demands

Year	Population	EDUs	Water Demands			
			Average	Max. Month	Max. Day	Peak Hour
			gallons per day x 1,000			
2014	5,186	3,557	530	690	910	1,540
2015	5,277	3,585	540	700	920	1,550
2020	5,440	3,731	560	730	950	1,610
2025	5,661	3,883	580	760	990	1,670
2030	5,891	4,040	610	790	1,030	1,730
2035	6,131	4,204	630	820	1,070	1,800
			gallons per minute (gpm)			
2014	5,186	3,557	370	480	630	1,070
2015	5,277	3,585	370	490	640	1,080
2020	5,440	3,731	390	510	660	1,120
2025	5,661	3,883	400	530	690	1,160
2030	5,891	4,040	420	550	720	1,200
2035	6,131	4,204	440	570	750	1,250

All water demand figures rounded.

5.8.2 Projected Water System Production Demand

Projected water system demands for the system as a whole including customer usage, reservoir overflows, and unaccounted-for water are shown in Table 5.7. Peak hour demands may be met by a combination of waters from storage and production water from the intake. The 2035 maximum day demand is 1,600 gpm. This is less than the minimum monthly spring flow noted in Table 5.3 (1,960 gpm).

Table 5.7: Projected Water System Demands[1]

Year	Water Demands			
	Average	Max. Month	Max. Day	Peak Hour
	gallons per day x 1,000			
2014	1,770	1,930	2,140	2,770
2015	1,770	1,930	2,150	2,780
2020	1,800	1,960	2,190	2,840
2025	1,820	1,990	2,230	2,900
2030	1,840	2,020	2,270	2,970
2035	1,870	2,060	2,310	3,040
	gallons per minute (gpm)			
2014	1,230	1,340	1,490	1,920
2015	1,230	1,340	1,490	1,930
2020	1,250	1,360	1,520	1,970
2025	1,260	1,380	1,550	2,010
2030	1,280	1,410	1,570	2,060
2035	1,300	1,430	1,600	2,110

[1] *Projected customer demand plus annual averages for: Booth Hill overflow of 584,510 gpd, Pine Grove overflow of 120,375 gpd and unaccounted-for water of 441,556 gpd.*

All figures rounded.

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SECTION 6 | WATER SYSTEM ANALYSIS

6.1 INTRODUCTION

This section of the Water Master Plan assumes the reader is familiar with the previous sections. Focus of this section is on evaluations and analyses of the water utility with a goal of developing an understanding of current and future needs and developing strategies and improvements to address those needs and level of service goals. Costs, insofar as discussed, generally reflect considerations discussed in Section 7.2.

6.2 WATER DEMANDS

Water usage and demands are discussed in detail in Section 5. Current and projected water demands for design purposes are summarized in Table 5.7.

The resulting water demand projections are conservative based on the projected 0.8% average annual growth rate (AAGR) and the assumption, for planning purposes, that conservation considerations will not be used to reduce projected water demands. Metered customer demand is reasonable, but unaccounted-for water losses are relatively high; consequently, continued efforts at leak detection and correction are needed. Water conservation associated with the correction of water system deficiencies could result in significant reductions in system water demand as measured at the intake meter. Reduction or elimination of overflows at the reservoirs would also significantly reduce system water demand. Water losses tend to increase over time; consequently, some level of effort is required just to maintain the current levels.

6.3 SOURCE AND WATER RIGHTS – RECOMMENDATIONS

6.3.1 Spring Source

Available spring flows are well above projected year 2035 maximum day water system demand of 1,600 gpm; consequently there are no capacity issues with the source.

District water rights total 7.15 cfs (3,209 gpm); however, only 1.0 cfs (449 gpm) has been certficated. Permit 29377 has been extended to October 1, 2028 and will require action prior to that date to either develop the right or seek another extension. Permit 34196 has been extended to October 1, 2058 and will not require attention within the 20-year planning period.

6.4 WATER QUALITY

In general, water quality in Crystal Springs is excellent (see Section 3.11 for discussion). There are no specific water quality recommendations other than diligence in meeting regulatory requirements.

6.5 CAPACITY

6.5.1 General

Water system capacity is currently a significant issue primarily in the context of meeting local reservoir storage and fire flow requirements. Capacity, as it pertains to specific elements (supply, distribution, pumping, and storage), is discussed in Section 6.7.

6.5.2 Hydraulic Model

A hydraulic model of the water system was developed primarily to assess general capacity and capabilities of the water system. The model was created using InfoWater, a hydraulic modeling program developed by Innovyze, Inc. of Monrovia, California.

The model includes 988 pipes, 866 nodes, 50 valves (47 existing pressure reducing, pressure relief, and pressure sustaining valves; 3 proposed PRVs), and 4 storage reservoirs (Pine Grove, Booth Hill, proposed "West Side", and proposed "South").

6.6 VULNERABILITIES

This section focuses on major vulnerabilities of the water system as a whole; specific deficiencies and consequent, or associated, vulnerabilities are discussed elsewhere as applicable.

6.6.1 Climate Change

Climate change forecasts call for increased average annual temperatures that will result in increased glacial melt and consequent recession of the glaciers. Flow in Crystal Spring is understood to be significantly influenced by snow and glacier meltwater. As the glaciers recede, less meltwater will be created, implying that flow in Crystal Spring will diminish during the summer and fall when recharge from precipitation is nominal. Current intake production is approximately 60% of spring flow and actual metered customer consumption is approximately 15% of spring flow. Reducing or eliminating the reservoir overflows and unaccounted-for water could buffer the impact of potentially lower water availability in Crystal Spring in the future.

6.6.2 Slides

Slides and slumps are not uncommon in the area. Avoidance of known problem areas is the obvious solution but may not be possible based on local service requirements, limited alternatives for infrastructure location, and limited knowledge of the slide potential in any given area. Engineered solutions may be possible, but will require geotechnical evaluations of the sites in question. Slides often occur on a geological time scale; consequently, problems may not occur until well into the constructed life of the infrastructure.

6.6.3 Earthquakes

The Hood River County Natural Hazards Mitigation Plan (August 2012) includes a detailed discussion of earthquakes and potential impacts in Hood River County. (The Plan is available on the County's website.) Expected losses in Hood River County associated with a magnitude 8.5 Cascadia Subduction Zone earthquake off the Oregon Coast include: no casualties or deaths, no buildings extensively damaged, but over $3.8 million in economic damage. The 2012 Plan concludes that there is a moderate probability for a damaging earthquake during the next 50 years and that Hood River County has moderate vulnerability to that earthquake. The Plan assigns a moderate risk rating to earthquakes in Hood River County.

Critical facilities are designed to meet seismic code requirements, but the code has changed over the years; consequently, older structures, reservoirs in particular, may not meet current code requirements. In addition to direct damage to pipelines and reservoirs, earthquakes can also trigger landslides that may cause additional damage.

6.6.4 Infrastructure Deficiencies

This is a very broad category with most of the specifics more appropriately discussed elsewhere (Section 6.7). Some general comments are warranted here. Older systems often have elements that are functional but of an obsolete design and utilized well beyond the intended design life. These elements can be problematic and costly to maintain, and may harbor undetectable material deficiencies that could result in unforeseen and catastrophic failures. For Crystal Springs, the general concern is focused on aging water mains and potential for main breaks in higher pressure areas or in areas experiencing higher pressures as a result of new construction or PRV adjustments.

6.6.5 Security

All water systems have particular susceptibilities to security issues, and these issues are typically addressed in a vulnerability assessment and emergency response plan. System security has not been evaluated as part of this master plan; the District should review its emergency response plan and update it as appropriate. Proposed new water system facilities typically include basic security elements (fencing, lighting, locks, and alarms). Additional elements can be developed as warranted during the preliminary design phase of project development.

6.7 INFRASTRUCTURE

6.7.1 Water Supply

Capacity of the water supply system is adequate for Crystal Springs during the planning period. There are no specific recommendations, other than regular inspections and maintenance, and timely replacement of treatment system components in accordance with need. Replacement of the perforated collector piping associated with the Crystal Spring source will need to be addressed in the next 20-year master planning cycle.

6.7.2 Storage

6.7.2.1 Capacity Analysis

Total storage capacity of the existing reservoirs is **1,100,000 gallons** (Table 6.1).

Table 6.1: Existing Reservoir Storage Capacity

Existing Reservoirs	Volume (gallons)
Booth Hill	700,000
Pine Grove	400,000
Total	**1,100,000**

For the water system as a whole the recommended storage capacity is three times the average day demand (3xADD) plus fire flow (FF). Recommended FF is 3,000 gpm for 3 hours (540,000 gallon reserve). Table 6.2 projects storage capacity for the District as a whole. Additional capacity is needed throughout the planning period.

Table 6.2: Projected District Reservoir Capacity Needs

	Average Day Demand (ADD) (mgd)	3x ADD (mgd)	Reservoir Volume Needed at 3xADD + FF (MG)	Existing Reservoir Volume (MG)	Additional Volume Needed (MG)
District Total 2015	0.540	1.62	2.16	1.10	1.06
District Total 2020	0.560	1.68	2.22	1.10	1.12
District Total 2025	0.580	1.74	2.28	1.10	1.18
District Total 2030	0.610	1.83	2.37	1.10	1.27
District Total 2035	0.630	1.89	2.43	1.10	1.33

The recommended storage volume is consistent with prior master plans; however, the methodology varies somewhat. The 1991 Plan used the same basis of 3xADD plus FF, but fire reserve was based on the District's objective at that time of providing 500 gpm for two hours (60,000 gallons). With allowances for growth, the recommended total storage in the1991 Plan was 2.1 MG. The 2006 Plan used 2xADD plus FF plus an equalization allowance of 0.2xADD. The fire reserve in the 2006 Plan was based on 3,000 gpm for two hours. A total storage volume of 2.281 MG was recommended for year 2025 (the design year). Both the 1991 Plan and the 2006 Plan used metered customer usage as the basis for the computation. The District is working toward the elimination of the reservoir overflows and in reducing unaccounted-for water; consistent with these objectives, the current plan also bases the computation on metered customer demand. An equalization allowance is not explicitly included; an allowance for equalization is implicit in the 3xADD methodology. The current recommendation uses a fire reserve based on 3,000 gpm for three hours in accordance with current fire code standards.

6.7.2.2 Additional Reservoir Storage

Previous District Master Plans proposed two new reservoirs: a new 500,000 gallon reservoir south of Kollas road and west of Odell Creek, and a new 800,000 gallon reservoir off Cooper Spur Road near Evans Creek Drive. These have been renamed in this Water master Plan Update as "West Side Reservoir" and "South Reservoir" respectively. Site locations for the two

reservoirs are currently being identified by District staff and, while in the general areas identified in the previous plans, some of the locations considered do not necessarily correspond to the more site specific names used in the previous plans. Proposed maximum water surface elevations are approximately 1,280 feet for the West Side Reservoir and 2,420 feet for the South Reservoir. Table 6.3 and Table 6.4 provide opinions of probable cost for the two reservoirs. Note: costs include an allowance for the associated transmission mains. The costs are based on the locations noted in the previous Plans – alternate sites will require modifications of the costs to reflect the different site, access, and transmission requirements. Land acquisition costs have not been included in Tables 6.3 and 6.4 – these could be significant for some sites.

Table 6.3: West Side 500,000 Gallon Reservoir - Opinion of Probable Cost[1]

Item	Quantity	Units	Unit Cost	Total Cost[2]
Mobilization	1	LS	$70,000	$70,000
Site Preparation	1	LS	$40,000	$40,000
Reservoir (nominal 500,000 gallon)	500,000	Gal.	$0.90	$450,000
12-inch Transmission Main	5,200	LF	$180	$936,000
Misc. Pipe, Valves, connections	1	LS	$50,000	$50,000
Electrical and Telemetry	1	LS	$35,000	$35,000
Misc. Site Restoration	1	LS	$20,000	$20,000
Construction Subtotal				**$1,601,000**
Contingencies @ 20%				$320,000
Geotechnical				$20,000
Engineering and Construction Observation @ 20%				$320,000
Legal and Administration @ 5%				$80,000
OPC Total				**$2,341,000**

[1]Based on 2006 plan location.
[2] Totals rounded to nearest $1,000.

Table 6.4: South 800,000 Gallon Reservoir - Opinion of Probable Cost[1]

Item	Quantity	Units	Unit Cost	Total Cost[2]
Mobilization	1	LS	$80,000	$80,000
Site Preparation	1	LS	$40,000	$40,000
Reservoir (nominal 800,000 gallon)	800,000	Gal.	$0.90	$720,000
12-inch Transmission Main	1,000	LF	$180	$180,000
Misc. Pipe, Valves, connections	1	LS	$50,000	$50,000
Electrical and Telemetry	1	LS	$35,000	$35,000
Misc. Site Restoration	1	LS	$20,000	$20,000
Construction Subtotal				**$1,125,000**
Contingencies @ 20%				$225,000
Geotechnical				$20,000
Engineering and Construction Observation @ 20%				$225,000
Legal and Administration @ 5%				$56,000
OPC Total				**$1,651,000**

[1]Based on 2006 plan location.
[2] Totals rounded to nearest $1,000.

6.7.2.3 Deficiencies

The reservoirs were recently (November 2014) cleaned and inspected and are in very good condition with few deficiencies (see Section 3.5). The deficiencies can be addressed as part of general water system maintenance.

6.7.3 Distribution and Transmission

6.7.3.1 General

An assessment of Crystal Spring's distribution and transmission system was developed primarily through map review, review of recent construction and improvements, modelling, and information from staff on problem areas.

6.7.3.2 Model Set-up and Calibration

The Crystal Springs Water District water system was modeled in order to perform an analysis of the existing water system, future demand scenarios, and recommended improvements. The hydraulic model was developed for this Water System Plan by using the District's current GIS data for the water system, including waterlines and vault stations, County and State Lidar data for the area, and a compilation of fire hydrant data from the local fire Districts.

A steady state hydraulic model was run using the spring and the storage tanks as the source of supply for the system. The storage tanks were modeled as completely full, Booth Hill at a water level of 24 feet and Pine Grove at a water level of 16 feet, since they are both typically overflowing. All existing main and bypass valves settings and locations were imported from GIS data. Pipe locations, lengths, diameters, and materials were imported from GIS data. The system contains a variety of pipe materials: steel, iron, galvanized, and plastic, of varying ages. Since the condition of each of these pipes varies, even those of the same material, a single roughness coefficient (C-value) of 135 was used for all pipes within the system as the starting point.

Once the model was built, it was calibrated against real system data. The current average day demand (ADD) scenario with a spring flow of 1,230 GPM was used for calibration of the model. Demand and unaccounted for water quantities were combined and divided evenly among nodes throughout the District. During ADD, the smaller of a main and bypass valve is typically open. Thus, the larger of two valves in parallel at any location within the system was set as closed. The spring flow entering the system varies based on the amount of water being used within the system and the amount overflowing from the reservoirs. The model was adjusted (demand, C factor, and valve settings) until the spring flow, the overflow volume from Pine Grove, and the overflow volume from Booth Hill were all approximately equal (within 5 per cent) to their current average values.

After initial calibration, low pressure areas within the model that exist during ADD were also confirmed with the District staff. Similarly, certain valves within the system are often closed during ADD. The District also provided fire flow data collected from the Parkdale Fire District between 2013 and 2014. For fire flow tests within the model, the smaller of two valves in parallel at any location within the system was closed. Exact conditions and flows within the system during the fire flow tests were not known, but the static and dynamic pressure along with fire flow at each hydrant was recorded.

Some hydrant flow test data matched up well with the model results, while others varied. For the hydrants that did not correspond, the model tended to underestimate the amount of flow available. Adjusting the C-factor only provided minimal difference, and it was decided to leave it as a single value. There were also some

discrepancies in elevation between the field data and Lidar data. Because the model was built using best available technology (GIS databases and Lidar) and because the fire flow estimates were conservative where it did not match the hydrant flow tests, it was determined that the model was calibrated for purposes of this study.

6.7.3.3 Model Results and Analysis

With the model calibrated, demand scenarios were run modeling existing infrastructure and with proposed improvements. The model was run for maximum day demand plus fire flow for existing and 2035 conditions. The results for selected locations in the existing and future system are indicated in Table 6.5 on the following page. The selected locations are indicated on Figure 6.1.

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Table 6.5: Water System Model Results

Item	Node	Location	Zone	Target Fire Flow (gpm)	Existing System Fire Flow Availability (gpm) with 20 psi residual		Future System with CIPs Fire Flow Availability (gpm) with 20 psi residual		Comments
					at node	in system	at node	in system	
1	J940	London Dr and Jordan Rd	Upper	1000	>1000	>1000	>1000	>1000	
2	J858	Cooper Spur Rd near London Dr	Upper	1000	751	489	>1000	>1000	
3	J1076	Culbertson Dr near Cooper Spur Rd	Upper	1000	637	358	>1000	>1000	
4	J1504	Baseline Dr and Allen Rd	Upper Hood	3000	308	308	>3000	>3000	
5	J108	Hess Rd and N Hess Rd	Upper Hood	1000	551	551	552	552	on 4" line
6	J830	Hwy 35 and Cunningham Dr	Upper Hood	2000	>2000	1779	>2000	>2000	
7	J452	Allen Rd and Woodworth Dr	Upper Hood	1000	904	773	>1000	>1000	
8	J82	Trout Creek Ridge Rd south of Woodworth Dr	Upper Hood	1000	328	328	617	617	on 6" dead end line
9	J1074	West end of Baldwin Creek Dr.	Upper Hood	1000	>1000	>1000	>1000	>1000	
10	J158	Miller Rd and Harriet Dr	Upper Hood	1000	>1000	>1000	>1000	>1000	
11	J76	Trout Creek Ridge Rd and McCrum Dr.	Trout Creek	1000	500	500	978	697	8" looped line fed by 6" line
12	J696	Dee Highway near Billings Rd	Trout Creek	1000	593	550	>1000	709	6" looped line fed by 6" line
13	J738	Green Mountain Drive	Middle Valley	1000	388	388	494	494	high elevation
14	J1824	Hwy 35 and Neal Creek Rd	Middle Valley	3000	1824	1166	2197	954	on 10" line; nearby high elevation
15	J494	Hwy 35 and Endow Dr	Middle Valley	1000	>1000	>1000	>1000	>1000	
16	J190	Furrow Dr and Willow Flat Rd	Booth Hill	1000	686	686	>1000	>1000	
17	J2064	Bear Ridge Dr	Booth Hill	1000	>1000	808	>1000	>1000	
18	J184	Hwy 35 and Willow Flat Rd	Booth Hill	1000	>1000	>1000	>1000	>1000	
19	J262	Centralvale Dr and WyEast Rd	Odell South	1000	456	456	>1000	>1000	
20	J266	Sylvester Dr	Odell South	1000	300	300	>1000	>1000	
21	J642	Dee Hwy and Summit Dr	Odell	1000	536	536	>1000	>1000	
22	J1002	Davis Drive and Odell Hwy	Odell	2000	>2000	N/A	>2000	2000	
23	J1524	Stadelman Dr	Odell	3000	1806	N/A	>3000	>3000	
24	J514	Neal Mill Rd and Lower Mill Rd	Odell	3000	980	757	>3000	>3000	
25	J1020	Chevron Dr and Willow Rd	Odell	3000	2105	N/A	>3000	>3000	
26	J330	Ehrck Hill Dr and Lingren Rd	Odell	1000	712	712	>3000	>3000	
27	J540	WyEast Rd north of Chamberlain Dr	Odell	1000	>1000	>1000	>1000	>1000	
28	J1808	Fir Mountain Loop	Odell	1000	150	150	384	384	on 4" line
29	J2066	Wells Dr	Odell	1000	412	412	>1000	>1000	
30	J246	Glass Rd west of Eastside Rd	Odell	1000	396	396	>1000	>1000	
31	J1416	Dethman Ridge Rd and Webster Rd	Pine Grove	1000	646	646	>1000	>1000	
32	J634	Mason Rd west of Eastside Rd	Pine Grove	1000	>1000	678	>1000	>1000	
33	J426	East end of Paasch Dr.	Pine Grove	1000	475	251	>1000	1000	
34	J754	Old Dalles Rd near Oakridge Dr	Pine Grove	1000	N/A	N/A	N/A	N/A	high elevation; residual pressure <20 psi
35	J734	Eastside Rd near Panorama Pt	Pine Grove	1000	399	N/A	>1000	930	
36	J730	Highline Rd	Lower	1000	280	N/A	>1000	930	
37	J1092	Highline Rd and Riverview Dr	Lower	1000	275	N/A	>1000	930	

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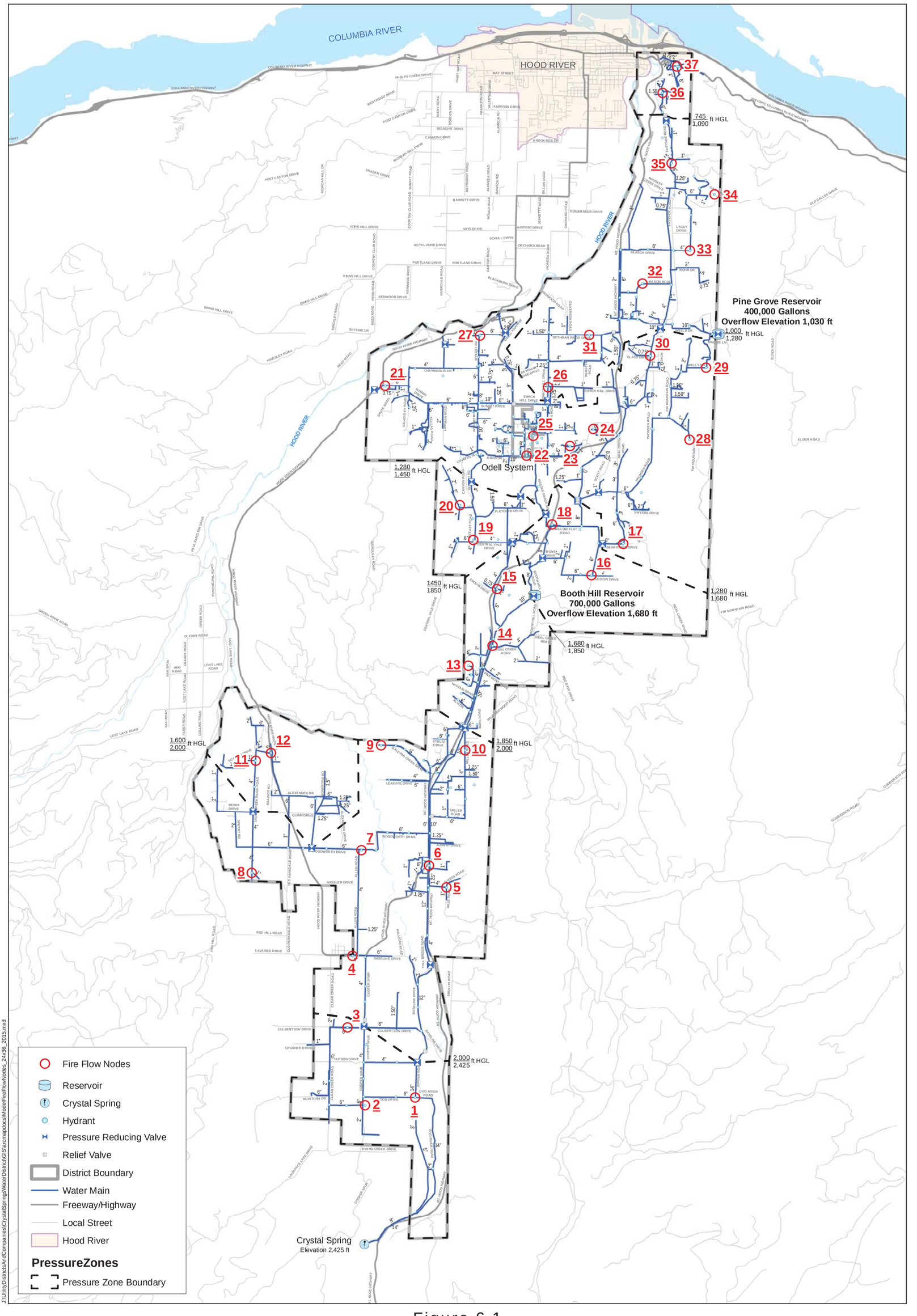

Figure 6.1
Model Fire Flow Nodes
Crystal Springs Water District

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In general, the model showed that there are several areas of low pressure and low fire flow within the District. This is related to a large degree with undersized pipe which limits the flow. Undersized pipe will have extremely high velocities and headloss during a fire event. Previous analysis have been for the District to provide lower fire flow than is currently the goal. Thus, the smaller pipe sizes may have been more adequate. Also, given the high pressure in areas throughout the system, smaller diameter pipes help to keep residual pressure within an acceptable range. However, providing 1,000 gpm fire flow through 6-in diameter pipe and 2,000 gpm through a 10-inch diameter pipe is difficult due to high headloss.

The recommended improvements were able to address several key deficiencies within the existing system. Some of these improvements were carried over from previous Water System Master Plans and address areas that have had problems for years. Adding a West Side Reservoir near Odell and connecting to the system with a 12-inch diameter pipe allow the District to significantly improve fire flows to Odell and the industrial area. Upsizing the main line connecting the Booth Hill Reservoir with Odell and looping the industrial area near Neal Creek Mill allow the District to fully provide 3,000 gpm to this area. Similarly, upsizing portions of the system along Highway 35 near Booth Hill help to provide increased flow to all of the District north of this area.

Upsizing numerous 4-inch diameter pipes throughout the District will provide increased fire flow to desired levels, as can be seen on Furrow Drive, Dethman Ridge Drive, Glass Drive, Wells Drive, and elsewhere. Many of these are older pipes in need of replacement, and multiple upsized lines will add system redundancy. In areas such as along Centralvale Drive and Wyeast Road, the increased pipe size both improved fire flow and removed a section with flow velocities above 6 ft/sec during normal conditions.

Adding a South Reservoir provides a level of redundancy and fire protection for the southern portion of the District. Along with upsizing several key waterlines, this would allow the District to fully provide industrial fire flow to Parkdale in the future. Model results also show that there are problem areas within the existing and future systems which the proposed improvements cannot completely alleviate. Some fire hydrants are on 4-inch diameter lines, such as on Hess Road and Fir Mountain Loop.

These hydrants cannot provide 1,000 gpm, even if pipes are upsized upstream as recommended. Similarly, hydrants fed by a single 6-inch diameter line, such as those on Trout Creek, will have improved flow with recommended improvements, but may still be unable to provide 1,000 gpm. The industrial area near Neal Creek Road and Highway 35 had improved flow with proposed improvements, but the area is fed primarily by a 10-inch diameter line. Other areas of the District, such as on Green Mountain Road and Old Dalles Road, struggle to provide a residual pressure of 20 psi due to significant elevation increases. Adding pumps or localized reservoirs would be the only way to address these deficiencies.

As proposed improvements are implemented and pipe sizes are increased and reservoirs added, pressures will go up downstream. The PRV settings upstream of these pipes will need to be adjusted on a case by case basis to keep pressures within an acceptable range, and new PRVs are included with the proposed improvement where needed.

6.7.3.4 Unaccounted-for Water

Unaccounted-for water losses currently total 23 - 38% and indicate that the water system has excessive losses. Normally leak detection would be recommended; however, reducing the losses through leaks would likely increase the overflows at the reservoirs. The District is currently evaluating the feasibility of eliminating the overflows. Elimination of the overflows should be followed with system-wide leak detection. Follow up replacement of leak-prone lines should also reduce water losses as well as O&M costs associated with emergency main repairs.

6.7.4 Pumping

There are no existing pump stations in the District.

6.7.5 SCADA and Telemetry

The District has a basic hard-wired telemetry system at the spring for the sodium hypochlorite generator, which includes an autodiater. There is no SCADA or telemetry which links the entire water system. All data is collected and transcribed manually. The District is currently evaluating the feasibility of eliminating the reservoir overflows. Part of this evaluation includes consideration of adding SCADA and telemetry.

6.8 WATER SYSTEM MANAGEMENT

6.8.1 Planning

The District does not have a ***Water Conservation Management Plan*** (WMCP) and has not been required to complete one. OAR 690-086-0100(1) states that *"Municipal water suppliers are encouraged to prepare water management and conservation plans, but are not required to do so unless a plan is prescribed by a condition of a water use permit; a permit extension; or another order or rule of the Commission." Future water rights related work that requires action by the Oregon Water Resources Department (OWRD) is likely to trigger a requirement that the District prepare a water management and conservation plan consistent with the provisions of OAR Chapter 690, Division 86; and submit the plan to OWRD for review and approval. A WMCP must be updated every five years.*

A general recommendation is to update the Water Master Plan every 5- 10 years depending on the extent of changes to the community and water system. The next update for the Crystal Springs Water District should be undertaken by year 2025. Budget $70,000 - actual cost may vary according to issues and level of detail desired.

6.8.2 Asset Management

The District should consider developing an asset management program. Asset management is a proactive approach that estimates when critical upgrades or replacement of infrastructure is needed based on condition and design life. It allows the utility to plan well in advance of need and therefore budget more effectively. It also helps minimize management by crisis or urgent need. Initial efforts can be quite labor intensive, since a detailed inventory that includes each component in the water system must be made along with an evaluation of the assets condition and remaining life.

Periodic leak detection surveys of the water system are recommended as general practice to maintain or possibly reduce overall system water losses. It can also provide data for an asset management program for refining the design life estimates for local conditions, and for prioritizing replacement projects. Many communities have found the costs of leak detection to be largely offset by the savings in cost associated with the otherwise lost water.

6.8.3 Operations and Maintenance (O&M)

Most of the recommended capital improvements will not result in increased O&M costs; however, O&M costs are subject to inflationary pressures, so annual increases are typically required. Budgets and water rates are typically adjusted to take recent or anticipated changes into account; however, system deficiencies that have not been addressed can increase O&M costs. This may occur in ways and to an extent not easily foreseen; and may take the form of emergency (overtime) call outs and extra cost, interim measures that may be needed until the problem can be addressed correctly, and un-budgeted emergency projects of potentially significant expense. Over time, such costs can add significantly to the overall utility budget.

Recommended O&M tasks for the distribution system include:

- Valve exercising (once per year on main lines and once every 3-4 years on other lines).
- Hydrant exercising (once per year) and repairs as needed.
- Periodic flushing of dead-end lines.

SECTION 7 | CAPITAL IMPROVEMENT PLAN (CIP)

7.1 INTRODUCTION

This section focuses on recommended capital improvements. The CIP is not exhaustive and does not include many smaller projects or elements that would be more properly characterized as general O&M.

7.2 OPINIONS OF PROBABLE COST (OPCs)

7.2.1 Introduction

Opinions of probable cost (OPCs) developed in the Water Master Plan are preliminary in nature and based on the level and extent of planning completed. It will be necessary to update costs as specific projects proceed and a more detailed understanding of the issues and opportunities is developed.

For general planning purposes, contingencies, engineering, and administration costs are determined on a percentage-of-construction cost basis (see Sections 7.2.3-7.2.5). This is generally most accurate for larger projects. Smaller projects, undertaken independently, may have additional costs associated with mobilization and/or economics of scale.

7.2.2 Construction Cost

Construction costs in the Plan are based on preliminary layouts and design parameters developed, construction bids for similar work, published cost guides, and the author's experience within the State of Oregon. It is common practice to relate the costs to a specific index that tracks changes in the national economy. A commonly referenced index is the Engineering News Record (ENR) Construction Cost Index. All costs in this Plan are referenced to the May 2015 ENR Construction Cost Index of 10036. Costs in the Plan can be updated in the future by multiplying the Plan cost by the current index value and dividing by 10036. This approach is generally valid for a 2 to 3 year period, after which the costs should be updated by an engineer. Construction bids and consequent costs can vary markedly according to the actual and perceived market and economic trends, level of competition, project size, etc.; this is particularly the case during periods of economic uncertainty or volatility.

Since the Engineer has no control over the cost of labor, materials, equipment or services furnished by others, or the future contractor's methods for determining prices or competitive bidding or marketing conditions, the Engineer's opinion of probable "total project cost and

construction cost" provided herein is made on the basis of the Engineer's experience and qualifications and represents the Engineer's best judgment as an experienced and qualified professional engineer familiar with the construction industry as it relates to water system improvements. The Engineer cannot and does not guarantee that proposals, bids, or actual total project or construction costs will not vary from the opinion of probable costs prepared herein.

7.2.3 Construction Contingencies

The Plan includes a contingency factor of 20 percent of the construction cost to allow for variables associated with the bid and construction process, consistent with the level of planning included.

7.2.4 Engineering, Construction Observation, & Construction Management Costs

The Plan includes a general planning allowance of 20-25 percent of the construction cost for engineering, construction observation, and construction management. The higher percentage is typically associated with more complex mechanical and electrical work.

7.2.5 Legal and Administrative Costs

An allowance of 5 percent of the construction costs is included for legal and administration costs.

7.2.6 Other Costs

Other costs may include specialized studies, property or right-of-way acquisition, specific equipment or supplies, fees, and other items that are not part of the specific categories discussed above.

Typically, these other costs are listed individually in the OPC.

7.3 CAPITAL IMPROVEMENTS

Recommended capital improvements are summarized in Table 7.1 and shown in Figure 7.1. Appendix 7.1 includes project mapping and descriptions. Table 7.1 includes (referenced) Section and Figure numbers - where projects are described or shown in more detail. The table was created in Microsoft Excel; a copy of the spreadsheet file has been provided to the District. It allows staff to modify the CIP implementation schedule and update costs by entering a current Engineering News Record (ENR) Construction Cost Index. The spreadsheet uses the ratio of the current ENR, and the May 2015 reference ENR, to update costs. All costs in the table are referenced to the May 2015 ENR; annual updates of the

CIP costs can facilitate project budgeting, planning, and implementation. The table also allows the work and costs for any project to be allocated to any year or even several years according to main length or percentage of the project to be undertaken.

Note some recommended projects are not entered in the table because an alternative needs to be selected or an evaluation needs to be completed. The CIP table can be updated as project details are developed.

All projects should include a pre-design element that verifies any critical project requirement or data need such as key elevations, pipe size/material/location, operation characteristics, etc.

7.4 PROJECT PRIORITIZATION

Some projects are noted as high priority in Table 7.1; the high priority designation is based on current condition or current lack of capacity. Ideally, these projects will be addressed as soon as possible, possibly as one large, or several smaller, project(s). Deferral of these projects will result in a lower level of service and, depending on the particular projects, leave the District vulnerable to system or failures. Project prioritization should ultimately be reflected in the CIP scheduling.

District staff provided input on project prioritization (primarily for water main improvements) in relative terms of "low, medium, or high" priorities. A more precise assignment to specific years was not provided. There are some current developments and concerns that could affect the scheduling; consequently, a tentative CIP is offered that provides for:

High Priority Projects (implementation year 2015-2019)
Medium Priority Projects (implementation year 2020-2025)
Low Priority Projects (implementation year 2026-2035)

For high priority projects, all projects are entered under year 2015 – though it is understood that implementation will actually occur between 2015 and 2019. The CIP table, as previously noted, is in a spreadsheet format that can be readily updated or modified as needed by the District. The CIP and any subsequent modifications will need to be adopted by the District prior to use for SDC purposes.

7.5 FINANCING AND IMPLEMENTATION

Implementation and financing are discussed in Section 8.

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Table 7.1: Crystal Springs Water District CIP (All costs in current dollars) | **Reference May 2015 ENR CCI:** 10036 | **Current ENR CCI: (May 2015)** 10036 | **Crystal Springs Water System Master Plan 2015** | **Distribution Improvements**

Unit Costs May 2015 ($/LF)	Project Priority	Project Reference Number	Project Name (Description)	New Diameter (in.)	Length (LF)	Unit Cost ($/LF)	Construction Cost ($)	Total Cost ($)	Implementation (LF and Total Cost) 2015 (LF)	2015 ($)	2016 (LF)	2016 ($)	2017 (LF)	2017 ($)	2018 (LF)	2018 ($)	2019 (LF)	2019 ($)	2020-25 (LF)	2020-25 ($)	2026-35 (LF)	2026-35 ($)	CIP Totals Length (LF)	CIP Totals Cost ($)
180	L	2	**Dog River to Cooper Spur**	12	**9,200**	$180	$1,656,000	**$2,401,200**		$0		$0		$0		$0		$0		$0	9,200	$2,401,200	9,200	$2,401,200
			Replaces 6,200 LF of existing 2" and 5" lines and adds 3,000 LF of new main.																					
180	L	3	**Cooper Spur Evans Creek to Culberton**	12	**6,000**	$180	$1,080,000	**$1,566,000**		$0		$0		$0		$0		$0		$0	6,000	$1,566,000	6,000	$1,566,000
			Replaces existing 2" and 4" lines to improve redundancy and fire flows in the south part of the District.																					
140	H	4	**Culbertson to Cooper Spur**	6	**500**	$140	$70,000	**$101,500**	500	$101,500		$0		$0		$0		$0		$0		$0	500	$101,500
			New line to complete loop.																					
180	L	5	**Cooper Spur - Culbertson to Baseline**	12	**5,400**	$180	$972,000	**$1,409,400**		$0		$0		$0		$0		$0		$0	5,400	$1,409,400	5,400	$1,409,400
			Replaces existing 4" line to improve redundancy and fire flows in the south part of the District.																					
180	M	6	**Baseline Dr. - West of Tollbridge**	12	**7,500**	$180	$1,350,000	**$1,957,500**		$0		$0		$0		$0		$0	7,500	$1,957,500		$0	7,500	$1,957,500
			Replaces existing 2", 4", and 6" lines and adds 2,000 LF of new main.																					
150	L	7	**Allen Road - Baseline to Woodworth**	8	**8,000**	$150	$1,200,000	**$1,740,000**		$0		$0		$0		$0		$0		$0	8,000	$1,740,000	8,000	$1,740,000
			Replaces existing 4" line to improve redundancy and fire flows in the south part of the District.																					
150	L	8	**Trout Creek Ridge Road**	8	**10,600**	$150	$1,590,000	**$2,305,500**		$0		$0		$0		$0		$0		$0	10,600	$2,305,500	10,600	$2,305,500
			Replaces existing 4" line to improve redundancy and fire flows to the Trout Creek area.																					
140	H	9	**Sperry Road Loop**	6	**5,300**	$140	$742,000	**$1,075,900**	5,300	$1,075,900		$0		$0		$0		$0		$0		$0	5,300	$1,075,900
			Replaces existing 2" and 4" lines to improve fire flows to the Trout Creek area.																					
150	M	10	**Highway 35 near Hillcrest**	8	**6,800**	$150	$1,020,000	**$1,479,000**		$0		$0		$0		$0		$0	6,800	$1,479,000		$0	6,800	$1,479,000
			Replaces existing 4" line and adds 700 LF of new main.																					
150	L	11	**Neal Creek/ Booth Hill Road**	8	**6,900**	$150	$1,035,000	**$1,500,750**		$0		$0		$0		$0		$0		$0	6,900	$1,500,750	6,900	$1,500,750
			Replaces existing 4" and 6" lines and adds 3,300 LF of new main.																					
150	H	12	**Highway 35 and Endow Dr.**	8	**2,000**	$150	$300,000	**$435,000**	2,000	$435,000		$0		$0		$0		$0		$0		$0	2,000	$435,000
			Replaces existing 4" along Highway 35 to complete improvements and address fire flow deficiencies in Odell.																					
180	M	13	**Booth Hill to Odell**	12	**12,700**	$180	$2,286,000	**$3,314,700**		$0		$0		$0		$0		$0	12,700	$3,314,700		$0	12,700	$3,314,700
			Replaces existing 8" line to improve fire flow capability.																					
165	H	14	**Centralvale Road - Hwy 35 to WyEast**	10	**5,500**	$165	$907,500	**$1,315,875**	5,500	$1,315,875		$0		$0		$0		$0		$0		$0	5,500	$1,315,875
			Replaces existing 4" line to improve local hydraulics and improve flow to Odell and the proposed West side Reservoir.																					
165	H	15	**WyEast Road - Centralvale to Sylvester**	10	**2,700**	$165	$445,500	**$645,975**	2,700	$645,975		$0		$0		$0		$0		$0		$0	2,700	$645,975
			Replaces existing 4" line to improve local hydraulics and improve flow to Odell and the proposed West side Reservoir.																					
165	L	16	**WyEast Road - Sylvester to Lippman**	10	**4,800**	$165	$792,000	**$1,148,400**		$0		$0		$0		$0		$0		$0	4,800	$1,148,400	4,800	$1,148,400
			Replaces existing 4" line to improve flows to Odell.																					
175	H	17	**Sylvester Road to West Side Reservoir**	10	**5,500**	$175	$962,500	**$1,395,625**	5,500	$1,395,625		$0		$0		$0		$0		$0		$0	5,500	$1,395,625
			Replaces existing 1", 2", and 4" lines and adds 1,000 LF of new main and adds a new PRV station to supply the proposed West Side Reservoir.																					
150	L	19	**Lippman road**	8	**3,400**	$150	$510,000	**$739,500**		$0		$0		$0		$0		$0		$0	3,400	$739,500	3,400	$739,500
			Replaces existing 2" line and adds 1,400 LF of new main to increase fire flows to the west side of Odell.																					
180	M	20	**Davis Drive**	12	**2,900**	$180	$522,000	**$756,900**		$0		$0		$0		$0		$0	2,900	$756,900		$0	2,900	$756,900
			Replaces existing 8" line along Davis Drive in Odell to provide higher fireflow through industrial area.																					
180	H	21	**Stadelman Drive**	10	**3,400**	$180	$612,000	**$887,400**	3,400	$887,400		$0		$0		$0		$0		$0		$0	3,400	$887,400
			Replaces 1" and 6" lines and adds 1,400 LF of new pipe and PRV in Neal Creek Mill Industrial Area to loop system and provide fire flow.																					
150	L	22	**Lingren Road - Davis to Ehrck Hill**	8	**4,000**	$150	$600,000	**$870,000**		$0		$0		$0		$0		$0		$0	4,000	$870,000	4,000	$870,000
			Replaces existing 6" line to improve hydraulics and add redundancy.																					
150	L	23	**Ehrck Hill to Dethman Ridge**	8	**11,800**	$150	$1,770,000	**$2,566,500**		$0		$0		$0		$0		$0		$0	11,800	$2,566,500	11,800	$2,566,500
			Replaces existing 4" and 6" lines along Ehrck Hil, Lingren, and Dethman Ridge Road to add redundancy.																					
150	M	24	**Thomsen Road to Fir Mountain**	8	**9,800**	$150	$1,470,000	**$2,131,500**		$0		$0		$0		$0		$0	9,800	$2,131,500		$0	9,800	$2,131,500
			Replaces existing 4" and 6" lines to provide higher flows to Pine Grove and the north part of the water system.																					
155	M	25	**Fir Mountain to Pine Grove**	8	**9,800**	$155	$1,519,000	**$2,202,550**		$0		$0		$0		$0		$0	9,800	$2,202,550		$0	9,800	$2,202,550
			Replaces existing 4" lines to provide higher flows to Pine Grove and the north part of the District. Also adds a PRV station.																					
150	M	26	**East Side Road - South**	8	**18,000**	$150	$2,700,000	**$3,915,000**		$0		$0		$0		$0		$0	18,000	$3,915,000		$0	18,000	$3,915,000
			Replaces existing line from Fir Mountain to Old Dalles to improve fire flows in the north part of the District.																					
150	L	27	**Pine Grove to Paasch Drive**	8	**8,800**	$150	$1,320,000	**$1,914,000**		$0		$0		$0		$0		$0		$0	8,800	$1,914,000	8,800	$1,914,000
			Replaces existing 3/4", 3", and 4" lines and adds 5,500 LF of new main to improve fire flow and redundancy in the north part of the District.																					
150	L	28	**East Side Road - North**	8	**11,200**	$150	$1,680,000	**$2,436,000**		$0		$0		$0		$0		$0		$0	11,200	$2,436,000	11,200	$2,436,000
			Replaces existing 6" line to provide fire flow in the north part of the District.																					
150	H	29	**Neal Creek - Hwy 35 to Thomsen**	8	**4,300**	$150	$645,000	**$935,250**	4,300	$935,250		$0		$0		$0		$0		$0		$0	4,300	$935,250
			Replaces existing 3" line and adds 2,000 LF of new main to replace aged pipe and connects loop to Highway 35.																					
150	M	30	**Odell Hwy - Wyeast to Web**	8	**2,800**	$150	$420,000	**$609,000**		$0		$0		$0		$0		$0	2,800	$609,000		$0	2,800	$609,000
			New line to complete loop and improve fire flow.																					
			Distribution Totals		**189,600**		**$30,176,500**	**$43,755,925**	**29,200**	**$6,792,525**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**70,300**	**$16,366,150**	**90,100**	**$20,597,250**	**189,600**	**$43,755,925**

Miscellaneous

Constr. Costs May 2015 ($)	Total Costs May 2015 ($)	Project Priority	Project Name (Description)	Plan Section # Reference	ENR Ratio	Construction Cost ($)	Total Cost ($)	Implementation (% and Total Cost) 2015 (%)	2015 ($)	2016 (%)	2016 ($)	2017 (%)	2017 ($)	2018 (%)	2018 ($)	2019 (%)	2019 ($)	2020-25 (%)	2020-25 ($)	2026-35 (%)	2026-35 ($)	CIP Totals (%)	Cost ($)
$1,125,000	$1,651,000	L	**South Reservoir**	**6.7.2.2**	1.000	$1,125,000	$1,651,000		$0		$0		$0		$0		$0		$0	100	$1,651,000	100	$1,651,000
			Nominal 800,000 gallon reservoir and 1,000 LF 12" of new main supplying it, located at south end of the District. Provides storage for the system as a whole and provides storage for areas above Booth Hill Reservoir that currently have no storage.																				
$1,601,000	$2,341,000	H	**West Side Reservoir**	**6.7.2.2**	1.000	$1,601,000	$2,341,000	100	$2,341,000		$0		$0		$0		$0		$0		$0	100	$2,341,000
			Nominal 500,000 gallon reservoir located west of Odell and 5,200 LF 12" line replaces 3,000 LF existing 1", 2", and 4" lines and adds 2,200 LF of new main along Lippman Road. Provides general storage for system and specifically provides for nearby industrial fire flow needs.																				
	$40,000	H	**Water Rate Study**	**8.2.3**	1.000	$0	$40,000	100	$40,000		$0		$0		$0		$0		$0		$0	100	$40,000
			Prepare a new water rate study.																				
	$20,000	H	**System Development Charge Study**	**8.3**	1.000	$0	$20,000	100	$20,000		$0		$0		$0		$0		$0		$0	100	$20,000
			Prepare a new water SDC study and methodology.																				
	$70,000	M	**Water Master Plan Update**	**6.8.1**	1.000	$0	$70,000		$0		$0		$0		$0		$0	100	$70,000		$0	100	$70,000
			Periodic update of Plan. Actual budget should be adjusted as needed to reflect theanticipated level of effort required.																				
			Miscellaneous Totals			**$2,726,000**	**$4,122,000**		**$2,401,000**		**$0**		**$0**		**$0**		**$0**		**$70,000**		**$1,651,000**		**$4,122,000**
			CIP Total			**$32,902,500**	**$47,877,925**		**$9,193,525**		**$0**		**$0**		**$0**		**$0**		**$16,436,150**		**$22,248,250**		**$47,877,925**

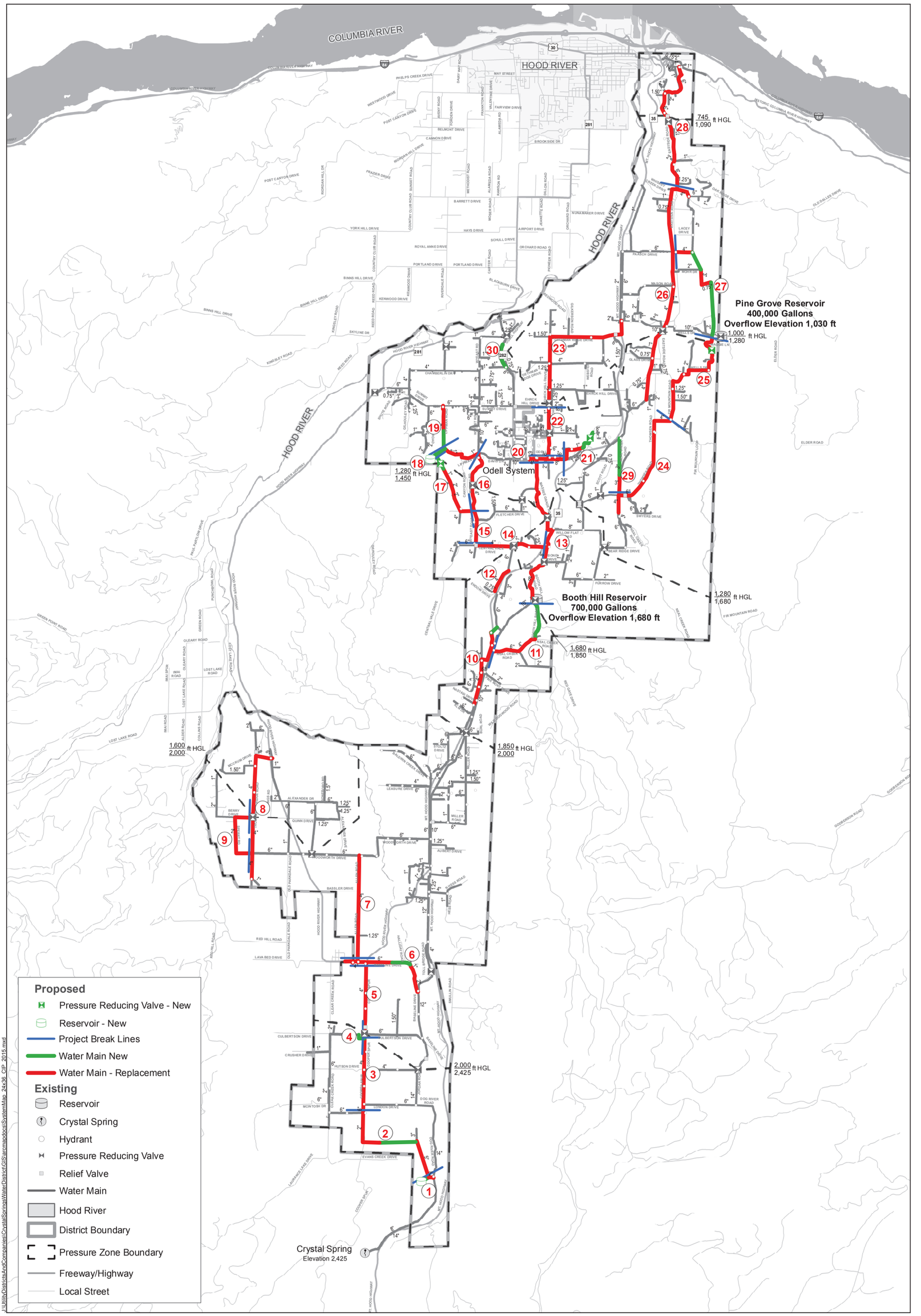


Figure 7.1
Crystal Springs Water District
Capital Improvement Projects

8.1 RECENT WATER FUND BUDGETS

The District's General Fund covers personnel and water system costs and is funded primarily through water user fees (water rates and connection fees) and interest on invested funds. Recent budgets for the fund are shown in Table 8.1.

Table 8.1: General Fund Budgets

Description	Actual Fiscal Year 2010-2011	Actual Fiscal Year 2011-2012	Actual Fiscal Year 2012-2013	Actual Fiscal Year 2013-2014
Resources				
Beginning Total	$1,485,532	$1,492,048	$1,564,017	$1,574,644
Transfers In	$0	$4,694	$0	$0
Revenue				
User Fees	$989,540	$1,031,741	$1,029,790	$1,098,960
New Meter Connections	$5,687	$7,228	$6,263	$12,926
Other	$17,546	$25,171	$42,269	$36,788
Revenue Total	$1,012,773	$1,064,140	$1,078,322	$1,148,674
Resources Total	*$2,498,305*	*$2,560,140*	*$2,642,339*	*$2,723,318*
Expenses				
Transfers Out	$10,000	$10,000	$15,000	$10,000
Expenditures				
Personal Services	$507,438	$500,578	$556,062	$570,089
Materials and Services	$127,356	$134,546	$144,129	$156,582
Capital Outlay	$361,463	$351,741	$352,504	$438,257
Expenditures Total	$996,257	$986,865	$1,052,695	$1,164,928
Expenses Total	*$1,006,257*	*$996,865*	*$1,067,695*	*$1,174,928*
Revenue – Expenditures	$16,516	$77,275	$10,627	$(16,254)
Resources – Expenses	$1,492,048	$1,564,017	$1,574,644	$1,548,390

For the four fiscal years shown, "Resources minus Expenses" show a general increasing trend with the most recent year being somewhat lower as a result of significantly higher capital outlay.

8.1.1 System Development Fund

The District's System Development Fund covers capital outlay and debt service for expanding and improving the water system and is funded primarily through system development charges (SDCs) and forest management revenue. Recent budgets for the fund are shown in Table 8.2.

Table 8.2: System Development Fund Budgets

Description	Actual Fiscal Year 2010-2011	Actual Fiscal Year 2011-2012	Actual Fiscal Year 2012-2013	Actual Fiscal Year 2013-2014
Resources				
Beginning Total	$179,358	$184,763	$364,431	$402,105
Revenue				
SDCs	$27,183	$23,599	$47,253	$55,470
Forest Management	$0	$371,650	$74,794	$0
Revenue Total	$27,183	$395,249	$122,047	$55,470
Resources Total	*$206,541*	*$580,012*	*$486,478*	*$457,575*
Expenses				
Expenditures				
Capital Outlay	$21,778	$215,581	$84,373	$37,136
Expenditures Total	$21,778	$215,581	$84,373	$37,136
Expenses Total	*$21,778*	*$215,581*	*$84,373*	*$37,136*
Revenue – Expenditures	$5,405	$179,668	$37,674	$18,334
Resources – Expenses	$184,763	$364,431	$402,105	$420,439

The System Development Fund budget appears healthy and has increased in each of the four consecutive fiscal years reviewed. A total beginning balance of $420,439 is available for fiscal Year 2015.

8.1.2 Vehicle Replacement Fund

The Vehicle Replacement Fund covers future capital expenses for replacement vehicles and is funded primarily through transfers from the General Fund. Recent budgets for the fund are shown in Table 8.3.

Table 8.3: Vehicle Replacement Fund Budgets

Description	Actual Fiscal Year 2010-2011	Actual Fiscal Year 2011-2012	Actual Fiscal Year 2012-2013	Actual Fiscal Year 2013-2014
Resources				
Beginning Total	$27,240	$37,280	$25,950	$27,450
Transfers In	$10,000	$10,000	$15,000	$10,000
Revenue				
Sale of Vehicle	$0	$0	$0	$12,500
Other	$40	$12,565	$0	$0
Revenue Total	$40	$12,565	$0	$12,500
Resources Total	$37,280	$59,845	$40,950	$49,950
Expenses				
Capital Outlay	$0	$33,895	$13,500	$35,157
Expenses Total	$0	$33,895	$13,500	$35,157
Resources – Expenses	$37,280	$25,950	$27,450	$14,793

8.1.3 Property Fund

The Property Fund covers debt service payments associated with purchase of the spring property. The fund was terminated in 2011-2012; residual funds were transferred to the General Fund. Recent budgets for the fund are shown in Table 8.4.

Table 8.4: Property Fund Budgets

Description	Actual Fiscal Year 2010-2011	Actual Fiscal Year 2011-2012	Actual Fiscal Year 2012-2013	Actual Fiscal Year 2013-2014
Resources				
Beginning Total	$40,776	$4,693		
Revenue				
Interest Income	$46	$0		
Revenue Total	$46	$4,693		
Resources Total	$40,822	$4,693		
Expenses				
Bond Expenditures	$36,129	$0		
Transfers Out	$0	$4,693		
Expenses Total	$36,129	$4,693		
Resources – Expenses	$4,693	$0		

8.1.4 Adopted 2014-2015 Budget

The District's 2014-2015 budget was adopted on June 5, 2014. A copy of the complete budget is included in Appendix 8.1.

8.2 CURRENT WATER RATES

8.2.1 Rate Structure

Crystal Springs Water District's current (effective July 1, 2014) water rate schedule is included in Appendix 8.2. A summary of current rates is provided in Table 8.5.

Table 8.5: Rate and System Development Charge Summary

Meter Size *(in.)*	Base Water Rate[1] *(effective 7/1/14)*	System Development Charge *(effective 7/1/14)*
3/4	$6.25	$4,240
1	$10.35	$10,648
1-1/2	$15.25	$21,294
2	$24.00	$34,107
4	$41.35	$106,550
6	$120.10	$213,662
8	$195.00	$341,085
10	$360.50	$638,882
3/4	$6.25	$4,240

[1] The usage rate of $5.50 per 1,000 gallons is added to the base rate to determine the monthly billing

Rates are based on a base monthly service charge according to meter size. Base charge for a ¾" meter is $6.25. To the base charge is added water usage rate of $5.50 per 1,000 gallons for all water used. Some water meters are on lines that are for standby fire protection. These accounts are charged an additional monthly fee of $4.25 per inch diameter of the associated service line.

Water rates are typically increased annually to keep pace with inflation.

8.2.2 Rate Revenue

For the fiscal year ending June 30, 2014, total rate revenue from monthly billings was $1,098,960. Based on 3,557 EDUs, the average monthly billing was $25.75 per EDU.

Funding agencies often evaluate a community's rates based on a monthly single-family residential billing associated with 7,500 gallons of usage; for Crystal Springs, this billing would be $47.50.

8.2.3 Comments

The General Fund budgets appear healthy with substantial reserves and significant allocations for capital improvements. The last water rate study for the District was prepared in 1991. A new rate study is recommended. Estimated cost for a new rate study is $40,000.

8.3 CURRENT SYSTEM DEVELOPMENT CHARGE (SDC)

The District's current Water SDCs are summarized in Table 8.5 above. District SDCs are updated annually to keep pace with inflation. SDCs were last reviewed in detail in 1991 by Economic Resource Associates, Inc. SDCs utilize an approved capital improvements plan as the basis for the SDC cost computation. As SDCs are based in part on anticipated project costs, the District should consider revising the SDC after the Water Master Plan has been adopted. Estimated cost for a water SDC update is $20,000.

8.4 O&M CONSIDERATIONS

The recommended capital improvements should not result in increased O&M costs; however, O&M costs are subject to market changes and inflationary pressures, so annual increases are typically required. Budgets and water rates are typically adjusted to take recent or anticipated changes into account; however, system deficiencies that have not been addressed can increase O&M costs in ways and to an extent not easily foreseen. This may take the form of emergency (overtime) call outs and extra cost, interim measures that may be needed until the problem can be addressed correctly, and un-budgeted emergency projects of potentially significant expense. Over time, such costs can add significantly to the overall utility budget.

8.5 CAPITAL IMPROVEMENT FINANCE

8.5.1 Introduction

Major capital improvements are often too expensive to fund exclusively with accumulated reserves. Such projects may be economically financed through programs

offered by various State and Federal agencies, or a mix of public and local financing. The following discussion identifies potential sources of that funding.

8.5.2 Public Works Funding Sources

This section includes a brief description of several funding programs that are likely to best meet Crystal Springs Water District's needs. Additional programs are described in Appendix 8.3 which includes an excerpt from the Rural Community Assistance Corporation's (RCAC) most recent edition of "Oregon Water & Wastewater Funding and Resource Guide" last updated in April 2014.

Safe Drinking Water Revolving Loan Fund (SDWRLF) is funded by EPA grants and from the (Oregon) Water/Wastewater Financing Program. The program is managed by Oregon Health Authority (OHA); the loans are managed by Infrastructure Finance Authority (IFA), a part of Business Oregon, a state agency. The program provides up to $6,000,000 per project with a 20-year term. The interest rate was 2.81% (June 2015 – the rate changes quarterly and is based on 80% of the state/local bond interest rate). The application process includes an initial Letter of interest which is used by the state to rate and rank projects to determine which applicants will be invited to submit complete applications.

Water/ Wastewater Financing Program (W/WW) is capitalized primarily through Oregon Lottery funds and loan repayments. The program is managed by IFA and the focus is on the design and construction of public works infrastructure to ensure compliance with Safe Drinking Water Act and the Clean Water Act. The program provides up to $10,000,000 per project with a 25-year term. The interest rate was 3.51% (June 2015 – the rate changes quarterly). Grants of up to $750,000 are possible with equivalent matching loans; however, grant eligibility is determined on a case by case basis. The application process includes submittal of a Project Notification and Intake Form (PNIF). Qualified applicants are then invited to submit a complete application.

Special Public Works Fund (SPWF) is capitalized primarily through Oregon Lottery funds and loan repayments. The program is managed by IFA and the focus is on infrastructure projects that support economic growth and job creation. The program provides up to $10,000,000 per project with a 25-year term. The interest rate was 3.51% (June 2015 – the rate changes quarterly). Grants of up to

$500,000 (or 85% of project cost, whichever is less) are possible; however, grants are typically based on up to $5,000 per family wage job created or retained; grant eligibility and extent, for the project, is determined on a case by case basis. If the project is strictly for capacity building, then no grant is awarded. The application process includes submittal of a Project Notification and Intake Form (PNIF). Qualified applicants are then invited to submit a complete application.

USDA Rural Development (RD) provides funding through the Water & Waste Disposal Direct Loan and Grant Program, and other programs (see Appendix 8.2 for information on other programs). The program provides funding for water and waste projects in communities of up to 10,000 persons with priority given to those communities with less than 5,500 persons. Loan terms are up to 25 years with a recent (June 2015) interest rate of 3.50% (rates change quarterly). The 3.50% rate is based on the District having a median household income (MHI) greater than 80% of the statewide MHI of $52,251 (American Community Survey Estimate for 2013, US Department of Commerce, US Census). Grants are possible but are generally lower than the agency guidelines suggest and typically require that a District raise their water rates to the state average for communities undertaking comparable projects; the agency will determine how much grant will be included. Applications for funding must include a preliminary engineering report (PER) – or equivalent - and an environmental report (ER).

It is important to understand that funding programs change over time. Interest rates, fund availability, relative grant participation, and eligibility requirements are common areas of change; consequently, the figures and opportunities presented here may not be applicable at the time of funding application and award.

8.5.3 Local Financing Sources

Commonly used local financing sources include:

General obligation (GO) bonds are backed by the full faith and credit of the issuer who is authorized to levy ad valorem (property) taxes for payment. The issuer can use other revenue for payment if desired. A term of 20 years is typical unless RD purchases the bonds (25 year term for RD funding).

Revenue bonds are backed by the District's pledge to operate the water system in a manner that will generate sufficient revenue to meet the financial obligations of the bond issue. These are generally paid with water rate revenue.

Sinking funds basically refer to a process of saving a budgeted amount over a period of time until enough funds have been accrued to undertake the project. This approach is generally viable for lower cost projects or ones with long lead times. It can be a significant tool in asset management where future projects are anticipated based on remaining design lives; however, it may result in significant near-term rate or fee increases that could be politically challenging to adequately implement for large capital improvement budgets. The District has historically favored this approach.

Ad valorem tax or property tax is often used to pay all or part of a GO bond. Property taxes can provide an alternative way of distributing project costs and minimizing financial impacts on homeowners with lower property valuations.

Water rates are a typical source of monies for debt service on loans from the state and federal funding agencies. Water rates can also be used for sinking funds. Water rate revenue increases with community growth and, as such, may help offset the effects of inflation on O&M costs. The assumption of rate revenue growth, for debt repayment, carries some risk insofar as the projected growth may not occur; it also entails greater attention to water rate increases since the added revenue associated with growth no longer buffers the inflationary costs associated with the annually increasing O&M budget.

System development charges (SDCs) provide monies for improvements that add capacity to the water system for new growth. SDCs are an important source of financing and in rapidly growing districts, can provide substantial revenues. SDCs are typically not adequate for the funding of major projects since they are often used when available and not allowed to accumulate. The assumption of future SDCs for debt service payment carries risk insofar as the projected growth may not occur.

8.6 CAPITAL IMPROVEMENT RATE IMPACTS

Table 8.6 includes debt service and rate impacts on a per EDU basis for projects funded through the programs identified in Section 8.5.2, plus a computation using a 6.5% interest rate. Very large projects often require funding through multiple sources; rate impacts for multiple funding sources are simply added together.

Note: Table 8.6 is for general planning purposes only. Actual interest rates, terms, and availability of funds through any given source may vary and are not locked in until an offer of funding is accepted by the District.

Table 8.6: Debt Service and Rate Impacts (per EDU basis)

	Annual Debt Service	Monthly Per EDU Rate Increase	Annual Debt Service	Monthly Per EDU Rate Increase	Annual Debt Service	Monthly Per EDU Rate Increase	Annual Debt Service	Monthly Per EDU Rate Increase
Interest Rate (%):	3.51		2.81		3.51		6.5	
Term (years):	25		20		25		25	
Reserve (%):	10							
EDUS:		3,557		3,557		3,557		3,557
Loan Total($)								
$100,000	$6,681.39	$0.16	$6,604.05	$0.15	$6,073.99	$0.14	$8,198.15	$0.19
$200,000	$13,362.78	$0.31	$13,208.10	$0.31	$12,147.98	$0.28	$16,396.30	$0.38
$300,000	$20,044.17	$0.47	$19,812.16	$0.46	$18,221.97	$0.43	$24,594.44	$0.58
$400,000	$26,725.56	$0.63	$26,416.21	$0.62	$24,295.96	$0.57	$32,792.59	$0.77
$500,000	$33,406.95	$0.78	$33,020.26	$0.77	$30,369.95	$0.71	$40,990.74	$0.96
$600,000	$40,088.34	$0.94	$39,624.31	$0.93	$36,443.94	$0.85	$49,188.89	$1.15
$700,000	$46,769.73	$1.10	$46,228.37	$1.08	$42,517.93	$1.00	$57,387.04	$1.34
$800,000	$53,451.11	$1.25	$52,832.42	$1.24	$48,591.92	$1.14	$65,585.18	$1.54
$900,000	$60,132.50	$1.41	$59,436.47	$1.39	$54,665.91	$1.28	$73,783.33	$1.73
$1,000,000	$66,813.89	$1.57	$66,040.52	$1.55	$60,739.90	$1.42	$81,981.48	$1.92
$2,000,000	$133,627.79	$3.13	$132,081.05	$3.09	$121,479.81	$2.85	$163,962.96	$3.84
$3,000,000	$200,441.68	$4.70	$198,121.57	$4.64	$182,219.71	$4.27	$245,944.44	$5.76
$4,000,000	$267,255.57	$6.26	$264,162.10	$6.19	$242,959.61	$5.69	$327,925.92	$7.68
$5,000,000	$334,069.47	$7.83	$330,202.62	$7.74	$303,699.52	$7.12	$409,907.41	$9.60

8.7 CAPITAL IMPROVEMENT IMPLEMENTATION

Capital improvements can be implemented over the planning period according to the nature of the projects, the relative prioritization of the project, and other financial and practical considerations that the District may have. Several of the projects are high priority and should be addressed as soon as practicable. Because of the high costs,

funding agency participation may be needed. If the District decides to pursue agency assistance, then once the District has determined which projects to include, the District should contact IFA to set up a One- Stop Meeting in Salem to discuss potential project funding. Representatives of potential funding agencies attend the meeting and can assist in developing an optimal funding approach.

Appendix 3.1

Water Rights

Certificates

Permits

Extensions

Permit A1—500—1-32

STATE OF OREGON

COUNTY OF HOOD RIVER

CERTIFICATE OF WATER RIGHT

This Is to Certify, *That* CRYSTAL SPRINGS WATER CO.

of Hood River *, State of* Oregon *, has made proof to the satisfaction of the STATE ENGINEER of Oregon, of a right to the use of the waters of* Crystal Springs *a tributary of* East Fork of Hood River *for the purpose of* Domestic

under Permit No. 9851 *of the State Engineer, and that said right to the use of said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from* June 7, 1930;

that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 1.0 cubic foot per second.

The point of diversion is located in the NW¼NW¼ *of Section* 29 *, Township* 1 S, *Range* 10 E, *W. M. The use hereunder for irrigation shall conform to such reasonable rotation system as may be ordered by the proper state officer.*

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, shall be limited to one-eightieth of one cubic foot per second per acre, or its equivalent in case of rotation.

A description of the lands irrigated under the right hereby confirmed, and to which such right is appurtenant (if for irrigation, or any other purpose), is as follows:

PLACE OF USE:

From the source in Section 29, Township 1 South, Range 10 East, W. M. to the end of the system in Section 31, Township 3 North, Range 11 East, W. M., supplying 365 users.

The right to the use of the water for any purpose is restricted to the lands or place of use herein described.

After the expiration of fifty years from the date of this certificate or on the expiration of any federal power license issued in connection with this right, and after not less than two years notice in writing to the holder hereof, the State of Oregon, or any municipality thereof, shall have the right to take over the dams, plants and other structures and all appurtenances thereto which have been constructed for the purpose of devoting to beneficial use the water rights specified herein, upon condition that before taking possession the State or municipality shall pay not to exceed the fair value of the property so taken, plus such reasonable damages, if any, to valuable, serviceable and dependable property of the holder of this certificate, not taken over, as may be caused by the severance therefrom of the property taken in accordance with the provisions of section 47-508, Oregon Code 1930.

WITNESS the signature of the State Engineer, affixed this 28th *day of* July *, 193* 3

CHAS. E. STRICKLIN

State Engineer

Recorded in State Record of Water Right Certificates, Volume 9 *, page* 10115 .

CERTIFICATE NO. 10115

*Permit No. 9831

APPLICATION FOR A PERMIT

ASSIGNED, Sec. Misc. Rec. Vol. 2, Page 55

To Appropriate the Public Waters of the State of Oregon

I, C. M. Hurlburt, for Farmers on the East Side of the Hood River Valley
(Name of applicant)
of Hood River (Postoffice), County of Hood River,
State of Oregon, do hereby make application for a permit to appropriate the following described public waters of the State of Oregon, subject to existing rights:

If the applicant is a corporation, give date and place of incorporation Not yet

1. The source of the proposed appropriation is Crystal Springs (Name of stream), tributary of East Fork of Hood River

2. The amount of water which the applicant intends to apply to beneficial use is Two cubic feet per second.

3. The use to which the water is to be applied is Domestic only (Irrigation, power, mining, manufacturing, domestic supplies, etc.)

4. The point of diversion is located 221 feet East of and 608 feet South of the (Give distance and bearing to section corner) NW Corner of Section 29, Twp. 1 South, Range 10 East, W.M.

being within the $NW\frac{1}{4}$ of $NW\frac{1}{4}$ (Give smallest legal subdivision) of Sec. 29, Tp. 1 S (No. N. or S.), R. 10 E (No. E. or W.), W. M., in the county of Hood River.

5. The Pipe line (Main ditch, canal or pipe line) to be 20 miles in length, terminating in the $SW\frac{1}{4}SW\frac{1}{4}$ (Smallest legal subdivision) of Sec. 31, Tp. 3 N (No. N. or S.), R. 11 E. (No. E. or W.), W. M., the proposed location being shown throughout on the accompanying map.

6. The name of the ditch, canal or other works is Crystal Pipe Line

DESCRIPTION OF WORKS

DIVERSION WORKS—

7. (a) Height of dam ..... feet, length on top ..... feet, length at bottom ..... feet; material to be used and character of construction ..... (Loose rock, concrete, masonry, rock and brush, timber crib, etc., wasteway over or around dam)

(b) Description of headgate Concrete 8' by 10' box (Timber, concrete, etc., number and size of openings)

* A different form of application is provided where storage works are contemplated. These forms can be secured without charge, together with instructions, by addressing the State Engineer, Salem, Oregon.

CANAL SYSTEM—

8. (a) Give dimensions at each point of canal where materially changed in size, stating miles from headgate. At headgate: width on top (at water line) ..... *feet; width on bottom* ..... *feet; depth of water* ..... *feet; grade* ..... *feet fall per one thousand feet.*

(b) At ..... *miles from headgate: width on top (at water line)* ..... *feet; width on bottom* ..... *feet; depth of water* ..... *feet; grade* ..... *feet fall per one thousand feet.*

.....

.....

.....

FILL IN THE FOLLOWING INFORMATION WHERE THE WATER IS USED FOR IRRIGATION—

9. The land to be irrigated has a total area of ..... *acres, located in each smallest legal subdivision, as follows:* .....
(Give area of land in each smallest legal subdivision which you intend to irrigate)

.....

.....

.....

.....

.....

.....

.....

.....

.....

(If more space required, attach separate sheet)

POWER, MINING, MANUFACTURING, OR TRANSPORTATION PURPOSES—

10. (a) Total amount of power to be developed ..... *theoretical horsepower.*

(b) Total fall to be utilized ..... *feet.*
(Head)

(c) The nature of the works by means of which the power is to be developed .....

.....

(d) Such works to be located in ..... *of Sec.* .....,
(Legal subdivision)

Tp. ....., *R.* ....., *W. M.*
(No. N. or S.) (No. E. or W.)

(e) Is water to be returned to any stream? .....
(Yes or No)

(f) If so, name stream and locate point of return .....

....., *Sec.* ....., *Tp.* ....., *R.* ....., *W. M.*
(No. N. or S.) (No. E. or W.)

(g) The use to which power is to be applied is .....

.....

(h) The nature of the mines to be served .....

.....

MUNICIPAL SUPPLY—

11. *To supply the ~~city~~ of* the East Side of the Hood River Valley
Hood River (Name of) *County, having a present population of* 2500,
and an estimated population of 5000 *in 192*40.

(Answer questions 12, 13, 14, and 15 in all cases)

12. *Estimated cost of proposed works,* $100,000.00

13. *Construction work will begin on or before* June 1930

14. *Construction work will be completed on or before* June 1931

15. *The water will be completely applied to the proposed use on or before* June 1932

Duplicate maps of the proposed ditch or other works, prepared in accordance with the rules of the State Engineer, accompany this application.

C. M. Hurlburt
(Name of applicant)
Hood River, Ore.

Signed in the presence of us as witnesses:

(1) W. H. Walker (Name), Hood River, Ore. (Address of witness)

(2) S. L. Peterson (Name), Hood River, Ore. (Address of witness)

Remarks:

STATE OF OREGON, }
County of Marion, } *ss.*

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for correction or completion, as follows:

Completion, and balance of fees
" " "

In order to retain its priority, this application must be returned to the State Engineer, with corrections, on or before February 16 / October 3, 1930, *192*30.

WITNESS my hand this 16th / 3rd *day of* January / September, *192*30.

Rhea Luper
HB
STATE ENGINEER.

9831(c)

Application No. 13490

Permit No. 9 8 3 1

PERMIT

TO APPROPRIATE THE PUBLIC WATERS OF THE STATE OF OREGON

District No.

This instrument was first received in the office of the State Engineer at Salem, Oregon,

on the 7th *day of* June,

*192*30, *at* 8:00 *o'clock* A.M.

Returned to applicant for correction:

Corrected application received:

Approved:

October 2, 1930

Recorded in Book No. 33 *of Permits, on page* 9 8 3 1

CHAS. E. STRICKLIN
STATE ENGINEER.

4 p. 82 a.
$11.00

STATE OF OREGON, }
County of Marion, } *ss.*

This is to certify that I have examined the foregoing application and do hereby grant the same, subject to the following limitations and conditions: If for irrigation, this appropriation shall be limited to one-eightieth of one cubic foot per second, or its equivalent, for each acre irrigated, and shall be subject to such reasonable rotation system as may be ordered by the proper state officer.

The right herein granted is limited to the appropriation of water from Crystal Springs for domestic purposes.

The amount of water appropriated shall be limited to the amount which can be applied to beneficial use and not to exceed 2.0 *cubic feet per second, or its equivalent in case of rotation. The priority date of this permit is* June 7, 1930.

Actual construction work shall begin on or before October 2, 1931 *and shall thereafter be prosecuted with reasonable diligence and be completed on or before* October 1, 1932

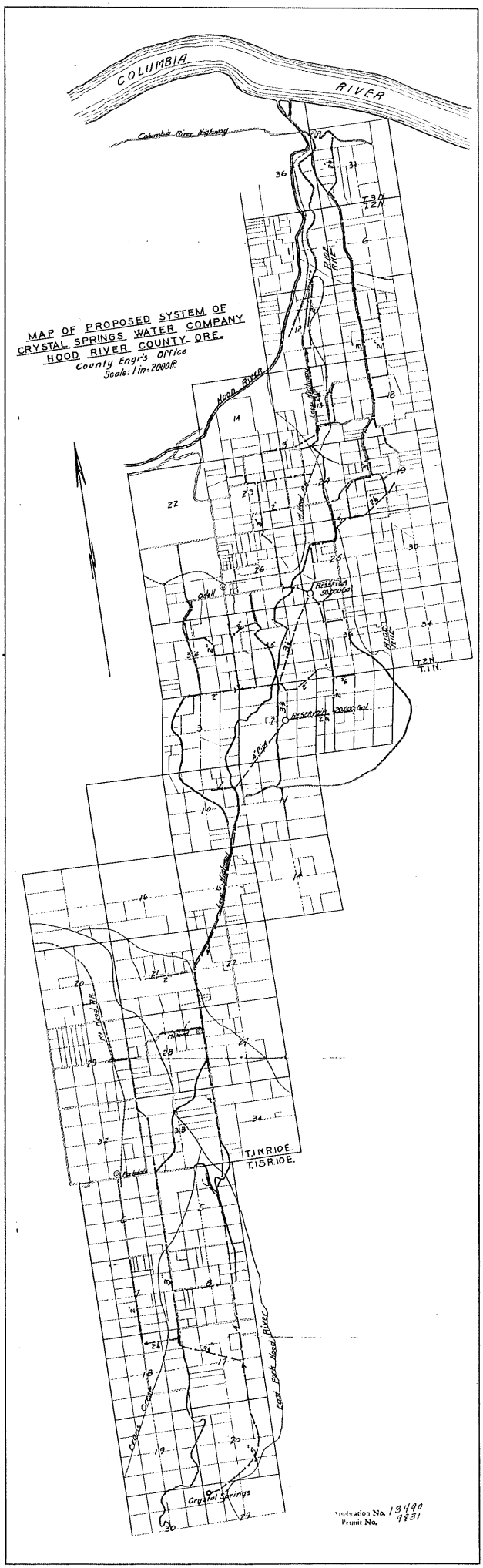
Complete application of the water to the proposed use shall be made on or before October 1, 1933

WITNESS my hand this 2nd *day of* October, *192*30.

CHAS. E. STRICKLIN.
STATE ENGINEER.

Permits for power development are subject to the limitation of franchise as provided in Section 5728, Oregon Laws, and the payment of annual fees as provided in Section 5803, Oregon Laws.

This form approved by the State Water Board, March 11, 1909.


COLUMBIA
RIVER
Columbia River Highway
MAP OF PROPOSED SYSTEM OF
CRYSTAL SPRINGS WATER COMPANY
HOOD RIVER COUNTY ORE.
County Engr's Office
Scale: 1 in. = 2000 ft.
Hood River
T.2N.
R.2E.
T.1N.
R.2E.
T.1N.
T.1N.R.10E.
T.1S.R.10E.
East Fork Hood River
Crystal Springs
Application No. 13490
Permit No. 9831

Permit No. 29377

***APPLICATION FOR PERMIT**

To Appropriate the Public Waters of the State of Oregon

I, Crystal Springs Water District
(Name of applicant)

of 106 Third Street, Hood River
(Mailing address)

State of Oregon, do hereby make application for a permit to appropriate the following described public waters of the State of Oregon, SUBJECT TO EXISTING RIGHTS:

If the applicant is a corporation, give date and place of incorporation Municipal Corporation, October 2, 1963, Hood River County, Oregon

1. The source of the proposed appropriation is Crystal Springs
(Name of stream)
, a tributary of East Fork of Hood River

2. The amount of water which the applicant intends to apply to beneficial use is 2.65 cubic feet per second. (See Remarks)
(If water is to be used from more than one source, give quantity from each)

**3. The use to which the water is to be applied is Public water supply for domestic use.
(Irrigation, power, mining, manufacturing, domestic supplies, etc.)

4. The point of diversion is located 608 ft. S (N. or S.) and 221 ft. E (E. or W.) from the NW corner of Section 29, T1S, R10E, WM,
(Section or subdivision)

(If preferable, give distance and bearing to section corner)

(If there is more than one point of diversion, each must be described. Use separate sheet if necessary)

being within the NW 1/4 of the NW 1/4 (Give smallest legal subdivision) of Sec. 29, Tp. 1 S (N. or S.)
R. 10E (E. or W.), W. M., in the county of Hood River

5. The pipe lines (Main ditch, canal or pipe line) to be (Miles or feet) in length, terminating in the NE 1/4 of the NW 1/4 (Smallest legal subdivision) of Sec. 31, Tp. 3N (N. or S.)
R. 11E (E. or W.), W. M., the proposed location being shown throughout on the accompanying map.

DESCRIPTION OF WORKS

Diversion Works—

6. (a) Height of dam ..... feet, length on top ..... feet, length at bottom ..... feet; material to be used and character of construction .....
(Loose rock, concrete, masonry, rock and brush, timber crib, etc., wasteway over or around dam)

(b) Description of ~~headgate~~ Collection System - Two 12-inch diameter perforated
(Timber, concrete, etc., number and size of openings)
collector pipes and concrete control box with 14-inch effluent pipe and overflow and drain.

(c) If water is to be pumped give general description .....
(Size and type of pump)

(Size and type of engine or motor to be used, total head water is to be lifted, etc.)

*A different form of application is provided where storage works are contemplated.

**Application for permits to appropriate water for the generation of electricity, with the exception of municipalities, must be made to the Hydroelectric Commission. Either of the above forms may be secured, without cost, together with instructions by addressing the State Engineer, Salem, Oregon.

29377

Canal System or Pipe Line -

7. (a) Give dimensions at each point of canal where materially changed in size, stating miles from headgate. At headgate: width on top (at water line) ____ feet; width on bottom ____ feet; depth of water ____ feet; grade ____ feet fall per one thousand feet.

(b) At ____ miles from headgate: width on top (at water line) ____ feet; width on bottom ____ feet; depth of water ____ feet; grade ____ feet fall per one thousand feet.

(c) Length of pipe, to res., 65,700 size at intake, 14 in.; size at 10,800 ft. from intake 10 in.; size at place of use varies in.; difference in elevation between intake and place of use, 1280 ft. Is grade uniform? No Estimated capacity, 3.65 sec. ft. *Assumes replacement of present system)

(Booth Hill Reservoir)

8. Location of area to be irrigated, or place of use See accompanying map

Township North or South	Range E. or W. of Willamette Meridian	Section	Forty-acre Tract	Number Acres To Be Irrigated
1S	R10E	4	W1/2 of SW1/4	
"		5	All	
"		6	All except N 1/2 of NW1/4 and NW 1/4 of NE 1/4	
"		7	All except W1/2 of NW1/4 and NW 1/4 of SW 1/4	
"		8	All	
"		9	W 1/2 of NW 1/4 and W1/2 of SW 1/4	
"		16	W 1/2 of NW 1/4 and W 1/2 of SW 1/4	
"		17	All except S 1/2 of SW1/4 and SW1/4 of SE 1/4	
"		18 q	N 1/2 of NW1/4, N1/2 of NE1/4, SE1/4 of NE1/4 and NE1/4 of SE 1/4	
"		20	E 1/2 of NE 1/4	
"		21	W 1/2 of NW 1/4	
"			(Also see attached sheets)	

(If more space required, attach separate sheet)

(a) Character of soil ____

(b) Kind of crops raised ____

Power or Mining Purposes—

9. (a) Total amount of power to be developed ____ theoretical horsepower.

(b) Quantity of water to be used for power ____ sec. ft.

(c) Total fall to be utilized ____ (Head) ____ feet.

(d) The nature of the works by means of which the power is to be developed ____

(e) Such works to be located in ____ (Legal subdivision) ____ of Sec. ____, Tp. ____ (No. N. or S.) ____, R. ____ (No. E. or W.) ____, W. M.

(f) Is water to be returned to any stream? (Yes or No)

(g) If so, name stream and locate point of return ____, Sec. ____, Tp. ____ (No. N. or S.) ____, R. ____ (No. E. or W.) ____, W. M.

(h) The use to which power is to be applied is ____

(i) The nature of the mines to be served ____

Supplement to Item 8
Application for the Crystal Springs Water District

29377

Town	Range	Section	Forty-Acre Tract
1N	9E	24	All E1/2 Sec. 24, except NW1/4 of NE1/4
1N	9E	25	E 1/2 of NE 1/4
1N	10E	1	All
"	"	2	All
"	"	3	All, except SW1/4
"	"	10	E 1/2
"	"	11	All, except E1/2 of NE1/4 and SE1/4
"	"	15	All, except W1/2 of NW1/4
"	"	17	(All except) NW1/4, NE1/4, NE1/4 of SW1/4 and N1/2 of SE1/4
"	"	18	All, except NE 1/4 and N1/2 of NW1/4
"	"	19	All
"	"	20	All
"	"	21	All, except N1/2 of NW1/4 and N1/2 of NE1/4
"	"	22	All
"	"	27	All
"	"	28	All
"	"	29	All
"	"	30	All
"	"	32	NW1/4 of NW1/4 and E1/2 of NE1/4
"	"	33	All
"	"	34	All
1N	11E	6	All

Supplement to Item 8 (continued)

29377

Town	Range	Section	Forty-Acre Tract
2N	10E	1	NE1/4 and SE 1/4
"	"	12	All, except W1/2 of NW1/4
"	"	13	All
"	"	14	All, except W1/2 of NW1/4
"	"	15	SE 1/4 and S 1/2 of SW1/4
"	"	16	S 1/2 of SE 1/4
"	"	21	All
"	"	22	All
"	"	23	All
"	"	24	All
"	"	25	All
"	"	26	All
"	"	27	All
"	"	28	All, except S1/2 of SE1/4 and S1/2 of SW1/4
"	"	34	All
2N	10E	35	All
"	"	36	All
2N	11E	6	All
"	"	7	All
"	"	18	All
"	"	19	All
"	"	30	All
2N	11E	31	All
3N	10E	25	SE1/4 of the SE1/4
"	"	36	SE1/4 of NE1/4 and E1/2 of SE1/4
3N	11E	30	S1/2 of the SW1/4
"	"	31	NW1/4 and SW1/4

Municipal or Domestic Supply—

29774

10. (a) To supply the ~~city or~~ Crystal Springs Water District of Hood River

(Name of) County, having a present population of 3050

and an estimated population of 5160 in 19 82

(b) If for domestic use state number of families to be supplied 1360

(Answer questions 11, 12, 13, and 14 in all cases)

11. Estimated cost of proposed works, $12,000 (Source Only), $480,000 initial improvements to the system

12. Construction work will begin on or before April 1965

13. Construction work will be completed on or before Phase I - December, 1965

14. The water will be completely applied to the proposed use on or before Initial improvements at the source in use by August 1965. Domestic demands will require all of the applied-for appropriation by 1982.

Gowlan Welk, Vice Pres.
(Signature of applicant)

Remarks: The Crystal Springs Water District presently utilizes as its sole source of supply water from Crystal Springs, use of which is granted under Permit No. 9831 to appropriate an amount not exceeding 1.0 cfs from the springs. Certificate was issued dated July 28, 1933, to the Crystal Springs Water Company for 365 domestic users. Present users number 830± with a maximum day demand of 1.55 cfs. Appropriation of more than 1.0 cfs at this time is limited by the present right, and capacity of the collection system and pipelines.

Granting of the requested appropriation will permit the Crystal Springs Water District to enlarge the collection system at the source and to construct the transmission lines to supply the District's users over the next 15 years.

STATE OF OREGON, }
County of Marion, } ss.

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for

In order to retain its priority, this application must be returned to the State Engineer, with corrections on or before ....., 19.....

WITNESS my hand this ..... day of ....., 19.....

STATE ENGINEER

By .....
ASSISTANT

PERMIT

STATE OF OREGON, }
County of Marion, } ss.

This is to certify that I have examined the foregoing application and do hereby grant the same, SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

The right herein granted is limited to the amount of water which can be applied to beneficial use and shall not exceed 2.65 *cubic feet per second measured at the point of diversion from the stream, or its equivalent in case of rotation with other water users, from* Crystal Springs

The use to which this water is to be applied is group domestic

If for irrigation, this appropriation shall be limited to -- *of one cubic foot per second or its equivalent for each acre irrigated*

and shall be subject to such reasonable rotation system as may be ordered by the proper state officer.

The priority date of this permit is January 22, 1964

Actual construction work shall begin on or before May 1, 1965 *and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19*66

*Complete application of the water to the proposed use shall be made on or before October 1, 19*67

WITNESS my hand this 1st *day of* May *, 19*64

[signature]
STATE ENGINEER

Application No. 39422
Permit No. 29377

PERMIT
TO APPROPRIATE THE PUBLIC WATERS OF THE STATE OF OREGON

This instrument was first received in the office of the State Engineer at Salem, Oregon, on the 22nd *day of* January *19*64*, at* 8:00 *o'clock* A. *M.*

Returned to applicant:

Approved: May 1, 1964

Recorded in book No 82 *of Permits on page* 29377

CHRIS L. WHEELER
STATE ENGINEER

Drainage Basin No 4 *page* 23

Fees

BC28

Extended to Oct. 1, 1967
Extended to Oct. 1, 1968
Extended to Oct. 1, 1969
Extended to Oct. 1, 1978
Extended to October 1, 1993
Extended to October 1, 1988
Extended to October 1, 1988

Water Right Information Query Results

Contact Information

Current contact information

OWNER:
CRYSTAL SPRINGS WATER DISTRICT
PO BOX 186
ODELL, OR 97044

Documents

View all scanned documents

Application: S 39422

Permit: S 29377 document

Signature: 5/1/1964

Permit Workflow			
Action	Date	Result	Completed By
Permit Issued	5/1/1964		
Extension Received	3/1/1999		ANN REECE
Extension PFO 315 Issued	6/1/1999		ANN REECE
Extension FO Issued	8/30/1999		
Extension Checkpoint 320 Received	9/30/2003		
Extension Checkpoint 320 Received	9/30/2008		SCOTT KUDLEMYER
Extension Checkpoint 320 Public Notice	12/2/2008		SCOTT KUDLEMYER
Extended Completion Date [Extension C Date]	10/1/2028		ANN REECE

Order(s)

Order Origin	Volume-Page	Signature	Description
Special	16-32	4/27/1967	EXTENSION OF TIME ON CERTAIN PERMITS
Special	18-307	6/20/1969	EXTENSION OF TIME FOR CERTAIN PERMITS
Special	25-100	9/16/1974	ORDER EXTENDING TIME IN WHICH TO COMPLETE CONSTRUCTION AND MAKE COMPLETE APPLICATION OF WATER UNDER CERTAIN PERMITS
Special	31-561	1/12/1979	EXTENDS TIME, CERTAIN PERMITS (385)
Special	38-225	5/1/1984	EXTENDS 266 PERMITS
Special	44-53	2/16/1990	EXTENSION ORDER
Special	48-113	2/9/1994	EXTENDS TIME LIMITS ON PERMITS

View right with Web Mapping

View Places of Use from Water Rights in the Same Area

View Reported Water Use

Water Right Information

Status: Non-Cancelled
County: Hood River
File Folder Location: Salem
Watermaster District: 3

Point(s) of Diversion

POD 1 - CRYSTAL SPRINGS > EAST FORK HOOD RIVER

Place(s) of Use

Add TRS grouping

Use - GROUP DOMESTIC (Primary); Priority Date: 1/22/1964

Water Right Genealogy

No genealogy records available for this water right, try the family link below instead.

View Water Rights in same Family

Report Errors with Water Right Data

Return to WRIS Query

RECEIVED
MAR 3 1969
STATE ENGINEER
SALEM, OREGON

IC State Engr.

Permit No. 34196

*APPLICATION FOR PERMIT

To Appropriate the Public Waters of the State of Oregon

I, Crystal Springs Water District
(Name of applicant)

of P.O. Box 35, Hood River 97031
(Mailing address),

State of Oregon, do hereby make application for a permit to appropriate the following described public waters of the State of Oregon, SUBJECT TO EXISTING RIGHTS:

If the applicant is a corporation, give date and place of incorporation
2 October 1963, Hood River

1. The source of the proposed appropriation is Crystal Springs
(Name of stream),
a tributary of East Fork of Hood River

2. The amount of water which the applicant intends to apply to beneficial use is 3.50 cubic feet per second.
(If water is to be used from more than one source, give quantity from each)

**3. The use to which the water is to be applied is domestic-municipal use
(Irrigation, power, mining, manufacturing, domestic supplies, etc.)

4. The point of diversion is located 500 ft. S. (N. or S.) and 320 ft. E. (E. or W.) from the N. W. corner of Section 29, T1S, R10E, WM
(Section or subdivision)

(If preferable, give distance and bearing to section corner)

(If there is more than one point of diversion, each must be described. Use separate sheet if necessary)

being within the NW1/4 of the NW1/4 (Give smallest legal subdivision) of Sec. 29, Tp. 1S (N. or S.),
R. 10E (E. or W.), W. M., in the county of Hood River.

5. The pipelines (Main ditch, canal or pipe line) to be variable (Miles or feet)
in length, terminating in the NE1/4 of NW1/4 (Smallest legal subdivision) of Sec. 31, Tp. 3N (N. or S.),
R. 11E (E. or W.), W. M., the proposed location being shown throughout on the accompanying map.

See map accompanying Application 39422 - Permit 29377.

DESCRIPTION OF WORKS

Diversion Works—

6. (a) Height of dam ..... feet, length on top ..... feet, length at bottom ..... feet; material to be used and character of construction
(Loose rock, concrete, masonry, rock and brush, timber crib, etc., wasteway over or around dam)

(b) Description of headgate See attached Drawing C 3711-1 sheets 5 & 6.
(Timber, concrete, etc., number and size of openings)

(c) If water is to be pumped give general description
(Size and type of pump)
(Size and type of engine or motor to be used, total head water is to be lifted, etc.)

*A different form of application is provided where storage works are contemplated.

**Application for permits to appropriate water for the generation of electricity, with the exception of municipalities, must be made to the Hydroelectric Commission. Either of the above forms may be secured, without cost, together with instructions by addressing the State Engineer, Salem, Oregon.

34196

Canal System or Pipe Line—

7. (a) Give dimensions at each point of canal where materially changed in size, stating miles from headgate. At headgate: width bn top (at water line) ..... feet; width on bottom ..... feet; depth of water ..... feet; grade ..... feet fall per one thousand feet.

(b) At ..... miles from headgate: width on top (at water line) ..... feet; width on bottom ..... feet; depth of water ..... feet; grade ..... feet fall per one thousand feet.

(c) Length of pipe, 250, 000 ft.; size at intake, 14 in.; size at 55, 000 ft. from intake 10 in.; size at place of use variable in.; difference in elevation between intake and place of use, up to 2300 ft. Is grade uniform? no Estimated capacity, 7. 15 sec. ft.

8. Location of area to be irrigated, or place of use see map accompanying Application 39422 - Permit 29377

Township North or South	Range E. or W. of Willamette Meridian	Section	Forty-acre Tract	Number Acres To Be Irrigated
See attached 3 sheets				

(If more space required, attach separate sheet)

(a) Character of soil .....

(b) Kind of crops raised .....

Power or Mining Purposes—

9. (a) Total amount of power to be developed ..... theoretical horsepower.

(b) Quantity of water to be used for power ..... sec. ft.

(c) Total fall to be utilized ..... (Head) feet.

(d) The nature of the works by means of which the power is to be developed .....

.....

(e) Such works to be located in ..... (Legal subdivision) of Sec. ....., Tp. ..... (No. N. or S.), R. ..... (No. E. or W.), W. M.

(f) Is water to be returned to any stream? ..... (Yes or No)

(g) If so, name stream and locate point of return .....

....., Sec. ....., Tp. ..... (No. N. or S.), R. ..... (No. E. or W.), W. M.

(h) The use to which power is to be applied is .....

(i) The nature of the mines to be served .....

Supplement to Item 8
Application for the Crystal Springs Water District

29377

Town.	Range	Section	Forty-Acre Tract
1N	9E	24	All E½ Sec. 24, except NW¼ of NE¼
1N	9E	25	E½ of NE¼
1N	10E	1	All
"	"	2	All
"	"	3	All, except SW¼
"	"	10	E½
"	"	11	All, except E½ of NE¼ and SE¼
"	"	15	All, except W½ of NW¼
"	"	17	All except NW¼, NE¼, NE¼ of SW¼ and N½ of SE¼
"	"	18	All, except NE¼ and N½ of NW¼
"	"	19	All
"	"	20	All
"	"	21	All, except N½ of NW¼ and N½ of NE¼
"	"	22	All
"	"	27	All
"	"	28	All
"	"	29	All
"	"	30	All
"	"	32	NW¼ of NW¼ and E½ of NE¼
"	"	33	All
"	"	34	All
1N	11E	6	All
2N	10E	1	NE¼ and SE¼
"	"	12	All, except W½ of NW¼

Application No. 45826
Permit No. 34196

Supplement to Item 8 (continued)

Town	Range	Section	Forty-Acre Tract
2N	10E	13	All
"	"	14	All, except W½ of NW¼
"	"	15	SE¼ and S½ of SW¼
"	"	16	S½ of SE¼
"	"	21	All
"	"	22	All
"	"	23	All
"	"	24	All
"	"	25	All
"	"	26	All
"	"	27	All
"	"	28	All, except S½ of SE¼ and S½ of SW¼
"	"	34	All
2N	10E	35	All
"	"	36	All
2N	11E	6	All
"	"	7	All
"	"	18	All
"	"	19	All
"	"	30	All
2N	11E	31	All
3N	10E	25	SE¼ of the SE¼
"	"	36	SE¼ of NE¼ and E½ of SE¼
3N	11E	30	S½ of the SW¼
"	"	31	NW¼ and SW¼

Application No. 45826
Permit No. 34196

Township North or South	Range E. or W. of Willamette Meridian	Section	Forty-acre Tract	Number Acres To Be Relinquished
1S	R10E	4	W½ of SW¼	
"		5	All	
"		6	All Except N½ of NW¼ and NW¼ of SW¼	
"		7	All except W½ of NW¼ and NW¼ of SW¼	
"		8	All	
"		9	W½ of NW¼ and W½ of SW¼	
"		16	W½ of NW¼ and W½ of SW¼	
"		17	All except S½ of SW¼ and SW¼ of SE¼	
"		18	N½ of NW¼, N½ of NE¼, SE¼ of NE¼ and NE¼ of SE¼	
"		20	E½ of NE¼	
"		21	W½ of NW¼	
"			(Also see attached sheets)	

(If more space required, attach separate sheet)

extended to C 58

of NE, SE, and SW

Application No. 45826
Permit No. 34196

Municipal or Domestic Supply—

34196

10. (a) To supply the city of Crystal Springs Water District

Hood River (Name of) County, having a present population of 3950

and an estimated population of, 8000 in 19 2000.

(b) If for domestic use state number of families to be supplied 2290

(Answer questions 11, 12, 13, and 14 in all cases)

11. Estimated cost of proposed works, $1,500,000

12. Construction work will begin on or before January 1968

13. Construction work will be completed on or before January 1970

14. The water will be completely applied to the proposed use on or before year 2000

Gowlan Wells
(Signature of applicant)

by Gowlan Wells, Chairman, Board of Commiss.

Remarks: Headworks, second storage reservoir, and first 60,000 feet of new pipelines already constructed (1967-1968). Next 125,000 feet of new pipelines and third storage reservoir under contract now and due to be completed by September 1969.

Domestic and industrial growth will require full use of all of existing water rights plus this application prior to year 2000.

Existing rights and permits are as follows:

Application 13490 - Permit 9831 for 1.0 cfs

Application 39422 - Permit 29377 for 2.65 cfs

Spring yield during water system high demand period is about 7.1 cfs.

Granting of this application will give the District rights to 7.15 cfs at the spring.

STATE OF OREGON, } ss.
County of Marion, }

This is to certify that I have examined the foregoing application, together with the accompanying maps and data, and return the same for

In order to retain its priority, this application must be returned to the State Engineer, with corrections on or before , 19.

WITNESS my hand this day of , 19.

STATE ENGINEER

By

ASSISTANT

PERMIT

STATE OF OREGON, }
County of Marion, } ss.

This is to certify that I have examined the foregoing application and do hereby grant the same, SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

The right herein granted is limited to the amount of water which can be applied to beneficial use and shall not exceed 3.5 cubic feet per second measured at the point of diversion from the stream, or its equivalent in case of rotation with other water users, from Crystal Springs

The use to which this water is to be applied is municipal

If for irrigation, this appropriation shall be limited to ——— of one cubic foot per second or its equivalent for each acre irrigated

and shall be subject to such reasonable rotation system as may be ordered by the proper state officer.

The priority date of this permit is March 3, 1969

Actual construction work shall begin on or before August 25, 1970 and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 1971
Extended to October 1, 1988 Extended to Oct. 1, 1983 Extended to October 1, 1993

Complete application of the water to the proposed use shall be made on or before October 1, 1972
Extended to October 1, 1988 Extended to Oct. 1, 1983 Extended to Oct. 1978 Extended to October 1, 1993

WITNESS my hand this 25th day of August, 1969

B+C to 10-1-98

Clara L. Mueller
STATE ENGINEER

Application No. 45824
Permit No. 24196

PERMIT
TO APPROPRIATE THE PUBLIC WATERS OF THE STATE OF OREGON

This instrument was first received in the office of the State Engineer at Salem, Oregon, on the 3rd day of March, 1969, at 8:00 o'clock A M.

Returned to applicant: ———

Approved:
August 25, 1969

Recorded in book No. ——— of Permits on page 24196

CHRIS L. WHEELER
STATE ENGINEER

Drainage Basin No. 4 page 24
Fees $37.00

State Printing 84137

Water Right Information Query Results

Contact Information

Current contact information

OWNER:
CRYSTAL SPRINGS WATER DISTRICT
PO BOX 186
ODELL, OR 97044

Documents

View all scanned documents

Application: S 45826

Permit: S 34196 document

Signature: 8/25/1969

Permit Workflow			
Action	Date	Result	Completed By
Permit Issued	8/25/1969		
Extension Received	3/1/1999		ANN REECE
Extension PFO 315 Issued	3/28/2000		ANN REECE
Extension FO Issued	8/4/2004		
Extension Checkpoint 315 Received	9/22/2009		SCOTT KUDLEMYER
Extension Checkpoint 320 Received	9/22/2009		
Extension Checkpoint 320 Public Notice	9/29/2009		SCOTT KUDLEMYER
Extension Checkpoint 320 Received	11/25/2014		
Extension Checkpoint 320 Public Notice	12/9/2014		
Extended Completion Date [Extension C Date]	10/1/2058		ANN REECE

Order(s)

Order Origin	Volume-Page	Signature	Description
Special	25-100	9/16/1974	ORDER EXTENDING TIME IN WHICH TO COMPLETE CONSTRUCTION AND MAKE COMPLETE APPLICATION OF WATER UNDER CERTAIN PERMITS
Special	31-561	1/12/1979	EXTENDS TIME, CERTAIN PERMITS (385)
Special	38-225	5/1/1984	EXTENDS 266 PERMITS
Special	44-53	2/16/1990	EXTENSION ORDER
Special	48-113	2/9/1994	EXTENDS TIME LIMITS ON PERMITS

View right with Web Mapping

View Places of Use from Water Rights in the Same Area

View Reported Water Use

Water Right Information

Status: Non-Cancelled
County: Hood River
File Folder Location: Salem
Watermaster District: 3

Point(s) of Diversion

POD 1 - CRYSTAL SPRINGS > EAST FORK HOOD RIVER

Place(s) of Use

Add TRS grouping

Use - MUNICIPAL USES (Primary); Priority Date: 3/3/1969

Water Right Genealogy

No genealogy records available for this water right, try the family link below instead.

View Water Rights in same Family

Report Errors with Water Right Data

Return to WRIS Query

Appendix 3.2

Instream Water Right

STATE OF OREGON

COUNTY OF HOOD RIVER

SUPERSEDING CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

STATE OF OREGON
WATER RESOURCES DEPARTMENT
SALEM, OREGON 97310

confirms the right to use the waters of EAST FORK HOOD RIVER, tributary of HOOD RIVER, in the HOOD RIVER BASIN, to maintain an instream flow for the purpose of SUPPORTING AQUATIC LIFE AND MINIMIZING POLLUTION.

The right is for flows to be maintained in the EAST FORK HOOD RIVER ABOVE ITS CONFLUENCE WITH THE MIDDLE FORK HOOD RIVER NEAR RIVER MILE 2.3 (Section 18, Township 1 North, Range 10 East, WM).

the right is established under Oregon Revised Statutes 537.346.

The date of priority is NOVEMBER 3, 1983.

The right is limited to not more than the amounts during the time periods listed below:

Period	Flow (cubic feet per second)
OCT 1 - DEC 31	150
JAN 1 - MAR 31	100
APR 1 - JUN 30	150
JUL 1 - SEP 30	100

A clerical error was inadvertently made in Water Right Certificate number 59677, incorrectly describing the reach of the river where the flow is to be maintained.

This Certificate is issued only to correctly describe the location of the river where flows are to be maintained and supersedes Water Right Certificate number 59677.

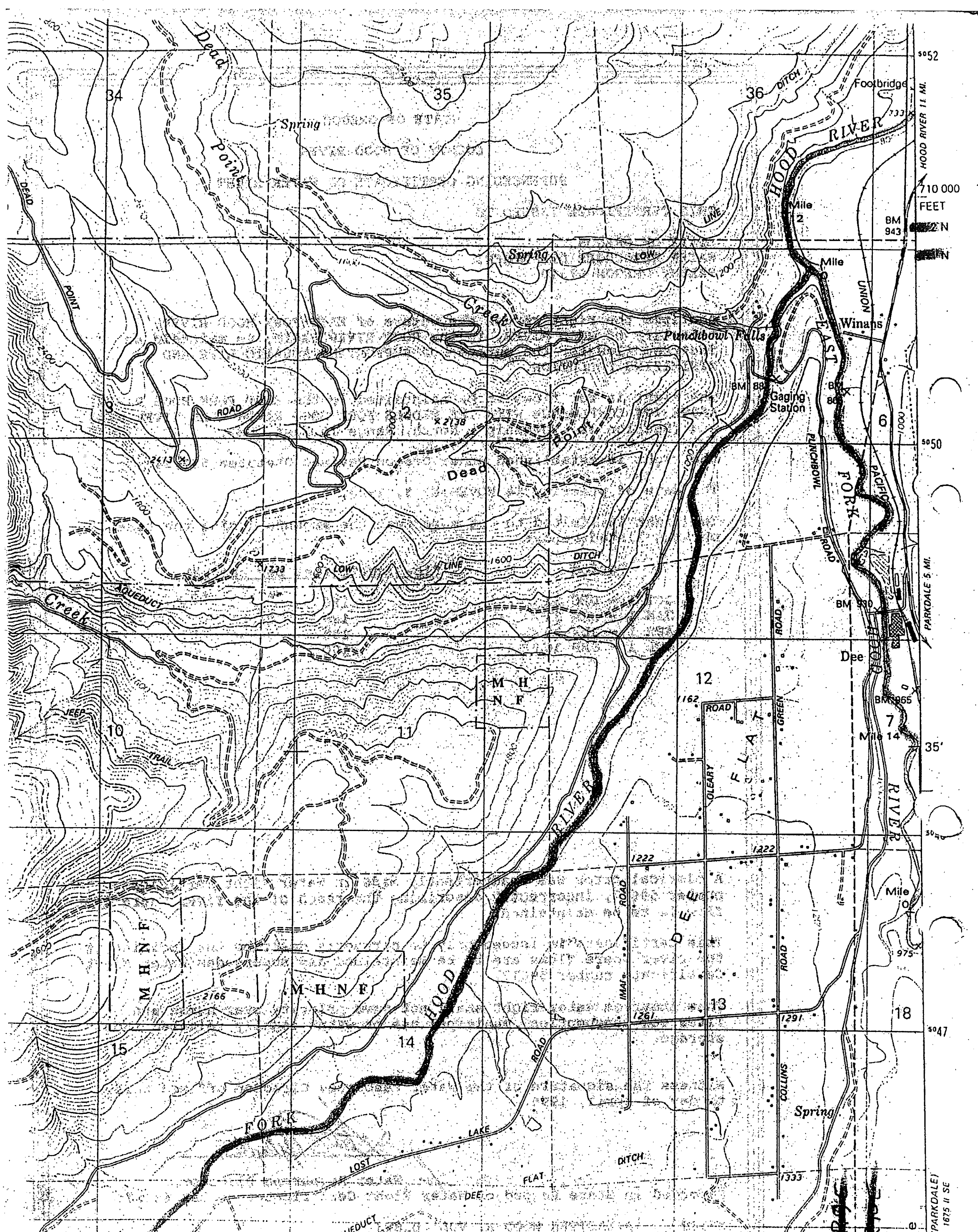
This instream water right shall not have priority over human and livestock consumption, municipal use or water legally released from storage.

Witness the signature of the Water Resources Director affixed this 12th day of April, 1995.

for Water Resources Director

Recorded in State Record of Water Right Certificates number 68457.

MF189 4.EASTTFK HOOD R. VOL1.DIST3



Dead Point
Spring
Footbridge
HOOD RIVER 11 MI.
HOOD RIVER
DITCH
710 000
FEET
Mile 2
BM 943
Mile
Spring
LOW LINE
Creek
UNION
Winans
Punchbowl Falls
EAST FORK
BM 88
Gaging Station
ROAD
x 2138
Point
Dead
PUNCHBOWL ROAD
PACIFIC
2413
1733
LOW LINE DITCH
AQUEDUCT
Creek
PARKDALE 5 MI.
BM 930
Dee
M H N F
1162
ROAD
DEE FLAT
GREEN ROAD
OLEARY
JEEP TRAIL
BM 965
Mile 14
35'
HOOD RIVER
RIVER
1222
IMAI ROAD
ROAD
Mile
975
MHNF
M H N F
2166
HOOD
13
1261
1291
18
14
15
ROAD
COLLINS
Spring
FORK
LAKE
LOST
DITCH
FLAT
1333
DEE
AQUEDUCT
1324
WEST
Ridge
(PARKDALE)
1675 II SE

Appendix 3.3

Pressure Control Valves

VAULTS	Main_Valve	In_	Out	Bypass	In1	Out_1	Sus	PaceID
Wyeast prv	3	180	155					1
wyeast preasure relief station	4	200	210					2
BEITLER PRV	6	350	250					3
Centralvale prv	4	250	140	1.25	250	150		4
BOOTH PRV	6	175	155	2				5
Masse Grade prv	3	250	140	3	140	70		6
masse grade prv 2	8	250	70					7
EHRK Hill prv	4"	185	115	1.25	185	120		8
Erchk Hill preasure relief vault	6	260	270					9
tucker park prv	4	220	75	1.25 regula	220	65		10
Hood River intertie	6	180	110				145	11
Dethman Ridge Rd. pressure relief valve	4	200	210					12
eatside prv and pressure relief vault	4	220	65	2	220	70	100	13
Eastside Rd. 10" prv	8	vented		3	vented			14
Eastside Rd. 4" prv	3	200	180	1.50	200	185		15
Pine Grove Alt. vault	4	35	10	2" rate of f	35	100gal		16
Thomson Rd. pressure relief valve	4	205	215					17
Scott Rd. prv	3	165	135	1.25	165	140		18
Tackasumi 8" prv	8	230	75				80	19
Tackasumi 3"	3	250	150	3	150	80	80	20
Tackasumi 6"prv	4	80	5	2	80	7		21
Tackasumi 6" pressure relief vault	6	80	90					22
Booth Hil Control vault	4	84	12				70	23
Gilhouley Rd. prv	4	175	145	1.25	175	150		24
Miller RD	8"	185	168					25
Miller Rd. prv								26
Miller Rd. pressure relief vault	6"	192	202					27
Woodworth Rd. prv	4"	200	55	2"	200	60		28
Trout Creek Rd.	4"	120	130c					29
Trout Creek prv	4"	190	60	1.25"	190	70		30
Copper Spur pressure relief	4"	60	70					31
Copper spur prv	4"	260PSI	60					32
Jorden Rd. prv	8"	250	50					33
Jorden Rd. pressure relief vault	8"	60	85					34
Toli Bridge prv	8"	150	130	3"	150	130		35
Woodworth Blank Vault								36
London Rd. 6" blank vault								37
PRV	4	175	110	1.5	175	105		38
Sherrard	4	160	15					39
Lenz Butte 2"PVC	1.5	240	140	3/4 regulat	240	150		40

Appendix 3.4

Hydrant Data

43

Address	Road Name	LAT (North)	LONG (West)	Current PSI lettering	Static	Residual	PITO
3296	AGA Rd	45.62883	121.54482	230			
3308	AGA Rd	45.62833	121.54465				
3344	AGA Rd (Sec A&B)	45.62653	121.54788	220			
3344	AGA Rd (Space 100)	45.62717	121.5464	210			
3344	AGA Rd (Space 155)	45.62722	121.54887	210			
3344	AGA Rd (Space G1)	45.62637	121.54878	210			
4038	Barlett Dr	45.63353	121.55513	200			
4070	Barlett Dr	45.63363	121.55818	200			
4038	Bartlett Loop	45.63353	121.55678	200			
3631	Beachwood Dr	45.63	121.53965	225			
	Bone Dr	45.60313	121.52847	150			
4115	Booth Hill Rd	45.60622	121.53395	190			
4485	Booth Hill Rd	45.59522	121.53827	160			
	Booth Hill Rd/Bone Dr	45.60302	121.54883	170			
3610	Central Vale Dr	45.60608	121.5399	230			
3790	Central Vale Dr	45.60685	121.54873	200			
4095	Central Vale Dr	45.60667	121.556	225			
4120	Central Vale Dr	45.60637	121.56078	210			
4280	Chamberlin Dr	45.6409	121.56573	125			
4475	Chamberlin Dr A16	45.64233	121.57408	125			
3360	Chevron DR	45.62895	121.53737	225			
3661	Chevron DR	45.62927	121.54123	225			
	Crystal Springs Behind locked gate	45.6245	121.554				
3430	Davis Dr (Duckwall Shipping)	45.62453	121.54775	225			
3430	Davis Dr (Stadelman's/Duckwall)	45.62482	121.53252	235			
3686	Davis Dr (west parking of school)	45.62525	121.54467	210			
	Davis Dr/Early RD	45.62437	121.54235	250			
	Davis Dr/Lingren Rd	45.62475	121.53417	210			
	Davis Dr/Odell Hwy	45.62463	121.54045	225			
	Davis Dr/Straight Hill Rd	45.62463	121.53792	225			
2935	Dethman Ridge Rd	45.65045	121.51488	200			
3166	Dethman Ridge Rd	45.64978	121.52237	175			
3484	Dethman Ridge Rd	45.65032	121.53438	180			
3579	Dethman Ridge Rd	45.64427	121.53455	170			
	Diamond Central Chevron Dr/Willow Rd	45.62857	121.53857	125			
	Diamond Central E Side in corner of Bldgs	45.62808	121.53607	125			
	Diamond Central N Side Shipping Office	45.62903	121.53737	125			
	Diamond Central NW Corner	45.62862	121.53938	125			
	Diamond Central Plant Office Entrance	45.62893	121.53723	125			
	Diamond Central South Side, East Corner	45.62707	121.5373	125			
	Diamond Central South Side, Middle hydrant	45.62727	121.53748	125			
	Diamond Central South side/West corner	45.62682	121.53933	125			

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Address	Road Name	LAT (North)	LONG (West)	Current PSI lettering	Static	Residual	PITO
	Diamond Central West Side/North hydrant	45.62828	121.53995	125			
	Diamond Central West Side/South hydrant	45.62793	121.54033	125			
	Diamond Fruit (Old Plant) SE corner by RR Tracks	45.6271	121.54123				
3800	Eagle Loop	45.62947	121.5462	230			
	Eagle Loop (North end)	45.6306	121.54642	230			
	Eagle Loop (South end)	45.6292	121.5462	230			
	Eagle Loop/Heron Dr	45.63007	121.54783	230			
3420	Early Rd	45.6257	121.54247	210			
1015	Eastside Rd	45.69122	121.50137	160			
1222	Eastside Rd	45.68587	121.49842	190			
2445	Eastside Rd	45.65228	121.49993	160			
	Eastside Rd/Old Dalles Dr	45.6793	121.4976	200			
	Eastside Rd/Paasch Dr	45.6677	121.49753	190			
3472	Ehrck Hill	45.63878	121.53437	150			
3557	Ehrck Hill	45.63552	121.53822	190			
	Ehrck Hill Rd/Lingren Dr	45.63492	121.5346	200			
2581	Fir Mtn Rd	45.6385	121.50317				
2900	Fir Mtn Rd	45.6393	121.49795	190			
3110	Fir Mtn Rd	45.63295	121.49845	225			
3320	Fir Mtn Rd	45.62818	121.4921	90			
3416	Gateway Dr	45.63065	121.53572	225			
2701	Glass Dr	45.64562	121.50408	140			
	Heron Dr (end)	45.62997	121.54987	230			
	Hidden Oak Dr (lower)	45.68078	121.49003				
	Hidden Oak Dr (Middle)	45.68245	121.48818				
	Hidden Oak Dr (Upper)	45.68323	121.49165				
575	Highline Rd	45.70613	121.49663	90			
662	Highline Rd	45.70155	121.50207	90			
680	Highline Rd	45.70058	121.50142	0			
	Highline Rd/Eastside Rd	45.69655	121.50137	0			
	Highline Rd/Riverview Dr	45.70613	121.49723	0			
	Homestead Dr/Farwig Dr	45.63177	121.54053				
1930	Hwy 35	45.66323	121.51342	200			
2165	Hwy 35	45.65897	121.5109	110			
2265	Hwy 35	45.65768	121.51343	190			
4320	Hwy 35	45.59522	121.54513	150			
4455	Hwy 35	45.59647	121.54883	150			
3015	Hwy 35 (front yard)	45.63583	121.51182	225			
	Hwy 35/Paasch Rd	45.66767	121.51328	210			
	Hwy 35/VanHorn DR	45.65327	121.51328	190			
	Jones Dr/Jones Loop	45.6334	121.5378	230			
3541	Jones Loop	45.63307	121.53732	230			
3291	Kollas Rd	45.62433	121.56983				
3366	Kollas Rd	45.63833	121.58167				
2399	Lacey Dr	45.67132	121.4925	170			
3265	Lingren Dr	45.62955	121.53442	225			
3430	Lingren Dr (N.W. Duckwall)	45.62677	121.53372	225			
3015	Lower Neal Mill Rd	45.63017	121.5208				
3045	Lower Neal Mill Rd	45.62927	121.5201				

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Address	Road Name	LAT (North)	LONG (West)	Current PSI lettering	Static	Residual	PITO
3057	Lower Neal Mill Rd	45.62887	121.51877	200			
3070	Lower Neal Mill Rd	45.62887	121.5181				
3085	Lower Neal Mill Rd	45.62912	121.51647				
	Maple Rd/Cedar Dr	45.6312	121.53967				
1905	Mason Rd	45.6605	121.49812	175			
2124	Mason Rd	45.6607	121.5066	180			
2225	Mason Rd	45.65783	121.50843	195			
3647	Massee Grade	45.61808	121.53692	150			
3915	Massee Grade	45.61188	121.5342	220			
3190	Midway Rd	45.63065	121.53665	225			
3848	Neal Creek Rd	45.61272	121.5133	180			
4670	Neal Creek Rd	45.60517	121.5045				
	Neal Creek/Hwy 35	45.62898	121.51312	200			
1425	Oak Ridge Dr (lower mailbox)	45.6785	121.48305	0			
1415	Oak Ridge Dr (middle)	45.67953	121.48558	100			
1370	Oak Ridge Dr (upper mailbox)	45.67953	121.48558	75			
2956	Odell Hwy	45.63805	121.54513				
3155	Odell Hwy	45.63257	121.54468				
3336	Odell Hwy	45.62855	121.54148	230			
3431	Odell Hwy	45.62442	121.54053	230			
	Odell Hwy/Webb Dr	45.64333	121.54737				
2390	Old Dalles Rd	45.6793	121.4939	190			
2700	Paasch Dr	45.66793	121.50513	215			
2470	Paasch Dr	45.6677	121.49267	155			
4411	Riverside Dr	45.64895	121.56975				
4470	Riverside Dr	45.65142	121.57142				
4520	Riverside Dr	45.65017	121.57303				
	Sherrard Rd/Bear Ridge Dr	45.60628	121.51145	160			
	Stadelman Dr/Broadmill	45.62655	121.52757	200			
	Stadelman Dr/Corner	45.622	121.52412				
	Stadelman Dr/Fox Packing House	45.62133	121.52433				
1535	Stricker Rd	45.67517	121.49252	190			
3756	Summit Dr	45.63517	121.54933	230			
3838	Summit Dr	45.6353	121.55483	200			
4100	Summit Dr	45.63512	121.558	200			
4260	Summit Dr	45.63497	121.56593	175			
4715	Summit Dr	45.63422	121.57563	200			
2615	Swyers Dr	45.60917	121.5025				
2820	Swyers Dr	45.60917	121.52433				
4179	Sylvester Dr	45.6139	121.56012	225			
3140	Tamarack Dr	45.63212	121.53803				
3209	Tamarack Rd	45.6308	121.53762	230			
3225	Thomsen Rd	45.63038	121.50335	190			
3322	Thomsen Rd	45.63018	121.50295	190			
3601	Thomsen Rd	45.62012	121.50625	190			
3725	Thomsen Rd	45.61702	121.50625	200			
3602	Vance Dr	45.62467	121.53817	250			
2885	VanHorn Dr	45.65328	121.51062	185			
2882	VanHorn Dr (North)	45.65433	121.50953	180			
2882	VanHorn Dr (South)	45.65412	121.50957	0			
	VanHorn Dr-Diamond Plant	45.65325	121.508	190			
2650	Webster Rd	45.64617	121.51863	175			

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Address	Road Name	LAT (North)	LONG (West)	Current PSI lettering	Static	Residual	PITO
2726	Webster Rd	45.64437	121.52407	170			
1802	Wells Dr	45.652	121.49245	130			
2093	Wells Dr	45.65033	121.48562	50			
2205	Wells Dr	45.63873	121.48672	60			
2360	Wells Dr	45.64328	121.48743	105			
2597	Wells Dr	45.64235	121.49478	175			
1665	Wells Dr	45.65232	121.4976	150			
1806	Wells Dr	45.65183	121.49245	100			
2925	Wheeler Rd	45.63865	121.5829				
3645	Willow Flat Rd	45.61012	121.53267	250			
3905	Willow Flat Rd	45.60983	121.5238	175			
4130	Willow Flat Rd	45.60633	121.51892	110			
4370	Willow Flat Rd	45.59982	121.5241	120			
	Willow Flat Rd/Furrow Rd	45.59963	121.52078	180			
	WyEast Middle School	45.63567	121.554				
2584	WyEast Rd	45.6494	121.55487	205			
2670	WyEast Rd	45.64305	121.55535	205			
2703	WyEast Rd	45.64488	121.5552	205			
2929	WyEast Rd	45.55553	121.55487	195			
3220	WyEast Rd	45.63068	121.5553				
3450	WyEast Rd	45.62455	121.55513	230			
3624	WyEast Rd	45.61875	121.5565	200			
3858	WyEast Rd	45.61113	121.55618	225			
	WyEast Rd/Odell Hwy	45.64963	121.54748				

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OBJECTID	Location	Manufactur	GPM	Cap_Color	Hydrant_ID	X_Long	Y_LAT	Steamer	Date_Serviced	Year_Made	Residual_P	Static_Pres	Flow_Press	F_Dist	Agency	Old_Hydrant_ID
9	2726 WEBSTER RD	AM Darl B62B HP	0		02N10E23_H02	121° 31' 26.603" W	45° 38' 39.698" N			0	0	145	0	PGFD	CSWD	9
10	2670 WEBSTER RD	Am Darl B62B-B	0		02N10E24_H01	121° 31' 7.118" W	45° 38' 46.121" N			0	0	165	0	PGFD	CSWD	10
11	3166 DETHMAN RIDGE DR	Am Darl B50B	0		02N10E13_H11	121° 31' 20.366" W	45° 38' 59.404" N			0	25	205	0	PGFD	CSWD	11
12	3345 DETHMAN RIDGE DR	Am Darl B50B	0		02N10E14_H03	121° 31' 45.718" W	45° 38' 59.473" N			0	20	220	0	PGFD	CSWD	12
13	3476 DETHMAN RIDGE DR	Am Darl B50B	0		02N10E14_H02	121° 32' 3.722" W	45° 38' 59.442" N			0	10	195	0	PGFD	CSWD	13
19	2701 GLASS DR	Am Darl B50B	0		02N10E24_H02	121° 30' 14.653" W	45° 38' 44.267" N			0	0	230	0	PGFD	CSWD	20
20	2900 FIR MOUNTAIN RD	Am Darl B50B HP	0		02N11E19_H04	121° 29' 52.625" W	45° 38' 21.126" N			0	0	190	0	PGFD	CSWD	21
21	3110 FIR MOUNTAIN RD	Am Darl B50B HP	0		02N11E30_H01	121° 29' 54.414" W	45° 37' 58.472" N			0	0	225	0	PGFD	CSWD	22
22	3315 FIR MOUNTAIN RD	Corey	0		02N11E30_H02	121° 29' 31.961" W	45° 37' 42.316" N			0	0	90	0	PGFD	CSWD	23
23	2597 WELLS DR	Am Darl B50B HP	0		02N11E19_H03	121° 29' 41.236" W	45° 38' 32.416" N			0	0	170	0	PGFD	CSWD	24
24	2495 WELLS DR	Am Darl B50B HP	0		02N11E19_H02	121° 29' 14.727" W	45° 38' 35.966" N			0	0	105	0	PGFD	CSWD	25
25	2205 WELLS DR	Am Darl B50B	0		02N11E19_H01	121° 29' 12.045" W	45° 38' 49.758" N			0	0	60	0	PGFD	CSWD	26
26	2093 WELLS DR	Am Darl B50B	0		02N11E18_H06	121° 29' 11.004" W	45° 39' 1.378" N			0	0	60	0	PGFD	CSWD	27
27	1802 WELLS DR	Am Darl B50B	0		02N11E18_H04	121° 29' 33.088" W	45° 39' 7.435" N			0	0	130	0	PGFD	CSWD	28
28	1806 WELLS DR	Am Darl B50B HP	0		02N11E18_H05	121° 29' 29.754" W	45° 39' 6.684" N			0	0	100	0	PGFD	CSWD	29
29	1665 ELLIS DR	Am Darl B50B HP	0		02N11E18_H03	121° 29' 51.460" W	45° 39' 8.439" N			0	0	150	0	PGFD	CSWD	30
30	2415 EASTSIDE RD	AM Darl B50B HP	0		02N11E18_H02	121° 29' 59.717" W	45° 39' 8.263" N			0	0	160	0	PGFD	CSWD	31
31	1905 MASON RD	Am Darl B50B	0		02N11E18_H01	121° 29' 53.168" W	45° 39' 37.934" N			0	0	170	0	PGFD	CSWD	32
528	2124 MASON RD	Mueller	0		02N10E13_H02	121° 30' 22.801" W	45° 39' 38.380" N			0	0	170	0	PGFD	CSWD	33
529	2609 VAN HORN DR	Am Darl B50B HP	0		02N10E13_H09	121° 30' 28.924" W	45° 39' 11.883" N			0	0	190	0	PGFD	CSWD	34
530	2865 VAN HORN DR	AM Darl B50B HP	0		02N10E13_H08	121° 30' 38.150" W	45° 39' 11.932" N			0	0	190	0	PGFD	CSWD	35
531	2385 VAN HORN DR	Am Darl B50B HP	0		02N10E13_H07	121° 30' 47.605" W	45° 39' 11.873" N			0	0	180	0	PGFD	CSWD	36
532	2470 DETHMAN RIDGE DR	Am Darl B50B HP	0		02N10E13_H10	121° 30' 54.061" W	45° 39' 1.593" N			0	0	200	0	PGFD	CSWD	37
533	2265 HWY 35	Am Darl B62B 1	0		02N10E13_H04	121° 30' 48.200" W	45° 39' 26.245" N			0	0	190	0	PGFD	CSWD	38
534	2199 HWY 35	Am Darl B62B	0		02N10E13_H03	121° 30' 40.741" W	45° 39' 31.650" N			0	0	190	0	PGFD	CSWD	39
535	HWY 35 | PAASCH DR	Am Darl B62B 1	0		02N10E12_H02	121° 30' 47.840" W	45° 40' 3.241" N			0	0	210	0	PGFD	CSWD	41
536	1015 EASTSIDE RD	Am Darl B50B HP	0		02N11E06_H01	121° 29' 54.884" W	45° 41' 28.360" N			0	0	200	0	PGFD	CSWD	42
537	1222 EASTSIDE RD	Am Darl B50B HP	0		02N11E06_H02	121° 29' 55.878" W	45° 41' 9.191" N			0	0	190	0	PGFD	CSWD	43
538	EASTSIDE RD | OLD DALLES DR	Am Darl B50B	0		02N11E06_H03	121° 29' 51.520" W	45° 40' 50.773" N			0	0	220	0	PGFD	CSWD	44
539	STRICKER DR - SOUTH	Am Darl B62B	0		02N11E07_H01	121° 29' 33.163" W	45° 40' 30.719" N			0	0	190	0	PGFD	CSWD	45
540	2399 LACEY DR	US Pipe	0		02N11E07_H02	121° 29' 33.172" W	45° 40' 16.657" N			0	0	170	0	PGFD	CSWD	46
541	2440 OLD DALLES DR	Am Darl B62B	0		02N11E06_H04	121° 29' 38.084" W	45° 40' 45.446" N			0	0	205	0	PGFD	CSWD	47
542	2700 PAASCH DR	Am Darl B62B	0		02N10E12_H03	121° 30' 19.156" W	45° 40' 4.566" N			0	0	210	0	PGFD	CSWD	48
543	EASTSIDE RD | PAASCH DR	Am Darl B50B HP	0		02N11E07_H03	121° 29' 51.047" W	45° 40' 3.704" N			0	0	190	0	PGFD	CSWD	49
544	2350 EASTSIDE RD	Am Darl B50B HP	0		02N11E07_H04	121° 29' 33.530" W	45° 40' 3.747" N			0	0	150	0	PGFD	CSWD	50
545	662 HIGHLINE RD	Am Darl B62B HP	0		03N11E31_H03	121° 30' 7.604" W	45° 42' 5.481" N			0	0	90	0	PGFD	CSWD	51
606	1452 OAK RIDGE DR		0		02N11E06_H07	121° 28' 59.118" W	45° 40' 42.947" N			0	0	0	0	PGFD	CSWD	0
607	1425 OAK RIDGE DR		0		02N11E06_H06	121° 29' 7.401" W	45° 40' 45.758" N			0	0	0	0	PGFD	CSWD	0
608	1408 OAK RIDGE DR		0		02N11E06_H05	121° 29' 10.064" W	45° 40' 48.137" N			0	0	0	0	PGFD	CSWD	0
857	HIGHLINE RD | RIVERVIEW DR		0		03N11E31_H01	121° 29' 48.858" W	45° 42' 22.020" N			0	0	0	0	PGFD	CSWD	146
858	575 HIGHLINE RD		0		03N11E31_H02	121° 29' 48.513" W	45° 42' 8.146" N			0	0	0	0	PGFD	CSWD	147
859	680 Highline rd.		0		03N11E31_H04	121° 30' 5.240" W	45° 42' 1.671" N			0	0	0	0	PGFD	CSWD	148
939	Approx Highline-Eastside Rd. inter*		0		03N11E31_H05	121° 30' 4.563" W	45° 41' 46.742" N			0	0	0	0	PGFD	CSWD	149
950	2900 VAN HORN DR - NORTH	MUELLER	0		02N10E13_H05	121° 30' 34.449" W	45° 39' 15.574" N	YES		2008	0	0	0	PGFD	CSWD	0
951	2900 VAN HORN DR - SOUTH	ANNISTON	0		02N10E13_H06	121° 30' 34.406" W	45° 39' 14.868" N	YES		1960	0	0	0	PGFD	CSWD	0
952	1930 HWY 35	AMERICAN DARLING	0		02N10E13_H01	121° 30' 48.156" W	45° 39' 47.487" N	YES		1989	0	200	0	PGFD	CSWD	40

Crystal Springs Hydrants

PFD#	Water Main	Location	LAT (North)	LONG (West)	Static PSI	Pitot PSI	GPM	Year Tested
2		150 Yards S. of London Dr.	45.48825	-121.586	100	40	1061	2013
3		Cooper Spur Rd. @ London Dr.	45.49009	-121.5864	120	60	1300	2013
4		8190 Cooper Spur Rd.	45.49382	-121.58649	160	30	919	2013
5		Cooper Spur@ Hutson Dr.	45.49724	-121.58659	160	32	949	2013
6		7950 Cooper Spur Rd.	45.50094	-121.586	180	26	856	2013
7		Cooper Spur@ Culbertson Rd.	45.50455	-121.58665	220	22	787	2013
8		N of 7680 Cooper Spur Rd.	45.50992	-121.5864	80	18	712	2013
9		7540 Cooper Spur Rd.	45.51313	-121.58642	90	20	750	2013
10		Corner Loop Rd.	45.53935	-121.56959	170	80	1501	2013
11		4476 London Dr.	45.49016	-121.57691	120	60	1300	2013
12		London Dr.@ Dog River Rd.	45.49002	-121.57119	170	110	1760	2013
13		8860 Dog River Rd.	45.47523	-121.56562	80	70	1404	2013
14		Jordon Rd, W. of Hutson 100'	45.49747	-121.57095	215	120	1838	2013
15		4495 Hutson Dr.	45.49738	-121.57672	200	38	1034	2013
18		4620 Culbertson Rd.	45.3016	-121.3447	70	86	1556	2013
21		8405 Clear Creek Rd.	45.48828	-121.5967	120	34	978	2013
26		Baseline Dr. @ Culbertson Dr.	45.50396	-121.56956	90	80	1501	2013
27		7675 Baseline Dr.	45.5089	-121.57073	100	80	1501	2013
28		Baseline Dr. @ Toll Bridge Rd.	45.5137	-121.57095	120	70	1404	2013
29		Baseline Dr. @ Cooper Spur Rd.	45.51924	-121.58659	100	20	750	2013
30		Baseline Dr. @ Allen Rd.	45.51958	-121.58875	100	18	712	2013
31		4895 Baseline Dr.	45.51944	-121.5903	120	18	712	2013
48		4400 Woodworth Dr.	45.54529	-121.57407	205	80	1501	2013
49		4585 Woodworth Dr.	45.54525	-121.58048	230	70	1404	2013
50		4655 Woodworth Dr.	45.5416	-121.58363	200	50	1186	2013
51		4780 Woodworth Dr.	45.54154	-121.58813	195	50	1186	2013
52		5026 Woodworth Dr.	45.54171	-121.59847	210	40	1061	2013
53		Woodworth Dr. @ Highway 281	45.54176	-121.60538	210	34	978	2013
54		Old Parkdale Rd.@ Woodworth Dr.	45.54183	-121.60996	180	28	888	2013
56		6670 Trout Creek Ridge Rd.	45.5365	-121.62056	170	20	750	2013
57		Trout Creek Ridge Rd. @ Sperry Rd.	45.54910	-121.62071	190	28	888	2013

58		6350 Trout Creek Ridge Rd.	45.3243	-121.3713	200	20	750	2013
59		Trout Creek Ridge Rd. @ Berry Dr.	45.5492	-121.62051	220	20	750	2013
60		6020 Trout Creek Ridge Rd.	45.55448	-121.62017	170	20	750	2013
61		Trout Creek Ridge Rd. @ McCrum Dr.	45.55993	-121.61994	170	20	750	2013
62		5130 Trout Creek Ridge Rd.	45.56274	-121.61965	130	20	750	2013
76		5730 Highway 281	45.56161	-121.61537	150	24	822	2013
77		Highway 35 @Toll Bridge Rd.	45.523944	-121.56825	140	70	1404	2013
78		6950 Highway 35	45.52952	-121.56813	160	76	1463	2013
79		Highway 35@ Hess Rd.	45.53432	-121.56814	180	100	1678	2013
80		Highway 35 @ Cooper Spur Rd.	45.53854	-121.56796	180	80	1501	2013
81		6573 Highway 35	45.53973	-121.56759	180	70	1404	2013
83		Highway 35 @ Woodworth Dr.	45.54526	-121.56786	210	110	1760	2013
84		Highway 35 @ S. Miller Rd.	45.54872	-121.56791	210	100	1678	2013
85		Highway 35 @ Chandler Dr.	45.53348	-121.56792	230	110	1760	2013
86		5915 Highway 35	45.55794	-121.5662	220	86	1556	2013
87		5775 Highway 35	45.56207	-121.56235	200	68	1384	2013
88		N. Miller Rd. @ Highway 35	45.56753	-121.55753	155	84	1538	2013
89		5443 Highway 35	45.57073	-121.55624	160	78	1482	2013
90		5315 Highway 35	45.57416	-121.55473	130	66	1363	2013
91		Highway 35 @ Pinemont Dr.	45.5801	-121.55248	110	52	1210	2013
92		Highway 35 @ Neel Creek Rd.	45.58461	-121.54993	130	70	1404	2013
93		Highway 35 @ Mt. Hood Lumbar	45.58607	-121.54967	130	70	1404	2013
94		4850 Highway 35	45.58565	-121.5505	130	66	1363	2013
95		5346 Highway 35.	45.57319	-121.55563	130	34	978	2013
96		4485 Booth Hill Rd.	45.59488	-121.53846	90	44	1113	2013
97		Hillcrest Rd. @ N. Hillcrest Rd.	45.58245	-121.55345	100	30	919	2013
98		Hillcrest Rd.	45.57994	-121.55356	110	44	1113	2013
99		Green Mountain Dr. @ Highway 35	45.57699	-121.55421	140	40	1061	2013
100		4135 Green Mountain Dr.	45.57637	-121.55689	130	32	949	2013
101		4040 Green Mountain Dr.	45.57848	-121.55614	100	32	949	2013
102		560 Oregon Rd.	45.5659	-121.56329	170	40	1061	2013
103		4155 Semmes Dr.	45.55923	-121.56782	170	68	1384	2013
104		4260 Semes Dr.	45.5605	-121.56993	140	46	1138	2013
105		Miller Rd. @ Bailey Rd.	45.54874	-121.56286	190	80	1501	2013

106		6204 Miller Rd.	45.52194	-121.55755	160	50	1186	2013
107		Miller Rd. @ Mountain Meadow Dr.	45.55255	-121.5573	180	44	1113	2013
108		6125 Lauren Rd.	45.55485	-121.56183	210	46	1138	2013
109		5975 Lauren Rd.	45.55454	-121.56272	200	40	1061	2013
110		5735 Miller Rd.	45.5627	-121.55767	200	40	1061	2013
112		1/4 Mile off Road - 8405 Clear Creek Rd.	45.48819	-121.59146	130	34	978	2013
113		4305 KLM Dr.	45.57322	-121.5599	130	36	1007	2013
130		Covey Rd.	45.55223	-121.60183	98	24	822	2013
131		White Fir Rd.	45.58037	-121.55706	65	18	712	2013
132		Stoltz Dr.	45.565084	-121.565592	180	54	1233	2013
133		Burl Rd.	45.568162	-121.554192	150	46	1138	2013
134		Nastasi Dr.	45.574574	-121.559023	130	24	822	2013
135		4778 Highway 35	45.588248	-121.550737	140	22	787	2013
137		8620 Cooper Spur Rd.	45.45	-121.58	60	20	750	2013
138		4640 Baldwin Creek Dr.	45.563503	-121.582713	246	48	1163	2013
139		4592 Baldwin Creek Dr.	45.56353	-121.5783	240	46	1138	2013
140		4498 Baldwin Creek Dr.	45.562733	-121.575594	230	48	1163	2013
141		4285 Baldwin Creek Dr.	45.558026	-121.568792	230	48	1163	2013
142		8235 Clear Creek Rd.	45.49326	-121.59666	150	22	787	2013
143		4890 Culbertson Dr.	45.5045	-121.59155	210	32	949	2013
146		Hess Rd. @ N. Hess Rd.	45.53402	-121.56271	140	16	671	2014
147		Alexander Rd. @ Boneboro Rd.	45.54545	-121.27081	200	26	856	2014
148		Clear Creek Rd. @ Crusher Dr.	45.303	-121.3548	190	22	787	2014
149		4584 Leasure Dr.	45.55625	-121.58008	240	68	1384	2014
150		4520 Leasure Dr.	45.55626	-121.57644	220	24	822	2014
151		4370 LeasureDr.	45.55621	-121.57353	220	70	1404	2014

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OBJECTID	Location	Manufactur	GPM	Cap_Color	Hydrant_ID	X_Long	Y_LAT	Steamer	Date_Serviced	Year_Made	Residual_P	Static_Pres	Flow_Press	F_Dist	Agency	Old_Hydrant_ID
8	3480 EHRCK HILL DR	Mueller	0		02N10E23_H03	121° 32' 4.220" W	45° 38' 19.744" N			0	0	0	0	OFD	CSWD	8
14	3579 DETHMAN RIDGE DR	Dresser	0		02N10E23_H01	121° 32' 4.650" W	45° 38' 39.492" N			0	0	170	0	OFD	CSWD	14
15	THOMSEN RD | NEAL CREEK RD	Am Darl B50B	0		02N10E36_H02	121° 30' 48.565" W	45° 37' 1.559" N			0	0	0	0	OFD	CSWD	15
16	3601 THOMSEN RD	Am Darl B50B	0		02N10E36_H01	121° 30' 22.239" W	45° 37' 12.252" N			0	0	0	0	OFD	CSWD	16
17	3322 THOMSEN RD	Am Darl B50B	0		02N10E25_H03	121° 30' 12.006" W	45° 37' 37.093" N			0	0	0	0	OFD	CSWD	17
18	3255 THOMSEN RD	Am Darl B50B	0		02N10E25_H02	121° 30' 11.959" W	45° 37' 48.952" N			0	15	220	0	OFD	CSWD	18
546	3450 WY'EAST RD	Am Darl B50B HP	0		02N10E27_H01	121° 33' 18.722" W	45° 37' 30.528" N			0	0	0	0	OFD	CSWD	54
547	3624 WY'EAST RD	Am Darl B50B HP	0		02N10E34_H01	121° 33' 24.723" W	45° 37' 8.477" N			0	0	0	0	OFD	CSWD	55
548	4133 SYLVESTER DR	Am Darl B62B 1	0		02N10E34_H02	121° 33' 37.001" W	45° 36' 48.021" N			0	5	225	5	OFD	CSWD	56
549	4095 CENTRAL VALE DR	Mueller	0		02N10E34_H06	121° 33' 21.193" W	45° 36' 22.538" N			0	5	0.21	5	OFD	CSWD	57
550	3100 LINGREN RD	Am Darl B50B HP	0		02N10E26B_H02	121° 32' 4.199" W	45° 38' 6.669" N			0	75	225	50	OFD	CSWD	59
551	NEAL CREEK RD | HWY 35	Am Darl B50B HP	0		02N10E25_H01	121° 30' 49.211" W	45° 37' 43.950" N			0	0	230	0	OFD	CSWD	60
552	3579 EHRCK HILL DR	Am Darl B50B	0		02N10E26B_H01	121° 32' 17.952" W	45° 38' 6.845" N			0	15	225	30	OFD	CSWD	61
553	2956 ODELL HWY	Am Darl B62B	0		02N10E22_H07	121° 32' 42.122" W	45° 38' 17.525" N			0	0	0	0	OFD	CSWD	62
554	ODELL HWY | WEBB DR	Mueller	0		02N10E22_H05	121° 32' 50.417" W	45° 38' 36.189" N			0	0	0	0	OFD	CSWD	63
555	2530 WY'EAST RD	Dreser	0		02N10E22_H02	121° 33' 18.658" W	45° 38' 57.387" N			0	30	205	18	OFD	CSWD	64
556	2670 WY'EAST RD	Mueller	0		02N10E22_H03	121° 33' 18.714" W	45° 38' 41.827" N			0	30	250	18	OFD	CSWD	65
557	2749 WY'EAST RD	Mueller	0		02N10E22_H04	121° 33' 18.743" W	45° 38' 33.805" N			0	40	205	15	OFD	CSWD	66
558	4280 CHAMBERLIN DR	Am Darl B62B	0		02N10E21A_H01	121° 33' 55.966" W	45° 38' 33.032" N			0	5	225	5	OFD	CSWD	67
559	4475 CHAMBERLIN DR - A16	US PIPE	0		02N10E21_H01	121° 34' 26.166" W	45° 38' 32.863" N			0	5	125	5	OFD	CSWD	68
560	3748 SUMMIT DR	Am Darl B50B HP	0		02N10E22_H08	121° 32' 44.398" W	45° 38' 7.228" N			0	0	225	0	OFD	CSWD	69
561	3838 SUMMIT DR	AM Darl B50B HP	0		02N10E22_H09	121° 32' 58.936" W	45° 38' 7.196" N			0	65	230	15	OFD	CSWD	70
562	2929 WY'EAST RD	Am Darl B50B HP	0		02N10E22_H06	121° 33' 18.599" W	45° 38' 18.774" N			0	50	195	30	OFD	CSWD	72
603	3487 EARLY RD		0		02N10E26C_H14	121° 32' 32.110" W	45° 37' 34.375" N			0	0	0	0	OFD	CSWD	0
604	3515 CHEVRON DR - NORTH CENTRAL		0		02N10E26C_H02	121° 32' 18.038" W	45° 37' 44.656" N			0	0	0	0	OFD	CSWD	0
605	3515 CHEVRON DR - NORTH WEST		0		02N10E26C_H01	121° 32' 21.079" W	45° 37' 44.601" N			0	0	0	0	OFD	CSWD	0
609	3409 ODELL HWY		0		02N10E26C_H17	121° 32' 27.809" W	45° 37' 31.366" N			0	0	0	0	OFD	OWD	0
610	3515 CHEVRON DR - NORTH EAST		0		02N10E26C_H03	121° 32' 14.927" W	45° 37' 44.036" N			0	0	0	0	OFD	CSWD	0
611	3515 CHEVRON DR - EAST		0		02N10E26C_H05	121° 32' 10.419" W	45° 37' 40.938" N			0	0	0	0	OFD	CSWD	0
612	3515 CHEVRON DR - SOUTH EAST		0		02N10E26C_H06	121° 32' 13.470" W	45° 37' 36.741" N			0	0	0	0	OFD	CSWD	0
613	3515 CHEVRON DR - OFFICE		0		02N10E26C_H04	121° 32' 14.147" W	45° 37' 41.840" N			0	0	0	0	OFD	CSWD	0
614	3515 CHEVRON DR - WEST NORTH		0		02N10E26C_H10	121° 32' 22.939" W	45° 37' 41.339" N			0	0	0	0	OFD	CSWD	0
615	3515 CHEVRON DR - SOUTH WEST		0		02N10E26C_H08	121° 32' 21.095" W	45° 37' 37.590" N			0	0	0	0	OFD	CSWD	0
616	3515 CHEVRON DR - SOUTH CENTRAL		0		02N10E26C_H07	121° 32' 17.314" W	45° 37' 36.708" N			0	0	0	0	OFD	CSWD	0
617	3515 CHEVRON DR - WEST CENTRAL		0		02N10E26C_H09	121° 32' 22.898" W	45° 37' 39.550" N			0	0	0	0	OFD	CSWD	0
618	FARWIG RD | HOMESTEAD DR		0		02N10E26BB_H03	121° 32' 28.836" W	45° 37' 55.500" N			0	0	0	0	OFD	CSWD	0
619	4110 BOOTH HILL RD		0		01N10E02_H01	121° 32' 3.816" W	45° 36' 21.871" N			0	100	0	0	OFD	CSWD	0
620	3245 STADELMAN DR - NORTH SIDE		0		02N10E26D_H02	121° 31' 38.332" W	45° 37' 35.598" N			0	0	0	0	OFD	CSWD	0
621	3199 ODELL HWY		0		02N10E26BC_H01	121° 32' 39.970" W	45° 37' 52.462" N			0	0	0	0	OFD	OWD	0
622	4100 SUMMIT DR	Am Darl B50B HP	0		02N10E22_H11	121° 33' 30.486" W	45° 38' 6.954" N			0	40	175	15	OFD	CSWD	73
623	4260 SUMMIT DR	Am Darl B50B	0		02N10E22_H12	121° 33' 55.173" W	45° 38' 6.814" N			0	0	175	0	OFD	CSWD	74
720	STRAIGHT HILL RD | FLETCHER DR	Mueller	0		02N10E35_H04	121° 32' 31.682" W	45° 36' 48.375" N			0	0	0	0	OFD	CSWD	97
726	4455 HWY 35		0		01N10E03_H02	121° 32' 56.280" W	45° 35' 47.578" N			0	0	0	0	OFD	CSWD	103
727	3280 BONE DR		0		01N10E02_H03	121° 31' 42.449" W	45° 36' 11.518" N			0	0	0	0	OFD	CSWD	105
728	3905 WILLOW FLAT RD		0		02N10E36_H04	121° 31' 25.839" W	45° 36' 35.332" N			0	0	0	0	OFD	CSWD	107
729	4370 FURROW DR		0		01N10E01_H03	121° 31' 28.724" W	45° 35' 58.502" N			0	0	0	0	OFD	CSWD	110
730	3915 MasseY GRADE RD		0		02N10E35_H02	121° 32' 4.147" W	45° 36' 42.094" N			0	25	250	30	OFD	CSWD	111
731	3647 MASSEY GRADE RD		0		02N10E35_H01	121° 32' 15.981" W	45° 37' 5.505" N			0	50	150	30	OFD	CSWD	112
732	DAVIS DR | LINGREN RD		0		02N10E26C_H22	121° 32' 4.207" W	45° 37' 28.210" N			0	60	225	50	OFD	CSWD	114
733	2925 WHEELER RD		0		02N10E21_H03	121° 34' 58.710" W	45° 38' 19.393" N			0	0	0	0	OFD	CSWD	130
734	3631 BEACHWOOD DR		0		02N10E26BC_H04	121° 32' 21.763" W	45° 37' 48.285" N			0	0	225	0	OFD	CSWD	131
735	3209 TAMARACK RD		0		02N10E26BD_H02	121° 32' 15.463" W	45° 37' 50.873" N			0	0	0	0	OFD	CSWD	132
736	3150 TAMARACK RD		0		02N10E26BD_H01	121° 32' 16.181" W	45° 37' 55.424" N			0	0	0	0	OFD	CSWD	133
737	3600 JONES DR		0		02N10E26B_H03	121° 32' 16.106" W	45° 38' 0.499" N			0	0	0	0	OFD	CSWD	134
738	3546 JONES LP		0		02N10E26B_H04	121° 32' 11.659" W	45° 37' 58.472" N			0	0	0	0	OFD	CSWD	135
739	CEDAR DR | MAPLE RD		0		02N10E26BC_H03	121° 32' 23.586" W	45° 37' 52.320" N			0	0	0	0	OFD	CSWD	136
740	VANCE DR | FARWIG RD		0		02N10E26BB_H02	121° 32' 28.986" W	45° 37' 58.326" N			0	0	0	0	OFD	CSWD	137
741	3640 hOMESTEAD DR		0		02N10E26BB_H04	121° 32' 32.984" W	45° 37' 55.626" N			0	0	0	0	OFD	CSWD	138
742	3344 AGA RD - E 3		0		02N10E27D_H01	121° 32' 51.274" W	45° 37' 35.660" N			0	0	210	0	OFD	CSWD	141
743	3344 AGA RD - SP G 1		0		02N10E27D_H04	121° 32' 55.232" W	45° 37' 36.675" N			0	0	210	0	OFD	CSWD	142
744	3344 AGA RD - SP 155		0		02N10E27D_H03	121° 32' 57.885" W	45° 37' 39.516" N			0	0	210	0	OFD	CSWD	143
745	3344 AGA RD - SP 101		0		02N10E27D_H02	121° 32' 45.708" W	45° 37' 37.654" N			0	0	210	0	OFD	CSWD	144
746	3440 AGA RD - EAST SIDE		0		02N10E26C_H20	121° 32' 40.409" W	45° 37' 30.973" N			0	0	0	0	OFD	CSWD	145
843	3430 DAVIS DR - NORTH SIDE		0		02N10E26D_H05	121° 31' 56.978" W	45° 37' 28.143" N			0	0	235	0	OFD	CSWD	115
844	3430 DAVIS DR - EAST SIDE		0		02N10E26D_H04	121° 31' 51.711" W	45° 37' 30.417" N			0	75	225	40	OFD	CSWD	116
845	3431 ODELL HWY - EAST SIDE		0		02N10E26C_H18	121° 32' 24.509" W	45° 37' 30.618" N			0	0	230	0	OFD	CSWD	117
846	DAVIS DR | EARLY RD		0		02N10E26C_H16	121° 32' 32.653" W	45° 37' 27.664" N			0	0	230	0	OFD	CSWD	119

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847	EARLY RD | ATKINSON DR		0	02N10E26C_H15	121° 32' 32.765" W	45° 37' 31.587" N			0	0	0	0	OFD	CSWD	120
848	3296 AGA RD - EAST SIDE		0	02N10E26BC_H07	121° 32' 40.451" W	45° 37' 43.539" N			0	0	230	0	OFD	CSWD	122
850	3445 CHEVRON DR		0	02N10E26BD_H05	121° 32' 14.066" W	45° 37' 45.133" N			0	0	0	0	OFD	CSWD	124
851	3190 MIDWAY RD		0	02N10E26BD_H04	121° 32' 12.492" W	45° 37' 49.261" N			0	0	0	0	OFD	CSWD	125
852	3225 LINGREN RD		0	02N10E26_H01	121° 32' 3.615" W	45° 37' 45.029" N			0	75	225	50	OFD	CSWD	126
853	3416 GATEWAY DR		0	02N10E26BD_H03	121° 32' 8.072" W	45° 37' 49.451" N			0	0	0	0	OFD	CSWD	127
854	ODELL HWY | WY'EAST RD		0	02N10E22_H01	121° 32' 50.994" W	45° 38' 58.674" N			0	0	0	0	OFD	CSWD	128
855	3291 KOLLAS RD - WEST SIDE		0	02N10E28_H02	121° 34' 18.289" W	45° 37' 45.389" N			0	0	0	0	OFD	CSWD	129
923	2600 FIR MOUNTAIN RD	AM Darl B50B	0	02N10E24_H03	121° 30' 17.776" W	45° 38' 32.324" N			0	0	0	0	OFD	CSWD	19
924	3015 HWY 35 - EAST	Metropolttan	0	02N10E24_H05	121° 30' 38.404" W	45° 38' 8.985" N			0	0	0	0	OFD	CSWD	52
925	3015 HWY 35 - WEST	Am Darl B50B	0	02N10E24_H04	121° 30' 41.833" W	45° 38' 9.577" N			0	0	0	0	OFD	CSWD	53
926	4140 CENTRAL VALE DR	Mueller	0	02N10E34_H07	121° 33' 38.693" W	45° 36' 22.819" N			0	0	0	0	OFD	CSWD	58
927	SUMMIT DR | WY'EAST RD	Am Darl B50B Hp	0	02N10E22_H10	121° 33' 18.459" W	45° 38' 7.272" N			0	0	0	0	OFD	CSWD	71
928	3006 CHEVRON DR - IN YARD	Am Darl B50B	0	02N10E26BD_H06	121° 32' 20.773" W	45° 37' 47.203" N			0	0	0	0	OFD	CSWD	79
929	3900 EAGLE LP	Mueller	0	02N10E27A_H03	121° 32' 59.702" W	45° 37' 48.088" N			0	0	0	0	OFD	CSWD	82
930	BOOTH HILL RD | BONE DR		0	01N10E02_H02	121° 32' 6.918" W	45° 36' 11.334" N			0	0	0	60	OFD	CSWD	104
931	WILLOW FLAT RD | HIGHWAY 35		0	02N10E35_H03	121° 31' 58.307" W	45° 36' 35.165" N			0	105	250	0	OFD	CSWD	106
932	WILLOW FLAT RD | NORMAN RD		0	01N10E01_H02	121° 31' 14.684" W	45° 35' 58.450" N			0	0	0	0	OFD	CSWD	109
933	DAVIS DR | STRAIGHT HILL RD		0	02N10E26C_H21	121° 32' 16.508" W	45° 37' 28.029" N			0	0	225	0	OFD	CSWD	113
934	DAVIS DR | ODELL HWY		0	02N10E26C_H19	121° 32' 26.797" W	45° 37' 27.537" N			0	0	225	0	OFD	CSWD	118
935	3364 ODELL HWY - DIAMOND ODELL		0	02N10E26C_H12	121° 32' 28.608" W	45° 37' 37.836" N			0	0	0	0	OFD	CSWD	121
936	DAVIS DR | CATHERN LN		0	02N10E27D_H05	121° 32' 45.455" W	45° 37' 27.676" N			0	0	0	0	OFD	CSWD	123
937	MUD ALLEY DR | CHEVRON DR		0	02N10E26BC_H05	121° 32' 28.733" W	45° 37' 45.238" N			0	0	0	0	OFD	CSWD	139
938	3336 ODELL HWY - IN ALLEY		0	02N10E26BC_H06	121° 32' 29.997" W	45° 37' 42.551" N			0	0	0	0	OFD	CSWD	140
940	EAGLE LP | HERON DR	Mueller	0	02N10E27A_H02	121° 32' 52.582" W	45° 37' 48.222" N			0	0	0	0	OFD	CSWD	83
941	3610 CENTRAL VALE DR	Am Darl B50B HP	0	02N10E35_H05	121° 32' 22.336" W	45° 36' 22.371" N			0	10	255	10	OFD	CSWD	87
953	4130 WILLOW FLAT RD	ANNISTON	0	01N10E01_H01	121° 31' 7.456" W	45° 36' 22.321" N	NO		1973	25	170	30	OFD	CSWD	108
954	3151 ODELL HWY	US PIPE	0	02N10E26BB_H01	121° 32' 40.842" W	45° 37' 57.237" N	Yes	11/28/2009 0:00	0	0	0	0	OFD	OWD	0
955	3515 CHEVRON DR - WEST DRIVEWAY	MUELLER	0	02N10E26C_H11	121° 32' 27.675" W	45° 37' 37.896" N	Yes	11/28/2009 0:00	2003	0	0	0	OFD	OWD	0
434	2978 SHUTE RD		0	02N10E28_H01	121° 34' 59.353" W	45° 37' 56.817" N			0	0	0	0	OFD	CSWD	0
464	3308 AGA RD - EAST SIDE		0	02N10E26BC_H08	121° 32' 40.564" W	45° 37' 41.948" N			0	0	0	0	OFD	OWD	0
465	3245 STADELMAN DR - SOUTH SIDE		0	02N10E26D_H03	121° 31' 38.316" W	45° 37' 35.198" N			0	0	0	0	OFD	CSWD	0
466	3686 MUD ALLEY DR		0	02N10E26BC_H02	121° 32' 33.280" W	45° 37' 51.943" N			0	0	0	0	OFD	OWD	0
467	3485 EARLY RD		0	02N10E26C_H13	121° 32' 35.304" W	45° 37' 34.927" N			0	0	0	0	OFD	CSWD	0
781	4715 SUMMIT DR	Am Darl B50B HP	0	02N10E21_H02	121° 34' 32.749" W	45° 38' 14.221" N			0	5	140	5	OFD	CSWD	75
782	4038 BARTLETT LP	Am Darl B50B	0	02N10E27BA_H01	121° 33' 23.702" W	45° 38' 3.932" N			0	55	200	30	OFD	CSWD	76
783	BARTLETT DR | WY'EAST RD	Am Darl B50B	0	02N10E27BA_H03	121° 33' 19.066" W	45° 38' 1.176" N			0	55	200	30	OFD	CSWD	77
784	4068 BARLETT DR	Am Darl B50B HP	0	02N10E27BA_H02	121° 33' 28.667" W	45° 38' 1.216" N			0	0	200	0	OFD	CSWD	78
785	3831 EAGLE LP	Mueller	0	02N10E27A_H05	121° 32' 43.866" W	45° 37' 44.987" N			0	0	0	0	OFD	CSWD	80
786	3800 EAGLE LP	Muelker	0	02N10E27A_H04	121° 32' 48.972" W	45° 37' 45.194" N			0	0	0	0	OFD	CSWD	81
787	3760 EAGLE LP	Mueller	0	02N10E27A_H01	121° 32' 46.635" W	45° 37' 49.907" N			0	0	0	0	OFD	CSWD	84
788	3941 SYLVESTER DR	Am Darl B50B HP	0	02N10E34_H03	121° 33' 19.554" W	45° 36' 41.528" N			0	0	0	0	OFD	CSWD	85
789	3790 CENTRAL VALE DR	Am Darl B50B HP	0	02N10E34_H05	121° 32' 54.182" W	45° 36' 22.559" N			0	5	200	5	OFD	CSWD	86
790	4320 HWY 35	Am Darl B50B HP	0	01N10E03_H01	121° 32' 46.409" W	45° 36' 3.446" N			0	0	0	0	OFD	CSWD	88
793	SHEPPARD RD | BEAR RIDGE DR	Mueller	0	02N10E36_H05	121° 30' 41.327" W	45° 36' 22.448" N			0	0	0	0	OFD	CSWD	91
794	3848 NEAL CREEK RD	Mueller	0	02N10E36_H03	121° 30' 49.083" W	45° 36' 45.504" N			0	0	0	0	OFD	CSWD	92
795	3366 KOLLAS RD	Mueller	0	02N10E28_H03	121° 34' 14.555" W	45° 37' 35.141" N			0	0	0	0	OFD	CSWD	94
796	3430 DAVIS DR - NORTH WEST	Mueller	0	02N10E26D_H01	121° 32' 1.561" W	45° 37' 35.686" N			0	75	225	40	OFD	CSWD	95
797	3828 FLETCHER DR	Mueller	0	02N10E34_H04	121° 32' 59.495" W	45° 36' 48.319" N			0	0	0	0	OFD	CSWD	96

OBJECTID	Location	Manufactur	GPM	Cap_Color	Hydrant_ID	X_Long	Y_LAT	Steamer	Date_Serviced	Year_Made	Residual_P	Static_Pres	Flow_Press	F_Dist	Agency	Old_Hydrant_ID
8	3480 EHRCK HILL DR	Mueller	0		02N10E23_H03	121° 32' 4.220" W	45° 38' 19.744" N				0	0	0	OFD	CSWD	8
14	3579 DETHMAN RIDGE DR	Dresser	0		02N10E23_H01	121° 32' 4.650" W	45° 38' 39.492" N				0	0	170	0 OFD	CSWD	14
15	THOMSEN RD | NEAL CREEK RD	Am Darl B50B	0		02N10E36_H02	121° 30' 48.565" W	45° 37' 1.559" N				0	0	0	0 OFD	CSWD	15
16	3601 THOMSEN RD	Am Darl B50B	0		02N10E36_H01	121° 30' 22.239" W	45° 37' 12.252" N				0	0	0	0 OFD	CSWD	16
17	3322 THOMSEN RD	Am Darl B50B	0		02N10E25_H03	121° 30' 12.006" W	45° 37' 37.093" N				0	0	0	0 OFD	CSWD	17
18	3255 THOMSEN RD	Am Darl B50B	0		02N10E25_H02	121° 30' 11.959" W	45° 37' 48.952" N				0	15	220	0 OFD	CSWD	18
546	3450 WY'EAST RD	Am Darl B50B HP	0		02N10E27_H01	121° 33' 18.722" W	45° 37' 30.528" N				0	0	0	0 OFD	CSWD	54
547	3624 WY'EAST RD	Am Darl B50B HP	0		02N10E34_H01	121° 33' 24.723" W	45° 37' 8.477" N				0	0	0	0 OFD	CSWD	55
548	4133 SYLVESTER DR	Am Darl B62B 1	0		02N10E34_H02	121° 33' 37.001" W	45° 36' 48.021" N				0	5	225	5 OFD	CSWD	56
549	4095 CENTRAL VALE DR	Mueller	0		02N10E34_H06	121° 33' 21.193" W	45° 36' 22.538" N				0	5	0.21	5 OFD	CSWD	57
550	3100 LINGREN RD	Am Darl B50B HP	0		02N10E26B_H02	121° 32' 4.199" W	45° 38' 6.669" N				0	75	225	50 OFD	CSWD	59
551	NEAL CREEK RD | HWY 35	Am Darl B50B HP	0		02N10E25_H01	121° 30' 49.211" W	45° 37' 43.950" N				0	0	230	0 OFD	CSWD	60
552	3579 EHRCK HILL DR	Am Darl B50B	0		02N10E26B_H01	121° 32' 17.952" W	45° 38' 6.845" N				0	15	225	30 OFD	CSWD	61
553	2956 ODELL HWY	Am Darl B62B	0		02N10E22_H07	121° 32' 42.122" W	45° 38' 17.525" N				0	0	0	0 OFD	CSWD	62
554	ODELL HWY | WEBB DR	Mueller	0		02N10E22_H05	121° 32' 50.417" W	45° 38' 36.189" N				0	0	0	0 OFD	CSWD	63
555	2530 WY'EAST RD	Dreser	0		02N10E22_H02	121° 33' 18.658" W	45° 38' 57.387" N				0	30	205	18 OFD	CSWD	64
556	2670 WY'EAST RD	Mueller	0		02N10E22_H03	121° 33' 18.714" W	45° 38' 41.827" N				0	30	250	18 OFD	CSWD	65
557	2749 WY'EAST RD	Mueller	0		02N10E22_H04	121° 33' 18.743" W	45° 38' 33.805" N				0	40	205	15 OFD	CSWD	66
558	4280 CHAMBERLIN DR	Am Darl B62B	0		02N10E21A_H01	121° 33' 55.966" W	45° 38' 33.032" N				0	5	225	5 OFD	CSWD	67
559	4475 CHAMBERLIN DR - A16	US PIPE	0		02N10E21_H01	121° 34' 26.166" W	45° 38' 32.863" N				0	5	125	5 OFD	CSWD	68
560	3748 SUMMIT DR	Am Darl B50B HP	0		02N10E22_H08	121° 32' 44.398" W	45° 38' 7.228" N				0	0	225	0 OFD	CSWD	69
561	3838 SUMMIT DR	AM Darl B50B HP	0		02N10E22_H09	121° 32' 58.936" W	45° 38' 7.196" N				0	65	230	15 OFD	CSWD	70
562	2929 WY'EAST RD	Am Darl B50B HP	0		02N10E22_H06	121° 33' 18.599" W	45° 38' 18.774" N				0	50	195	30 OFD	CSWD	72
603	3487 EARLY RD		0		02N10E26C_H14	121° 32' 32.110" W	45° 37' 34.375" N				0	0	0	0 OFD	CSWD	0
604	3515 CHEVRON DR - NORTH CENTRAL		0		02N10E26C_H02	121° 32' 18.038" W	45° 37' 44.656" N				0	0	0	0 OFD	CSWD	0
605	3515 CHEVRON DR - NORTH WEST		0		02N10E26C_H01	121° 32' 21.079" W	45° 37' 44.601" N				0	0	0	0 OFD	CSWD	0
609	3409 ODELL HWY		0		02N10E26C_H17	121° 32' 27.809" W	45° 37' 31.366" N				0	0	0	0 OFD	OWD	0
610	3515 CHEVRON DR - NORTH EAST		0		02N10E26C_H03	121° 32' 14.927" W	45° 37' 44.036" N				0	0	0	0 OFD	CSWD	0
611	3515 CHEVRON DR - EAST		0		02N10E26C_H05	121° 32' 10.419" W	45° 37' 40.938" N				0	0	0	0 OFD	CSWD	0
612	3515 CHEVRON DR - SOUTH EAST		0		02N10E26C_H06	121° 32' 13.470" W	45° 37' 36.741" N				0	0	0	0 OFD	CSWD	0
613	3515 CHEVRON DR - OFFICE		0		02N10E26C_H04	121° 32' 14.147" W	45° 37' 41.840" N				0	0	0	0 OFD	CSWD	0
614	3515 CHEVRON DR - WEST NORTH		0		02N10E26C_H10	121° 32' 22.939" W	45° 37' 41.339" N				0	0	0	0 OFD	CSWD	0
615	3515 CHEVRON DR - SOUTH WEST		0		02N10E26C_H08	121° 32' 21.095" W	45° 37' 37.590" N				0	0	0	0 OFD	CSWD	0
616	3515 CHEVRON DR - SOUTH CENTRAL		0		02N10E26C_H07	121° 32' 17.314" W	45° 37' 36.708" N				0	0	0	0 OFD	CSWD	0
617	3515 CHEVRON DR - WEST CENTRAL		0		02N10E26C_H09	121° 32' 22.898" W	45° 37' 39.550" N				0	0	0	0 OFD	CSWD	0
618	FARWIG RD | HOMESTEAD DR		0		02N10E26BB_H03	121° 32' 28.836" W	45° 37' 55.500" N				0	0	0	0 OFD	CSWD	0
619	4110 BOOTH HILL RD		0		01N10E02_H01	121° 32' 3.816" W	45° 36' 21.871" N				0	100	0	0 OFD	CSWD	0
620	3245 STADELMAN DR - NORTH SIDE		0		02N10E26D_H02	121° 31' 38.332" W	45° 37' 35.598" N				0	0	0	0 OFD	CSWD	0
621	3199 ODELL HWY		0		02N10E26BC_H01	121° 32' 39.970" W	45° 37' 52.462" N				0	0	0	0 OFD	OWD	0
622	4100 SUMMIT DR	Am Darl B50B HP	0		02N10E22_H11	121° 33' 30.486" W	45° 38' 6.954" N				0	40	175	15 OFD	CSWD	73
623	4260 SUMMIT DR	Am Darl B50B	0		02N10E22_H12	121° 33' 55.173" W	45° 38' 6.814" N				0	0	175	0 OFD	CSWD	74
720	STRAIGHT HILL RD | FLETCHER DR	Mueller	0		02N10E35_H04	121° 32' 31.682" W	45° 36' 48.375" N				0	0	0	0 OFD	CSWD	97
726	4455 HWY 35		0		01N10E03_H02	121° 32' 56.280" W	45° 35' 47.578" N				0	0	0	0 OFD	CSWD	103
727	3280 BONE DR		0		01N10E02_H03	121° 31' 42.449" W	45° 36' 11.518" N				0	0	0	0 OFD	CSWD	105
728	3905 WILLOW FLAT RD		0		02N10E36_H04	121° 31' 25.839" W	45° 36' 35.332" N				0	0	0	0 OFD	CSWD	107
729	4370 FURROW DR		0		01N10E01_H03	121° 31' 28.724" W	45° 35' 58.502" N				0	0	0	0 OFD	CSWD	110
730	3915 MasseY GRADE RD		0		02N10E35_H02	121° 32' 4.147" W	45° 36' 42.094" N				0	25	250	30 OFD	CSWD	111
731	3647 MASSEY GRADE RD		0		02N10E35_H01	121° 32' 15.981" W	45° 37' 5.505" N				0	50	150	30 OFD	CSWD	112
732	DAVIS DR | LINGREN RD		0		02N10E26C_H22	121° 32' 4.207" W	45° 37' 28.210" N				0	60	225	50 OFD	CSWD	114
733	2925 WHEELER RD		0		02N10E21_H03	121° 34' 58.710" W	45° 38' 19.393" N				0	0	0	0 OFD	CSWD	130
734	3631 BEACHWOOD DR		0		02N10E26BC_H04	121° 32' 21.763" W	45° 37' 48.285" N				0	0	225	0 OFD	CSWD	131
735	3209 TAMARACK RD		0		02N10E26BD_H02	121° 32' 15.463" W	45° 37' 50.873" N				0	0	0	0 OFD	CSWD	132
736	3150 TAMARACK RD		0		02N10E26BD_H01	121° 32' 16.181" W	45° 37' 55.424" N				0	0	0	0 OFD	CSWD	133
737	3600 JONES DR		0		02N10E26B_H03	121° 32' 16.106" W	45° 38' 0.499" N				0	0	0	0 OFD	CSWD	134
738	3546 JONES LP		0		02N10E26B_H04	121° 32' 11.659" W	45° 37' 58.472" N				0	0	0	0 OFD	CSWD	135
739	CEDAR DR | MAPLE RD		0		02N10E26BC_H03	121° 32' 23.586" W	45° 37' 52.320" N				0	0	0	0 OFD	CSWD	136
740	VANCE DR | FARWIG RD		0		02N10E26BB_H02	121° 32' 28.986" W	45° 37' 58.326" N				0	0	0	0 OFD	CSWD	137
741	3640 hOMESTEAD DR		0		02N10E26BB_H04	121° 32' 32.984" W	45° 37' 55.626" N				0	0	0	0 OFD	CSWD	138
742	3344 AGA RD - E 3		0		02N10E27D_H01	121° 32' 51.274" W	45° 37' 35.660" N				0	0	210	0 OFD	CSWD	141
743	3344 AGA RD - SP G 1		0		02N10E27D_H04	121° 32' 55.232" W	45° 37' 36.675" N				0	0	210	0 OFD	CSWD	142
744	3344 AGA RD - SP 155		0		02N10E27D_H03	121° 32' 57.885" W	45° 37' 39.516" N				0	0	210	0 OFD	CSWD	143
745	3344 AGA RD - SP 101		0		02N10E27D_H02	121° 32' 45.708" W	45° 37' 37.654" N				0	0	210	0 OFD	CSWD	144
746	3440 AGA RD - EAST SIDE		0		02N10E26C_H20	121° 32' 40.409" W	45° 37' 30.973" N				0	0	0	0 OFD	CSWD	145
843	3430 DAVIS DR - NORTH SIDE		0		02N10E26D_H05	121° 31' 56.978" W	45° 37' 28.143" N				0	0	235	0 OFD	CSWD	115
844	3430 DAVIS DR - EAST SIDE		0		02N10E26D_H04	121° 31' 51.711" W	45° 37' 30.417" N				0	75	225	40 OFD	CSWD	116
845	3431 ODELL HWY - EAST SIDE		0		02N10E26C_H18	121° 32' 24.509" W	45° 37' 30.618" N				0	0	230	0 OFD	CSWD	117
846	DAVIS DR | EARLY RD		0		02N10E26C_H16	121° 32' 32.653" W	45° 37' 27.664" N				0	0	230	0 OFD	CSWD	119

847	EARLY RD | ATKINSON DR		0	02N10E26C_H15	121° 32' 32.765" W	45° 37' 31.587" N				0	0	0	0	OFD	CSWD	120
848	3296 AGA RD - EAST SIDE		0	02N10E26BC_H07	121° 32' 40.451" W	45° 37' 43.539" N				0	0	230	0	OFD	CSWD	122
850	3445 CHEVRON DR		0	02N10E26BD_H05	121° 32' 14.066" W	45° 37' 45.133" N				0	0	0	0	OFD	CSWD	124
851	3190 MIDWAY RD		0	02N10E26BD_H04	121° 32' 12.492" W	45° 37' 49.261" N				0	0	0	0	OFD	CSWD	125
852	3225 LINGREN RD		0	02N10E26_H01	121° 32' 3.615" W	45° 37' 45.029" N				0	75	225	50	OFD	CSWD	126
853	3416 GATEWAY DR		0	02N10E26BD_H03	121° 32' 8.072" W	45° 37' 49.451" N				0	0	0	0	OFD	CSWD	127
854	ODELL HWY | WY'EAST RD		0	02N10E22_H01	121° 32' 50.994" W	45° 38' 58.674" N				0	0	0	0	OFD	CSWD	128
855	3291 KOLLAS RD - WEST SIDE		0	02N10E28_H02	121° 34' 18.289" W	45° 37' 45.389" N				0	0	0	0	OFD	CSWD	129
923	2600 FIR MOUNTAIN RD	AM Darl B50B	0	02N10E24_H03	121° 30' 17.776" W	45° 38' 32.324" N				0	0	0	0	OFD	CSWD	19
924	3015 HWY 35 - EAST	Metropolttan	0	02N10E24_H05	121° 30' 38.404" W	45° 38' 8.985" N				0	0	0	0	OFD	CSWD	52
925	3015 HWY 35 - WEST	Am Darl B50B	0	02N10E24_H04	121° 30' 41.833" W	45° 38' 9.577" N				0	0	0	0	OFD	CSWD	53
926	4140 CENTRAL VALE DR	Mueller	0	02N10E34_H07	121° 33' 38.693" W	45° 36' 22.819" N				0	0	0	0	OFD	CSWD	58
927	SUMMIT DR | WY'EAST RD	Am Darl B50B Hp	0	02N10E22_H10	121° 33' 18.459" W	45° 38' 7.272" N				0	0	0	0	OFD	CSWD	71
928	3006 CHEVRON DR - IN YARD	Am Darl B50B	0	02N10E26BD_H06	121° 32' 20.773" W	45° 37' 47.203" N				0	0	0	0	OFD	CSWD	79
929	3900 EAGLE LP	Mueller	0	02N10E27A_H03	121° 32' 59.702" W	45° 37' 48.088" N				0	0	0	0	OFD	CSWD	82
930	BOOTH HILL RD | BONE DR		0	01N10E02_H02	121° 32' 6.918" W	45° 36' 11.334" N				0	0	0	60	OFD	CSWD	104
931	WILLOW FLAT RD | HIGHWAY 35		0	02N10E35_H03	121° 31' 58.307" W	45° 36' 35.165" N				0	105	250	0	OFD	CSWD	106
932	WILLOW FLAT RD | NORMAN RD		0	01N10E01_H02	121° 31' 14.684" W	45° 35' 58.450" N				0	0	0	0	OFD	CSWD	109
933	DAVIS DR | STRAIGHT HILL RD		0	02N10E26C_H21	121° 32' 16.508" W	45° 37' 28.029" N				0	0	225	0	OFD	CSWD	113
934	DAVIS DR | ODELL HWY		0	02N10E26C_H19	121° 32' 26.797" W	45° 37' 27.537" N				0	0	225	0	OFD	CSWD	118
935	3364 ODELL HWY - DIAMOND ODELL		0	02N10E26C_H12	121° 32' 28.608" W	45° 37' 37.836" N				0	0	0	0	OFD	CSWD	121
936	DAVIS DR | CATHERN LN		0	02N10E27D_H05	121° 32' 45.455" W	45° 37' 27.676" N				0	0	0	0	OFD	CSWD	123
937	MUD ALLEY DR | CHEVRON DR		0	02N10E26BC_H05	121° 32' 28.733" W	45° 37' 45.238" N				0	0	0	0	OFD	CSWD	139
938	3336 ODELL HWY - IN ALLEY		0	02N10E26BC_H06	121° 32' 29.997" W	45° 37' 42.551" N				0	0	0	0	OFD	CSWD	140
940	EAGLE LP | HERON DR	Mueller	0	02N10E27A_H02	121° 32' 52.582" W	45° 37' 48.222" N				0	0	0	0	OFD	CSWD	83
941	3610 CENTRAL VALE DR	Am Darl B50B HP	0	02N10E35_H05	121° 32' 22.336" W	45° 36' 22.371" N				0	10	255	10	OFD	CSWD	87
953	4130 WILLOW FLAT RD	ANNISTON	0	01N10E01_H01	121° 31' 7.456" W	45° 36' 22.321" N	NO			1973	25	170	30	OFD	CSWD	108
954	3151 ODELL HWY	US PIPE	0	02N10E26BB_H01	121° 32' 40.842" W	45° 37' 57.237" N	Yes	11/28/2009 0:00		0	0	0	0	OFD	OWD	0
955	3515 CHEVRON DR - WEST DRIVEWAY	MUELLER	0	02N10E26C_H11	121° 32' 27.675" W	45° 37' 37.896" N	Yes	11/28/2009 0:00		2003	0	0	0	OFD	OWD	0
434	2978 SHUTE RD		0	02N10E28_H01	121° 34' 59.353" W	45° 37' 56.817" N				0	0	0	0	OFD	CSWD	0
464	3308 AGA RD - EAST SIDE		0	02N10E26BC_H08	121° 32' 40.564" W	45° 37' 41.948" N				0	0	0	0	OFD	OWD	0
465	3245 STADELMAN DR - SOUTH SIDE		0	02N10E26D_H03	121° 31' 38.316" W	45° 37' 35.198" N				0	0	0	0	OFD	CSWD	0
466	3686 MUD ALLEY DR		0	02N10E26BC_H02	121° 32' 33.280" W	45° 37' 51.943" N				0	0	0	0	OFD	OWD	0
467	3485 EARLY RD		0	02N10E26C_H13	121° 32' 35.304" W	45° 37' 34.927" N				0	0	0	0	OFD	CSWD	0
781	4715 SUMMIT DR	Am Darl B50B HP	0	02N10E21_H02	121° 34' 32.749" W	45° 38' 14.221" N				0	5	140	5	OFD	CSWD	75
782	4038 BARTLETT LP	Am Darl B50B	0	02N10E27BA_H01	121° 33' 23.702" W	45° 38' 3.932" N				0	55	200	30	OFD	CSWD	76
783	BARTLETT DR | WY'EAST RD	Am Darl B50B	0	02N10E27BA_H03	121° 33' 19.066" W	45° 38' 1.176" N				0	55	200	30	OFD	CSWD	77
784	4068 BARLETT DR	Am Darl B50B HP	0	02N10E27BA_H02	121° 33' 28.667" W	45° 38' 1.216" N				0	0	200	0	OFD	CSWD	78
785	3831 EAGLE LP	Mueller	0	02N10E27A_H05	121° 32' 43.866" W	45° 37' 44.987" N				0	0	0	0	OFD	CSWD	80
786	3800 EAGLE LP	Muelker	0	02N10E27A_H04	121° 32' 48.972" W	45° 37' 45.194" N				0	0	0	0	OFD	CSWD	81
787	3760 EAGLE LP	Mueller	0	02N10E27A_H01	121° 32' 46.635" W	45° 37' 49.907" N				0	0	0	0	OFD	CSWD	84
788	3941 SYLVESTER DR	Am Darl B50B HP	0	02N10E34_H03	121° 33' 19.554" W	45° 36' 41.528" N				0	0	0	0	OFD	CSWD	85
789	3790 CENTRAL VALE DR	Am Darl B50B HP	0	02N10E34_H05	121° 32' 54.182" W	45° 36' 22.559" N				0	5	200	5	OFD	CSWD	86
790	4320 HWY 35	Am Darl B50B HP	0	01N10E03_H01	121° 32' 46.409" W	45° 36' 3.446" N				0	0	0	0	OFD	CSWD	88
793	SHEPPARD RD | BEAR RIDGE DR	Mueller	0	02N10E36_H05	121° 30' 41.327" W	45° 36' 22.448" N				0	0	0	0	OFD	CSWD	91
794	3848 NEAL CREEK RD	Mueller	0	02N10E36_H03	121° 30' 49.083" W	45° 36' 45.504" N				0	0	0	0	OFD	CSWD	92
795	3366 KOLLAS RD	Mueller	0	02N10E28_H03	121° 34' 14.555" W	45° 37' 35.141" N				0	0	0	0	OFD	CSWD	94
796	3430 DAVIS DR - NORTH WEST	Mueller	0	02N10E26D_H01	121° 32' 1.561" W	45° 37' 35.686" N				0	75	225	40	OFD	CSWD	95
797	3828 FLETCHER DR	Mueller	0	02N10E34_H04	121° 32' 59.495" W	45° 36' 48.319" N				0	0	0	0	OFD	CSWD	96

Appendix 4.1

2010 Oregon Fire Code

Appendix B: Fire-Flow Requirements for Buildings

Appendix C: Fire Hydrant Locations and Distribution

APPENDIX B

FIRE-FLOW REQUIREMENTS FOR BUILDINGS

The provisions contained in this appendix are adopted by the State of Oregon.

SECTION B101 GENERAL

B101.1 Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix and as required by the fire code official. This appendix does not apply to structures other than buildings. Also see ORS 479.200.

> ORS 479.200 is not a part of this code but is reproduced or paraphrased here for the reader's convenience.
>
> ORS 479.200 regulates water supply requirements for certain buildings erected after July 1, 1967, as defined in ORS 479.010(1)(i).

SECTION B102 DEFINITIONS

B102.1 Definitions. For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

OCCUPANCY HAZARD. A classification system based on the classification of occupancies and commodities system specified in NFPA 13.

PROTECTED AREAS. Geographic areas where a service or an agency has been established for the purpose of providing fire suppression services for buildings and other structures. Examples of agencies typically include public fire departments, rural fire protection districts and private fire protection services.

UNPROTECTED AREAS. Geographic areas where no organized service or agency exists to provide fire suppression services for buildings and other structures. Examples of unprotected areas typically included areas where wildland fire protection is provided by federal (USFS, BLM, BIA, etc.) state (ODF), or regional (forest protection associations) organizations and other areas that are generally in remote or rural isolated areas where no structural fire protection service is present.

SECTION B103 MODIFICATIONS

B103.1 Decreases. The fire code official is authorized to reduce the fire-flow requirements when the development of full fire-flow requirements is impractical based on, but not limited to, the following: type of occupancy, type of construction, location on property, floor area, height and number of stories, yards as defined by the *International Building Code*, fire walls, and the fire-fighting capabilities of the jurisdiction.

B103.2 Increases. The fire code offical is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Limiting. The fire code official is authorized to limit the maximum required fireflow based on, but not limited to, the fire-fighting capabilities of the jurisdiction. Fire-flow limitations shall be in accordance with Section B106 which are in addition to the fire-flow requirements as specified in Section B105.

SECTION B104 FIRE-FLOW CALCULATION AREA

B104.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the *exterior walls*, and under the horizontal projections of the roof of a building, except as modified in Section B104.2 or B104.3.

B104.2 Area separation. Portions of buildings which are separated by *fire walls* constructed in accordance with the *International Building Code*, are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105 FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN PROTECTED AREAS WITH ADEQUATE AND RELIABLE WATER SYSTEMS

B105.1 General. The provisions of Section B105 are intended for use by the fire code official in protected areas in which adequate and reliable water systems exist. Refer to Section B106 for additional alternative provisions regarding limiting fire flows.

B105.2 One- and two-family dwellings. The minimum fire-flow and flow duration requirements for one- and two-family *dwellings* having a fire-flow calculation area that does not exceed 3,600 square feet (344.5 m^2) shall be 1,000 gallons per minute (3785.4 L/min) at 20 pounds per square inch (138kPa) residual for 1 hour. Fire-flow and flow duration for dwellings having a fire-flow calculation area in excess of 3,600

square feet (344.5m^2) shall not be less than that specified in Table B105.1 as modified by Section B105.4.

Exceptions:

1. A reduction in required fire-flow of 50 percent is allowed when the building is provided with an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.3 (NFPA 13D) of the *Oregon Fire Code*.
2. When there are not more than one each, Group R, Division 3 and Group U occupancies or agricultural buildings, as defined by ORS 455.315, on a single parcel of not less than 1 acre, the requirements of this section may be modified provided, the Group R, Division 3 occupancy does not require a fire flow in excess of 1500 gallons per minute (5678 L/min) and in the opinion of the fire code official, fire fighting or rescue operations would not be impaired.

B105.3 Buildings other than one- and two-family dwellings. The minimum fire-flow and flow duration for buildings other than one- and two-family *dwellings* shall be as specified in Table B105.1, as modified by Sections B105.3 and B105.4.

B105.3.1 Fire-flow reductions. The total required fire-flow may be reduced by one of the following options, but in no case shall the resulting fire-flow be less than 1500 gallons per minute (5678 L/min) at 20 pounds per square inch (138 kPa) residual.

B105.3.1.1 Sprinkler systems. A reduction in required fire-flow of up to 75 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 (NFPA 13) or 903.3.1.2 (NFPA 13R).

B105.3.1.2 Fire alarm systems. A reduction in required fire-flow of 25 percent is allowed when the building is provided with an approved automatic and manual fire alarm system that is installed throughout the building and is monitored by an approved central receiving station. The systems shall meet all requirements of NFPA 72 as specified for a central station fire alarm system providing total (complete) coverage by detection devices.

B105.4 Occupancy hazard modifiers. Where a single occupancy classification, as defined by NFPA 13, or a single high-piled combustible storage commodity classification, as specified in Section 2303, is present in a building, the minimum fire-flow required by Table B105.1 shall be multiplied by the appropriate factor in Table B105.4 to determine the total required fire-flow, but in no case shall the resulting fire-flow be less than 1500 gallons per minute (5678 L/min) at 20 pounds per square inch (138 kPa) residual.

B105.4.1 Multiple occupancy hazards. Where more than one occupancy classification, or commodity classification is present in a building, the minimum fire-flow required by Table B105.1 shall be proportioned by percentage of the floor area used for each hazard. The proportioned building fire-flow shall by multiplied by the factor, relating to that portion of the building, in Table B105.4 and totaled to determine the total required fire-flow, but in no case shall the resulting fire-flow be less than 1500 gallons per minute (5678 L/min) at 20 pounds per square inch (138 kPa) residual.

TABLE B105.4

Light hazard occupancies	0.75
Ordinary hazard (Group 1)	0.85
Ordinary hazard (Group 2) and HPCS[a] Classes I & II	1.00
Extra hazard (Group 1) and HPCS Class III	1.15
Extra hazard (Group 2) and HPCS Classes IV & High Hazard	1.25

a. HPCS—High-piled combustible storage

SECTION B106
LIMITING FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN PROTECTED AREAS WITH ADEQUATE AND RELIABLE WATER SYSTEMS

B106.1 General. The provisions of Section B106 are intended for use by the fire code official in addition to the provisions specified in Section B105 as authorized by Section B103.3. This section is intended to apply in protected areas in which adequate and reliable water systems exist.

B106.2 Limiting required fire-flow. No building shall be constructed, altered, enlarged, moved, or repaired in a manner that by reason of size, type of construction, number of stories, occupancy, or any combination thereof creates a need for a fire-flow in excess of 3,000 gallons per minute (11 356 L/min) at 20 pounds per square inch (138 kPa) residual pressure as specified in Table B105.1, or exceeds the available fire-flow at the site of the structure.

Exception: Fire-flow requirements in excess of 3,000 gallons per minute (11 356 L/min) may be allowed if, in the opinion of the fire code official, all reasonable methods of reducing the fire-flow have been included within the development and no unusual hazard to life and property exists.

B106.3 Existing buildings. Existing buildings that require a fire-flow in excess of 3,000 gallons per minute (11 356 L/min) are not required to comply with the fire-flow requirements of this section. However, changes in occupancies or the character of occupancies, alterations, additions or repairs shall not further increase the required fire-flow for buildings.

SECTION B107
FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN PROTECTED AREAS WITHOUT ADEQUATE AND RELIABLE WATER SYSTEMS

B107.1 Areas without water supply systems. The provisions of Section B107 are intended for use by the fire code official in protected areas in which adequate and reliable water supply systems do not exist. In determining the fire-flow for buildings, the fire code official is authorized to utilize the following nationally recognized standards; NFPA 1142, the *International Urban-Wildland Interface Code* or the *ISO Guide for Determining Needed Fire Flow, 2005 Edition.*

TABLE B105.1
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *International Building Code*.

b. Measured at 20 psi residual pressure.

APPENDIX B

SECTION B108
FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN UNPROTECTED AREAS (RESERVED)

SECTION B109
REFERENCED STANDARDS

ICC	IBC-09	International Building Code	B104.2, Table B105.1
ICC	IFC	International Fire Code	B105.3
ICC	IWUIC-09	International Wildland-Urban Interface Code	B107.1
NFPA	1142-07	Standard on Water Supplies for Suburban and Rural Fire Fighting	B107.1
ISO		Guide for Determining Needed Fire Flow, 2005 Edition	B107.1

APPENDIX C
FIRE HYDRANT LOCATIONS AND DISTRIBUTION

The provisions contained in this appendix are adopted by the State of Oregon.

SECTION C101
GENERAL

C101.1 Scope. Fire hydrants shall be provided in accordance with this appendix for the protection of buildings, or portions of buildings, hereafter constructed.

SECTION C102
LOCATION

C102.1 Fire hydrant locations. Fire hydrants shall be provided along required fire apparatus access roads and adjacent public streets.

SECTION C103
NUMBER OF FIRE HYDRANTS

C103.1 Fire hydrants available. The minimum number of fire hydrants available to a building shall not be less than that listed in Table C105.1. The number of fire hydrants available to a complex or subdivision shall not be less than that determined by spacing requirements listed in Table C105.1 when applied to fire apparatus access roads and perimeter public streets from which fire operations could be conducted.

SECTION C104
CONSIDERATION OF EXISTING FIRE HYDRANTS

C104.1 Existing fire hydrants. Existing fire hydrants on public streets are allowed to be considered as available. Existing fire hydrants on adjacent properties shall not be considered available unless fire apparatus access roads extend between properties and easements are established to prevent obstruction of such roads.

SECTION C105
DISTRIBUTION OF FIRE HYDRANTS

C105.1 Hydrant spacing. The average spacing between fire hydrants shall not exceed that listed in Table C105.1.

Exception: The fire chief is authorized to accept a deficiency of up to 10 percent where existing fire hydrants provide all or a portion of the required fire hydrant service.

Regardless of the average spacing, fire hydrants shall be located such that all points on streets and access roads adjacent to a building are within the distances listed in Table C105.1.

TABLE C105.1
NUMBER AND DISTRIBUTION OF FIRE HYDRANTS

FIRE-FLOW REQUIREMENT (gpm)	MINIMUM NUMBER OF HYDRANTS	AVERAGE SPACING BETWEEN HYDRANTS[a, b, c] (feet)	MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT[d]
1,750 or less	1	500	250
2,000-2,250	2	450	225
2,500	3	450	225
3,000	3	400	225
3,500-4,000	4	350	210
4,500-5,000	5	300	180
5,500	6	300	180
6,000	6	250	150
6,500-7,000	7	250	150
7,500 or more	8 or more[e]	200	120

For SI: 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

a. Reduce by 100 feet for dead-end streets or roads.

b. Where streets are provided with median dividers which cannot be crossed by fire fighters pulling hose lines, or where arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street and be arranged on an alternating basis up to a fire-flow requirement of 7,000 gallons per minute and 400 feet for higher fire-flow requirements.

c. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.

d. Reduce by 50 feet for dead-end streets or roads.

e. One hydrant for each 1,000 gallons per minute or fraction thereof.

Appendix 4.2

Crystal Springs Water District

Design Standards

CRYSTAL SPRINGS WATER DISTRICT
DESIGN STANDARDS

SECTION 5.0000 - WATER MAINS

5.0010 - GENERAL DESIGN REQUIREMENTS

Performance Standards - Water distribution systems shall be designed to meet State Water Administrative Rules and guidelines of the Water System Master Plan and its updates.

Water system design shall provide adequate flow for fire protection and maximum water usage and consumption. Required water system demands shall be met by maintaining the minimum operating pressures required by the District. For single family residential areas the minimum static pressure shall be 20 psi, and the minimum fire flow shall be 1000 gpm. For all other developments, the required fire flow shall be as determined by the Fire Chief.

Water system design shall meet distribution needs for maximum water usage and consumption within a given service area. New water systems shall be extended to the far side of the property to allow for future extensions beyond present development and to be consistent with the Master Plan.

All water lines shall be located within the public right-of-way or as directed by the Superintendent. These lines are placed in the public right-of-way for ease of maintenance and access, control of the facility, operation of the facility, and to permit required replacement and/or repair. The Superintendent, under special conditions, may allow a public water line to be located within a public water easement as referenced in Section 5.0024.

Where water lines are constructed on slopes greater than 20%, in areas designated as hazardous or where there are site conditions that may cause damage to improvements, slippage or slides as determined by the Superintendent, a soils and/or geologic report may be required.

Where the finished graded surface is greater than twenty percent (20%), or as required by the Superintendent, soil stabilization fabric shall be placed over the entire disturbed area.

Standard specifications and drawings relevant to this section may be found in the most current edition of the APWA Standard Specification for Public Works Construction, Oregon Chapter.

5.0011 - PIPE MATERIALS AND SIZE

All public water distribution systems shall be constructed with ductile iron pipe, minimum thickness as shown in the following table.

Pipe size (inches)	D.I. Class
8 and smaller	52
10	52
12	52

All ductile iron pipes shall be cement mortar-lined pipe with push-on or mechanical type joints. When a corrosive potential condition is encountered, all ductile iron pipe and fittings will be polyethylene encased with 8 mil tubing meeting manufacturer and AWWA standards. Where an active cathodic protection system is encountered as a result of other utilities, a deviation from the normal pipe design material/installation practice may be required by the Superintendent.

All valves and fittings shall be ductile iron, conforming to AWWA specifications, and rated for 350 psi. All fittings shall be factory cement lined and coated. Pipe constructed per Section 5.0025 will require the use of restrained pipe joints or ball and socket river pipe.

Service lines shall be as shown in the following table.

Service Pipe Size (inches)	Pipe Material
2 and Smaller	Type K Copper Tubing
3 and Larger	Ductile Iron

Water distribution main sizes shall conform to the following:

6-inch Minimum size residential subdivision distribution water main shall not exceed an unsupported length of 600 feet where feasible. Looping of the distribution grid shall be at least every 600 feet where feasible.

8-inch Minimum size for permanently dead-ended mains supplying fire hydrants with a fire flow less than 1,500 gpm and for primary feeder mains in residential subdivisions.

10-inch & up As required for primary feeder lines in subdivisions, industrial and commercial areas.

Water service lines shall conform to the following:

3/4" Typical residential services.

1" and up	Public, Commercial, Industrial, other non-residential, and high demand residential uses shall be sized per actual usage.

Velocity in distribution mains shall be designed not to exceed five feet (5') per second. Velocity in service lines (as defined in Section: 5.0050) shall not exceed ten feet (10') per second.

All pipe fittings and valves shall use Mega-Lug connections that meet the District Superintendent's discretion.

Changes in the direction of flow shall have bell restraints for a minimum of 3 joints or at least 60 feet from the location of the direction change.

5.0012 - GRID SYSTEM

The distribution system mains shall be looped at all possible locations. All developments will be required to extend mains across existing or proposed streets for future extensions by the District or other developments. All terminations shall be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended. The installation of permanent dead-end mains greater than 250 feet upon which fire protection depends and the dependence of relatively large areas on single mains will not be permitted.

5.0013 - DEAD-END MAINS

Dead-end mains which will be extended in the future shall be provided with a line-size gate valve and MJ plug at the end and tie rodded. The valve plug shall be tapped 2" and provided with a standard blow-off, except that the 2" gate valve shall not be installed.

Permanent dead-end mains shall terminate with a standard blow-off assembly.

5.0020 - ALIGNMENT AND COVER

5.0021 - RIGHT-OF-WAY LOCATION

Water systems within the right-of-way shall be located as directed by the Superintendent. Except as provided in Section 5.0024, all water lines shall be in the public right-of-way. All abrupt changes in vertical or horizontal alignment shall be made with a concrete thrust block or a Megalug or MJ grip ring as required by the Superintendent. Curved alignment for water lines or mains is permitted and shall follow the street centerline when practical. The minimum allowed radius shall be based on allowable pipe deflection for the pipe diameter and the pipe laying length bit not to exceed 3^{o} joint deflection.

5.0022 - MINIMUM COVER

The standard minimum cover over buried water mains within the street right-of-way or easements shall be thirty inches (30") from finish grade.

Finish grade shall normally mean the proposed pavement or ground elevation where the main is located.

Deviation from the above standards will be considered on a case-by-case basis when the following exists:

a. When there is underlying rock strata that prohibits placement of the water main thirty inches (30") below finish grade, a written request must be submitted to the Superintendent together with submission of a soils report with a plan and profile certifying that bed rock exists less than thirty inches (30") below the undisturbed ground surface.

5.0023 - SEPARATION WITH SEWER LINES

Water mains shall be installed a minimum clear distance of ten feet (10') horizontally from sanitary sewers and shall be installed to go over the top of such sewers with a minimum of eighteen inches (18") of clearance at intersections of these pipes. Exceptions shall first be approved by the Superintendent. In all instances, the distances shall be measured edge to edge. The minimum spacing between water mains and storm drains, gas lines, and other underground utilities, excepting sanitary sewers, shall be three feet (3') horizontally when the standard utility location cannot be maintained.

Where water lines are being designed for installation parallel with the other water mains, utility pipe, or conduit lines, the vertical separation shall be twelve inches (12") below or in such a manner which will permit future side connections of mains, hydrants, or services and avoid conflicts with parallel utilities without abrupt changes in vertical grade of the above mentioned main, hydrant, or service. Where crossing of utilities are required, the minimum vertical clearance shall be six inches (6").

5.0024 - EASEMENTS

Mains placed in easements along a property line shall have easements centered on the property line and shall be offset eighteen inches (18") from the property line. For mains placed in easements located other than along a property line, the main shall be placed in the center of the easement. Easements, when required, shall be exclusive and a minimum of ten feet (10') in width. The conditions of the easement shall be such that the easement shall not be used for any purpose which would interfere with the unrestricted use for water main purposes. Under no circumstances shall a building or structure be placed over a water main or water main easement. This includes overhanging structures with footings located outside the easement. Further, no trees or large bushes shall be planted in the easement.

Easement locations for public mains serving a PUD, apartment complex, or commercial/industrial development shall be in parking lots, private drives, or similar open areas which will permit unobstructed vehicle access for maintenance by District personnel.

All easements must be furnished to the District for review and approval prior to recording.

5.0025 - RELATION TO WATERCOURSES

New water mains may cross over or under existing streams, ponds, rivers, or other bodies of water.

a. Above Water Crossings - The pipe shall be engineered to provide support, anchorage, and protection from freezing and damage, yet shall remain accessible for repair and maintenance. All above water crossings will require review and approval by the Superintendent.

   1. Valves shall be provided at each end.

   2. Air/Vacuum relief valves shall be provided.

b. Underwater Crossings

   1. Mains crossing stream or drainage channels shall be designed to cross as nearly perpendicular to the channel as possible.

   2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding. The valve nearest to the supply source shall be in a manhole. Permanent taps shall be made on each side of the valve within the manhole to allow insertion of a small meter for testing to determine leakage and for sampling.

   3. The minimum cover from the bottom of the stream bed or drainage channel to the top of pipe shall be thirty-six inches (36").

   4. A scour pad centered on the water line will be required for the top of the pipe to the bottom of the stream bed or-drainage channel is thirty inches (30") or less. The scour pad shall be concrete, six inches (6") thick and six feet (6') wide, reinforced with number four bars twelve inches (12") on center both ways and shall extend to a point where a one-to-one slope, that begins at the top of the bank and slopes down from the bank away from channel centerline intersects the top of the pipe.

c. The following surface water crossings will be treated on a case-by-case basis:

   1. Stream or drainage channel crossing for pipes twelve inches (12") inside diameter and greater.

2. River or creek crossings requiring special approval from the Division of State Lands.

5.0030 - APPURTENANCES

5.0031 - VALVES

In general, valves shall be the same size as the mains in which they are installed.

Main line valves 8-inch and smaller shall be resilient seated gate valves meeting the requirements of AWWA C509.

Main line valves 10-inch and larger shall be butterfly valves conforming to AWWA C504.

Distribution system valves shall be located at all tee or cross fittings. There shall be a sufficient number of valves so located that not more than four (4) and preferably three (3) valves must be operated to effect any one particular shutdown. The spacing of valves shall be such that the length of any one shutdown in commercial or industrial areas shall not exceed 500 feet nor 800 feet in other areas.

In general, a tee-intersection shall be valved on all branches and a cross-intersection shall be valved on all branches. Transmission water mains shall have valves at not more than 1,000 foot spacing. Hazardous crossings, such as creek, railroad and highway crossings, shall be valved on each side.

Distribution tees and crosses with valves for future branch lines on transmission mains may be required at the direction of the Superintendent.

5.0032 - FIRE HYDRANTS

The public fire hydrant system shall be designed to provide up to a maximum of 3,000 GPM. The distribution system shall be designed in commercial/industrial areas to accommodate fire flows as required by the Fire Chief. Minimum fire flow in single family residential areas shall be 1000 GPM.

The distribution of hydrants shall be based upon the required average fire flow for the area served. Design coverage shall result in hydrant spacing of approximately 500 feet in residential areas, approximately 300 feet in commercial or industrial subdivisions or as approved by the Fire Chief and District Superintendent. In addition, sufficient hydrants shall be available within 1000 feet of a building in commercial/industrial areas to provide its required fire flow.

Residential hydrants shall be located as nearly as possible to the corner of street intersections and not more than 500 feet from any cul-de-sac radius point.

No fire hydrant shall be installed on a main of less than six inches (6") inside diameter. The hydrant lead shall be minimum six-inch (6") inside diameter.

All fire hydrants will be located behind the existing or proposed curb. If any public hydrant encroaches on private property an easement will be provided as directed by the Superintendent.

No hydrant shall be installed within five feet (5') of any existing aboveground utility nor shall any utility install facilities closer than five feet (5') from an existing hydrant.

Full-depth hydrants will be required in all installations. Installation of hydrant extensions will require Superintendent approval.

Each fire hydrant shall have an auxiliary valve and valve box which will permit repair of the hydrant without shutting down the main supplying the hydrant. Such auxiliary valves shall be resilient seat gate valves. The auxiliary valve shall have mechanical joint-flange ends. The valve shall be connected directly to the water main using a flange joint tee, tie rods, and thrust blocked.

Hydrants shall not be located within twenty feet (20') of any building, nor will they be blocked by parking. The large hydrant port should face the road or travel way. Hydrant shall have 2 2-1/2" ports and 1 4-1/2" port. All Fire Hydrants provided shall be Mueller Centurion.

Guard posts a minimum of three feet (3') high shall be required for protection from vehicles when necessary. Such protection shall consist of four-inch (4") diameter steel pipes six feet (6') long filled with concrete and buried a minimum of three (3') feet deep in concrete and located at the corners of a six (6') foot square with the hydrant located in the center. Use of posts other than at the four corners may be approved by the Superintendent.

5.0033 - PRESSURE-REDUCING AND AIR RELEASE VALVES

Where water systems cross pressure zone lines, a pressure-reducing valve station will be required. The specific design and location for such valves will be reviewed and approved by the Superintendent.

Because of the high pressures experienced in the District, all water services shall be provided with an individual pressure-reducing valve (PRV) installed adjacent to the meter in a meter box.

Air release valves shall be installed on water mains at all high points in grade.

5.0034 - RAILROAD OR HIGHWAY CROSSINGS

All such crossings defined above, or as determined by the District to be of a hazardous nature, shall be valved on both sides of the crossing. Casing of railroad or highway crossings, if required, shall be as noted in the permit from the respective agency.

5.0035 - ANCHOR BLOCKS

For water pipes greater than four inches (4") in diameter, concrete anchor blocks shall be required if the slopes are greater than twenty percent (20%). Anchor blocks shall key into trench sides. Spacing for anchor blocks is as follows:

SPACING FOR ANCHOR BLOCK FOR ALL SIZE PIPE

SLOPE %	MINIMUM SPACING (FT)
0 - 19.99	NO ANCHOR REQUIRED
20 - 34.99	35
35 - 50.99	25
51 - OR MORE	15 OR SPECIAL DESIGN

5.0036 - WATER BARS

Where the finished graded surface has a slope greater than or equal to 3 units horizontal to 1 unit vertical or as required, water bars shall be installed. The water bars shall be sloped slightly to drain runoff water away from the pipe line alignment. Water bars shall have a maximum spacing of forty feet (40').

5.0040 - BACKFLOW PREVENTION

Back flow prevention devices shall be required on all water services with potential for backflow and as directed by the Superintendent.

5.0050 - WATER SERVICE LINES

The sizes of water service lines which may be used are 3/4", 1-1/2", 1", 2", 3", 4", 6", 8", 10", and 12". Water service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.

For two-inch (2") and greater services, a design drawing must be submitted showing the vault and fitting requirements with the expected flow (normal and maximum daily flow) requirements and proposed usage.

Domestic service lines 3/4" through 2" shall normally extend from the main to behind the sidewalk with a meter setter and meter box located at the termination of the service connection. The face of the meter box shall be no closer than 6" to the sidewalk. Meters shall be provided and installed by the developer. Installation of meters shall be supervised and/or monitored by the District. Meter boxes are to be provided by the developer. In general, individual service connections shall terminate in front of the property to be served and shall be located two feet (2') on each side of a common property line.

When the service line is 1" or less, 8" corrugated PVC tile shall cover the meter and valves. Larger meter boxes shall be set as directed by the Superintendent.

Fire Service - There are three categories of private fire services: 1) hydrants, 2) fire sprinkler lines, and 3) combination hydrant and fire sprinkler lines.

The water fire service line shall normally extend from the main to the property line and end with a vault, metering device and valves. A double detector check back flow prevention device installed in a vault shall be required at each property being served.

Fire Vaults - A vault will be required when a development provides fire protection. The vault drawing will be included on construction drawings submitted to the District. The vault shall contain all valves, fittings, meters, and appurtenances required for fire service to the development.

5.0060 - SYSTEM TESTING

All new water systems (lines, valves, hydrants, & services) shall be individually pressure tested, chlorinated and tested for bacteria. All testing shall be performed in accordance with the latest edition of the Oregon Chapter APWA Standard Specifications for public works construction, OAR's and in the presence of a District representative.

5.0070 - EROSION CONTROL

Erosion control will be required for all areas disturbed during construction and following construction until permanent protection is established.

Temporary facilities may include silt fences, drain barriers, gravel entries, ditches, surface stabilization or other devices as necessary.

Temporary/permanent hydro-seeding or acceptable seeding and mulching must be provided whenever perennial cover cannot be established on sites which will be exposed after September 1 or prior to June 1.

Appendix 4.3

District Policy and Regulations

DISTRICT POLICY AND REGULATIONS

Page Link menu:

GENERAL

The Crystal Springs water system is the property of the people served by the Crystal Springs Water District, and is managed and operated by the Board of Commissioners elected by the people. The Board asks the cooperation of all citizens to insure compliance with the regulations, prompt payment of all charges, and protection of the system.

All transactions concerning water service shall be made through the District office. Before service will be connected, proper application including an easement signed by all parties shall be submitted to the Board. Plans for the laying of customer lines shall be approved by the Commissioners before construction begins.

- A "customer line" is the pipe, valves, and fittings between the meter and the premises served.
- A "service line" is the pipe, valves, and the fittings from the main, to and including the meter, meter box, and pressure reducing valve on the main side of the meter
- A "water main" or "main" is the pipe, usually two inches or larger in diameter, laid in the street, road, easement, or other access for the distribution of water to customers through service lines.

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APPLICATION FOR SERVICE

For each new water service the District requires an application which includes:

1. Signature of the applicant(s)
2. Location of the premises
3. Address to which bills shall be mailed
4. Sufficient information to determine which rate should apply and all other information that the District may reasonably require
5. A complete and notarized easement granting CSWD personnel access to customer property to install, repair and maintain service lines
6. System development fee payment

The application constitutes a written request for service, subject to approval of the Board of Commissioners, and does not bind the District to serve. Upon Board approval of the application, fees will be deposited by the District.

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Service Connection Charge

All water service applications include a system development fee based on requested meter size. Upon complete installation of service equipment, a final billing for labor and materials will be rendered and becomes due within 10 days. All charges and fees must be paid or a payment contract must be arranged before water service begins. Water service may be terminated for failure to pay fees or charges. (See SECTION 6)

The District will accept a deposit of 20% of the estimated total installation charge with the balance due in a maximum of 36 equal monthly payments at the interest rate in effect when the application is approved. There is no penalty for early payment. The monthly payments are due by the 10th of each month upon approval of the application. Installation fees and charges will be billed separately from the water bill.

1. The deposit and/or payments will be returned:
2. If the application for water service is denied
3. If a building permit is DENIED on the subject parcel and the water application is withdrawn

If the water application is approved and the application is withdrawn within 6 months The deposit and/or payments will NOT be refunded and right to service to the subject parcel becomes permanent:

1. If a building permit is approved on the subject parcel
2. If no building permit is applied for within 6 months after water application approval (1/92)

New water service customers will pay for all labor and materials to install the service from the main, to and including the meter, plus a system development fee which reflects a cost of investment in the water system to provide service to the property site (for main improvements and the indirect costs of providing service). (5/89) A system development fee schedule based on size will be determined by the Board of Commissioners. Material for all installations will be charged at actual cost plus thirty per cent (30%) for general overhead.

An additional hook-up fee will not be charged for a fire protection system hook-up to a site which is already served by Crystal Springs. If the site has no other Crystal Springs service, the fire protection system installation charge will include a system development fee. The customer will also be responsible for the installation (labor and materials) costs to make the installation. (2/89)

The Crystal Springs Water District requires a separate meter for each property. A property is defined as real estate consisting of one or more tax lots, contiguous in nature, under the same ownership. If a public road divides contiguous parcels and housing units exist on each side of the road, the District requires separate meters on each side of the public road. The charge for the property will be based upon the size of the meter and water usage.

Properties which are not in compliance with this policy as of May 1, 1991 may remain out of compliance unless:

1. Something is done such as new cabins or housing facilities which tend to undersize the meter, or,
2. If, in the opinion of the District, the existing meter is not properly serving the property. (REVISED 2/91)

The District will install a service of such size and at such location as the applicant requests, provided such requests are reasonable and that the size requested is one that is customarily installed by the District. The minimum size of service shall be 3/4". The District may refuse to install a service line which is undersized/oversized based upon review and recommendation to the Board of Commissioners by the Superintendent and/or Consulting Engineer.

Where the main is in a public right-of-way, the meter will normally by placed at a mutually agreeable site near the property line on the property to be served. The meter will be installed outside of buildings, except where it is not otherwise possible to do so. Meters will not be installed in driveways or other locations where damage to the meter or its related parts may occur. No rent or other charge whatsoever shall be made by the customer against the District for placing or maintaining meters upon customer premises.

Where pressure regulators or reducing valves are required by the District or are requested by the customer, they will normally be installed on the main side of the meter. Labor and materials costs for the installation of regulators/reducing valves will be borne by the customer. The District will maintain and repair one (1) regulator/reducing valve per meter installation.

The cost of customer-requested permanent changes in the size or location of the service line and/or meter shall be paid by the customer on the basis of actual cost plus thirty per cent (30%) for general overhead. The billing for an upsized meter will include a proportionate system development fee based on the current fee schedule.

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Contract

When an application and easement for water service has been approved and the premises are subsequently connected to District service lines, the customer application and easement shall constitute a contract. The applicant agrees to abide by those rates and regulations which are in effect at the time of the application, or are adopted thereafter by the District, and agrees to pay all bills promptly.

When the customer requirements for water are unusual or large, or necessitate considerable special or reserve equipment or capacity, the District may require a contract for an extended period and may also require the customer to furnish security satisfactory to the District to protect the District against loss and to guarantee the performance of the provisions of the contract.

When water is desired for the filling of a swimming pool or a tank, or for use in other unusually large quantities, arrangements must be made with the District prior to the taking of such water. Permission to take water in such large quantities will be given only if the water can be safely delivered through the District's facilities and if an adequate supply can at the same time be delivered to other customers.

Except for special contracts, all regulations are subject to modification or change by the District without notice.

The District reserves the right to make special contracts, the provisions and conditions of which are different from, or have exceptions to, the published schedules. The special contracts shall be in writing and signed by the customer and District officers.

In accordance with Oregon Law (ORS 264.312) all proposed water rate changes will be presented before a public meeting to allow public input. Final decisions, however, will rest with the Board of Commissioners.

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Water Service Rate Structure

The general rate structure will include a monthly charge based on meter size (per unit served (DELETED 7/1/91). Usage will be charged at a uniform rate for each thousand gallons through the meter.

The landowner is ultimately responsible for water service to his property. The bill will be sent to the property owner who may, in turn, require payment from the resident.

All bills for water use are due and payable bimonthly in advance at the District office on the first day of the billing month, and become delinquent fifteen (15) days thereafter, except in cases where special contract arrangements in writing specify the monthly payment date. (1-27-94)

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Payment and Non-payment of Bills

Thirty (30) days after billing, a reminder will be sent to the customer. Forty-five (45) days after billing, a second notice will advise that a two dollar ($2) late charge has been added to the unpaid account. (1-27-94)

Service may be discontinued to customers having delinquent bills, if such action is necessary to enforce collection. Sixty (60) days after the original billing date (on the date of the subsequent new bill), the meter reader or other agent of the District shall deliver a written notice to the customer stating that a fee of $25 has been added to the account and that the water service will be turned off in 48 hours unless all delinquent amounts have been paid. (1-27-94)

A delivery to any person residing at the address served by the meter shall be considered a delivery to the customer. If there is no person present at the address served, the notice may be left on the premises.

If delinquent bills are not paid within 48 hours (1-27-94), the meter reader or other agent of the District will return to the premises, shut off the water service, and leave a notice that a fee of $75 has been added to the account to restore service and that the water service will be restored after all delinquent amounts have been paid.

In all instances where water has been turned off because of delinquency, there will be a $75.00 service charge to restore service ($100, if after normal working hours, including weekends and holidays).

In cases of extreme hardship or mitigating circumstance, the Superintendent shall have the authority to waive the past due fee. The superintendent shall have the discretion of renewing service to a delinquent account upon receipt of a satisfactory installment plan for the payment of the overdue amount. A decision of the Superintendent may be appealed to the Board of Commissioners. (11/19/93).

In case water is turned on without authority during the period of any delinquency, the service will be disconnected and it will not be reconnected until all charges are paid in full, together with an additional charge of $75.00 (2/25/93) reconnection fee and any material or excess labor charge.

All delinquency notices and door notices will be printed in both English and Spanish. Service will not be terminated on the day immediately preceding the weekend or any District-recognized holiday.(2/25/93)

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Change of Occupancy / Discontinuance of Service

At the time specified by the customer that he expects to vacate the premises where service is supplied, or that he desires service to be discontinued, the meter will be read and a bill rendered, which is payable immediately. In no case will the bill be less than the proportionate share of the monthly base rate provided for in the schedule applying to the service furnished.

Each customer about to vacate any premises supplied with water service by the District shall give written notice of his intended removal at least two (2) days prior thereto, specifying the date service is to be discontinued; otherwise, he will be responsible for all water supplied to the premises until the District shall have notice of such removal.

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Temporary / Fire Protection / Agricultural / Non-domestic Service

For water service of a temporary nature for construction purposes, the customer may be required to make a deposit to cover the cost of labor and materials for connection/disconnection, and for a reasonable depreciation charge for the use of equipment and materials furnished and owned by the District.

Standby fire protection service connections will be installed only if adequate provisions are made to prevent the use of water from such services for purposes other than fire extinguishing. Sealed fire sprinkler systems with water-operated alarms shall be considered as having such provisions. The District may require that a suitable detector check meter be installed in the standby fire protection service connections to which hose lines or hydrants are connected. All pipe on the user premises shall be installed in accordance with the plumbing code of the State of Oregon.

Charges for standby fire protection service will be as established by the Board of Commissioners. No charge will be made for water used in the standby fire protection services to extinguish accidental fires or for routine testing of the fire protection system. The customer shall pay the full cost of the standby fire protection service connection, any required detector check meters, and any required special water meter installed solely for the service to the standby connection. There will be no additional hook-up fee to install a fire protection system at an existing service site. (2/89)

If water is used from a standby pipe connection service in violation of these regulations, an estimate of the amount used will be computed by the District. The customer shall pay for the water used at the regular rates, including the minimum charge based on the size of the service connection, and subsequent bills rendered on the basis of the regular water rates.

Standard fire hydrants for individual customers will be allowed by the District if the hydrant meets specifications required by the District. The cost of the fire hydrant will be the responsibility of the customer. The District will supply the labor to install the hydrant. After installation, the hydrant will become property of the District and will be repaired and maintained by the District.

Agricultural/non-domestic service connections will be installed upon request. The customer will pay for the cost of labor and materials to install the non-domestic tap and vaults, as well as the costs of any maintenance and/or testing of the valves as required by the State. The customer will pay the normal hook-up fee for the size of tap installed. In addition, all taps for non-domestic use must meet State regulations for backflow prevention. All fill spouts shall extend from above and not be in contact at any point with the tank/reservoir being filled. (2/25/88)

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Cross-connection

This policy, in conjunction with the Uniform Plumbing Code Chapter 10, State of Oregon Administrative Rules Chapter 333-61-070 and the current edition of the Cross Connection Control Manual - Accepted Procedure and Practice (published by the Pacific Northwest Section, American Water Works Association) is to protect the potability of the water in the Crystal Springs Water District distribution system. (4/95)

Neither cross-connections, nor any other type of physical connections, shall be made to any other water supply, whether public or private, without the written approval of the District. Included in this category are all pipe lines, appurtenances and facilities of the District's system and all pipes, appurtenances, pumps, tanks, storage, reservoirs, facilities, equipment, appliances etc. of other systems, whether located within, or on, public or private property or the premises of a water user.

Inspection and regulation of all actual, or potential, cross-connections between potable and non-potable systems is required to minimize the danger of contamination or pollution of the potable water supply. Controlling and preventing cross-connections is accomplished by removing the cross-connection or, depending on the degree of hazard, establishing sufficient air gap, or installing an approved backflow prevention assembly device.

All plumbing within a building served by the District shall be so installed, and all plumbing fixtures so constructed, as to prevent pollution of the water supply by back-siphonage or back-pressure of cross-connection. Water service to any premises known or found to have such defects and hazards shall be disconnected and not restored until such defects and hazards have been eliminated.

All Crystal Springs water users are required to comply with these regulations to eliminate or control all cross-connections throughout the District. The owner of any property on which a cross-connection occurs is potentially liable for all damages to the Crystal Springs Water system caused by that cross-connection.

The District's State-certified Cross-connection Control Inspector will enforce of this ordinance, the provisions of which may supersede State requirements but in no case shall be less stringent.

All backflow prevention assemblies shall be models approved by the Oregon Health Division Drinking Water Department and shall be installed per District standards.

All backflow prevention devices*, and air gaps installed in lieu of an approved backflow prevention assembly, must be tested upon installation prior to being put into service and annually thereafter.

Annual test results shall be submitted to Crystal Springs Water District by the requested date. Tests and inspections may be conducted on a more frequent basis at the discretion of the District Inspector.

Authorized employees of Crystal Springs Water District with proper identification shall have the right, without being deemed guilty of trespass or unlawful act, to check the user premises for physical connections with other water supplies. Any such connections shall be removed immediately by the customer, otherwise District water service to the premises shall be terminated. Water service shall be refused or terminated for failure to allow necessary inspections.

In accordance with the State of Oregon Administrative Rules Chapter 333-61-070, failure of the customer to cooperate in the installation, maintenance, repair, inspection or testing of cross-connection controls as required by this ordinance shall be grounds for termination of water service to the premises.

*DEFINITIONS:

- RPBA - Reduced Pressure Backflow Assembly
- RPDA - Reduced Pressure Detector Assembly
- DCVA - Double Check Valve Assembly
- DCDA - Double Check Detector Assembly
- PVBA - Pressure Vacuum Breaker

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Assembly Responsibility and Service Preference

The District shall not be liable for any loss, or damage of any nature whatsoever, caused by any defect in the customer line, plumbing or equipment. The District may, without further notice, discontinue service to any customer when a defective condition of plumbing or equipment upon the premises of the customer results, or is likely to result, in interference with proper service, or is likely to cause contamination of water.

The District does not assume the duty of inspecting the customer line, plumbing and equipment, and shall not be responsible therefore, and will not be liable for failure of the customer to receive service on account of defective plumbing or apparatus on the customer premises.

The District will exercise reasonable diligence and care to furnish and deliver a continuous and sufficient supply of pure water to the customer, and to avoid any shortage or interruption of delivery of same. The District will not be liable for high/low pressure conditions, chemical/bacteriological conditions, interruption, shortage, or insufficiency of supply, or any loss or damage occasioned thereby. The use of water upon the premises of the customer is at the risk of the customer, and the responsibility of the District shall cease at the point of delivery of the water. Unless otherwise specified by agreement, the point of delivery shall be the point where the District service line attaches to the customer line at the meter.

The District may at its option install pressure reducing valves which will be installed at the customer expense for the purpose of reducing pressure from the distribution main only to protect the District water meters. The installation of the pressure reducing valve is neither designed nor intended to protect customer property beyond the meter. If any customer property is damaged by reason of water pressure or change thereof after the water passes through the meter, the loss or damage that may result to the customer property will be at the sole and exclusive expense of the customer and shall not be a responsibility of the District. Failure of District-installed control valves or devices will not in any way indicate negligence by the District or responsibility for damages caused therefrom.

Where pumping is required to serve a customer at an elevation too high to be served by gravity, the District may require the customer to provide a suitable pump as a condition of service. The installation shall be subject to District approval.

The District shall have the right to suspend temporarily the delivery of water for the purpose of making repairs or improvements to its system. In all such cases, reasonable notice thereof, as circumstances will permit, will be given to the customers and the making of such repairs or improvements will be prosecuted as rapidly as is practicable, and if practicable, at such times as will cause the least inconvenience to the customers.

Customers may install such additional pressure reducing valves, pressure relief valves, check valves, pop-off valves or other control valves as the customer may deem necessary to protect the customer lines from abnormally high/low pressures or from unanticipated water service interruptions.

In case of shortage of supply, the District reserves the right to restrict water use or give preference in the matter of furnishing service to customers and interests of the District, from the standpoint of public convenience or necessity.

Water will be furnished for ordinary domestic, business or food processing purposes and fire protection. The District reserves the right to limit or restrict any non-domestic water use (Gallons/minute or time of use). (2/25/88) Customers shall refrain from the use of water for lawn irrigation and gardening.

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Meters

The District will install and maintain all necessary meters for measuring water use by the customer and from time to time will inspect and test such meters. Installation of water meters shall be performed only by authorized employees of the District.

It shall be a violation of these regulations for the customer to operate or cause unauthorized operation of the meter stop or any other appurtenances on the service connection.

The meters will be read bimonthly to the nearest 1,000 gallons and customer will be billed on that basis. In the event that it shall be impossible/impractical to read a meter during the scheduled meter reading period, the customer shall be billed the base rate for that period. Any usage will be picked up on the next scheduled reading/billing.

The District will keep an accurate record of the meter readings, and such record, so kept, shall be offered at all times, places, and courts as prima facie evidence of the use of water service by the customer, and shall be the basis upon which all bills are calculated.

All meters are factory-tested before installation, and no meter, which is known to have error in registration in excess of two per cent (2%) under conditions of normal operation, will be placed in service, or allowed to remain in service. Upon written request, the District will test any meter and, where circumstances require, make adjustments for a period not to exceed one-half year previous. A charge of $30.00 will be deposited by the customer for a meter test. The deposit will be refunded if the meter is found to register five per cent (5%) or more in excess of actual use.

If, upon comparison of past water usage, it appears that a meter is not registering properly, the District may, at its option, test the meter and adjust the charges accordingly if the meter either over-registers or under-registers. No charge for meter testing will be made to the customer for the meter test under these conditions.

Should any meter fail to correctly register water use, usage shall be estimated by the District. The bill will be computed from an estimate of consumption based either on prior use during the same season of the year, or on a reasonable comparison with the use of other customers receiving the same class of service during the same season and under similar circumstances and conditions. If meter under-registration is due to tampering with the meter/service line, or is in any other way caused by the customer, the service will be discontinued. The service will not be reconnected until the customer has made adjustment for the loss of revenue and damage to equipment and given satisfactory assurance that there will be no more tampering.

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Service Line Connections

The laying of service pipes connected with the main for the distribution of water will be performed by the District. It shall be unlawful to make any unauthorized connections. Service lines, as defined in SECTION 1, shall remain the property of the District.

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Customer Lines

Pipe on the customer side of the meter must be installed in accordance with good engineering practice and maintained in good order by the user. The size of the customer line shall be not less than 3/4" ID galvanized iron, 3/4" copper tubing or 3/4" PVC (Schedule 40 or better plastic) in accordance with the plumbing code of the State of Oregon. Pipe must be laid not less than 24" deep and provided with stop and waste for drainage. All standpipes or fittings of any kind must be so located, anchored and installed so as not to interfere with or endanger the meter. All pipes should be well-protected from freezing.

Before the pipe is covered, the District should be notified that connection with the meter is desired. A minimum of 10 feet of copper will be connected to the customer side of the meter set by the District at customer expense. This will prevent potential damage to plastic customer lines during repair/maintenance of the meter set. After this connection is made by the District, the user should see that all joints between the meter and the premises are secure. The user will be held responsible for any losses occurring between the meter and the premises from leaks, freezing or otherwise.

Customers shall install a gate valve and a check valve in the customer line, immediately adjacent to the meter to isolate the customer line from the meter, and to prevent backflow of any water from the customer line into the District service line.

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Waste/Plumbing/Inspection

Water will not be furnished to premises where it is allowed to run to waste to prevent freezing, or through defective plumbing, or otherwise. Plumbing should be of high test and first class. Where water is wastefully or negligently used on a customer premises, seriously affecting the general service, the District may discontinue service if such conditions are not corrected after due notice by the District.

Authorized representatives of the District, with proper identification, shall have free access at all reasonable hours of the day to any, and all parts of the structure and premises in which water is, or may be, delivered. The District access will be for the purpose of inspecting connections, the conditions of the conduits and fixtures, and the manner and extent in which the water is being used. The District does not, however, assume the duty of inspecting the customer line, plumbing, and equipment, and shall not be responsible therefore.

The District will refuse or discontinue service to any premises where it is deemed necessary to protect the District from fraud or abuse. Discontinuance of service from one or both of these causes will be made immediately upon confirmation by the District that the condition or conditions exist.

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Outside Users

Mains and service lines laid outside the District must be installed at the customer expense for all labor and material, and shall only be permitted under special contract.

Water service to users outside the District shall at all times be subject to the prior and superior rights of the people of the District. All regulations now or hereafter in effect for users inside the District, except where modified by contract, shall apply to users outside the District.

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Suspension of Rules

Neither the Superintendent nor any employee of the District is not authorized to suspend any of the foregoing rules and provisions except in cases of emergency involving loss of life or property, or which would place the water system operation in jeopardy.

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Amendments / Special Rules

The Board of Commissioners of the Crystal Springs Water District shall have the power, at any time, to amend, change, or modify any regulation or contract. All water service is subject to such power.

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Complaints / Special Requests

All complaints and special requests for service and all other matters upon which action by the District is requested or sought shall be presented to the District in writing. No oral request or complaint will receive consideration.

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Constitutionality / Saving Clause

If any clause, sentence, paragraph, section, or portion of these regulations for any reason shall be adjudged invalid by a court of competent jurisdiction, such judgment shall not affect, impair, or invalidate the remainder of these regulations, but shall be confined in its operation to the clause, sentence, paragraph, section, or portion of this code directly involved in the controversy in which the judgment is rendered.

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Appendix 7.1

CIP Project Descriptions

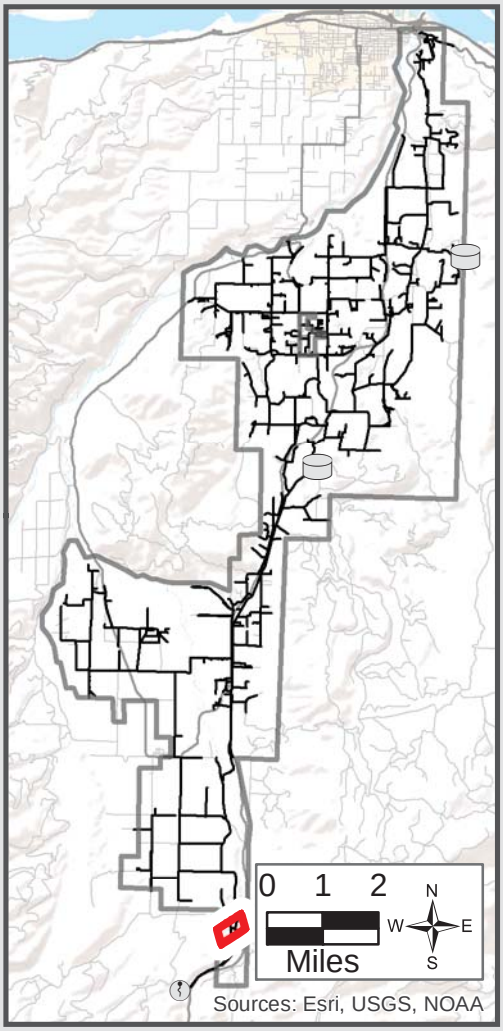
Project No. 1: South Reservoir

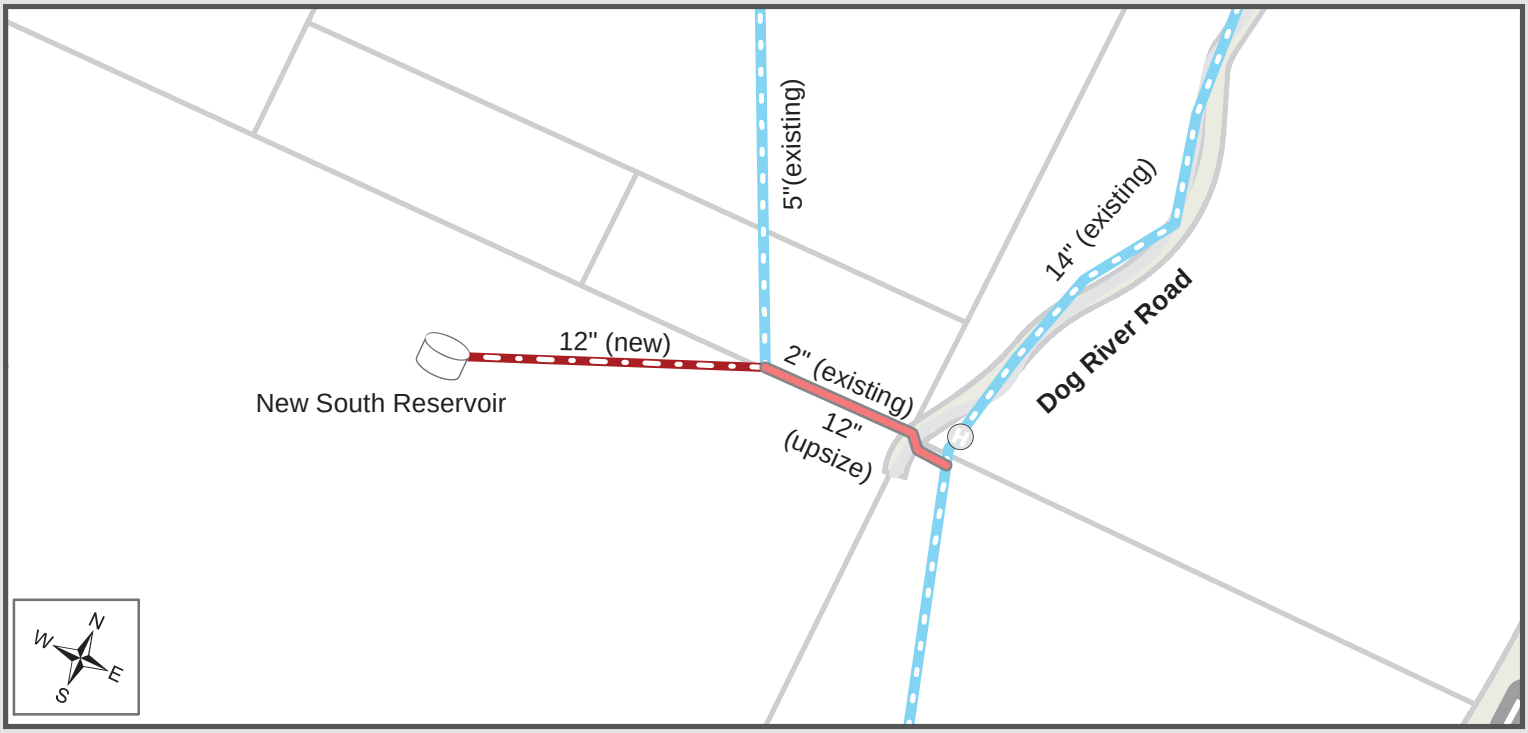
Estimated Project Cost: $1,651,000

Project Priority: Low

Project Description

A new 800,000 gallon reservoir will be constructed west of the south end of Dog River Road. 300ft of 12-inch diameter waterline will replace existing 2-inch diameter waterline and 700ft of new 12" diameter waterline will connect the new reservoir to the 14-inch diameter waterline on Dog River Road. The South Reservoir will provide additional storage for the entire District and provide fire storage for the pressure zones south of Booth Hill in the event the spring was not usable. Along with upsized waterlines, the South Reservoir will also improve fire flow in the pressure zones south of Booth Hill.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

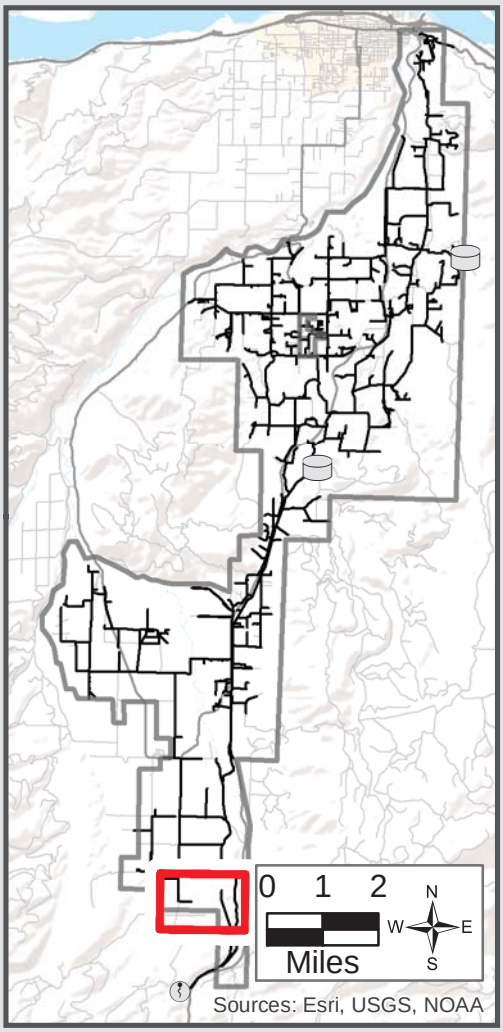
Project No. 2: Dog River to Cooper Spur

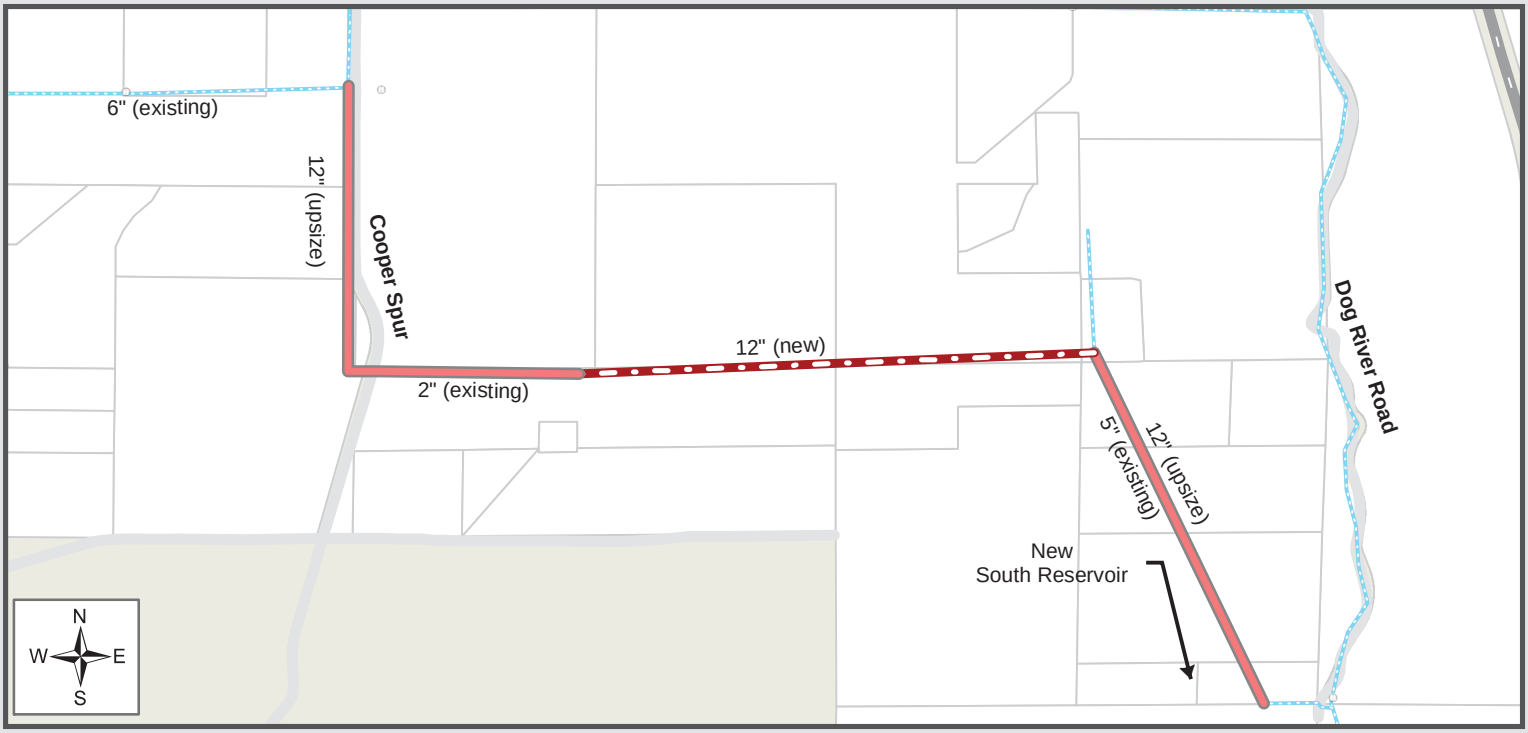
Estimated Project Cost: $2,401,200

Project Priority: Low

Project Description

A total of 9,200ft of 12-in diameter waterline will be installed from the new South Reservoir, following the existing waterline alignment where it exists, to Cooper Spur Road and ending south of London Drive. 6,200ft of 12-in waterline will replace existing 2-in and 5-in waterline, and 3,000ft of new 12-in waterline will connect those two sections of pipe. This waterline will provide redundancy in the south part of the District, increase distribution capacity, and improve fire flows.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000
Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

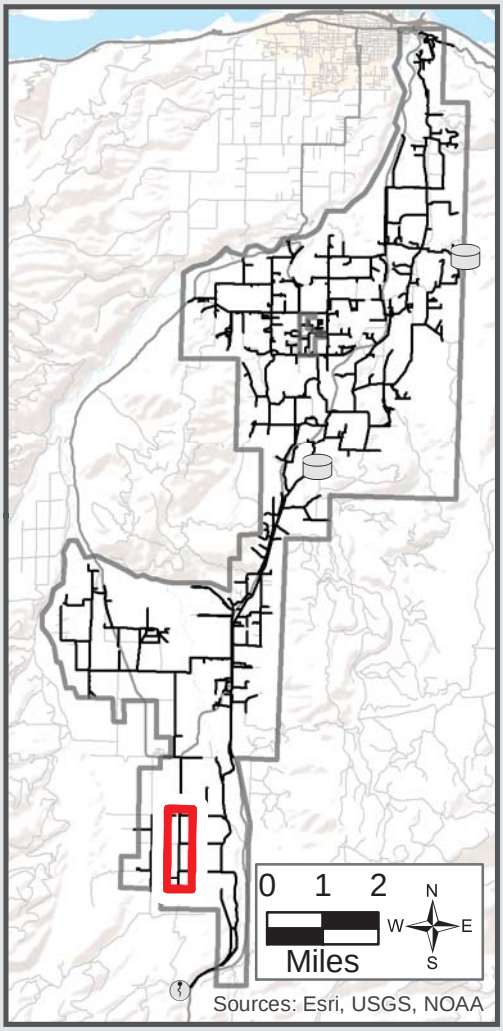
Project No. 3: Cooper Spur- London Drive Creek to Culbertson

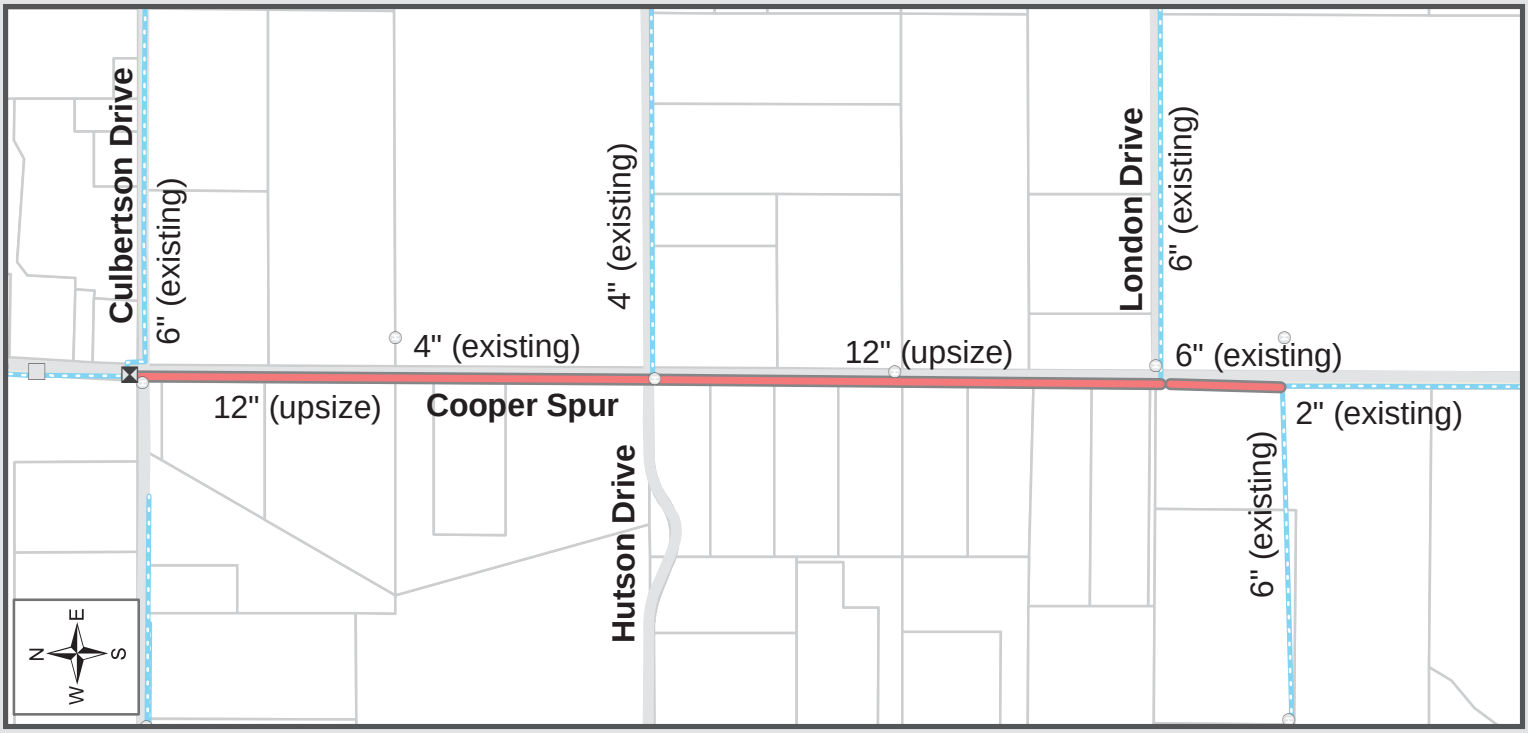
Estimated Project Cost: $1,566,000

Project Priority: Low

Project Description

A total of 6,000ft of 12-in diameter waterline will be installed along Cooper Spur Road, beginning south of London Drive and ending at Culbertson Drive, replacing existing 4-in and 6-in waterline. The upsized waterline will improve fire flows, redundancy, and distribution capacity in the south part of the District downstream from the new South Reservoir.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

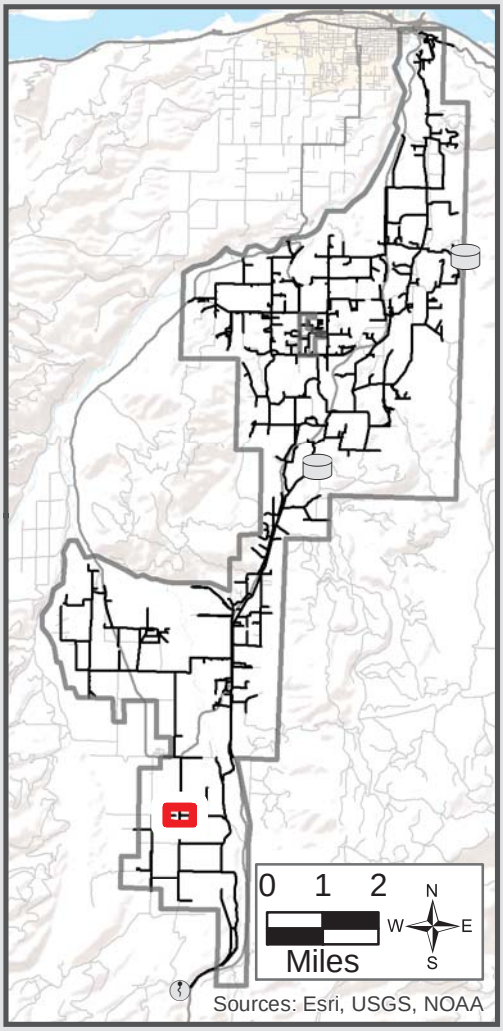
Project No. 4: Culbertson to Cooper Spur

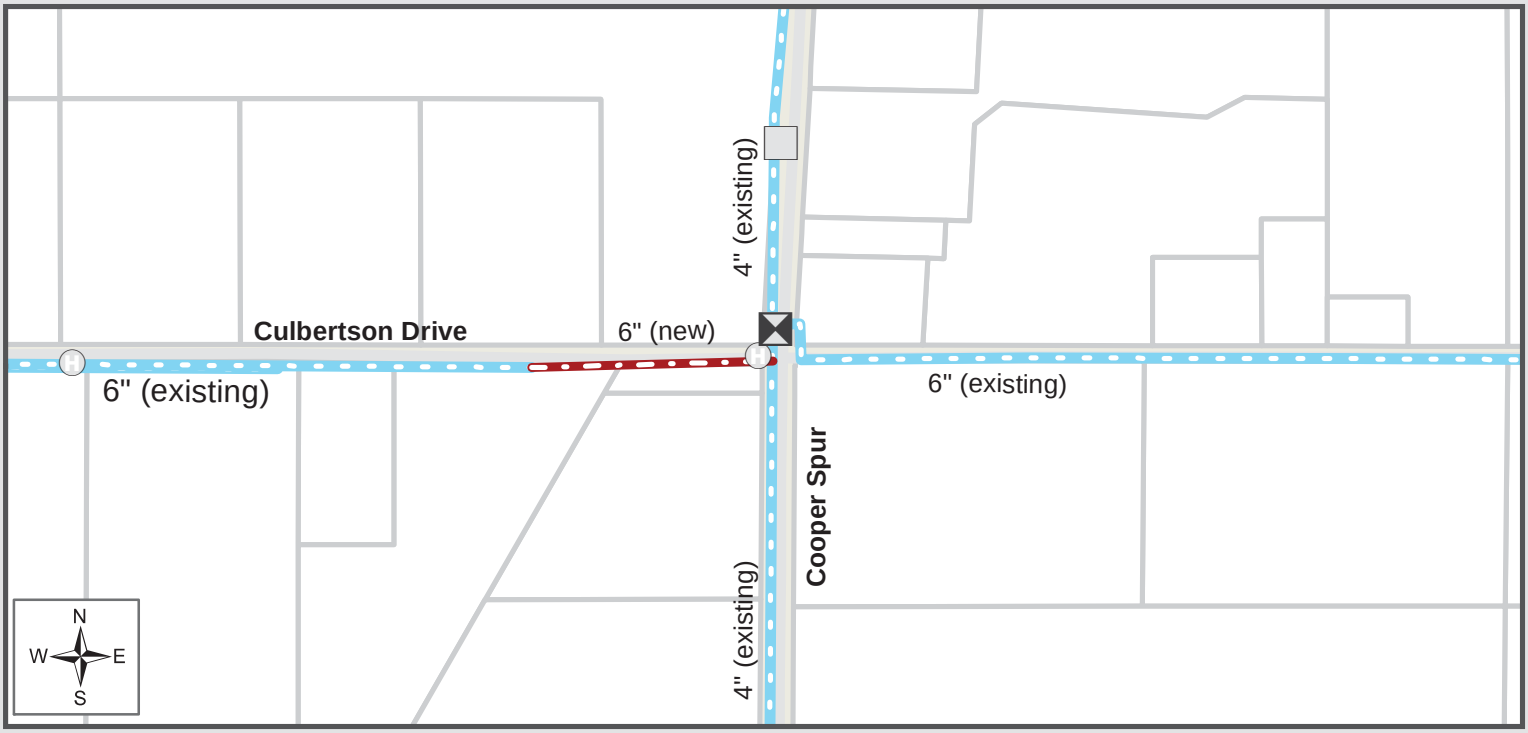
Estimated Project Cost: $101,500

Project Priority: High

Project Description

A total of 500ft of new 6-in diameter waterline will be installed along Culbertson Drive, completing a loop to connect the waterline on Culbertson west of Cooper Spur Road into the main line on Cooper Spur. By completing the loop, the new waterline will improve fire flows and redundancy in the area around Clear Creek Road in the south part of the District.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

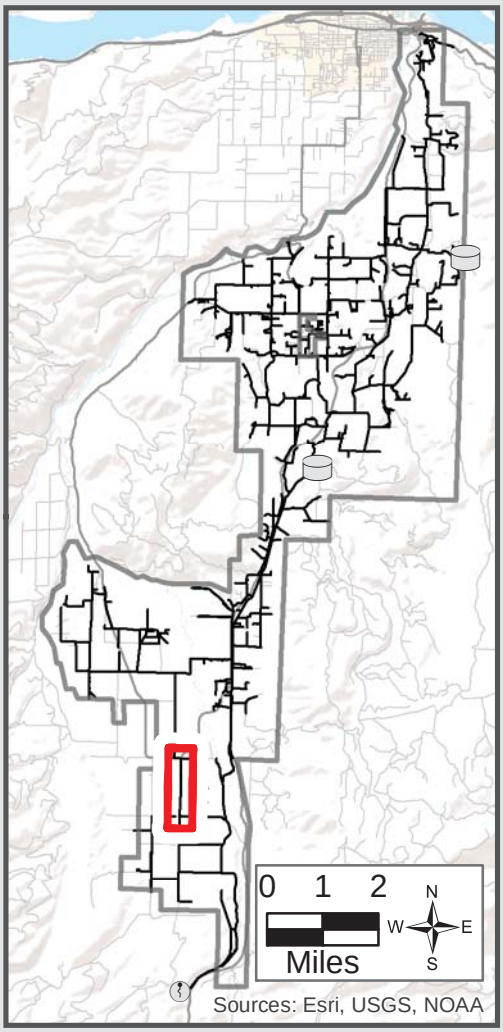
Project No. 5: Cooper Spur-Culbertson to Baseline

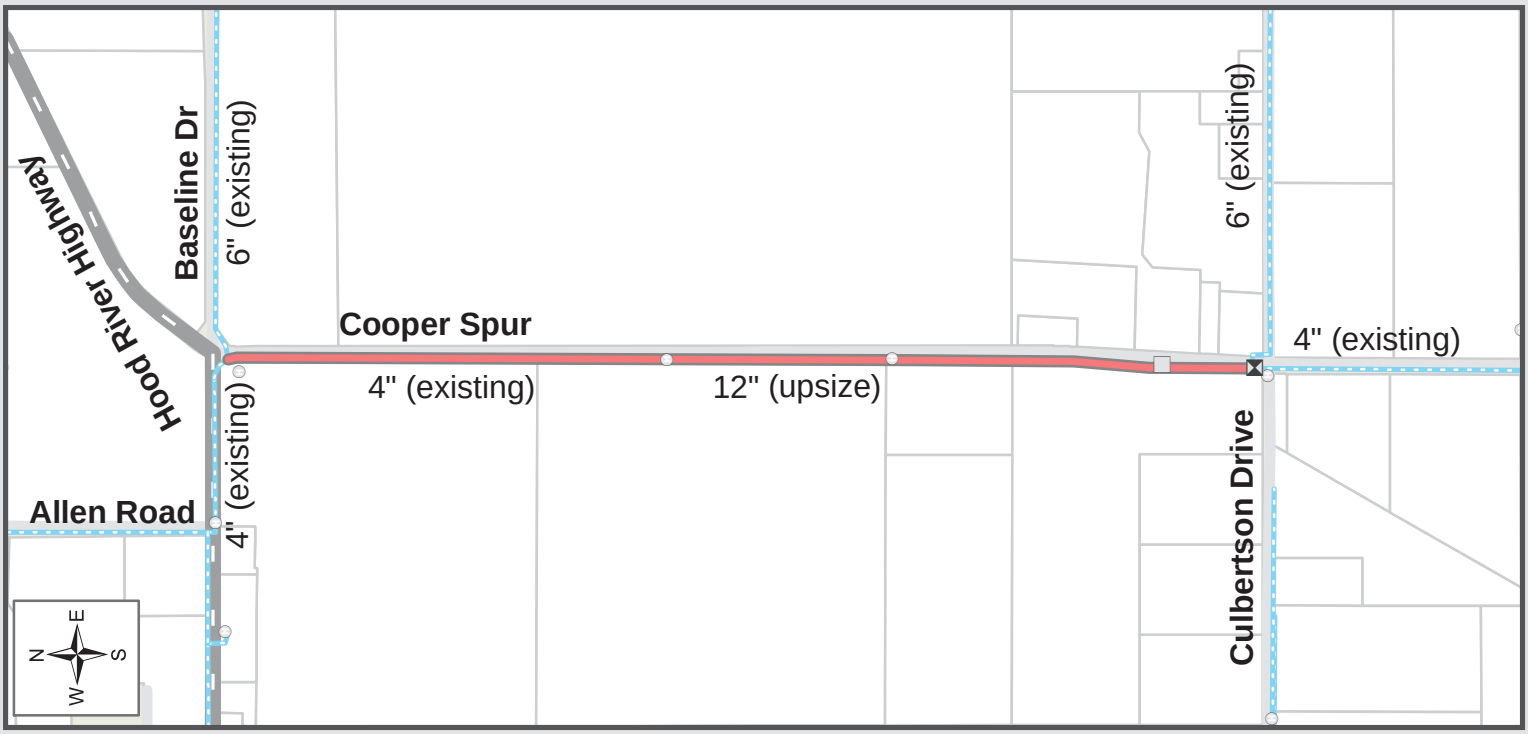
Estimated Project Cost: $1,409,400

Project Priority: Low

Project Description

A total of 5,400ft of 12-in diameter waterline will be installed along Cooper Spur Road, beginning at Culbertson Drive and ending at Baseline Drive, replacing existing 4-in waterline. The upsized waterline will improve fire flows, redundancy, and distribution capacity in the south part of the District near Parkdale.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

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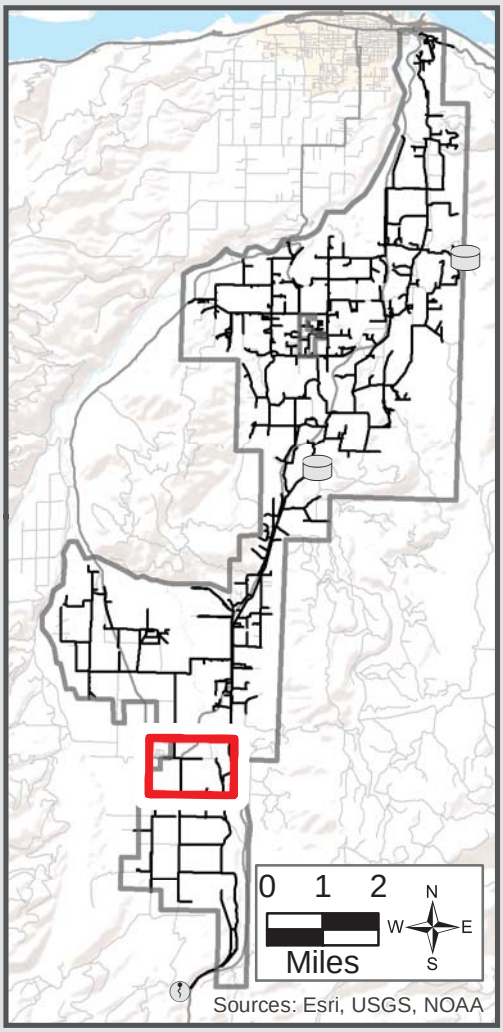
Project No. 6: Baseline Dr - West of Tollbridge

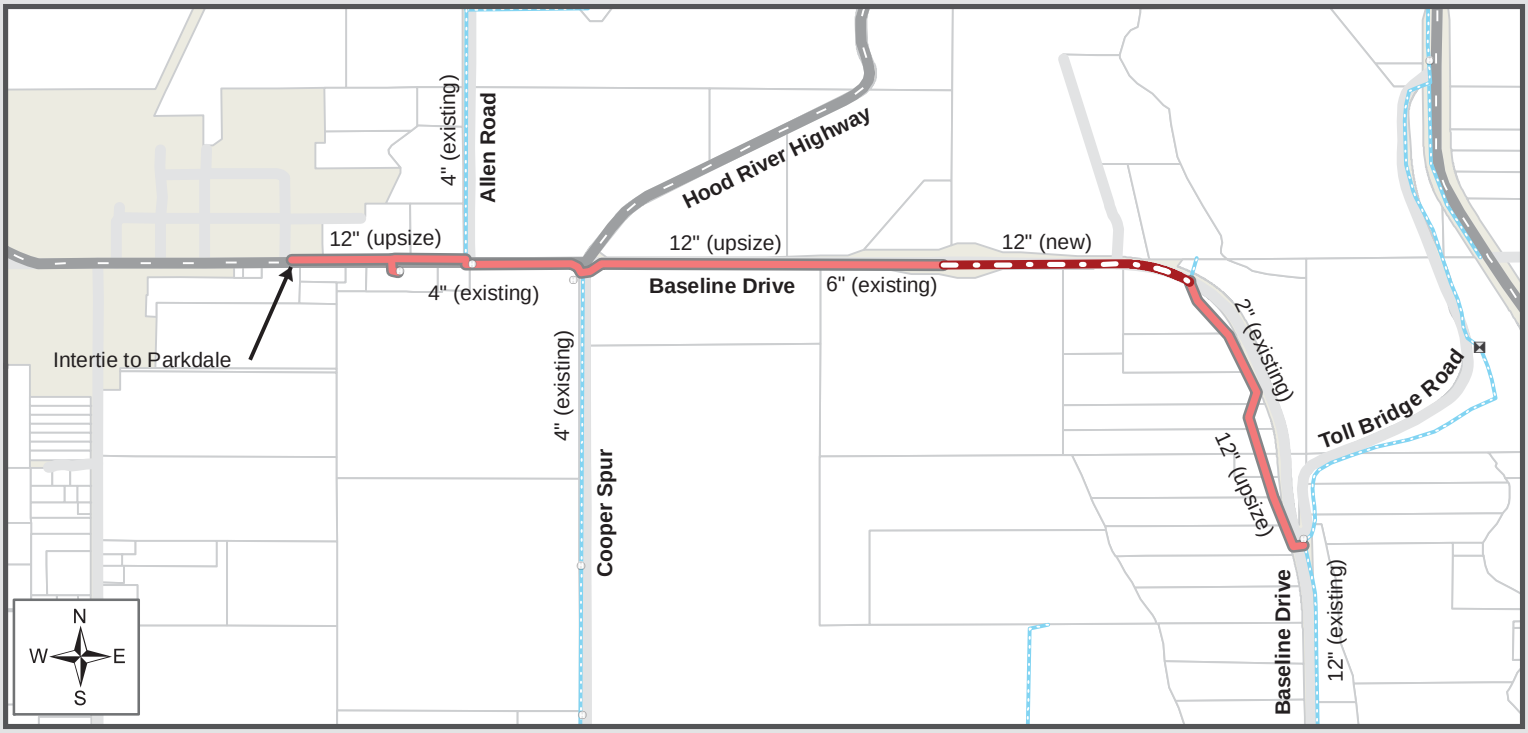
Estimated Project Cost: $1,957,500

Project Priority: Medium

Project Description

A total of 7,500ft of 12-in diameter waterline will be installed along Baseline Drive, beginning at the existing 12-in waterline on Baseline Drive and ending at the intertie with Parkdale. 5,500ft of 12-in waterline will replace existing 2-in, 4-in, and 6-in waterline and 2,000ft of new 12-in waterline will connect those two sections of pipe. This waterline will improve fire flows, redundancy, and distribution capacity in the south part of the District and be able to provide fire flow to Parkdale.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000 Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

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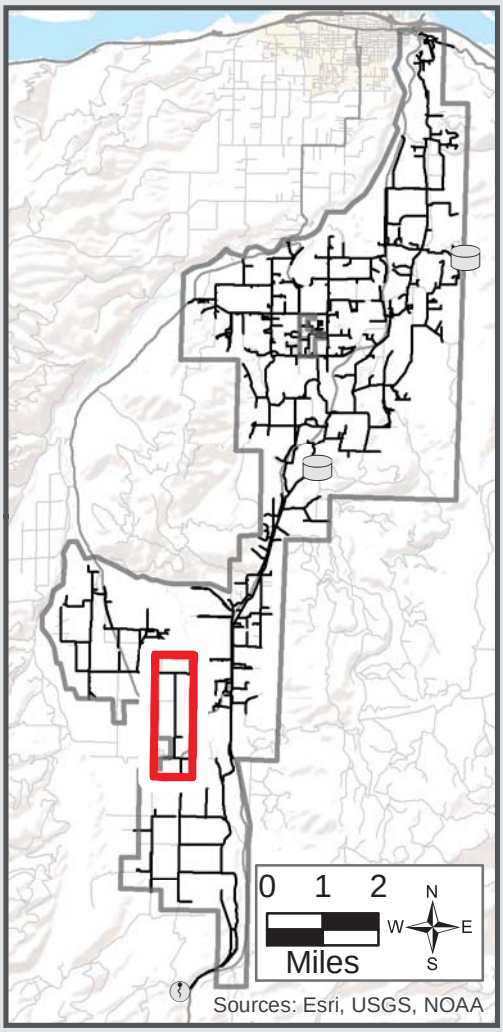
Project No. 7: Allen Road - Baseline to Woodworth

Estimated Project Cost: $1,740,000

Project Priority: Low

Project Description

A total of 8,000ft of 12-in diameter waterline will be installed along Allen Road, beginning at Baseline Drive and ending at Woodworth Drive, replacing existing 4-in waterline. The upsized waterline will improve fire flows, particularly in the Trout Creek area, and provide redundancy and distribution capacity in the south part of the District.



Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000
Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

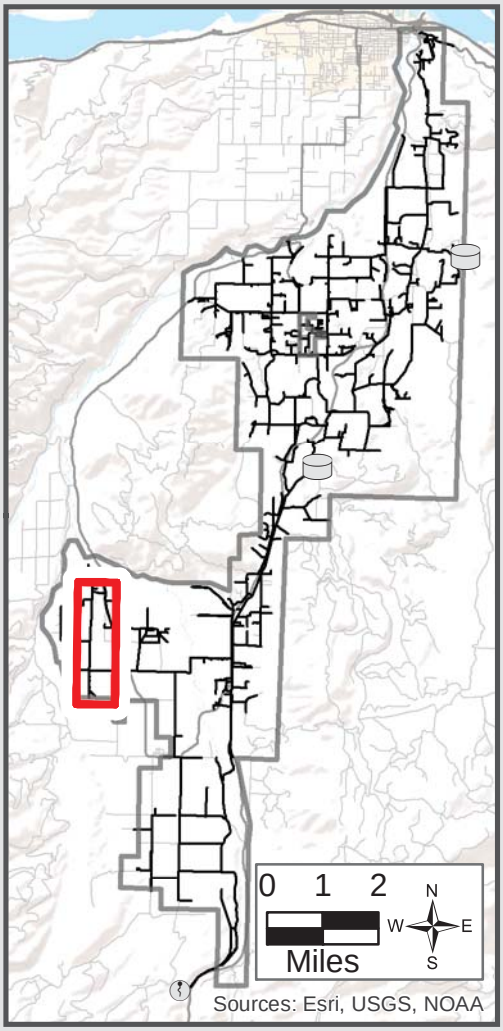
Project No. 8: Trout Creek Ridge Road

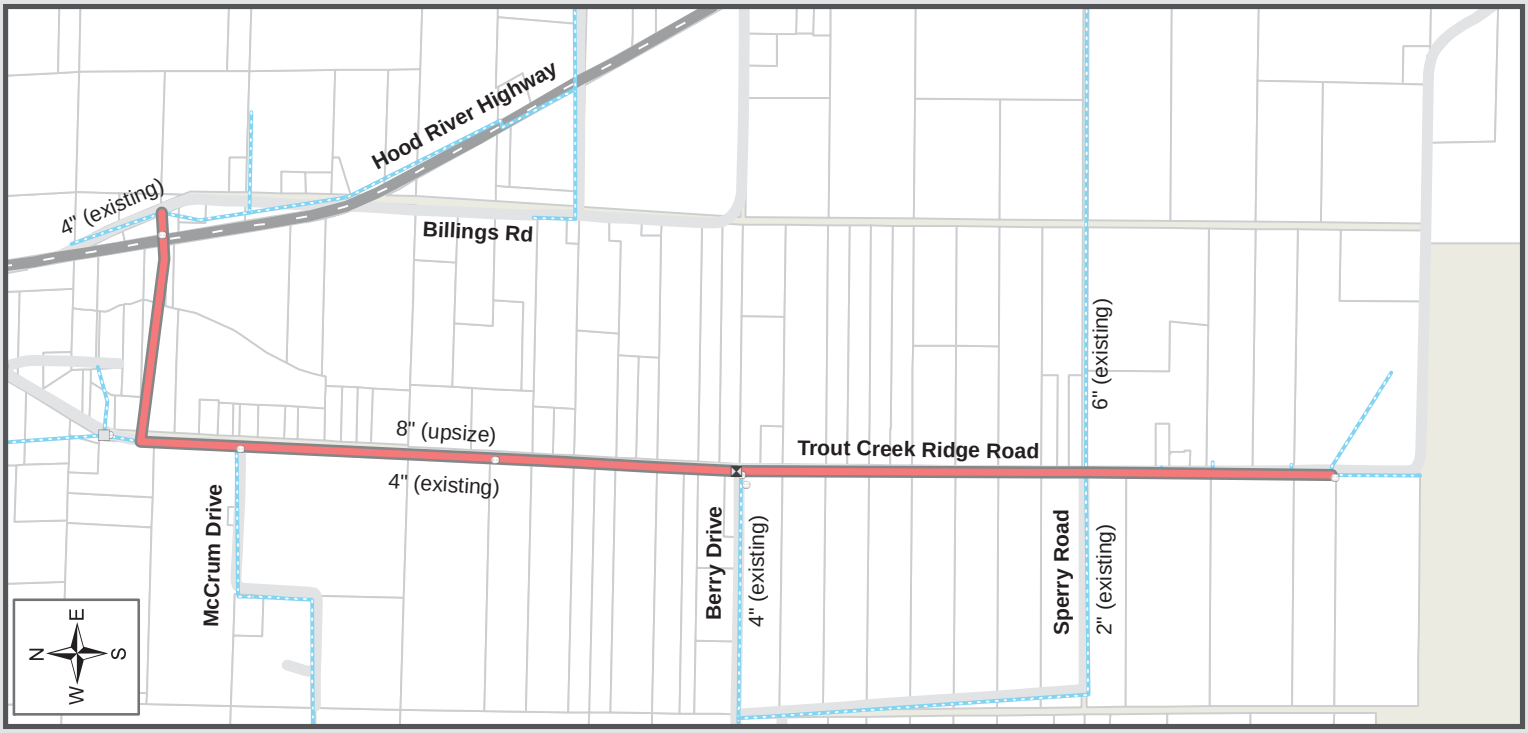
Estimated Project Cost: $2,305,500

Project Priority: Low

Project Description

A total of 10,600ft of 8-in diameter waterline will be installed along Trout Creek Ridge Road, beginning south of Woodworth Drive and connecting to Hood River Highway north of McCrum Drive, replacing existing 4-in waterline. The upsized waterline will improve fire flows and provide redundancy in the Trout Creek area.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000 Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

PACE
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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

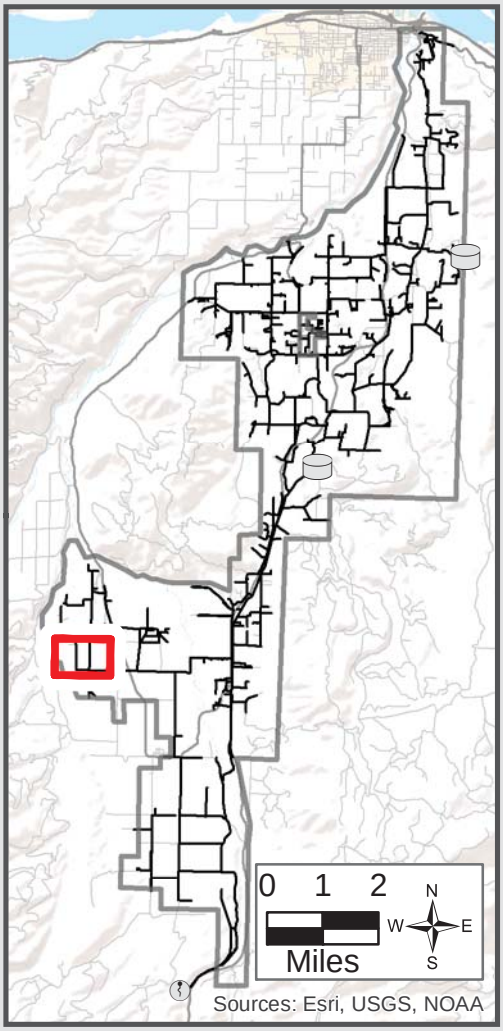
Project No. 9: Sperry Road Loop

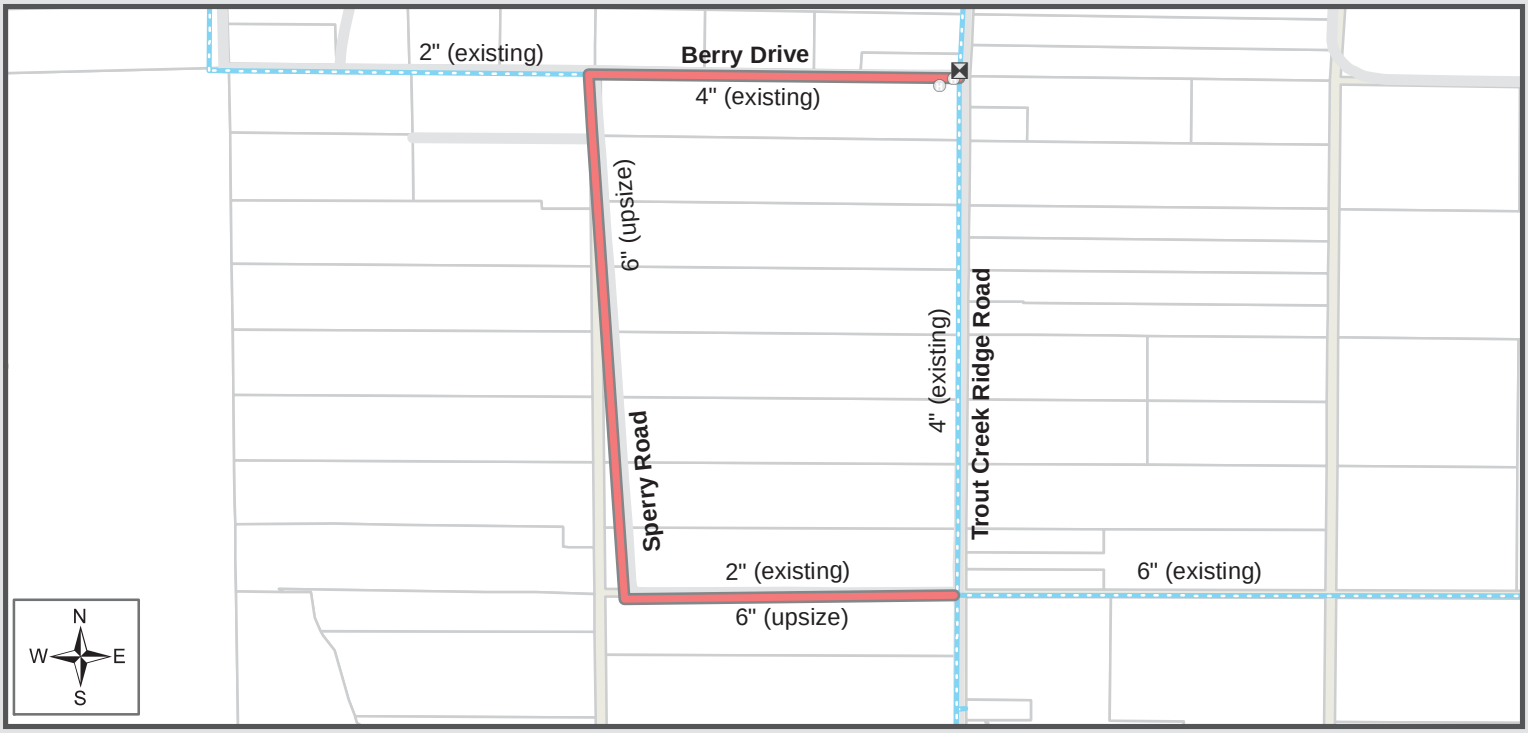
Estimated Project Cost: $1,075,900

Project Priority: High

Project Description

A total of 5,300ft of 6-in diameter waterline will be installed along Sperry Road and Berry Drive, beginning at the intersection of Sperry and Trout Creek Ridge Road to the south and ending at the intersection of Berry and Trout Creek Ridge to the north, replacing existing 2-in and 4-in waterline. The upsized waterline will improve fire flows and provide redundancy in the Trout Creek area.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water
0 1,000 Feet

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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

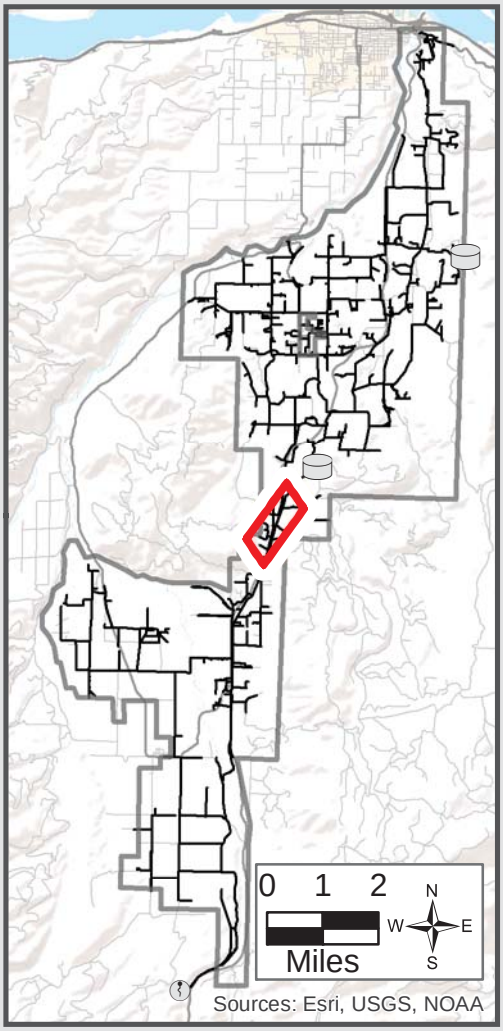
Project No. 10: Highway 35 Near Hillcrest

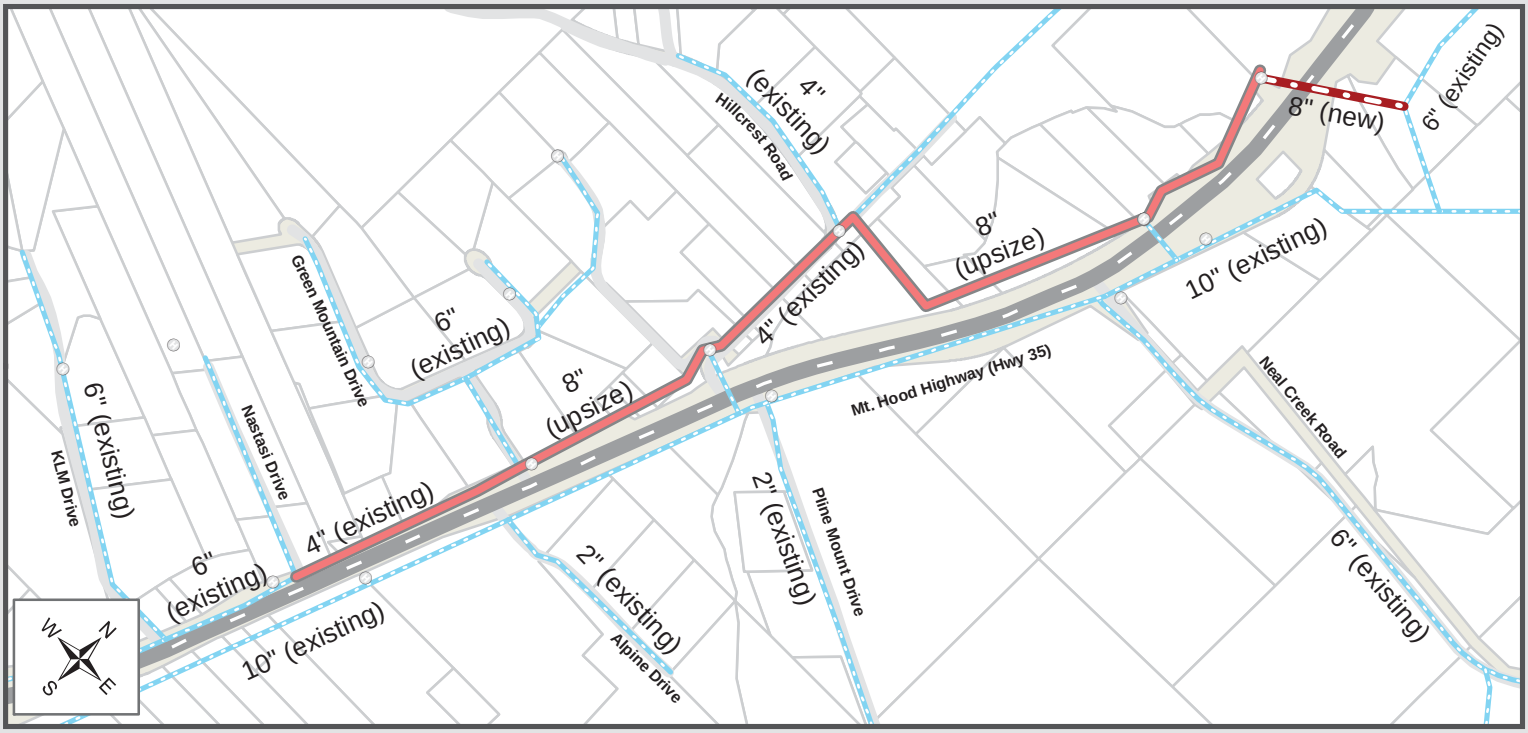
Estimated Project Cost: $1,479,000

Project Priority: Medium

Project Description

A total of 6,800ft of 8-in diameter waterline will be installed primarily along the west side of Highway 35, beginning at Nastasi Drive to the south and ending north of Hillcrest Road. 6,100ft of 8-in waterline will replace existing 4-in waterline and 700ft of new 8-in waterline will cross Highway 35 to add a new connection to the parallel 6-in waterline. The waterline will improve fire flows, redundancy, and distribution capacity in the central part of the District south of Booth Hill.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

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Date: 11/4/2015
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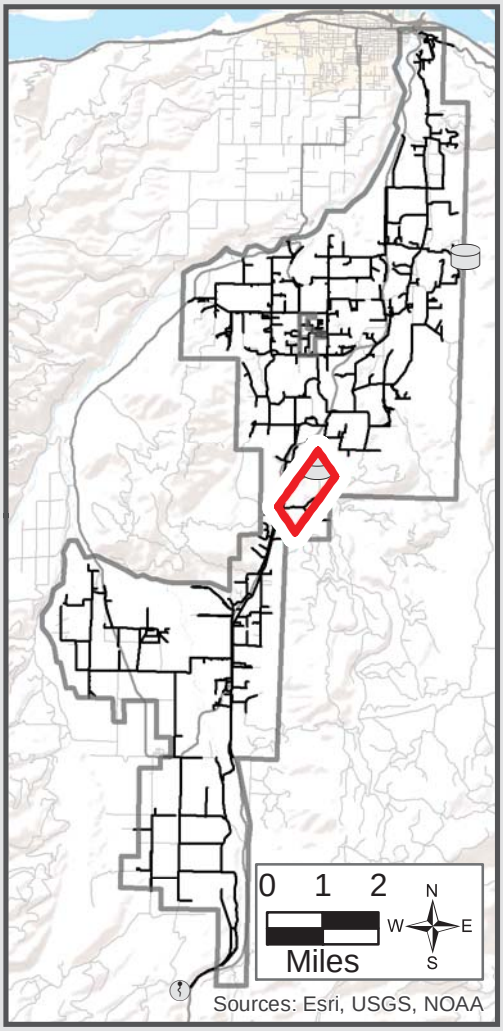
Project No. 11: Neal Creek/Booth Hill Road

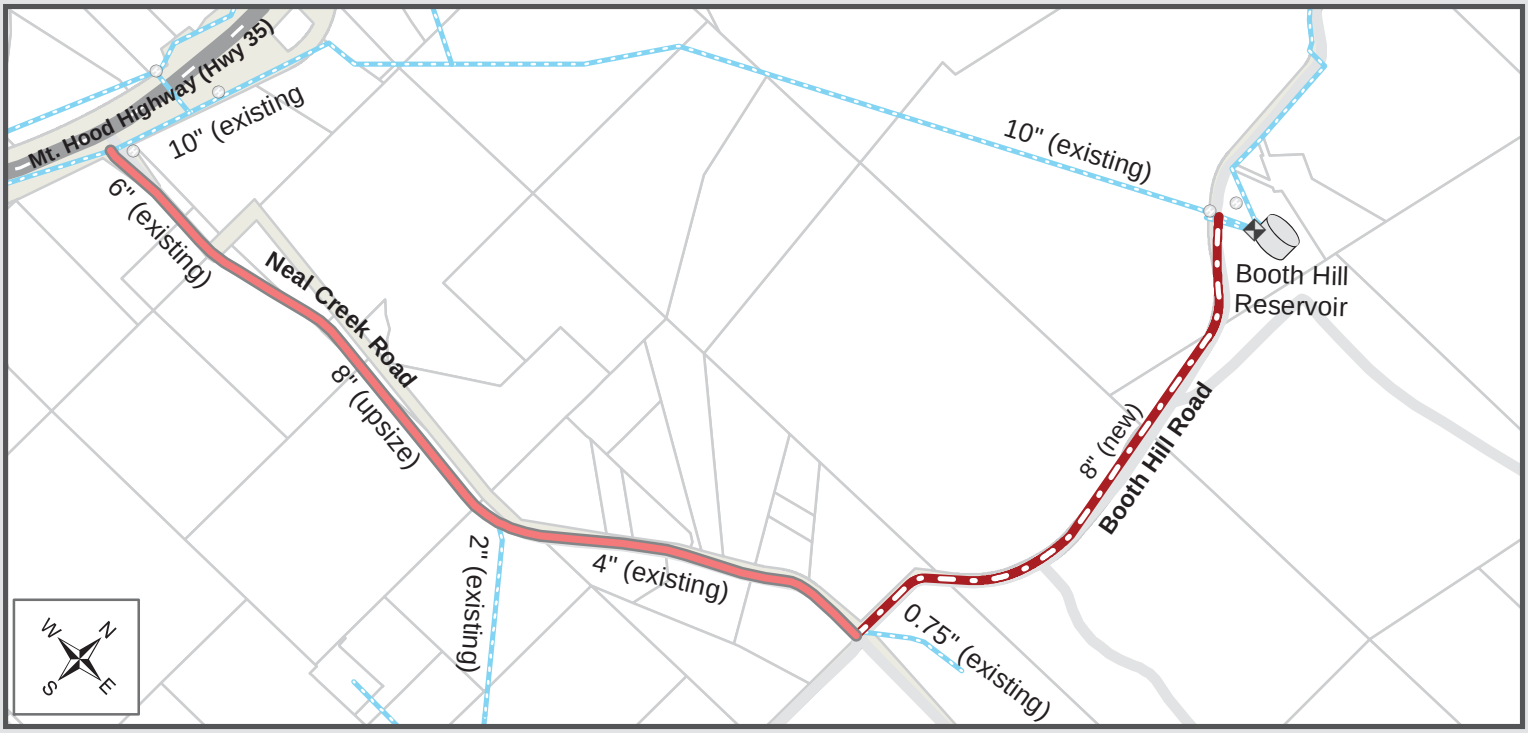
Estimated Project Cost: $1,500,750

Project Priority: Low

Project Description

A total of 6,900ft of 8-in diameter waterline will be installed Neal Creek Road and Booth Hill Road, beginning at Highway 35 to the south and ending near Booth Hill Reservoir. 3,600ft of 8-in waterline will replace existing 4-in and 6-in waterline and 3,300ft of new 8-in waterline will connect the upsized line to the existing 10-in waterline feeding Booth Hill Reservoir. The waterline will improve redundancy and provide a secondary distribution line to Booth Hill Reservoir.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

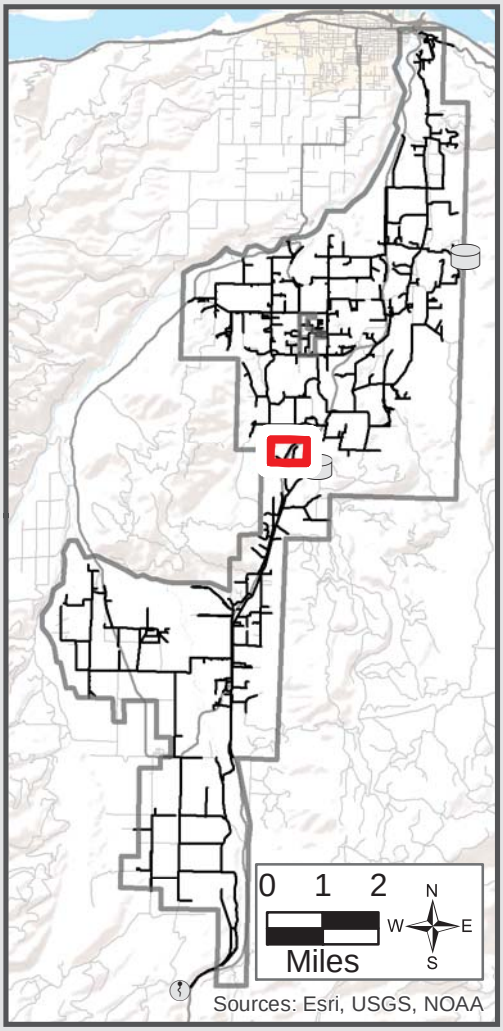
Project No. 12: HWY 35 and Endow Dr.

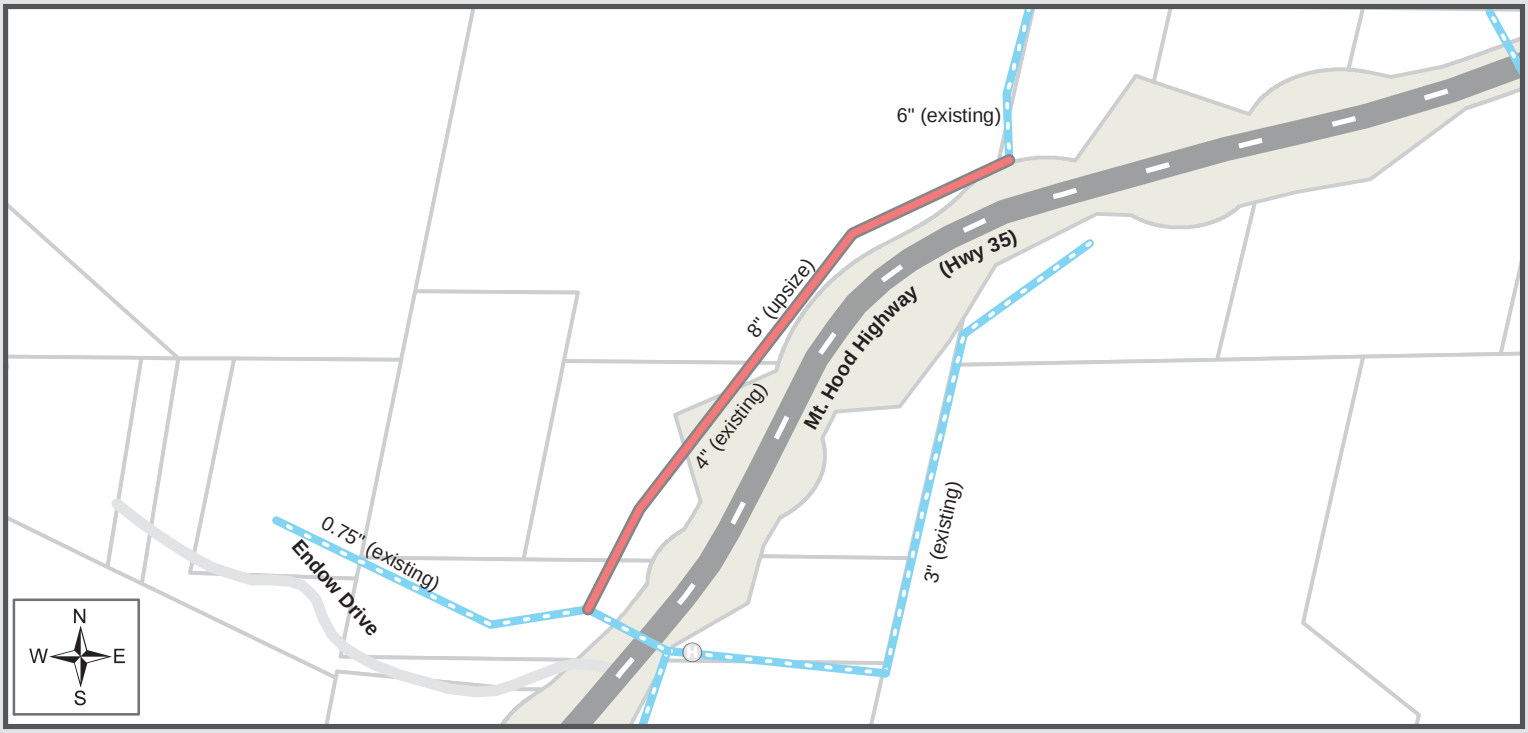
Estimated Project Cost: $435,000

Project Priority: High

Project Description

A total of 2,000ft of 8-in diameter waterline will be installed along the west side of Highway 35 north of Endow Drive. The 8-in waterline will replace existing 4-in waterline and complete previously started improvements. The upsized waterline will reduce high flow velocities through this section and improve fire flows, redundancy, and distribution capacity in the central part of the District west of Booth Hill.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water
0 1,000 Feet

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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

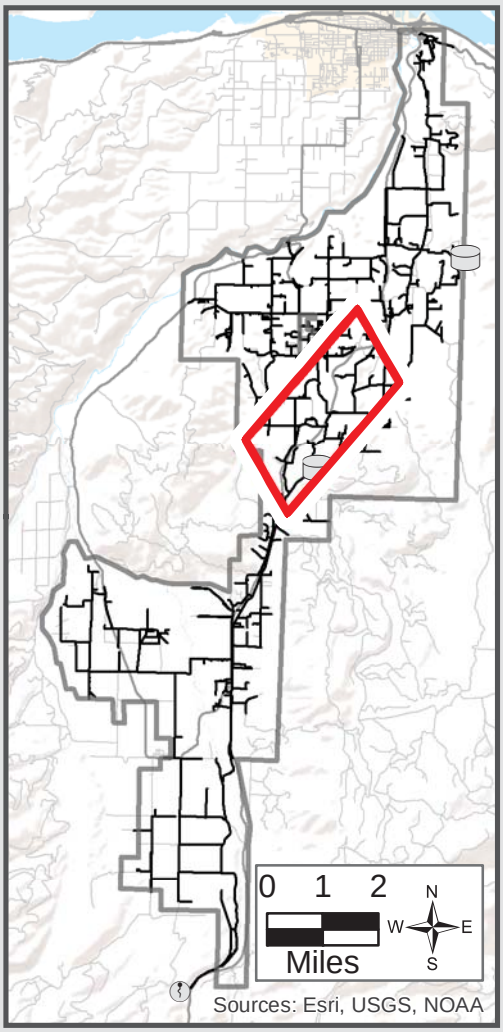
Project No. 13: Booth Hill to Odell

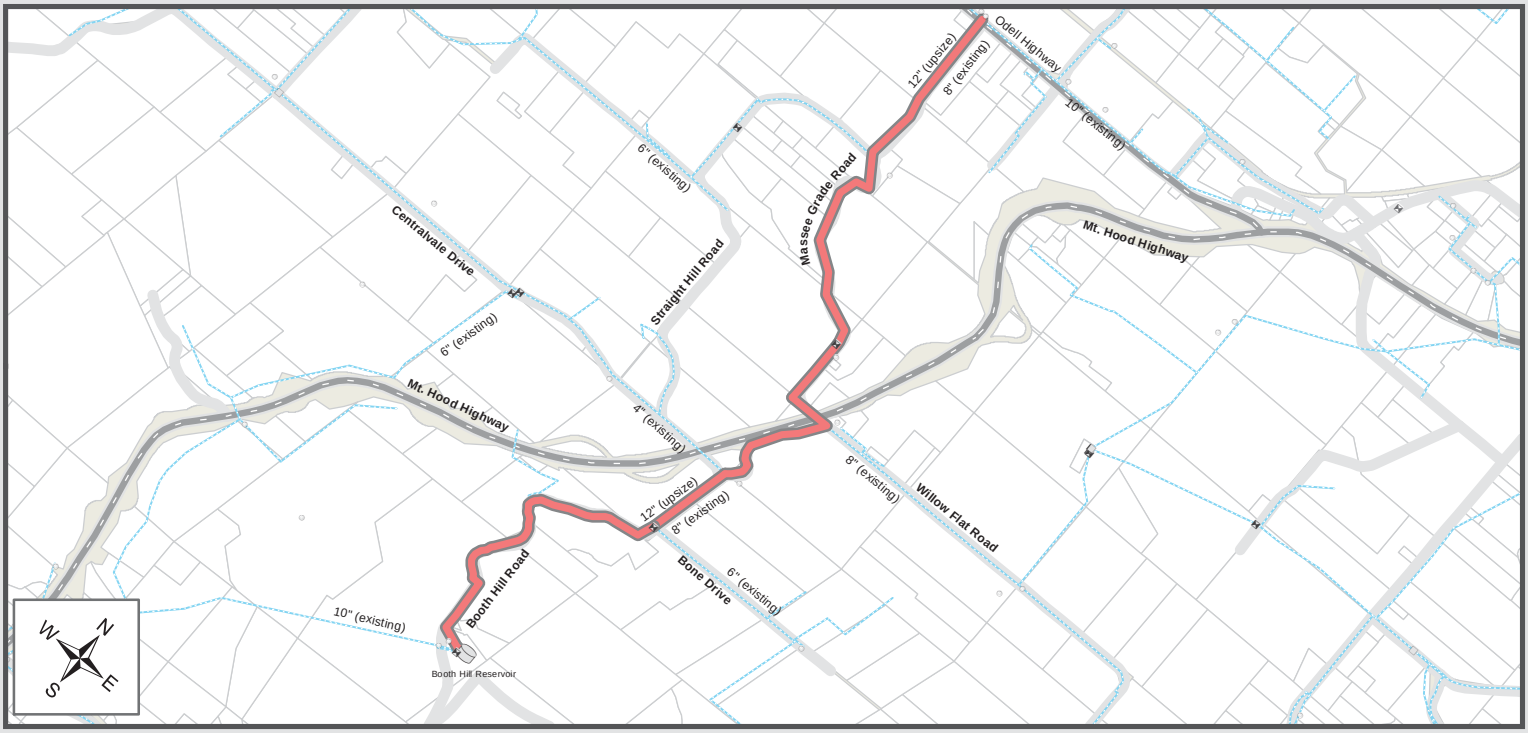
Estimated Project Cost: $3,314,700

Project Priority: Medium

Project Description

A total of 12,700ft of 12-in diameter waterline will be installed from Booth Hill Reservoir to Odell, replacing existing 8-in waterline. The upsized line will begin at the reservoir and follow Booth Hill Road, Massee Grade Road, and Straight Hill Road, ending at Odell Highway. The upsized waterline will improve fire flows and distribution capacity to Odell and reduce high flow velocities through this section.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000
Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

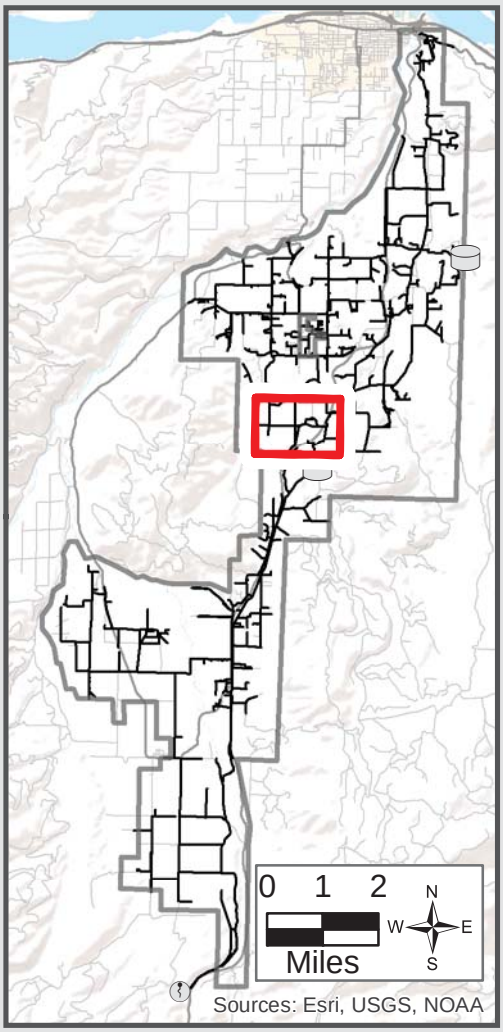
Project No. 14: Centralvale Road - HWY 35 to WyEast

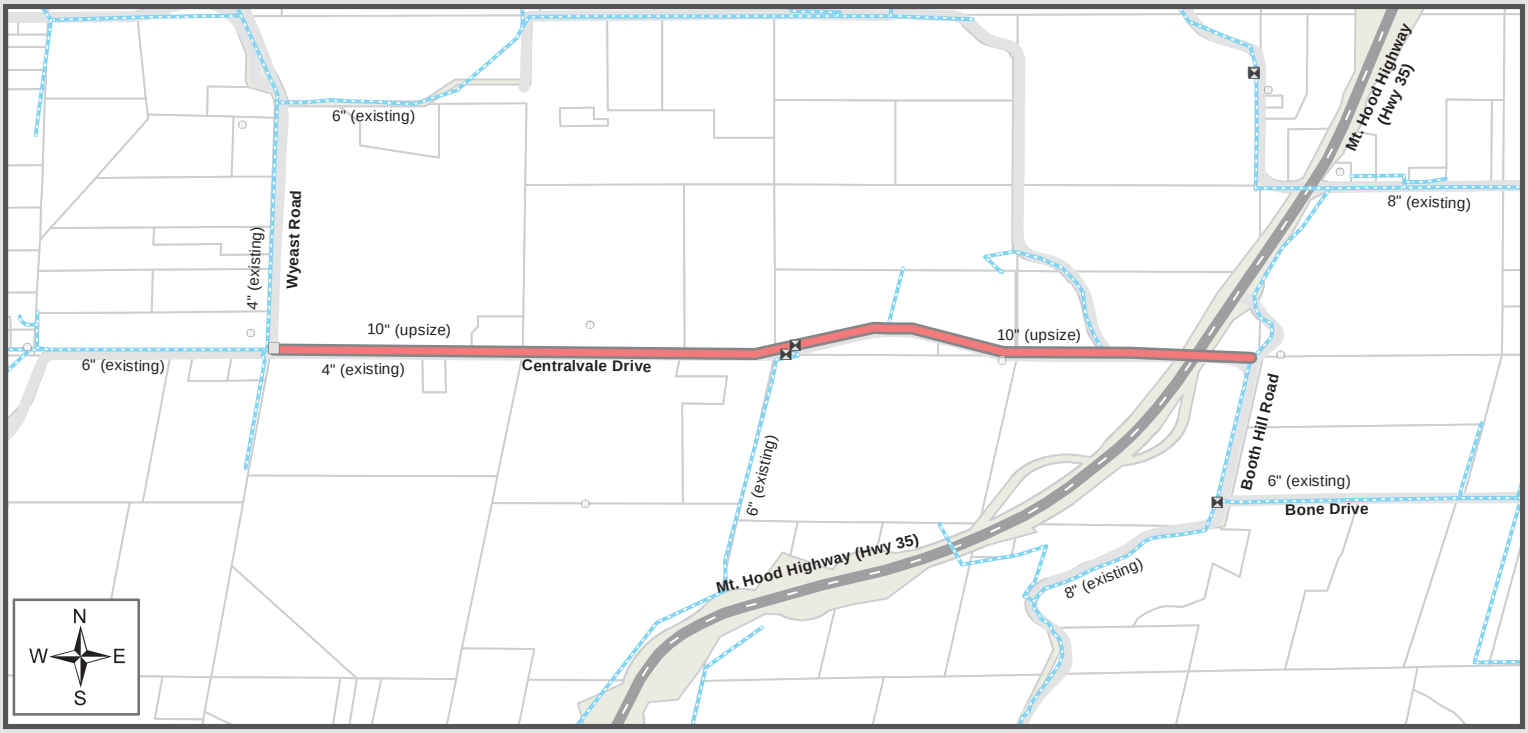
Estimated Project Cost: $1,315,875

Project Priority: High

Project Description

A total of 5,500ft of 10-in diameter waterline will be installed along Centralvale Drive, beginning at Booth Hill Road and ending at WyEast Road, replacing existing 4-in waterline. The upsized waterline will improve fire flows and distribution capacity to the west side of Odell and reduce high flow velocities through this section. The upsized line will also serve as a portion of the primary supply line to the new West Side Reservoir.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000 Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

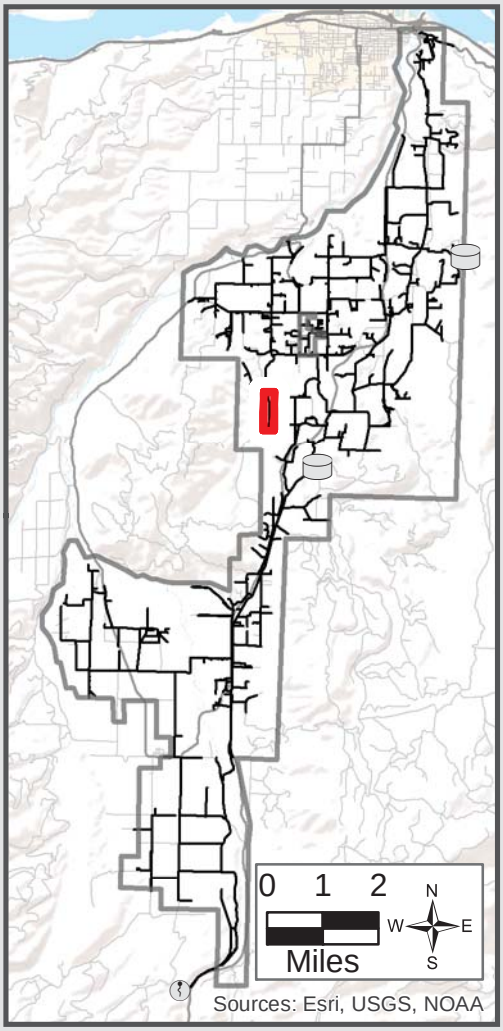
Project No. 15: WyEast Road - Centralvale to Sylvester

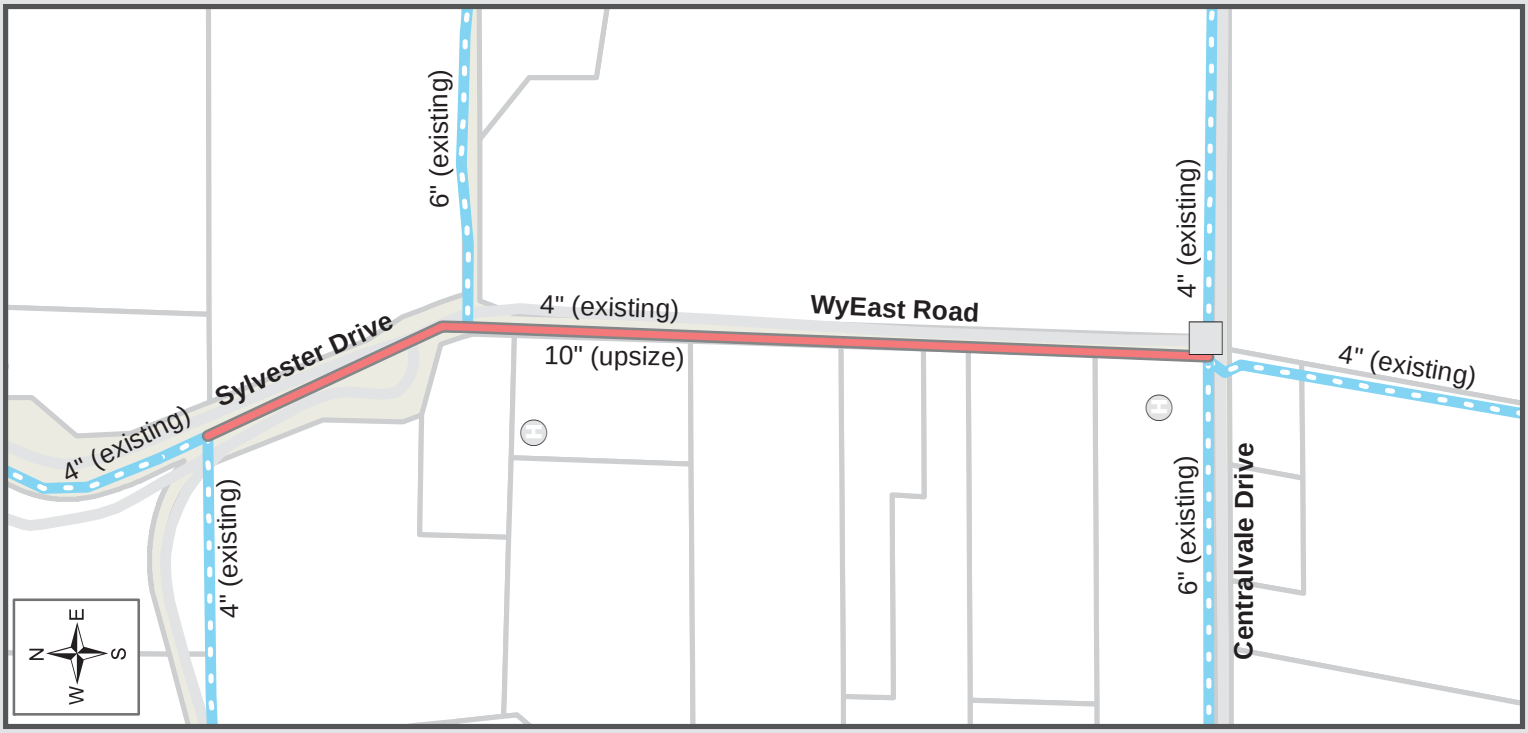
Estimated Project Cost: $645,975

Project Priority: High

Project Description

A total of 2,700ft of 10-in diameter waterline will be installed along WyEast Road, beginning at Centralvale Drive and ending at Sylvester Drive, replacing existing 4-in waterline. The upsized waterline will improve fire flows and distribution capacity to the west side of Odell and reduce high flow velocities through this section. The upsized line will also serve as a portion of the primary supply line to the new West Side Reservoir.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water
0 1,000 Feet

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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

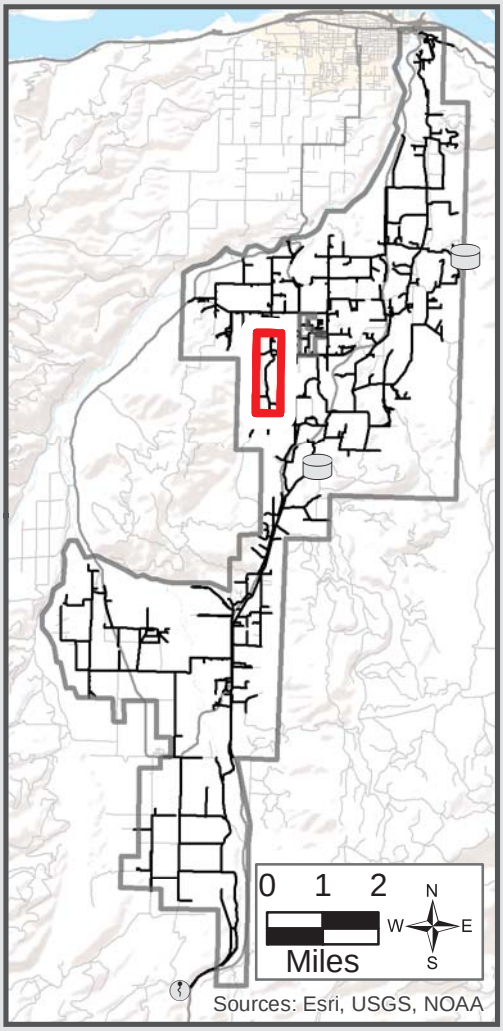
Project No. 16: WyEast Road - Sylvester - Sylvester to Lippman

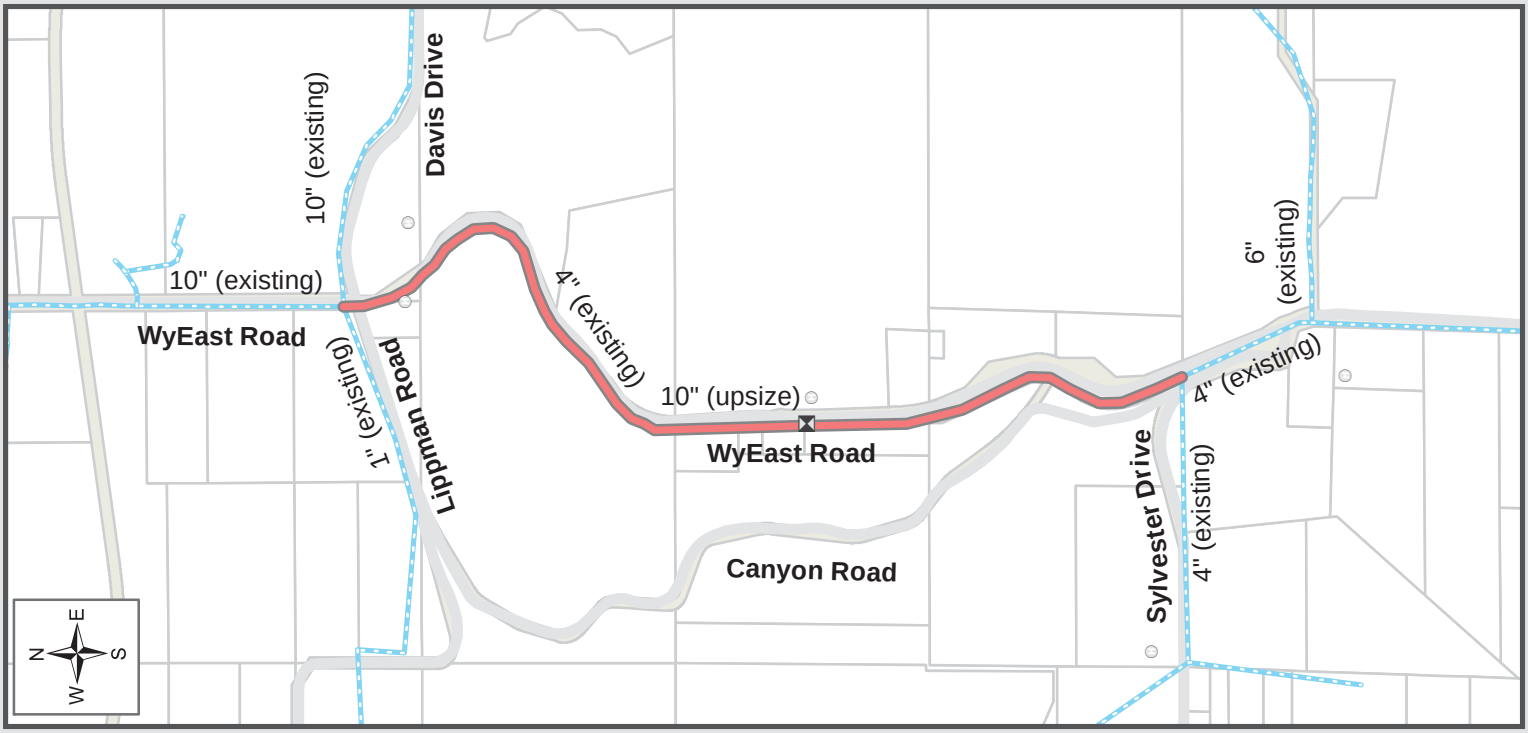
Estimated Project Cost: $1,148,400

Project Priority: Low

Project Description

A total of 4,800ft of 10-in diameter waterline will be installed along WyEast Road, beginning at Sylvester Drive and ending at Lippman Road, replacing existing 4-in waterline. The upsized waterline will improve fire flows and distribution capacity to the west side of Odell and reduce high flow velocities through this section.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water
0 1,000 Feet

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

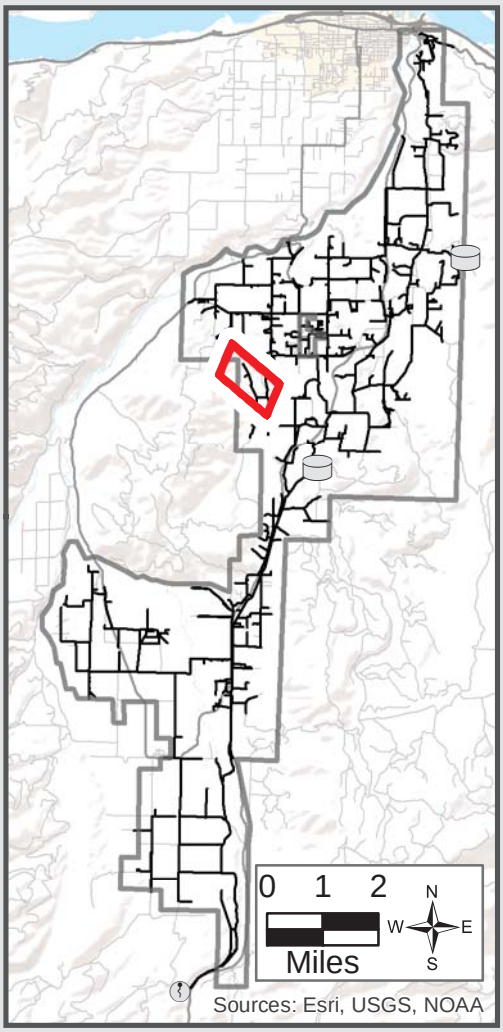
Project No. 17: Sylvester Road to West Side Reservoir

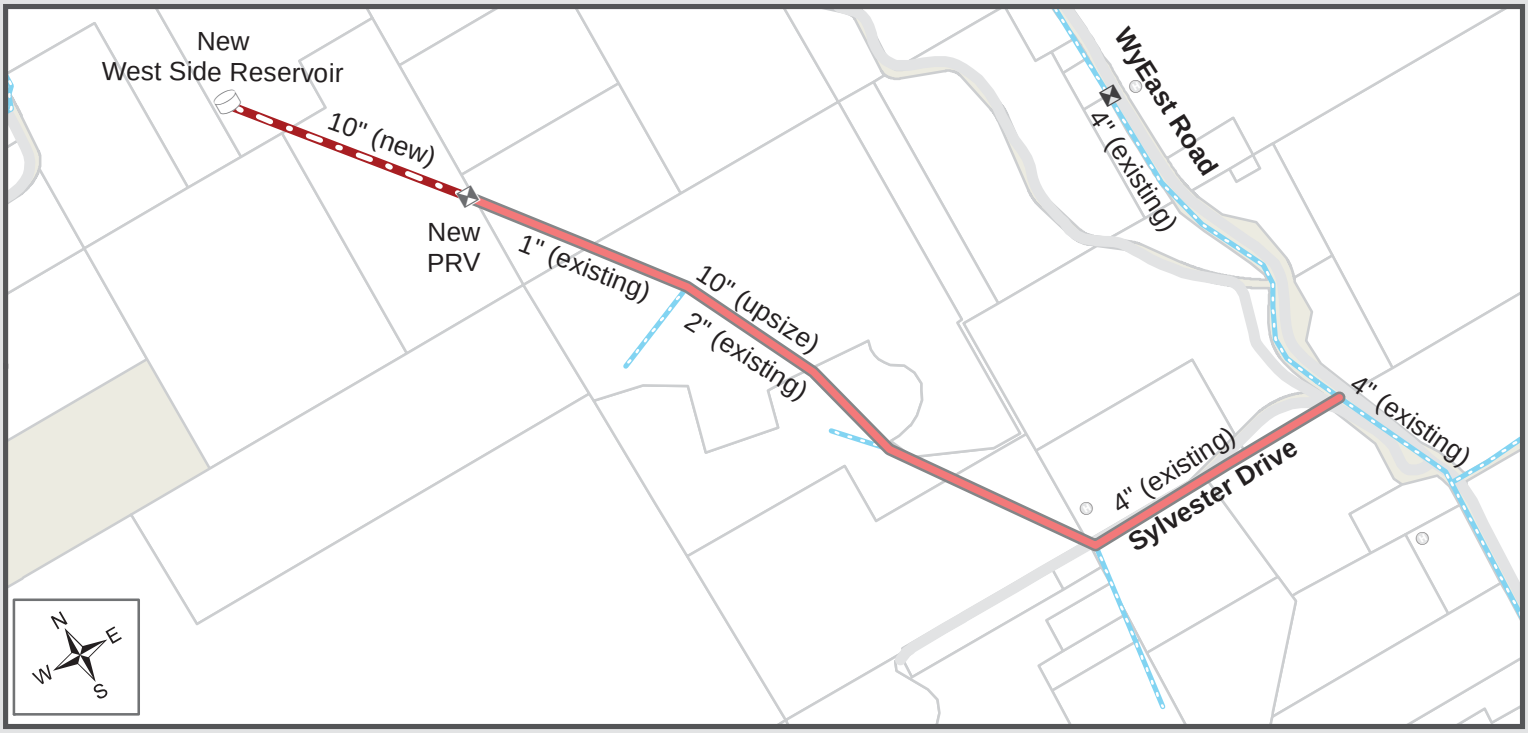
Estimated Project Cost: $1,395,625

Project Priority: High

Project Description

A total of 5,500ft of 10-in diameter waterline will be installed along Sylvester Drive, beginning at WyEast Road and ending at the new West Side Reservoir. 4,500ft of 10-in waterline will replace existing 1-in, 2-in, and 4-in waterline, and 1,000ft of new 10-in waterline will connect the upsized pipe to the new West Side Reservoir. The waterline will serve as a portion of the primary supply line to the new West Side Reservoir. A new PRV station will be installed along the new waterline, just upstream of the new reservoir.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

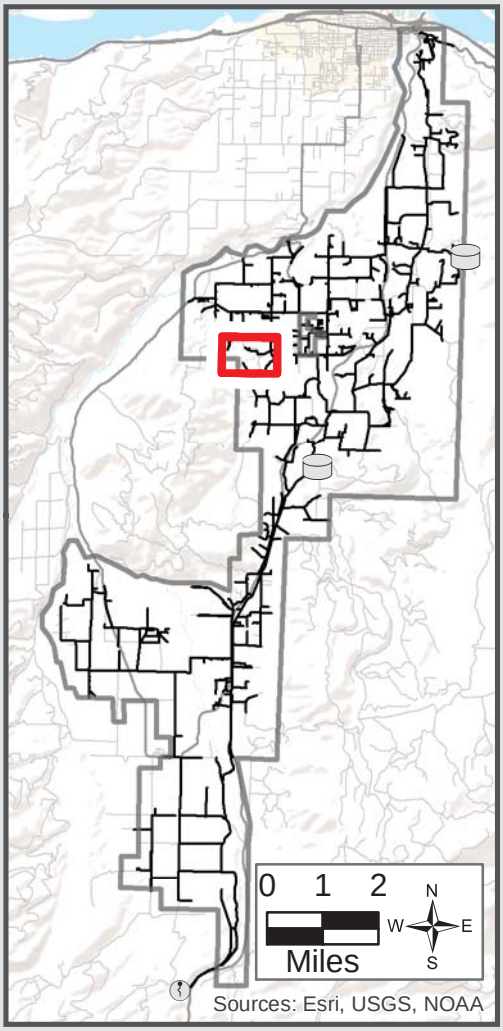
Project No. 18: West Side Reservoir

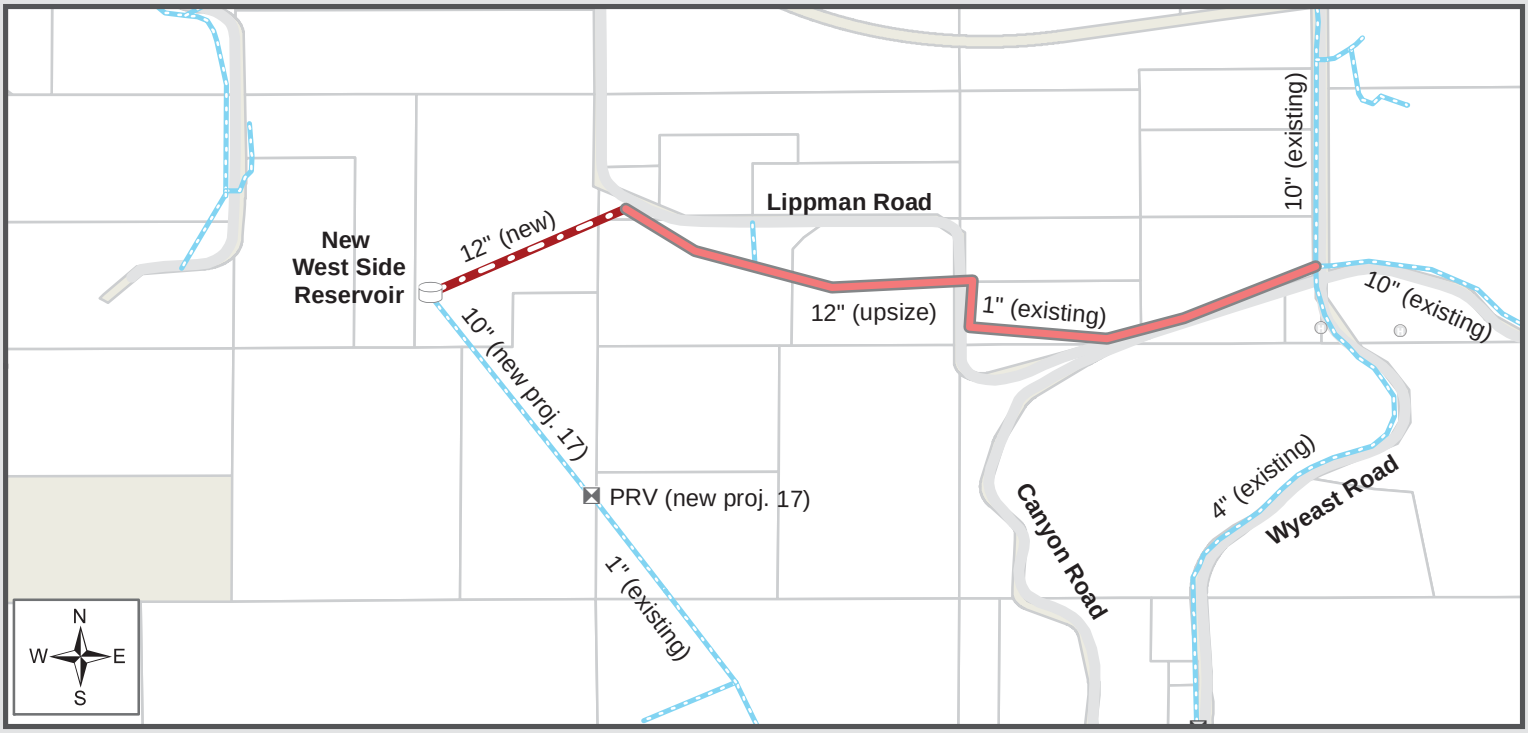
Estimated Project Cost: $2,341,000

Project Priority: High

Project Description

A new 540,000 gallon West Side Reservoir will be constructed northwest of Sylvester Drive. A total of 5,200ft of 12-in diameter waterline will be installed along Lippman Road, beginning at WyEast Road and ending at the reservoir. 3,000ft of 12-in waterline will replace existing 1-in, 2-in, and 4-in waterline, and 2,200ft of new 12-in waterline will connect the upsized pipe to the reservoir. The reservoir will provide general and fire storage for Odell and the pressure zones north of Odell. Combined with the supply and distribution waterlines, the reservoir will also improve fire flow and redundancy in these same areas.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water
0 1,000 Feet

PACE
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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

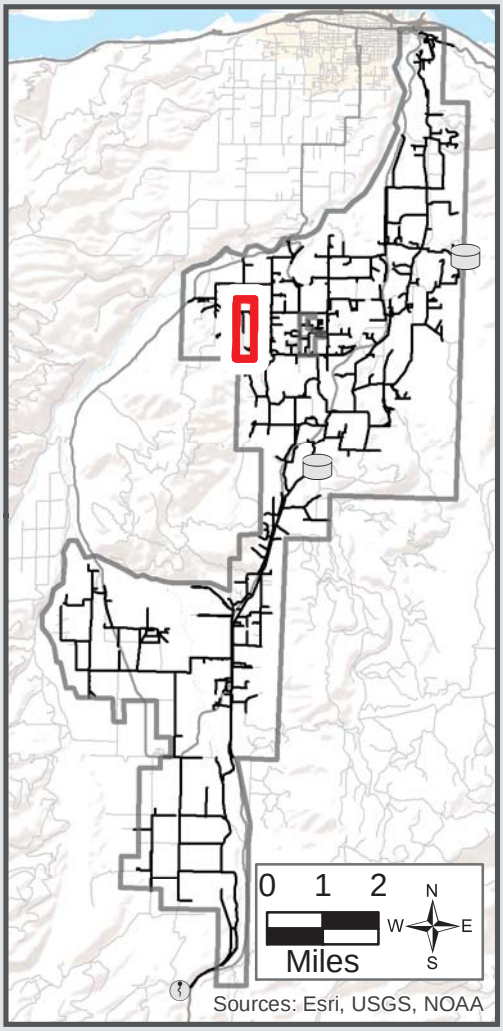
Project No. 19: Lippman Road

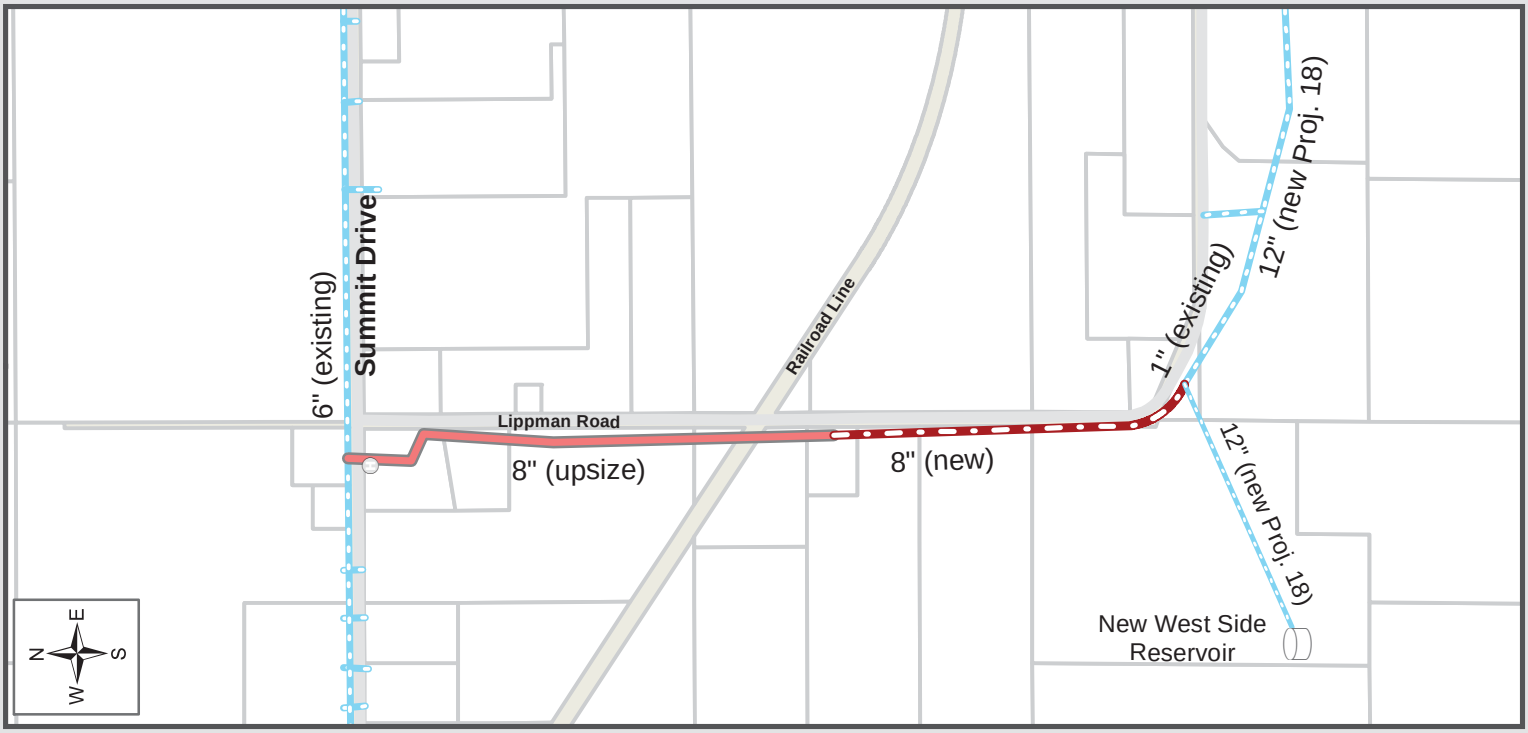
Estimated Project Cost: $739,500

Project Priority: Low

Project Description

A total of 3,400ft of 8-in diameter waterline will be installed along Lippman Road, beginning at the proposed 12-in outlet waterline from the West Side Reservoir and ending at Summit Drive. 2,000ft of 8-in waterline will replace existing 2-in waterline, and 1,400ft of new 8-in waterline will connect to end of the existing waterline on Lippman Road. This waterline will provide redundancy in Odell, increase distribution capacity, and improve fire flows.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water
0 1,000 Feet

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

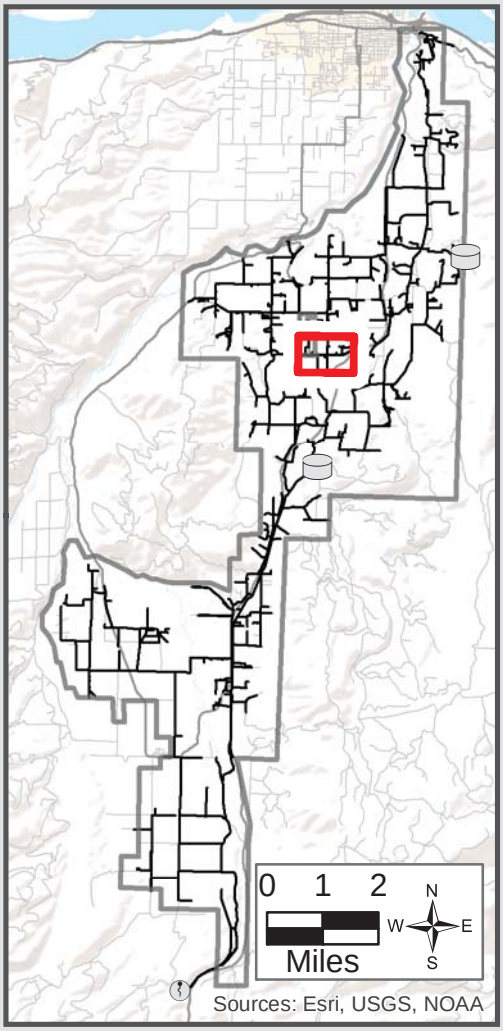
Project No. 20: Davis Drive

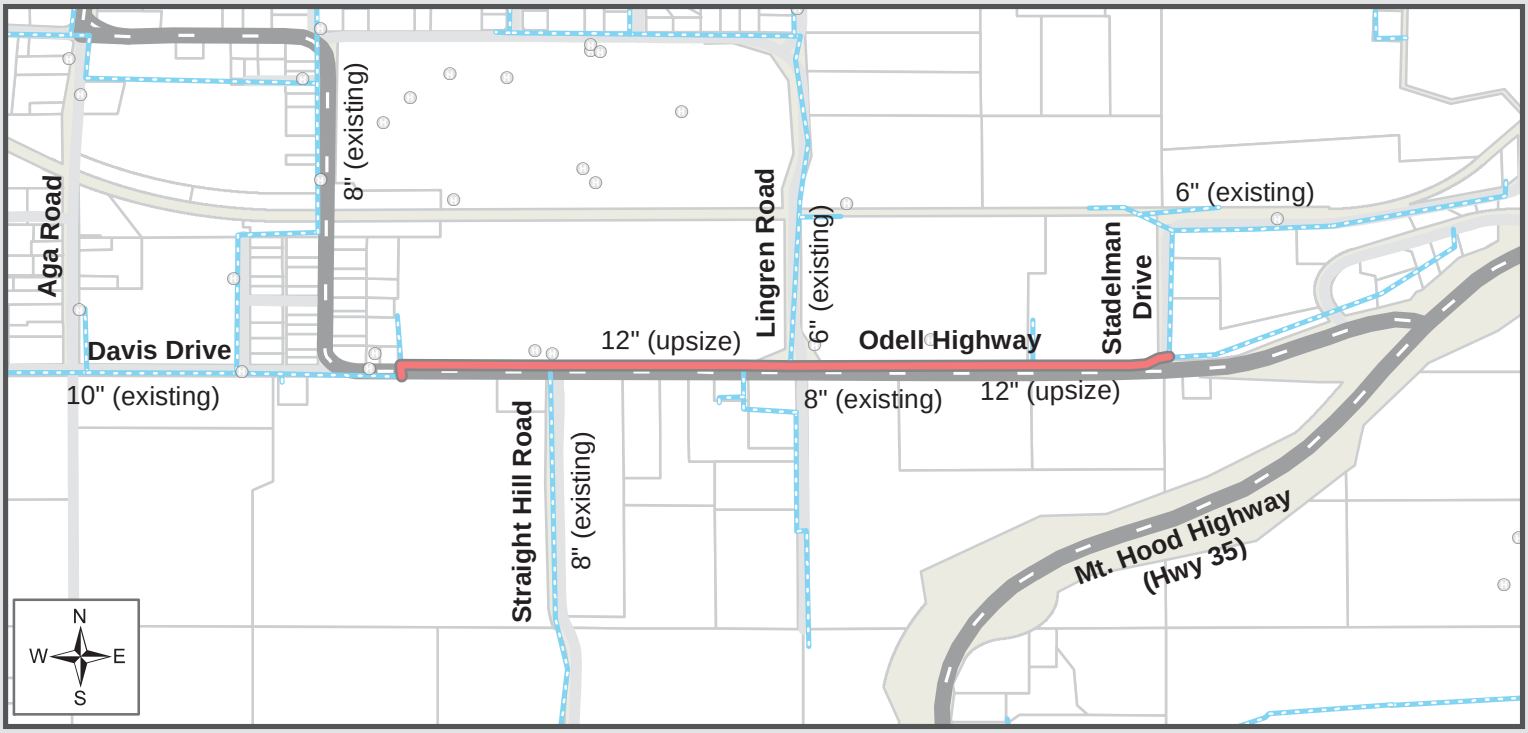
Estimated Project Cost: $756,900

Project Priority: Medium

Project Description

A total of 2,900ft of 12-in diameter waterline will be installed along Davis Drive, beginning east of Odell Highway and ending at Stadelman Drive, replacing existing 8-in waterline. The upsized waterline will improve fire flows and distribution capacity within Odell, specifically increasing fire flows to the industrial area.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
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Date: 11/4/2015
Document Name: 2015CIP_CutSheets

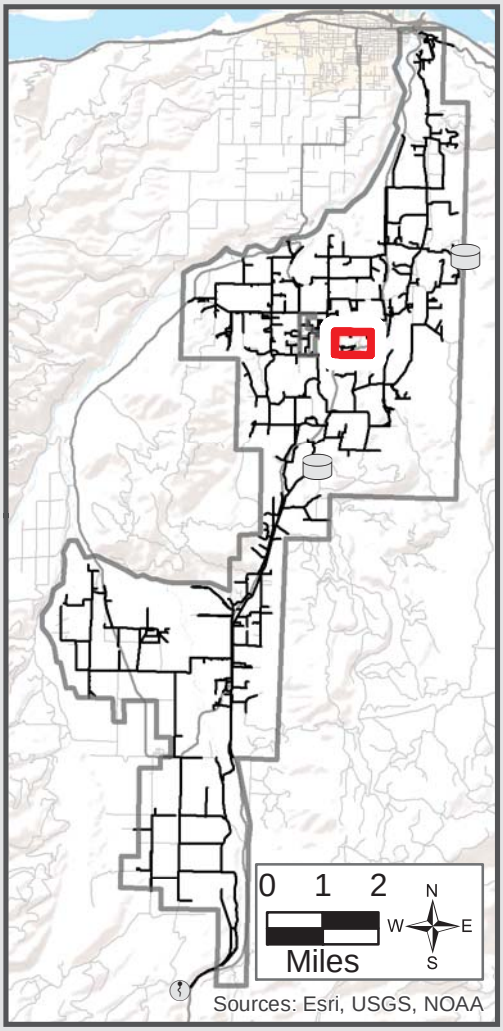
Project No. 21: Stadelman Drive

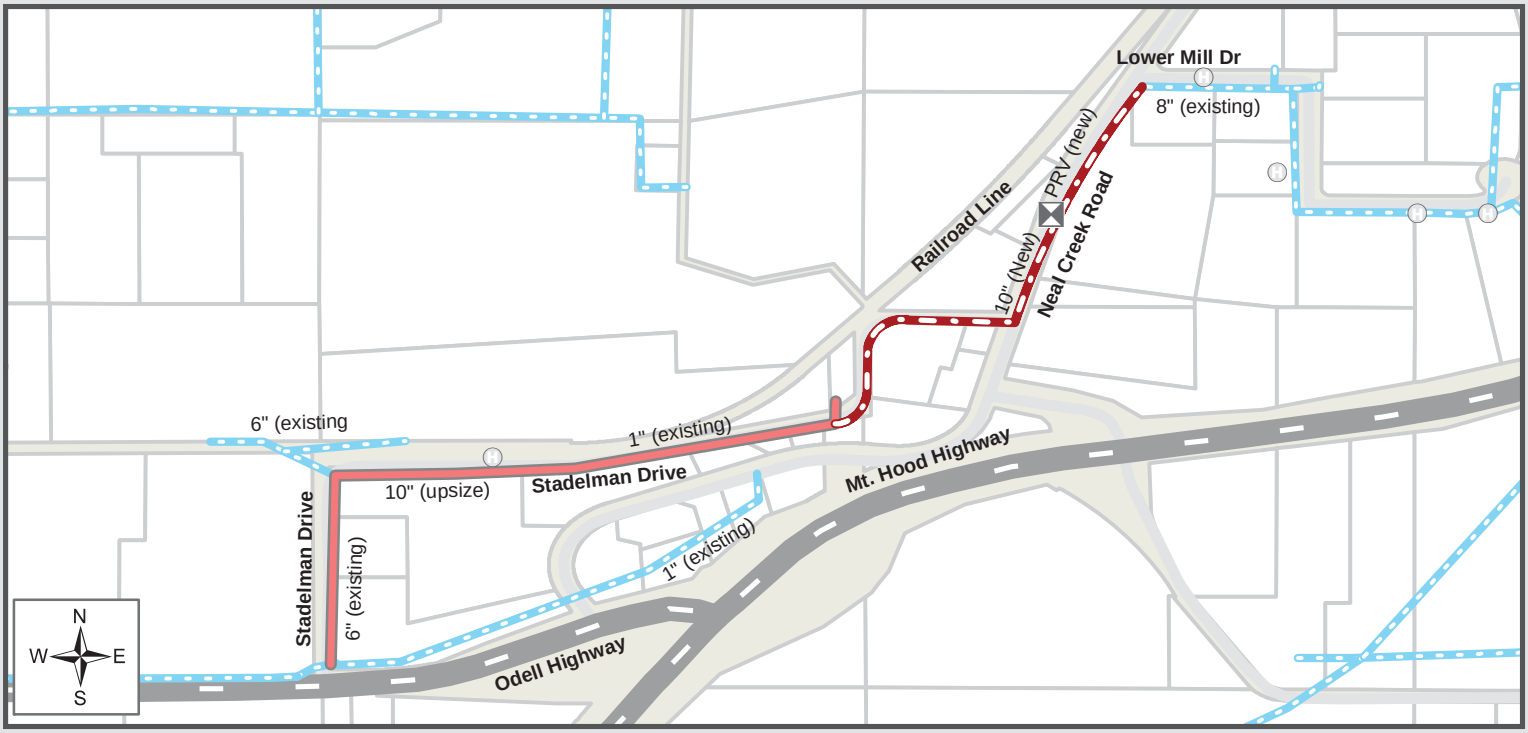
Estimated Project Cost: $887,400

Project Priority: High

Project Description

A total of 3,400ft of 10-in diameter waterline will be installed along Stadelman Drive, beginning at Odell Highway to the south and ending at Lower Mill Drive to the north. 2,000ft of 10-in waterline will replace existing 1-in and 6-in waterline, and 1,400ft of new 10-in waterline will connect the upsized pipe to the east side of the industrial area. The upsized waterline will improve fire flows, redundancy, and distribution capacity within Odell, specifically increasing fire flows within the industrial area. To maintain two pressure zones, a new PRV station will be installed along the new waterline, near Lower Mill Road.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

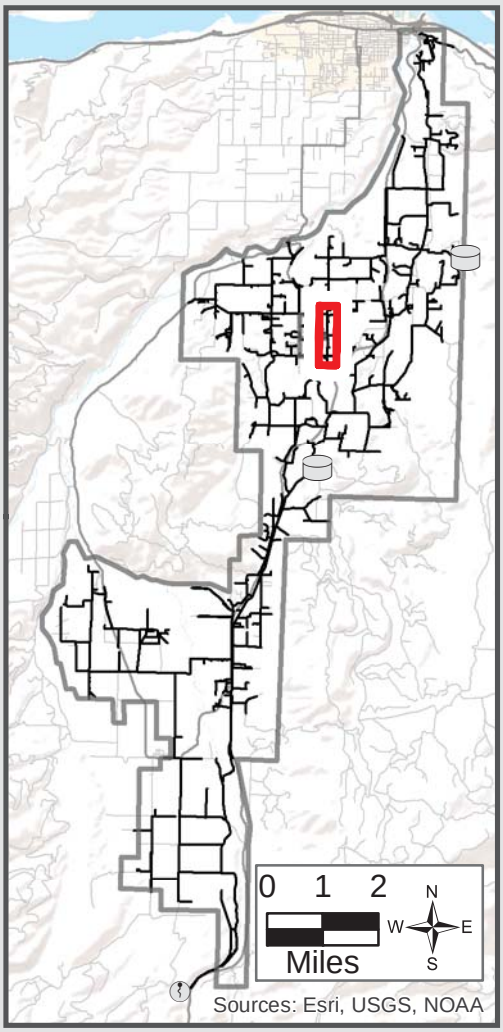
Project No. 22: Lingren Road - Davis to Ehrck Hill

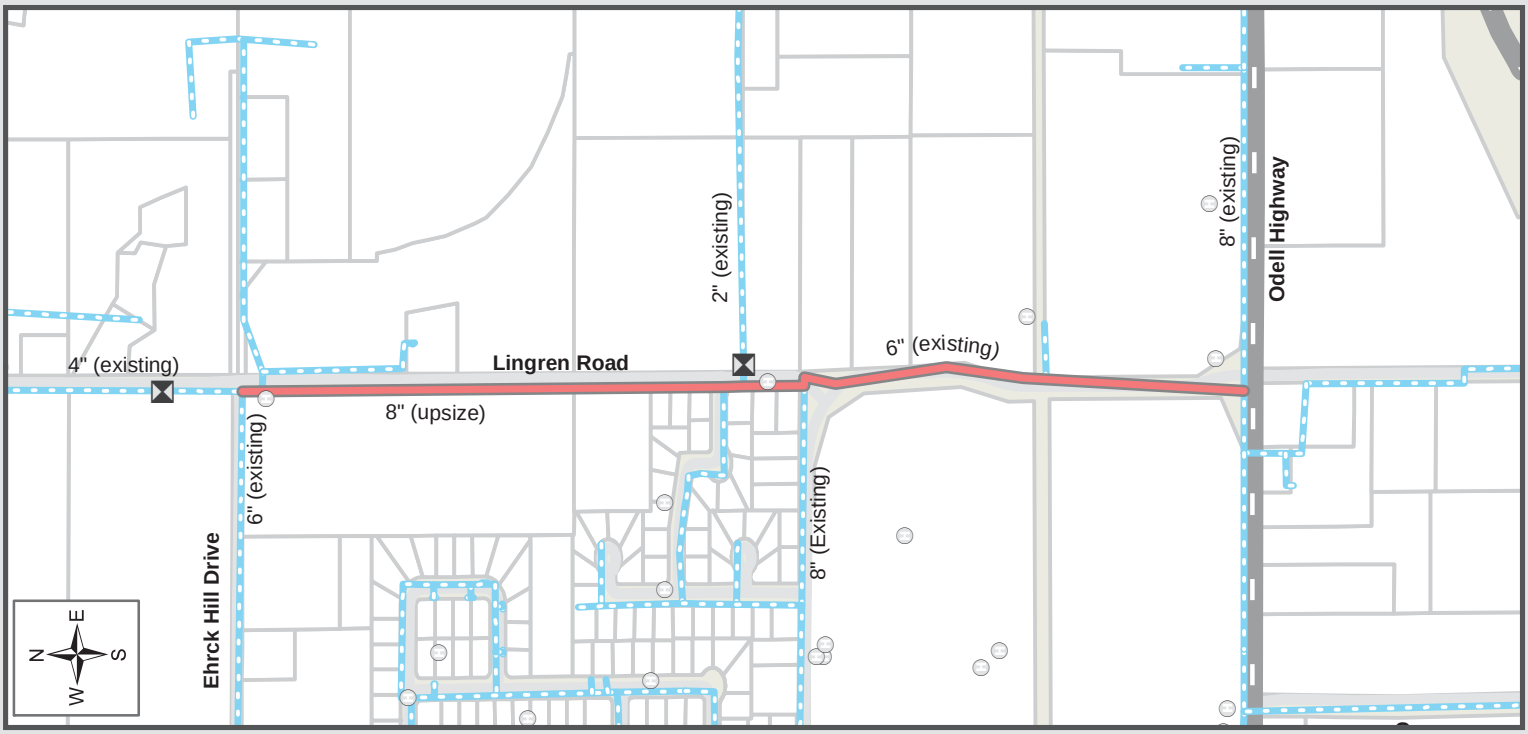
Estimated Project Cost: $870,000

Project Priority: Low

Project Description

A total of 4,000ft of 8-in diameter waterline will be installed along Lingren Road, beginning at Odell Highway and ending at Ehrck Hill Drive, replacing existing 6-in waterline. The upsized waterline will improve fire flows, redundancy, and distribution capacity in Odell and the parts of the District north of Odell.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

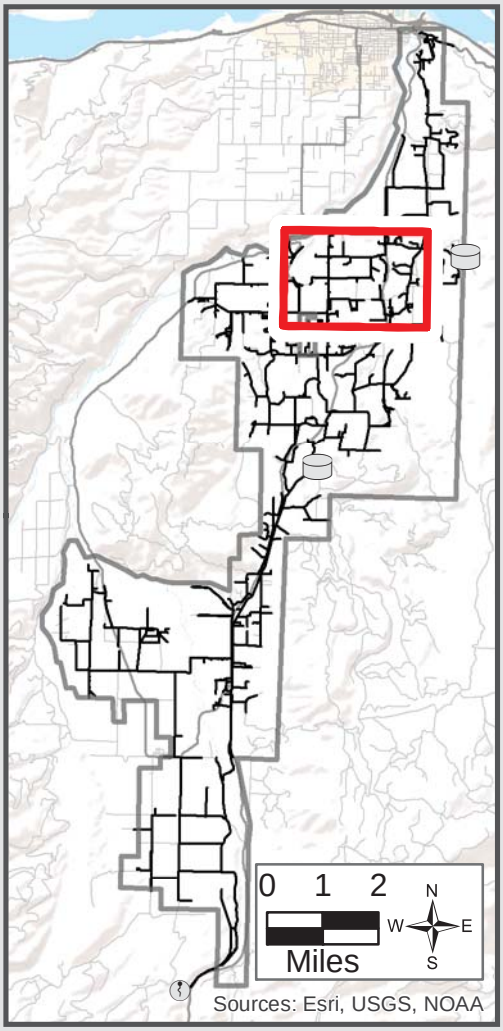
Project No. 23: Ehrck Hill to Dethman Ridge

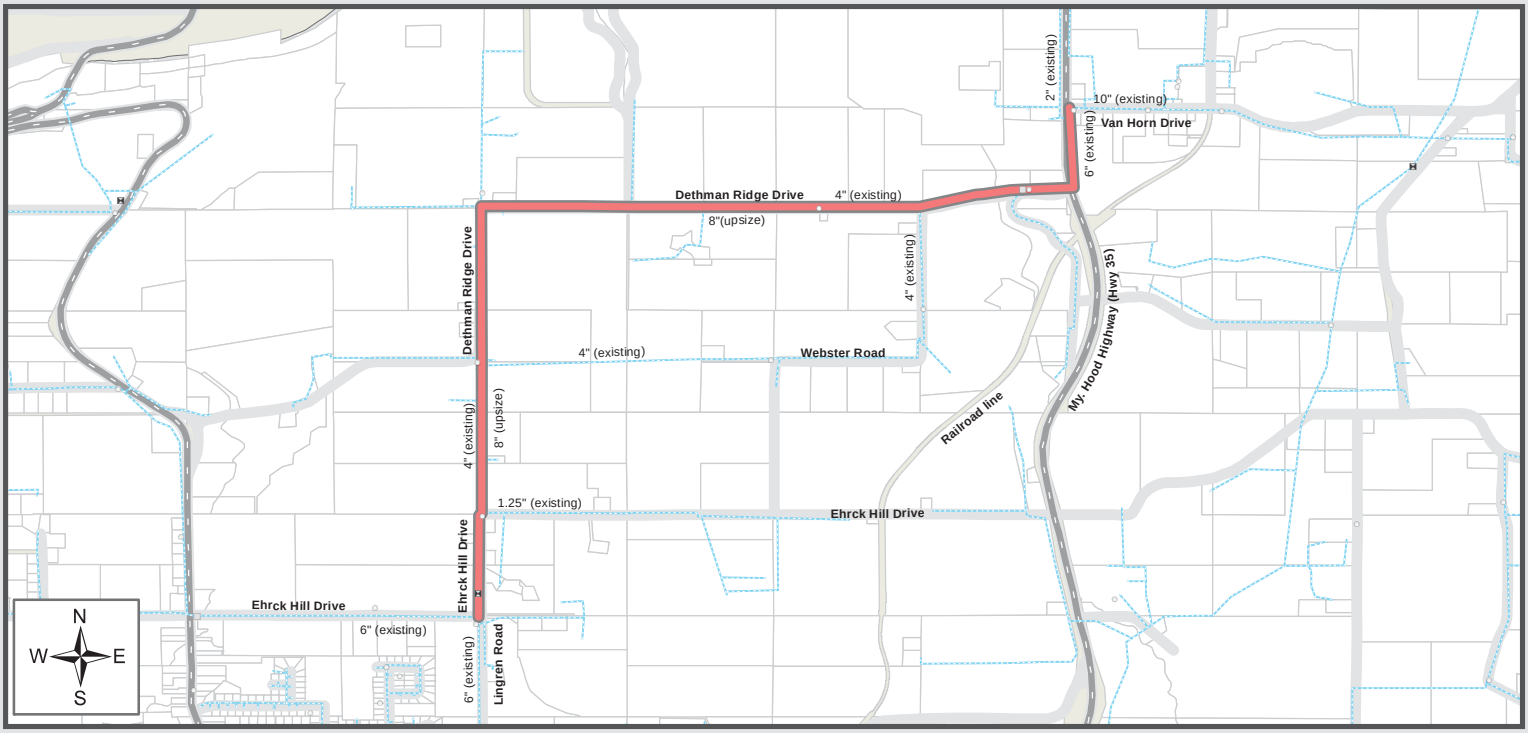
Estimated Project Cost: $2,566,500

Project Priority: Low

Project Description

A total of 11,800ft of 8-in diameter waterline will be installed along Ehrck Hill Drive and Dethman Ridge Drive, replacing existing 4-in and 6-in waterline. The upsized line will begin at Lingren Road and follow Ehrck Hill Drive north to Dethman Ridge Drive, follow Dethman Ridge Drive north and east to Highway 35, and follow Highway 35, ending at Van Horn Drive. The upsized waterline will improve fire flows, redundancy, and distribution capacity in the parts of the District north of Odell.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000
Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

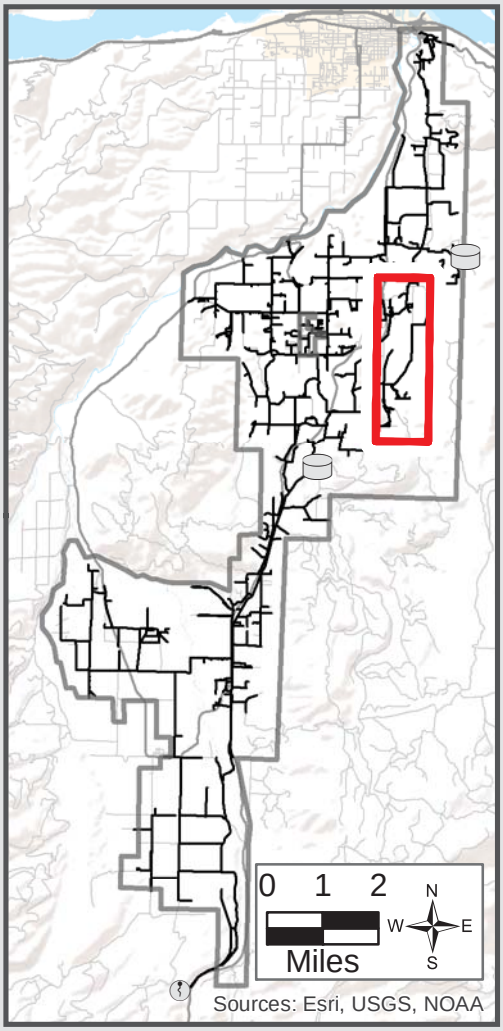
Project No. 24: Thomsen Road to Fir Mountain

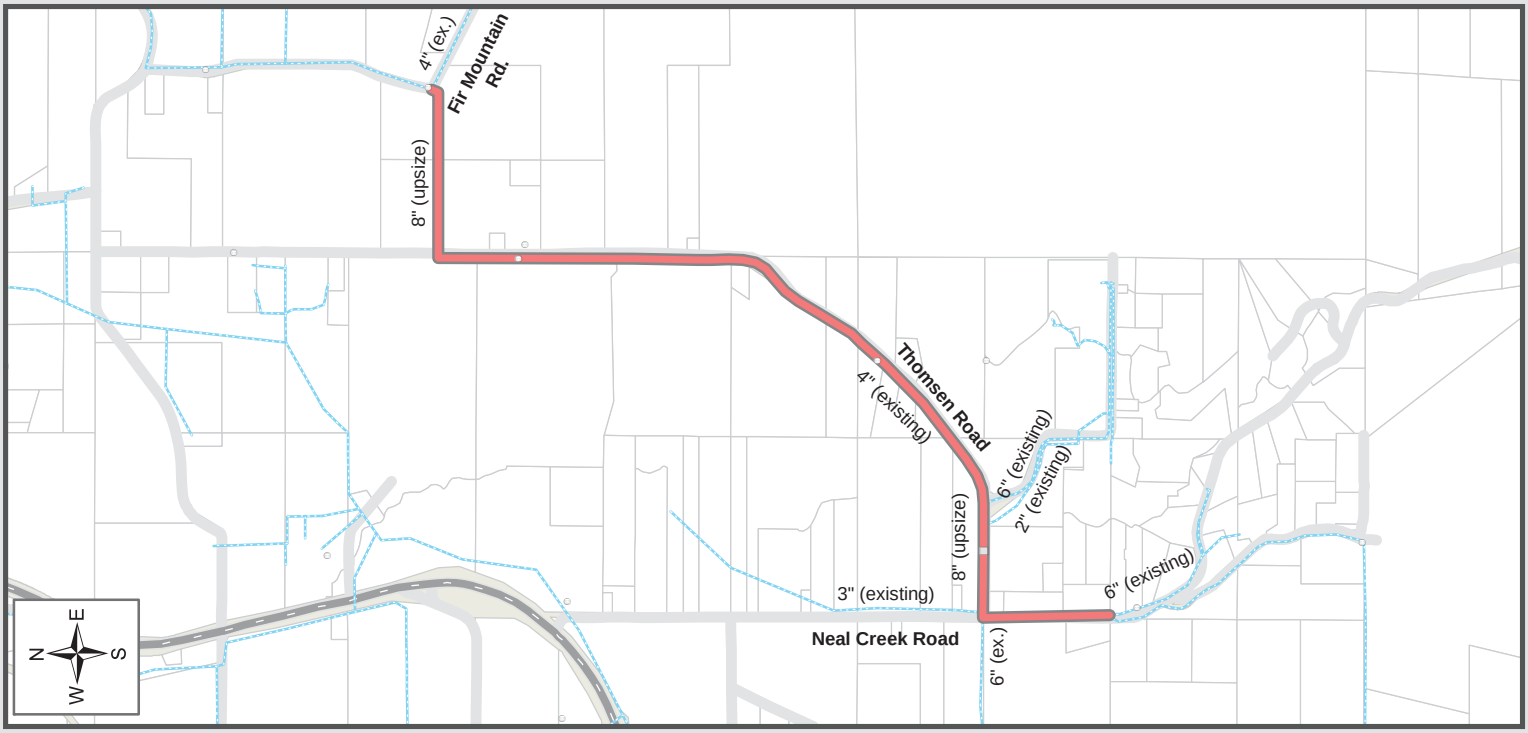
Estimated Project Cost: $2,131,500

Project Priority: Medium

Project Description

A total of 9,800ft of 8-in diameter waterline will be installed along Thomsen Road, beginning at Neal Creek Road and ending at Fir Mountain Road, replacing existing 4-in waterline. The upsized waterline will replace pipe at the end of its usable life and improve fire flows, redundancy, and distribution capacity to Pine Grove and the northern parts of the District.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000
Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

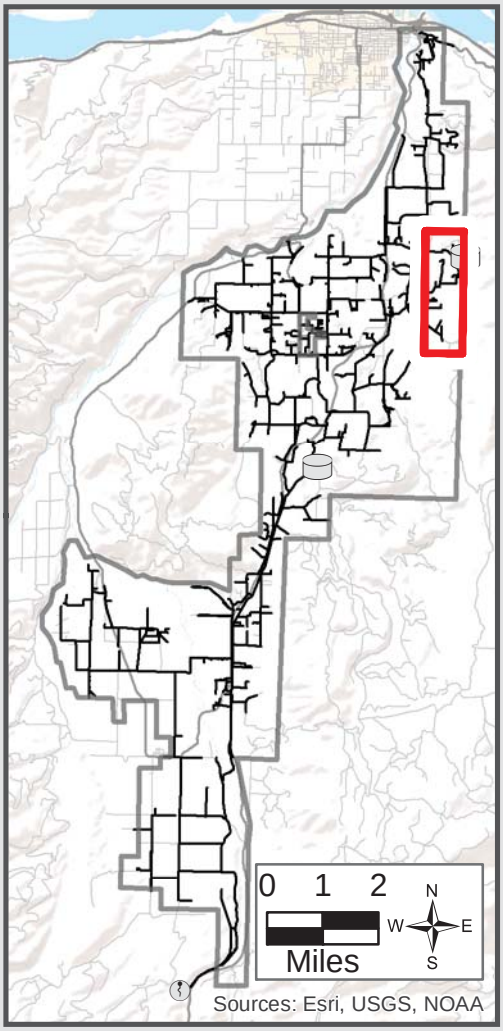
Project No. 25: Fir Mountain to Pine Grove

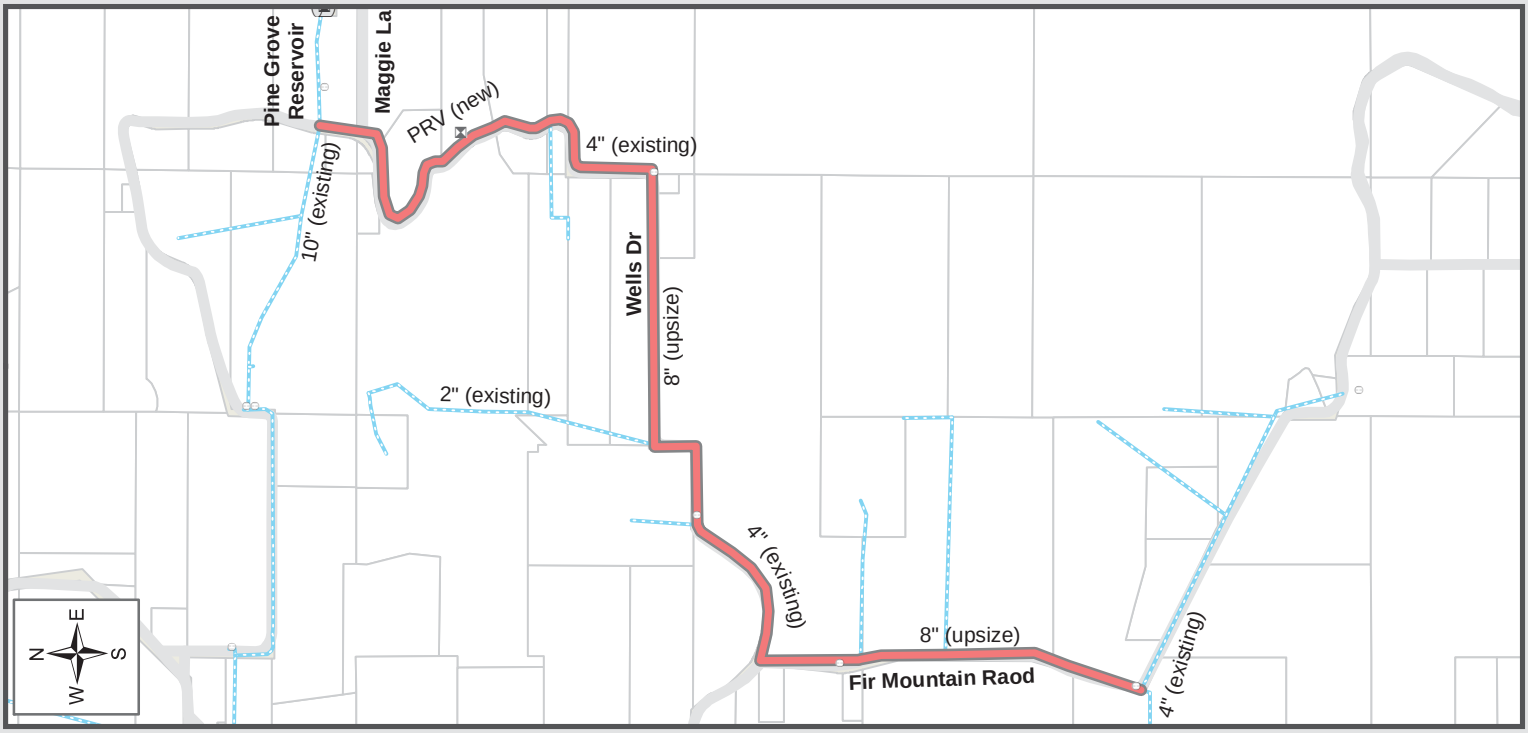
Estimated Project Cost: $2,202,550

Project Priority: Medium

Project Description

A total of 9,800ft of 8-in diameter waterline will be installed along Fir Mountain Road and Wells Drive, beginning at Thomsen Road and ending at Pine Grove Reservoir, replacing existing 4-in waterline. The upsized waterline will replace pipe at the end of its usable life and improve fire flows, redundancy, and distribution capacity to Pine Grove and the northern parts of the District. To maintain two pressure zones, a new PRV station will be installed along the Wells Drive, near Pine Grove Reservoir.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000 Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

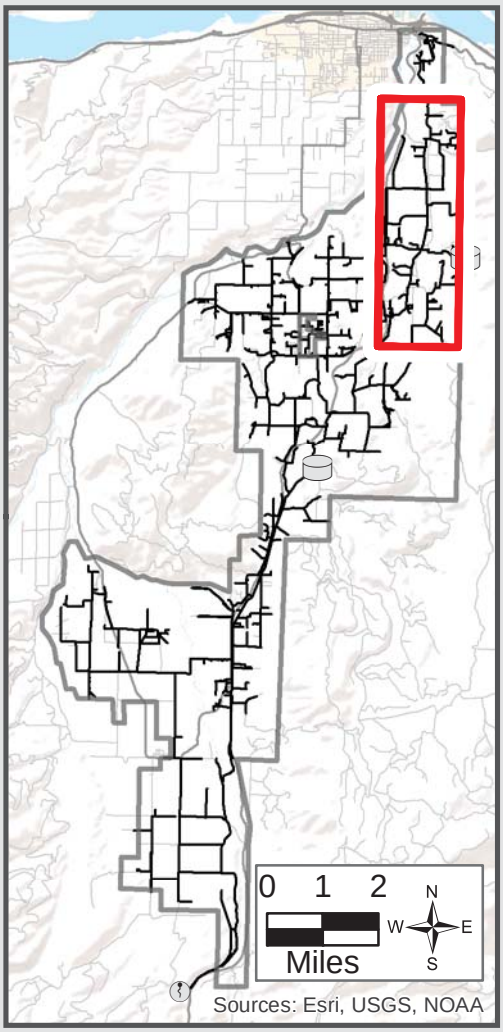
Project No. 26: East Side Road - South

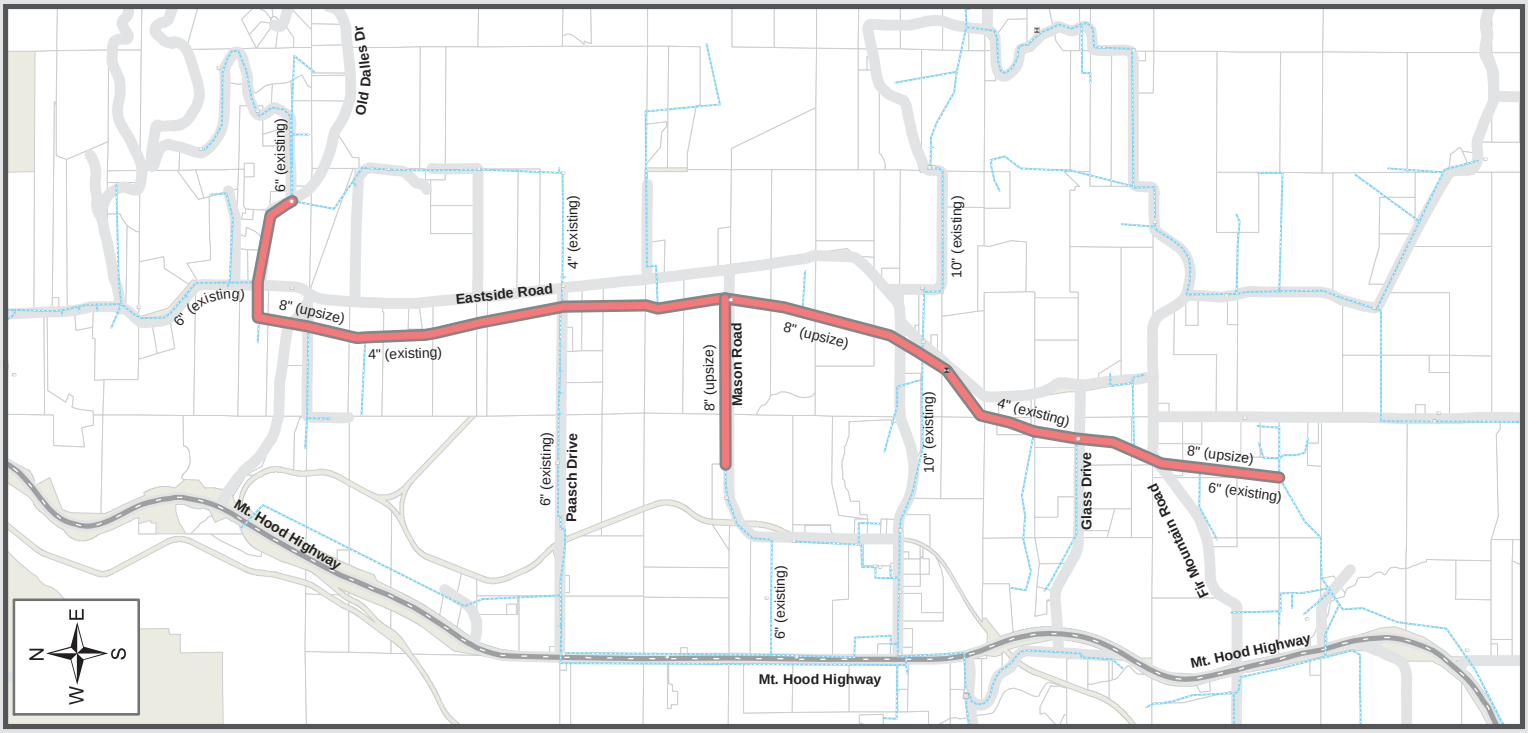
Estimated Project Cost: $3,915,000

Project Priority: Medium

Project Description

A total of 18,000ft of 8-in diameter waterline will be installed along Eastside Road, replacing existing 4-in waterline. The upsized line will begin south of Fir Mountain Road, follow Eastside Road north to Old Dalles Drive, and end on Old Dalles Road. The upsized waterline will replace pipe at the end of its usable life and improve fire flows, redundancy, and distribution capacity to the northern parts of the District.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000
Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

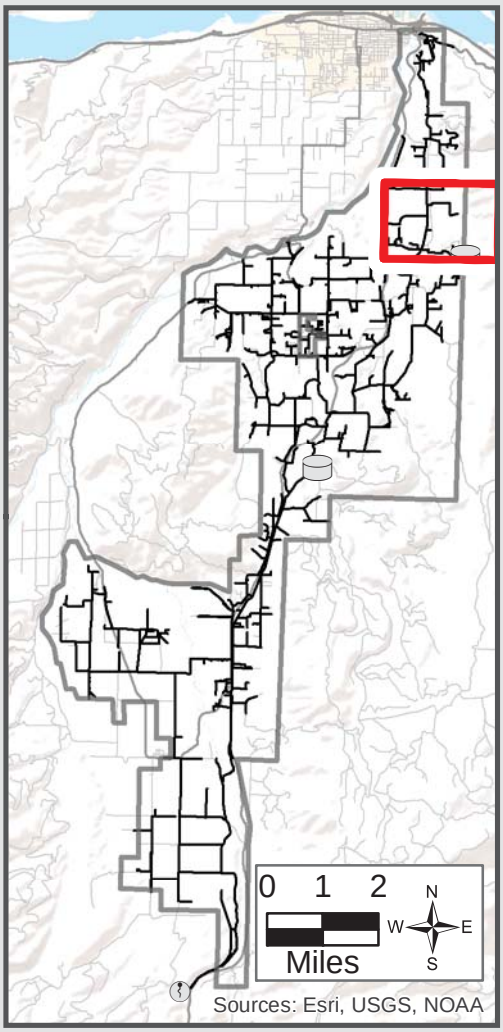
Project No. 27: Pine Grove to Paasch Drive

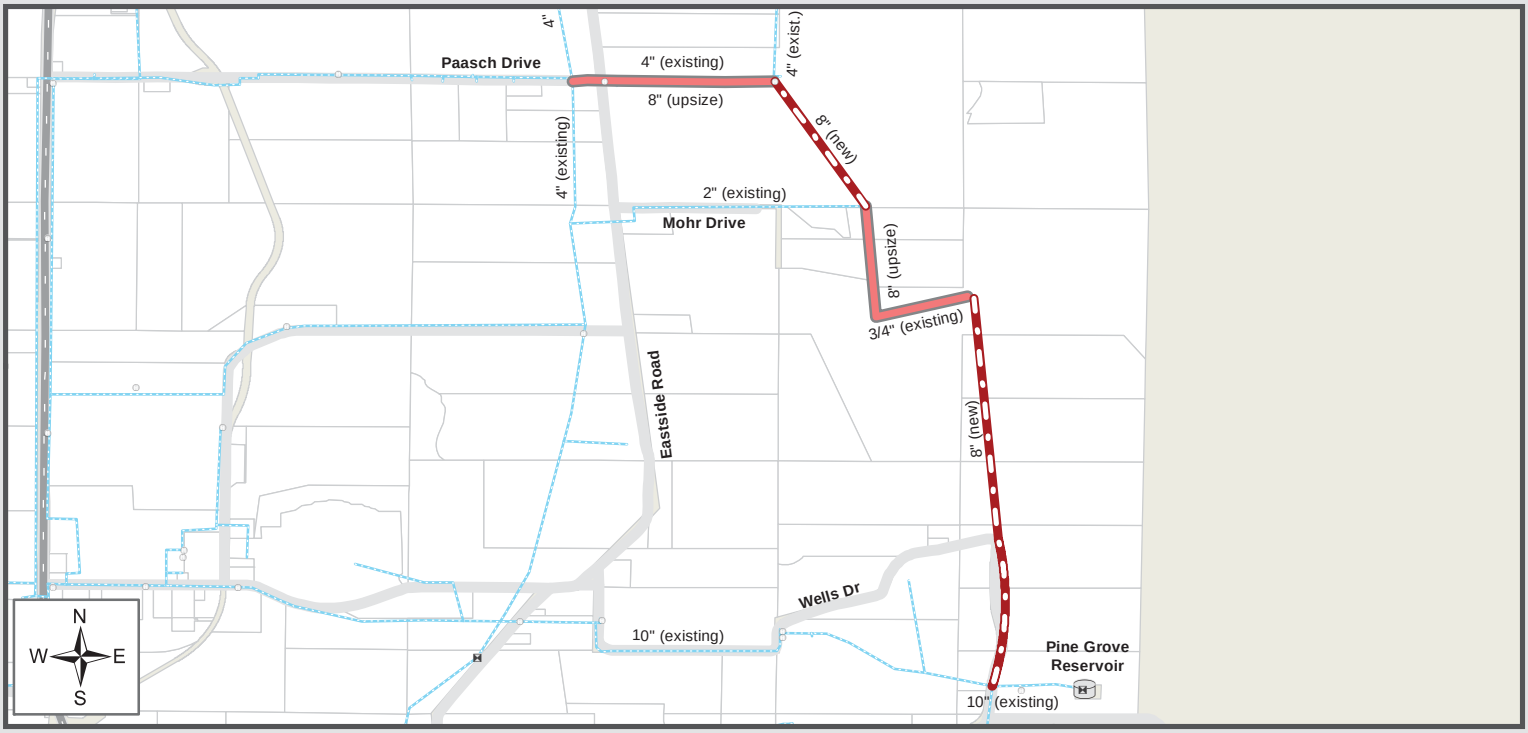
Estimated Project Cost: $1,914,000

Project Priority: Low

Project Description

A total of 8,800ft of 8-in diameter waterline will be installed connecting Wells Drive near Pine Grove to Paasch Drive. 3,300ft of 8-in waterline will replace existing 3/4-in, 3-in, and 4-in waterlines along Mohr Drive and Paasch Drive, and 5,500ft of new 8-in waterline will connect Wells Drive to Mohr Drive and Mohr Drive to Paasch Drive. This waterline will improve fire flows and provide redundancy to the northern parts of the District.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000
Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

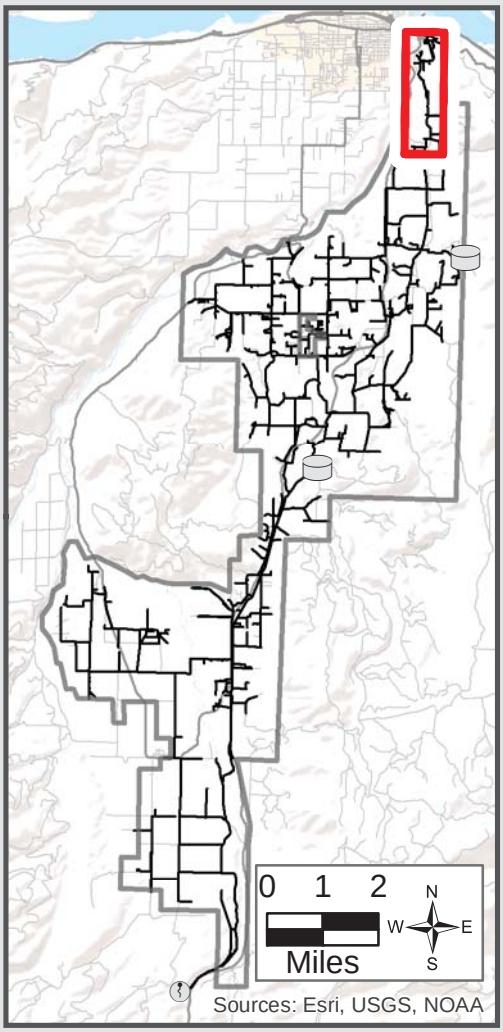
Project No. 28: East Side Road - North

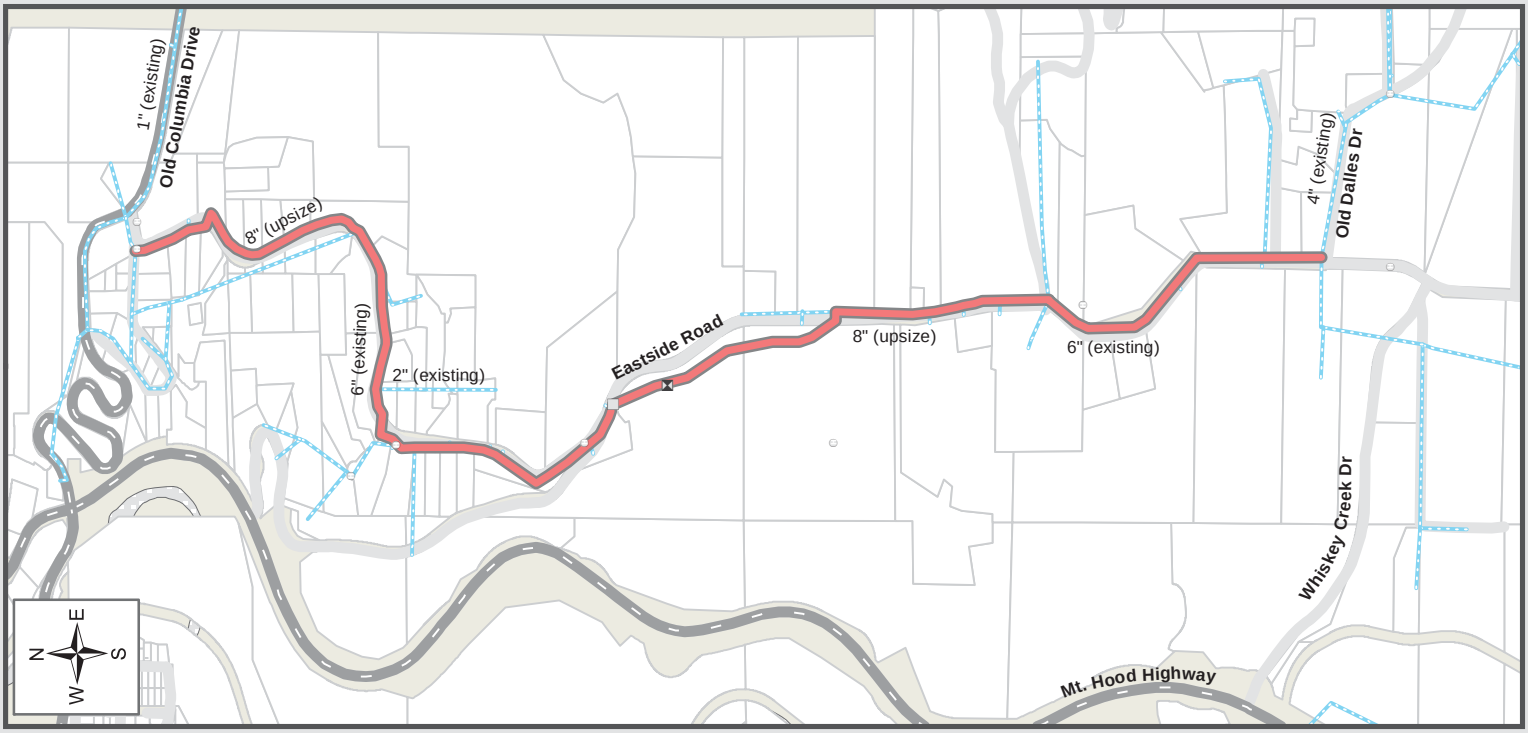
Estimated Project Cost: $2,436,000

Project Priority: Low

Project Description

A total of 11,200ft of 8-in diameter waterline will be installed along Eastside Road and Highline Drive, beginning at Old Dalles Road and ending near Old Columbia River Drive, replacing existing 6-in waterline. The upsized waterline will replace pipe at the end of its usable life and improve fire flows in the northern part of the District.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
0 1,000 Feet
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

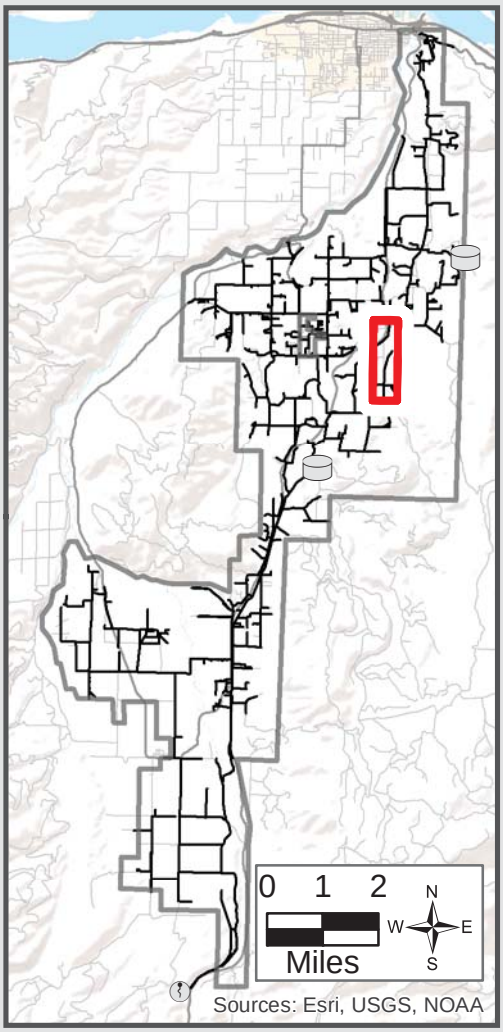
Project No. 29: Neal Creek – Hwy 35 to Thomsen

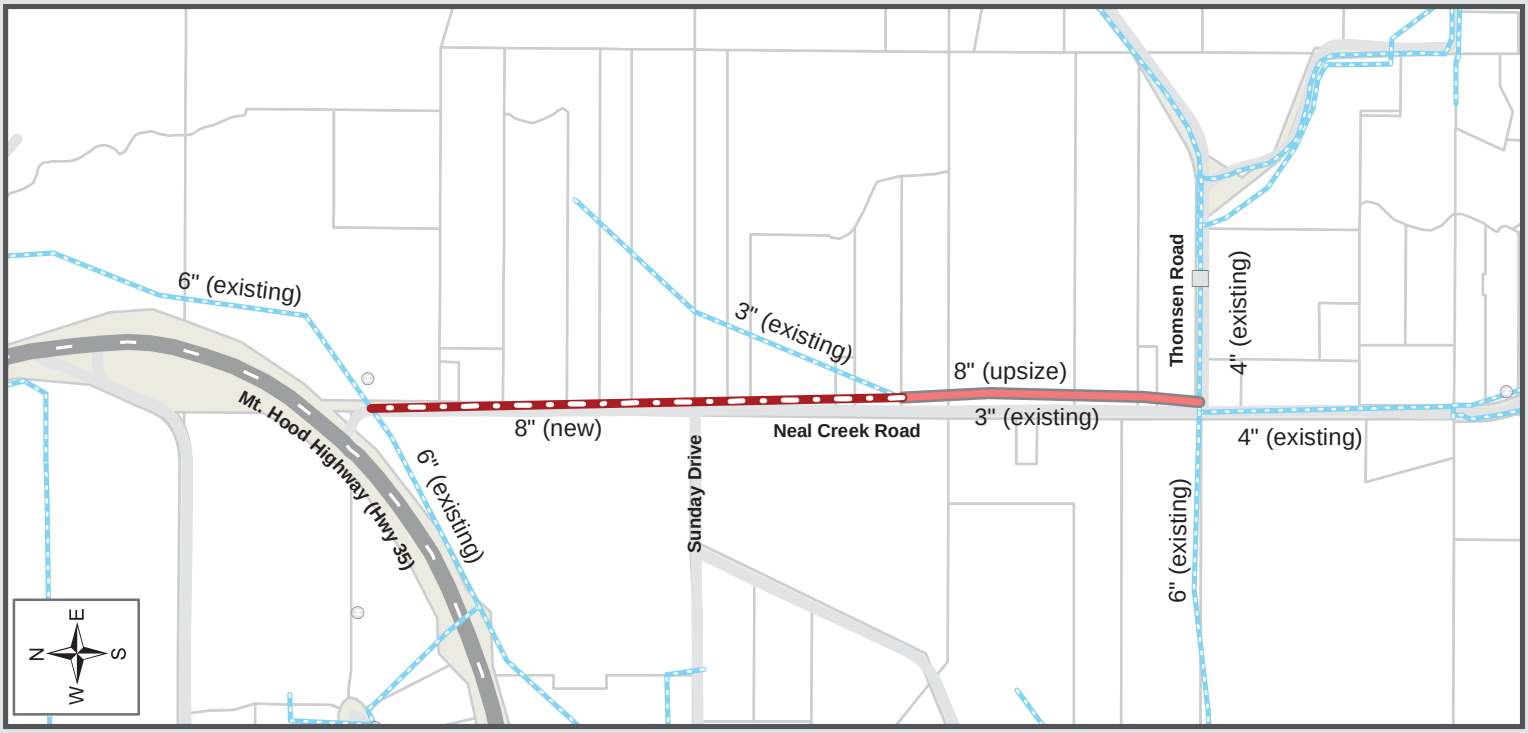
Estimated Project Cost: $935,250

Project Priority: High

Project Description

A total of 4,300ft of 8-in diameter waterline will be installed along Neal Creek Road, beginning at Thomsen Road and ending at Highway 35. 2,300ft of 8-in waterline will replace existing 3-in waterline, and 2,000ft of new 8-in waterline will connect loop to Highway 35. This waterline will replace pipe at the end of its usable life and provide redundancy in Odell.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

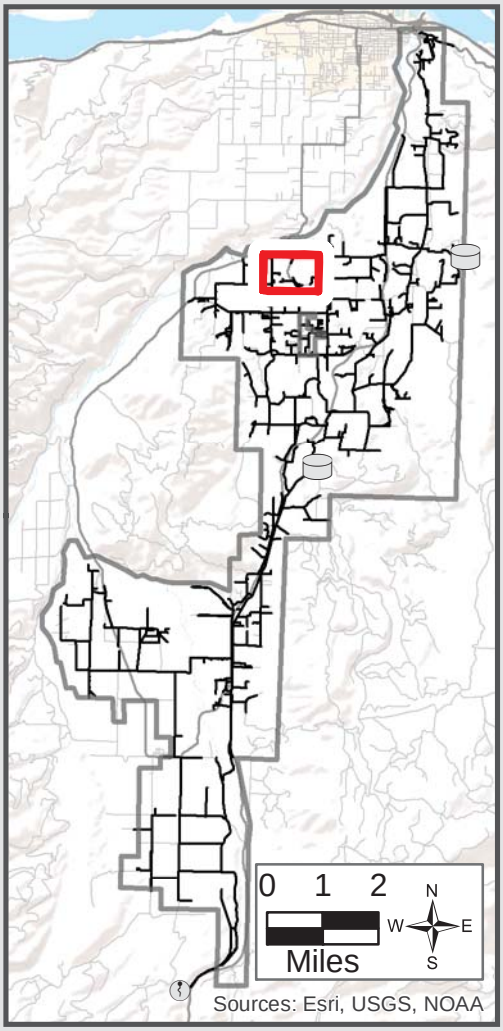
Project No. 30: Odell Hwy – WyEast To Web

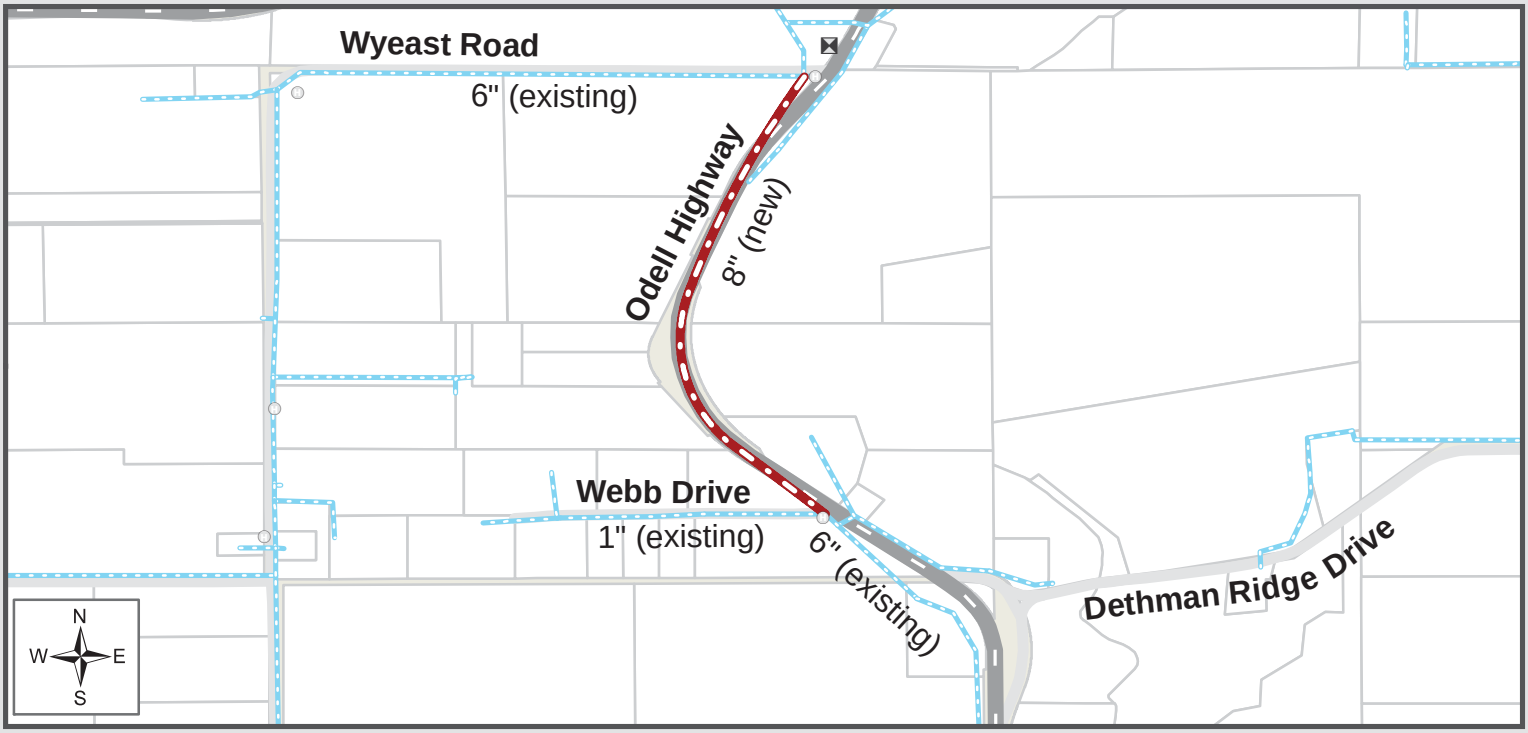
Estimated Project Cost: $609,000

Project Priority: Medium

Project Description

A total of 2,800ft of new 8-in diameter waterline will be installed along Odell Highway, beginning at Webb Drive and ending at WyEast Road. The new waterline will complete a loop between these roads and improve fire flows in the area.





Upsized Waterline
New Waterline
New PRV
New Reservoir
PRV Existing
Relief Valve
Hydrants
Existing Reservoir
Crystal Spring
Existing Waterline
Highway/Road
Property line
Water

0 1,000 Feet

PACE
An Engineering Services Company

Date: 11/4/2015
Document Name: 2015CIP_CutSheets

Appendix 8.1

2014-2015 Budget

CRYSTAL SPRINGS WATER DISTRICT

DOMESTIC WATER SYSTEM
FAX: 541.354.1821 ~PO Box 186 ~ 3006 Chevron Drive ~ Odell OR 97044 ~ PHONE: 541.354.1818

June 5, 2014

Resolution Adopting the 2014-2015 Budget. (1314.07)

Be it resolved that the **Board of Commissioners** of the **Crystal Springs Water District** hereby adopts the 2014-2015 budget approved by the Budget Committee in the total sum of **$2,928,592.87**. The document is now on file at the District office located at 3006 Chevron Drive in Odell, Oregon.

Resolution Making Appropriations (1314.08)

Be it resolved that the amounts for the fiscal year beginning July 1, 2014, and for the purposes shown are hereby appropriated as follows:

General Fund:		
Personal Services	600,330.43	
Materials & Services	193,550.00	
Capital Outlay	1,142,580.83	
General Operating Contingency	532,482.96	
Transfer to Vehicle Reserve	10,000.00	
Total General Fund Appropriation		*$2,478,944.22*
System Development Fund:		
office building	262,354.91	
reservoir$$	160,000.00	
timber hvst replant	2,500.00	
Total System Development Fund Appropriation		*$424,854.91*
Vehicle Reserve Fund:		
vehicle purchase reserve	24,793.74	
Total Vehicle Reserve Fund Appropriation		*$24,793.74*
Total 2014-2015 Appropriations		**$2,928,592.87**

Dated this 5th day of June, 2014

Larry Brown — President

G Mick Swyers — Secretary

	ACTUAL DATA		CURRENT			GENERAL FUND					
	10-11	11-12	13-14	ytd	projected 6/30			Proposed	2014-15	approved	to be adopted
							RESOURCES				
1	27 644 96	38.302 00	195,112.00	83,109.87	83,109.87	1	Beginning Balance	142,320.78		142,320.78	142,320.78
2	1,234,023 46	1,384,177 35	1,282,354.25	1,250,949.77	1,250,949.77	2	conting/rsvr$$ carryover	1,218,623.44		1,218,623.44	1,218,623 44
3	1,031,740 72	1,087,351 48	1,144,000.00	794,016.31	1,144,000.00	3	Water Sales	1,100,000.00		1,100,000.00	1,100,000.00
4	7,227.81	6 262 91	7,000.00	10,054.51	13,406.01	4	New Meters / Materials & Labor	7,000.00		7,000.00	7,000.00
5	0 00		0.00	0.00	0.00	5	System Extensions				
6	7,172 00	7,452 07	5,000.00	5,680.26	7,573.68	6	Interest	5,000.00		5,000.00	5,000.00
7	19,392 72	31,280 91	10,000.00	15,146.74	20,195.65	7	Repair & Materials	10,000 00		10,000.00	10,000.00
8	4,693 73	5,196 00	1,000.00	10,000.00	13,333.33	8	Miscellaneous	1,000.00		1,000.00	1,000.00
9	0.00					9					
10	0.00					10					
11	0.00					11					
12	0 00					12					
13	0 00					13					
14	-876 79	-1,661 73	-5,000.00	-308.09	-410.79	14	Cost of Materials Sold	-5,000.00		-5,000.00	-5,000.00
15	1,069,350 19	1,136,083 64	1,162,000.00	834,589.73	1,198,097.89	15	Total Income	1,118,000.00		1,118,000.00	1,118,000.00
16	2,331,018 61	2,618,562 99	2,639,466.25	2,168,649.37	2,532,157.53	16	Total Resources	2,478,944.22		2,478,944.22	2,478,944.22
							EXPENDITURES				
19						19	Personal Services				
20	76,315 20	104,887 62	82,095.46	52,329.36	52,329.36	20	Superintendent	79,404.00	1.8% cpi	79,404.00	79,404.00
21			0.00	52,500.06	74,000.00	21					
22	54,980.00	57 740 80	60,694.40	40,768.00	54,357.33	22	Foreman	58,352.32	cpi + 6.1%	58,352.32	58,352.32
23	37,744 64	43,197 36	43,222.40	22,478.77	22,478.77	23	Maint ct	0.00		0.00	0.00
24	51,436 00	29,034 75	0.00	0.00	9,728.00	24	Maint (kj) (rm)	42,203.20	cpi + 5%	42,203.20	42,203 20
24a		14,506 68	47,320.00	15,817.50	25,308.00	24a	Maint (mg)	42,203.20	cpi + 5%	42,203.20	42,203.20
25	40,028 18	23,923 39	0.00	0.00	0.00	25	Maint / mtr rdr ps			44,761.60	44,761.60
25a		13,813 32	43,118.40	31,800.40	42,400.53	25a	Maint / mtr rdr (dy)	44,761.60	cpi + 2%		
26	6,739 65	12,236 18	20,000.00	8,794.50	3,908.67	26	Part-time	20,000.00		20,000.00	20,000.00
27	25,395.37	27,418 30	28,292.73	20,474.14	27,298.85	27	office 2	29,053.20	cpi	29,053.20	29,053.20
28	25,242 72	29,243 83	27,476.00	29,471.51	39,295.35	28	office	29,374.80	cpi	29,374.80	29,374.80
29	3,493 90	4 688 00	5,000.00	4,870.62	6,494.16	29	Overtime	5,000.00		5,000.00	5,000 00
30	20,000.00	20 000 00	20,000.00	0.00	0.00	30	Unused Vacation	20,000.00		20,000.00	20,000.00
31						31	Payroll Expenses				
32	22,665 28	26,636 71	23,387.60	20,357.14	27,142.85	32	Social Security	22,961.84	6.20%	22,961.84	22,961.84
33	4,398.73	5,105 28	5,469.68	3,897.28	5,196.37	33	Medicare	5,370.11	1.45%	5,370.11	5,370.11
34	31,468 64	42 861.19	46,739.60	19,218.41	25,624.55	34	PERS	34,606.16	12.08%/10.72%	34,606.16	34,606 16
35	105,963 58	98,453 95	134,272.25	89,986.96	119,982.61	35	Medical/Life/Vision	130,000.00	moda/nylife +10%(?)	130,000.00	130,000.00
36	10,510.63	10,644.69	19,239.07	9,851.17	13,134.89	36	Dental	16,000.00	13-14+15% (?)	16,000.00	16,000.00
37	10,000 00	7,040 33	10,500.00	-1,474.11	10,500.00	37	Workers Comp	10,500.00		10,500.00	10,500.00
38	2,200 00	2,200 00	5,251.40	164.55	5,251.40	38	Unemployment Ins	5,040.00	Unemp 1.8%	5,040.00	5,040.00
39	1,432 11	2,478 35	1,500.00	1,657.17	2,209.56	39	Clothing	3,000.00		3,000.00	3,000.00
40	300 00	578.81	1,000.00	520.00	693.33	40	Other	2,500.00		2,500.00	2,500 00
41	530,304 63	576,690 54	624,579.00	423,483.43	567,334.60	41	Total Personal Services	600,330.43		600,330.43	600,330.43

	ACTUAL DATA		CURRENT			GENERAL FUND					
	10-11	11-12	13-14	ytd	projected 6/30			Proposed	2014-15	approved	to be adopted
							EXPENDITURES				
1						1	Materials & Services				
2		97 85			0.00	0.00	2 Repair & Maintenance/hyd	3,000.00	remote spr/b hill	3,000.00	3,000.00
3	2,323 32	3,491.51	7,000.00	147.64	196.85		3 Water System	7,000.00		7,000.00	7,000 00
4	14,553.80	25,081.92	15,000.00	14,539.29	19,385.72		4 Inventory Used	15,000.00		15,000.00	15,000.00
5	2,515.83	3.508 74	5,000.00	6,242.90	8,323.87		5 Chlorinator/dechlorinator	15,000.00	turb/dechl/bldg	15,000.00	15,000.00
6	8,677 31	10.181 21	17,000.00	1,503.39	12,004.52		6 cla-vlv parts/cla-vlv parts	17,000.00	cla-vlv parts	17,000.00	17,000.00
7	5 873 59	7 134 25	10,000.00	5,262.18	7,016.24		7 Building	10,000.00		10,000.00	10 000.00
8	3,093 13	5,400 92	3,000.00	3,798.30	5,064.40		8 3/4 T work trucks	3,000.00		3,000.00	3,000 00
9	2.512 77	560 60	2,500.00	4,122.31	5,496.41		9 ranger/colorados	2,500.00		2,500.00	2,500.00
10	606.99	535 65	1,150.00	0.00	0.00		10 Truck 1T	1,150.00		1,150.00	1,150.00
11	2,519.80	783 10	2,050.00	287.85	383.80		11 Backhoes JCB	2,050.00		2,050.00	2,050 00
12	336 06	346 19	650.00	78.17	78.17		12 Case			0.00	0.00
13	3,976 43	5,189 72	4,500.00	6,254.82	8,339.76		13 Equipment	4,500.00		4,500.00	4,500 00
14	18,223 30	17.593 20	18,000.00	10,946.64	14,595.52		14 Fuel	18,000.00		18,000.00	18,000.00
15	2,006 69	3,319 25	4,500.00	3,583.85	4,778.47		15 Office Equip/Softwr	4,500.00		4,500.00	4,500.00
16	1,818 11	2 286 21	2,000.00	2,943.41	3,924.55		16 Operating Supplies - Tools	3,000.00		3,000.00	3,000.00
17	899 86	1,056 88	1,200.00	748.51	998.01		17 Operating Supplies - Miscellane	1,200.00		1,200.00	1,200.00
18							18				
19	5,725 07	4,767 55	20,000.00	6,609.71	8,812.95		19 Office Expense	13,000.00		13,000.00	13,000.00
20	6,739.79	6,835.46	9,000.00	5,325.14	7,100.19		20 Postage	9,500.00		9,500.00	9,500.00
21							21				
22							22 Professional Services				
23	11,950.00	12,300.00	13,000.00	12,800.00	12,800.00		23 Audit	13,000.00		13,000.00	13,000.00
24	1 500 00	451 50	3,000.00	0.00	0.00		24 Computer	3,000.00		3,000.00	3,000.00
25		0 00	1,000.00	0.00	0.00		25 Engineer	1,000.00		1,000.00	1,000.00
26	8 015 00	6,352.50	9,000.00	6,492.50	8,656.67		26 Legal	9,000.00		9,000.00	9,000.00
27		0 00	0.00	0.00	0.00		27 Other	0.00		0.00	0.00
28	649.44	621.72	700.00	290.88	387.84		28 Locate	700.00		700.00	700.00
29			0.00	0.00	0.00		29	0.00		0.00	0 00
30	3,846 57	3.570 55	4,500.00	2,544.70	3,392.93		30 Utilities - Electricity	4,500.00		4,500.00	4 500.00
31	373 44	415 12	500.00	290.66	387.55		31 Garbage	500.00		500.00	500.00
32	510 00	739 53	700.00	432.00	576.00		32 Sewer	700.00		700.00	700.00
33	3,478 98	4,196 01	4,000.00	3,322.20	4,429.60		33 Telephone	6,000.00		6,000.00	6.000.00
34	265 06	238 70	500.00	179.35	239.13		34 Natural Gas	500.00		500.00	500.00
35	252.00	820 90	1,000.00	0.00	0.00		35 Budget/Elections	1 000.00		1,000.00	1,000.00
36	140.54	237 32	150.00	366.56	488.75		36 Board Mtg Expenses	150.00		150.00	150 00
37	7,025.00	7,418 00	8,500.00	8,122.50	8,122.50		37 Insurance/Bond	8,500.00		8,500.00	8,500.00
38		0 00	200.00	0.00	0.00		38 Rent/Lease	200.00		200.00	200 00
39	511 65	709.00	800.00	210.65	280.87		39 Miscellaneous	800.00		800.00	800.00
40	4,142 74	3,183.63	5,000.00	4,436.19	5,914.92		40 Training/Education	6,000.00		6,000.00	6,000 00
41	265.00	350 00	700.00	305.00	406.67		41 Certification Fees	700.00		700.00	700.00
42	0.00	0 00	100.00	0.00	0.00		42 Publications	100.00		100.00	100.00
43	200.00	200 00	1,000.00	200.00	266.67		43 Taxes/Licenses/Permits	1,000.00		1,000.00	1,000.00
44	1,146.06	495 60	1,200.00	880.91	1,174.55		44 Freight	1,200.00		1,200.00	1 200.00
45	2,573.60	2,860 50	3,000.00	4,508.00	6,010.67		45 Water Samples	4,500.00		4,500.00	4,500.00
46	757.00	793 04	1,100.00	1,044.64	1,392.85		46 Dues	1,100.00		1,100.00	1,100 00
47							47				
48	130,003.93	144,143.83	182,200.00	118,820.85	161,427.58		48 Total Materials & Services	193,550.00		193,550.00	193,550.00

	ACTUAL DATA		CURRENT			GENERAL FUND					
	10-11	11-12	13-14	ytd	projected 6/30			Proposed	2014-15	approved	to be adopted
							EXPENDITURES				
1						1	Capital Outlay				
2	1,330.00	2,190.39	0.00	0.00	0.00	2	Land Improvement /fencing			0.00	0.00
3	0.00		208,704.29	0.00	0.00	3	Building Improvement			0	0
4	13.98	30,619.17	0.00	0.00	0.00	4	Equipment /property/shed				
5	5,654.35	38.47	9,500.00	4,034.96	9,000.00	5	safety equip/safety equip	8,500.00	traffic	8,500.00	8,500.00
6	3,058.60	30,717.04	0.00	330.73	330.73	6	trash pumps/ vac trailer/cla-vlv bypass	13,600.00	welder	13,600.00	13,600.00
7						7	Furniture/Fixtures				
8	0.00		0.00	0.00	0.00	8	Water System (Non-SDC)				
9	9,643.82	7,857.65	0.00	5,942.67	7,923.56	9	New Meters				
10	1,064.86	299.95	15,500.00	9,862.52	14,150.03	10	tools /equip/tools/equip	85,000.00	track hoe/trailer	85,000.00	85,000.00
11	3,616.35	782.58				11	upg toolsOSHA /spr monitor	2,500.00	gis/upg	2,500.00	2,500.00
12	135,089.85	207.42				12	wy'east 10"				
13	0.00	2,100.00	0.00			13	computers/software/server	71,000.00	master plan	71,000.00	71,000.00
14	10,229.90	670.35	20,000.00	9,866.71	9,866.71	14	baldwin crk 6 /baldwin crk 6/kingdon drive	10,000.00	air vlv rehab	10,000.00	10,000.00
15	0.00		140,000.00	111,760.97	149,014.63	15	leasure drive	125,000.00	mtr bx mtr (500)	125,000.00	125,000.00
16	0.00	806.63	150,000.00	147,575.63	147,575.63	16	alexander/alexander dr				
17	488.71	2,480.92				17	hr city park (midway)/swyers dethman				
18	138,903.75	101,059.00	0.00	5,815.70	5,815.70	18	clear creek 6 / clear creek				
19	0.00	0.00	0.00	350.00	350.00	19	swyers dethman				
20	2,237.73		0.00	0.00	0.00	20	moe straight hill				
21	0.00	1,114.97	0.00	0.00	0.00	21	cooper spur 6 /straight hill 6				
22	735.67	3,891.74		1,860.57	1,860.57	22	sherrard rd/bracher farms/ cvale henage				
23	1,497.86	10.06		0.00	0.00	23	awald/old dalles dr				
24	173.48	41,310.97	0.00	43,569.18	43,569.18	24	vehicle / neal creek / neal creek				
25	0.00	103,474.24	0.00	7,853.39	7,853.39	25	trailer /swyers drive/swyers drive				
26	208.51					26	straight hill				
27	0.00	4,205.00	31,000.00	11,522.75	15,363.67	27	ehrck hill bridge/odot ehrck hill bridge	31,000.00	ehrck hill bridge/odot	31,000.00	31,000.00
28	6,401.74	9,516.39	30,000.00	7,996.90	16,082.02	28	small line rpl /sm line rpl	40,000.00	small line replacemt	40,000.00	40,000.00
29	673,763.75	685,500.00	685,500.00	685,500.00	685,500.00	29	rsvr$$ / rsvr$$ lgip	685,500.00		685,500.00	685,500.00
30	308.65		0.00	0.00	0.00	30	mason -> van horn	30,480.83	trout creek	30,480.83	30,480.83
31	784.77		0.00	0.00		31	roark 5"	20,000.00	billings road	20,000.00	20,000.00
32	8,804.00	1,046.58	0.00	0.00	0.00	32	GIS sfware upg	20,000.00	clear crk	20,000.00	20,000.00
33	122.44					33	tapping gun				
34	10,580.84	4,089.99	0.00	4,000.00	4,000.00	34	jobs mv/e bill /web pay				
35	1,014,713.61	1,033,789.51	1,290,204.29	1,057,842.68	1,118,255.82	35	Total Capital Outlay	1,142,580.83		1,142,580.83	1,142,580.83
36						36					
37	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	37	Transfer to Vehicle Reserve Fund	10,000.00		10,000.00	10,000.00
38				640.48	640.48	38	lgip general fund$	0.00		0.00	0.00
39	545,000.00	545,000.00	532,482.96	532,482.96	532,482.96	39	Contingency Reserve	532,482.96		532,482.96	532,482.96
40	2,230,022.17	2,309,623.88	2,639,466.25	2,143,270.40	2,390,141.43	40	Total Expenditures	2,478,944.22		2,478,944.22	2,478,944.22
41	-1,160,671.98	-1,173,540.24	-1,477,466.25	-1,308,680.67	-1,192,043.54	41	Income/Loss	-1,360,944.22		-1,360,944.22	-1,360,944.22
42	100,996.44	308,939.11	0.00	25,378.97	142,016.10	42	Resource Balance	0.00		0.00	0.00

	ACTUAL DATA		13-14				VEHICLE RESERVE					
	11-12	12-13	Budget	ytd $$$	JUNE 30		RESOURCES	Proposed	2014-15		approved	to be adopted
1	37,269.87	25,950.82	27,450.96	27,450.96	27,450.96	1	Beginning Balance	14,793.74			14,793.74	14,793.74
2	65.44	0.14	0.00		0.00	2	Interest	0.00			0.00	0.00
	12,500.00	0.00	0.00	12,500.00	12,500.00		income - used vehicle	0.00			0.00	0.00
3	10,000.00	15,000.00	10,000.00	10,000.00	10,000.00	3	Transfer from General Fund	10,000.00			10,000.00	10,000.00
4	22,565.44	15,000.14	10,000.00	10,000.00	10,000.00	4	Total Income	10,000.00			10,000.00	10,000.00
5	59,835.31	40,950.96	37,450.96	49,950.96	49,950.96	5	Total Resources	24,793.74			24,793.74	24,793.74
	0.00	0.00		0.00	0.00		EXPENDITURES					
6	18,006.46	27,450.82	0.00	14,793.74	14,793.74	6	Reserve	24,793.74	reserve		24,793.74	24,793.74
7	33,721.03	13,500.00	37,450.96	35,157.22	35,157.22	7	vehicle/fork lift/vehicle	0.00	vehicle purchase		0.00	0.00
8	51,727.49	40,950.82	37,450.96	49,950.96	49,950.96	8	Total Expenditures	24,793.74			24,793.74	24,793.74
9	8,107.82	0.14	0.00	0.00	0.00	9	Unappropriated Ending Balance	0.00			0.00	0.00

	ACTUAL DATA		Current			SYSTEM DEVELOPMENT FUND					
	11-12	12-13	BUDGET 13-14	ytd	*projected*		RESOURCES	Proposed	2014-15	approved	to be adopted
1	176 097 84	364,430 44	230,795.71	234,770.28	*234,770.28*	1	Beginning Balance	224,735.16		224,735.16	224 735 16
2				159,619.75	*159,619.75*	2	reservoir (lgip)	159,619.75		159,619.75	159,619 75
3	0 00	32.57	500.00	0.00	*0.00*	3	Interest Income	500.00		500.00	500 00
4	23,599 00	43,448 01	40,000.00	28,618.00	*28,618.00*	4	System Development Fees	40,000.00	new meters(10)	40,000.00	40,000 00
5	0 00	0 00	0.00	0.00	*0.00*	5				0.00	0 00
6	0.00	0 00	0.00	0.00	*0.00*	6	forest mgmt			0.00	0.00
7	371,650 06	74.793 67	0.00	0.00	*0.00*	7	timber harvest	0.00		0.00	0.00
8	53,551 20	0 00	0.00	0.00	*0.00*	8				0.00	0.00
9	0 00	0 00	0.00	0.00	*0.00*	9				0.00	0 00
10	0.00	0 00	0.00	0.00	*0.00*	10				0.00	0.00
11	0 00	0 00	0.00	0.00	*0.00*	11				0.00	0.00
12	458,800.26	118,274 25	40,500.00	28,618.00	*28,618.00*	12	Total Income	40,500.00		40,500.00	40,500.00
13	534,898 10	482 704 69	271,295.71	423,008.03	*423,008.03*	13	Total Resources	424,854.91		424,854.91	424,854.91
							EXPENDITURES				
14	0	0 00				14					
15	0.00	0.00				15	Water System Improvement				
16						16					
17	6714 42	24,358 73	91,295.71	13,989.84	*18,653.12*	17	wtrshd protec/forest mgmt	0.00		0.00	0.00
18						18					
19						19					
20	208,866 04	43,000 00	20,000.00	16,000.00	*20,000.00*	20	timber harvest	2,500.00	replant	2,500.00	2,500.00
21		3,942.00		0.00	*0.00*	21	hanel development				
22		1.134 43		0.00	*0.00*	22	quinn/gilbert				
23						23	office building	262,354.91	office bldg	262,354.91	262,354 91
24						24			(to balance)		
25	157,277 84	159,619 75	160,000.00	159,619.75	*159,619.75*	25	reservoir (lgip$)	160,000.00		160,000.00	160,000.00
26		15,879.50				26	reservoir/property				
27						27					
28	372,858 30	247 934 41	271,295.71	189,609.59	*198,272.87*	28	Total Expenditures	424,854.91		424,854.91	424,854 91
29	85,941 96	-129,660 16	-230,795.71	-160,991.59	*-169,654.87*	29	Income / Loss	-384,354.91		-384,354.91	-384,354 91
30	262,039 80	234.770 28	0.00	233,398.44	*224,735.16*	30	Unappropriated Ending Balance	0.00		0.00	0.00

Appendix 8.2

Water Rate Schedule

WATER RATES

Rate Schedule as of 7-1-2014

Meter Size (in Inches)	Monthly Rate	System Development Fee	Estimate Total Installation Cost
3/4	$ 6.25	$ 4,165.00	$ 5,600.00
1	$10.35	$10,460.00	$11,900.00
1 1/2	$15.25	$20,918.00	$22,500.00
2	$24.00	$33,504.00	$36,000.00
4	$41.35	$104,666.00	call

All water used is charged @ $5.50 per 1,000 gallons (as of 7-1-2014) Standby fire protection is charged at $4.25 per inch of service connection per month.

Installation charges are based on labor** and the actual cost of materials (+30%) plus a system development fee which reflects a cost of investment in the water system to provide service to the property. The above figures are subject to change periodically and shall in no way bind the District to install any service for the charge stated herein.

(** Hourly Rates: Labor @ $40 Backhoe W/ Operator @ $100 Trencher W/ Operator @ 75.00)

Meter sizes of 4, 6, 8 and 10 inches are available. Please contact CSWD for more information.

Appendix 8.3

Oregon Water & Wastewater Funding and Resource Guide

RCAC, 2014

2014

OREGON WATER & WASTEWATER FUNDING AND RESOURCE GUIDE

Compiled by:

RCAC
www.rcac.org

Oregon Water & Wastewater Funding and Resource Guide
April 2014

Background and Purpose

Rural Community Assistance Corporation (RCAC), a private non-profit organization serving 13 states in the West, helps rural communities achieve their vision and goals through training, technical assistance, and access to resources. RCAC works with funding and regulatory agencies and partners to address utility compliance issues for lower income rural communities.

The purpose of the RCAC Oregon Water Wastewater Funding and Resource Guide is to provide an easy to use document which identifies water and wastewater funding programs, agencies, and organizational resources. RCAC hopes that this guide will be used as a tool to help you move forward with water and wastewater infrastructure projects in your community**.**

Scope

The Guide provides information on primary agency funding programs which support planning, predevelopment, and construction of drinking water and wastewater infrastructure projects. It also includes information on resources available to assist communities with completing drinking water and wastewater projects, addressing regulatory compliance, drinking water protection, improving water quality and local public health. Additional resources may be available. Please contact RCAC to suggest a resource to include in this guide.

Contents

- Agencies serving water/wastewater needs for small Oregon communities
- Funding programs for water and wastewater projects

Key Project Stages

- Planning
- Predevelopment
- Engineering and Design
- Construction

This publication was made possible by Grant Number 90EF0069-04-00 from Health and Human Services and Rural Community Development Activities Program. The information was compiled in partnership with agencies and organizations by Rural Community Assistance Corporation (RCAC). RCAC is the Western regional affiliate of the Rural Community Assistance Partnership, Inc. (RCAP).

For more information on Rural Community Assistance Corporation, visit: www.rcac.org

Agencies Serving Water/Wastewater Needs of Small Oregon Communities

U.S. Environmental Protection Agency
EPA Region 10 Oregon Operations Office
805 SW Broadway, Suite 500
Portland, OR 97205
Joel Salter Oregon Water Programs Coordinator
Phone: (503) 326-2653
Email: Salter.Joel@epa.gov

Drinking Water SRF Site:
http://yosemite.epa.gov/r10/water.nsf/Drinking+Water/State+Revolving+Fund

Clean Water SRF Site:
http://yosemite.epa.gov/R10/ecocomm.nsf/state+revolving+fund/cwsrf

United States Department of Agriculture Rural Development (USDA RD)
1201 NE Lloyd Blvd., Ste. 801
Portland, OR 97232-1274
Sam Goldstein, Community Programs Director
Phone: (503) 414-3362
Email: Sam.goldstein@or.usda.gov

Website: http://www.rurdev.usda.gov/ORcp.html

U.S. Department of Health and Human Services
Portland Area Indian Health Service
1414 NW Northrup Street, Suite 800
Portland, OR 97209
Phone: (503) 414-5555
Website: www.ihs.gov

U.S. Department of Commerce Economic Development Administration (EDA)
121 SW Salmon Street, Suite 244
Portland, OR 97204
David Porter, Economic Development Representative
Phone: (503) 326-3078
Email: dporter@eda.doc.gov

Oregon Health Authority (OHA)
Drinking Water Services
PO Box 14450
Portland, OR 97293-0450
Phone: (971) 673-0422
Website: http://healthoregon.org/dwp

Adam DeSemple, Safe Drinking Water Revolving Loan Fund, (971) 673-0422

Tony Fields, Planning Protection & Certification Manager, (971) 673-2269

Debra Lambeth, Environmental Review Coordinator, (971) 673-0414

Tom Pattee, Groundwater Protection, (541) 726-2587 x 24

Kari Salis, Technical Services Region 1, (971) 673-0423

Karen Kelley, Technical Services Region 2, (541) 726-2587 x 22

Julie Wray, Plan Review, (971) 673-0408

Technical Assistance:
HBH Consulting Engineers, Inc., (503) 625-8065

Oregon Business Development Department (OBDD)
Infrastructure Finance Authority (IFA)
775 Summer St. NE, Suite 200
Salem, OR 97301-1280
Phone: (503) 986-0123
Email: infrastruture.info@state.or.us

Website: www.orinfrastructure.com

Agencies Serving Water/Wastewater Needs of Small Oregon Communities *Continued*

Oregon Department of Environmental Quality (DEQ)

811 SW Sixth Avenue
Portland, OR 97204-1390

Clean Water State Revolving Fund (CWSRF)
Katie Foreman, Program Coordinator: (503) 229-5622
Kathy Estes, Loan Specialist: (503) 229-6814
Website: www.deq.state.or.us/wq/loans/loans.htm

Drinking Water Protection Program
Sheree Stewart, Program Coordinator: (503) 229-5413
Julie Harvey, Drinking Water Specialist: (503) 229-5664

Website: www.deq.state.or.us/wq/dwp/dwp.htm

Rural Community Assistance Corporation (RCAC)

1020 S.W. Taylor Street Suite 450
Portland, OR 97205

Chris Marko, Rural Development Specialist
(503) 228-1780 cmarko@rcac.org

RosAnna Noval, Rural Development Specialist
(503) 308-0207 rnoval@rcac.org

Website: www.rcac.org

Additional Resources for Water and Wastewater Needs

Association of Oregon Counties 1201 Court St NE Suite 300 Salem, OR 97301 Laura Cleland Phone: (503) 585-8351 Website: www.aocweb.org LOCAP Underwriter: Wedbush Securities, Katie Schwab, (503) 471-6798	**League of Oregon Cities** 1201 Court St. NE, Suite 200 Salem, OR 97301 Susan Muir Phone: (503) 588-6550 Website: www.orcities.org LOCAP Underwriter: Wedbush Securities, Katie Schwab, (503) 471-6798
Special Districts Association of Oregon PO Box 12613 Salem, OR 97309 Phone: (503) 371-8667 Website: www.sdao.com Luann Richey, (503) 371-8667 x 113	**Oregon Water Resources Department** 725 Summer Street NE, Suite A Salem, OR 97301 Phone: (503) 986-0900 Website: www.oregon.gov/owrd
Oregon Association of Water Utilities 935 N Main Street Independence, Oregon 97351 Phone: (503) 837-1212 Website: www.oawu.net	**Oregon Watershed Enhancement Board** 775 Summer St. NE Suite 360 Salem, OR 97301 Phone: (503) 986-0178 Website: www.oregon.gov/OWEB

Federal Regulatory Information:

Safe Drinking Water Act (SDWA): www.epa.gov/safewater/sdwa

Clean Water Act (CWA): http://www.epa.gov/oecaagct/lcwa.html

National Pollutant Discharge Elimination System (NPDES): http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45

FUNDING PROGRAMS FOR WATER AND WASTEWATER PROJECTS IN OREGON
Planning and Predevelopment

Program	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
OBDD Infrastructure Finance Authority (IFA) **Community Development Block Grant (CDBG)**	Preliminary engineering and planning – water master plans, wastewater facilities plans, water conservation and management plans, capital improvement plans, inflow and infiltration studies. Final engineering – preliminary engineering reports, studies	Projects must principally benefit low to moderate income people in non-entitlement cities and counties. Projects must serve primarily residential needs, not primarily for capacity building.	• Grants up to $175,000 for preliminary engineering and planning • Grants up to $3,000,000 for final design engineering and construction	Competitive applications are accepted year-round and reviewed quarterly. All awards are subject to funding availability. Contact the Oregon Business Development Department (OBDD) at (503) 986-0123 and ask for your regional coordinator, or view program details at: www.orinfrastructure.com
OBDD IFA **Special Public Works Fund (SPWF)**	Preliminary engineering studies; and economic investigations related to municipal utility projects (water, wastewater, stormwater)	Cities, counties, county service districts (ORS Chapter 451), Tribes, ports, & districts (ORS 198.010)	• Grants up to $60,000 or 85% of project costs. • Loans available at reduced interest rates/7-year term.	Apply year-round based on funding availability. Contact OBDD at (503) 986-0123 and ask for your regional coordinator or view program details at: www.orinfrastructure.com
OBDD IFA **Water Wastewater (WWF)**	Preliminary planning, engineering studies and economic investigations in preparation for construction projects that address an existing or pending compliance issue.	Cities, counties, county service districts (ORS Chapter 451), tribes, ports and districts (ORS 198.010). For a population of less than 15,000 with a Notice of Non-compliance or potential notice.	• Grants up to $20,000 • Loans up to $20,000	Apply year-round based on funding availability. Contact OBDD at (503) 986-0123 and ask for the regional coordinator or view program details at: www.orinfrastructure.com
USDA-Rural Development Pre-development Planning Grant (PPG)	Water and/or wastewater planning; preliminary engineering reports, environmental reports, and other work to assist in developing a project that is expected to be funded by RD in the next 12 – 18 months.	Public bodies (such as municipality, county, district or authority); non-profit organizations, and Indian tribes. Priority given to the smallest and poorest communities and systems with limited resources.	• Maximum $25,000 grant or 75% of project costs, whichever is less.	Apply year-round based on funding availability. Contact USDA-Rural Development Oregon State Office at (503) 414-3360 and ask for your regional loan specialist or view program details at: www.rurdev.usda.gov/UWP-predevelopment.htm

FUNDING PROGRAMS FOR WATER AND WASTEWATER PROJECTS IN OREGON
Planning and Predevelopment continued

Program	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
USDA-Rural Development Special Evaluation Assistance for Rural Communities and Households **(SEARCH)**	Water and/or wastewater planning; preliminary engineering reports, environmental reports, and other work to assist in developing a project that is expected to be funded by RD in the next 12-18 months.	Public bodies (such as municipality, county, district or authority); non-profit organizations, and Indian tribes. Priority given to the smallest and poorest communities and systems with limited resources.	• Maximum $30,000 grant or 100% of project costs, whichever is less	Apply year-round based on funding availability. Contact USDA-Rural Development Oregon State Office at (503) 414-3360 and ask for your regional loan specialist or view program details at: www.cfda.gov (Number 10.759)
Rural Community Assistance Corp. Loan Fund Feasibility and Predevelopment	Water and/or wastewater planning; environmental work; and other work to assist in developing an application for infrastructure improvements	Nonprofit organizations, public agencies and tribal governments serving rural areas with a population of 50,000 or less; or 10,000 if guaranteed by RD financing	• Max $50,000 for feasibility loan • Max $350,000 for predevelopment loan • 1 year term • Interest rate @ 5.5%	Applications accepted anytime Contact: Josh Griff at (720) 951-2163 or jgriff@rcac.org. Applications available on-line at www.rcac.org
EDA Technical Assistance Grants Feasibility Studies	EDA's mission is to help economically distressed communities in ways that help them build long-term economic development capacity. Projects must foster the creation or retention of higher-skilled, higher-wage employment opportunities for local displaced workers and attract private-sector capital investment.	Indian Tribes; state, county, city or other political subdivisions of a state; institutions of higher education; public or private non-profit organizations or associations	• $50,000 to $75,000 • Local match required • Grant funds received from other Federal Agencies may **not** be used to satisfy local share match.	Visit agency website at www.eda.gov and review latest "Federal Funds Announcement" (FFO). Submit application through www.grants.gov
Clean Water State Revolving Fund (CWSRF)	Loans are available for planning and design projects associated with: publicly owned wastewater treatment and stormwater facilities and systems, non-point source water quality improvement projects and estuary management projects.	Federally recognized tribal governments, cities, counties, sanitary districts, soil and water conservation districts, irrigation districts, various special districts and certain intergovernmental entities.	• Loan only • Up to 5 years • Substantially discounted interest rate • No annual fee	Applications accepted year round with scheduled review and ranking in February, June and October. Contact the Oregon Department of Environmental Quality (DEQ); call Katie Foreman at (503) 229-5622.

FUNDING PROGRAMS FOR WATER AND WASTEWATER PROJECTS IN OREGON
Construction

Program	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
OBDD IFA **Community Development Block Grant (CDBG)**	All projects must be in accordance with an approved water plan or wastewater plan. Eligible activities include: construction engineering; acquisition of property (including easements); grant administration; and audits. Projects addressing an existing or pending compliance issue will score higher.	Projects must principally benefit low to moderate income people in non-entitlement cities and counties. Projects must serve primarily residential needs and not be for capacity building.	• Maximum Grant of $3 million, subject to the maximum $3 million per project limitation during a five-year period. • Single grant may be awarded to cover final engineering and construction.	Competitive applications accepted year-round and reviewed quarterly. All awards are subject to funding availability. Contact OBDD at (503) 986-0123 and ask for your regional coordinator or view program information at www.orinfrastructure.com
OBDD IFA **Special Public Works Fund (SPWF)**	Planning for raising and managing funds, pre-construction and construction of water, wastewater, stormwater projects. Projects must be publically owned and support economic and community development in Oregon.	Cities, counties, county service districts (ORS Chapter 451), tribes, ports and districts (ORS 198.010)	• Primarily a loan program • Maximum $10 million loan • 25 year term maximum. • Grants based on retention or creation of jobs, up to max. of $5,000 per job • Grants cannot exceed $500,000 or 85% of the project cost, whichever is less	Apply year-round, based on funding availability. Contact OBDD at (503) 986-0123 and ask for your regional coordinator or view program details at www.orinfrastructure.com
OBDD IFA **Water Wastewater Financing (WWF)**	Planning, pre-construction, and construction improvements of drinking water, wastewater, or stormwater projects. Projects must be publically owned and address an existing or pending compliance issue.	Cities, counties, county service districts (ORS Chapter 451), tribes, ports, & districts (ORS 198.010)	• Maximum $10 million loan • 25 year term maximum • Grant eligibility based on median household income • Maximum $750,000 grant	Competitive applications are accepted year-round and reviewed quarterly. All awards are subject to funding availability. Contact OBDD at (503) 986-0123 and ask for your regional coordinator, or view program details at www.orinfrastructure.com

FUNDING PROGRAMS FOR WATER AND WASTEWATER PROJECTS IN OREGON
Construction continued

Program	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
Oregon Health Authority **Safe Drinking Water Revolving Loan Fund (SDWRLF)**	Drinking water system projects must resolve *existing* or *future* non-compliance with *current* or *future* state and federal drinking water standards, that addresses the most serious human health risks, or that is essential to create a new drinking water system improvement that will substantially benefit public health. *Eligible Activities:* Planning, engineering, design, water source construction, land or easement acquisition, treatment, storage, transmission/distribution, system purchase, system consolidation, system creation, system security, restructuring	Public and privately owned community and non-profit non-community public water systems. Federally owned systems are not eligible.	• Projects requesting $3 million or more require additional review and approval from the Drinking Water Advisory Committee • Interest rate fluctuates quarterly (set at 80% of the previous quarters municipal bond rate) • 20-year term maximum • 30-year term maximum for disadvantaged communities • Principal Forgiveness • Green Project Reserve (GPR) financial incentive • Circuit Rider assistance for eligible systems under 10,000 in population	A Letter of Interest (LOI) may be submitted anytime to be eligible for funding consideration. Contact Oregon Health Authority's Drinking Water Services at (971) 673-0405 or go to the OHA website: http://healthoregon.org/srf You may also contact Business Oregon's Infrastructure Finance Authority (IFA) at (503) 986-0123 or visit their website at: http://www.orinfrastructure.org/LOI-Form/ to take you directly to the LOI.
Oregon Health Authority **Drinking Water Source Protection Fund (DWSPF)**	Drinking Water Source Protection projects that lead to risk reduction within a delineated source water area or that would contribute to a reduction in contaminant concentration within the drinking water source.	Any public and privately owned community and non-profit non-community water systems with a completed Source Water assessment. Federally owned systems are not eligible.	• Max $30,000 Grant • Max $100,000 loan • Interest rate fluctuates quarterly (set at 80% of previous quarter's municipal bond rate). • 20 year term • 30-year term maximum for disadvantaged communities	A letter of interest must be submitted to be eligible for funding consideration. Check with OHA on submittal schedule. Contact Oregon OHA Drinking Water Services at (971) 673-0405 or visit http://healthoregon.org/srf or contact OBDD at (503) 986-0123 or visit www.orinfrastructure.com

FUNDING PROGRAMS FOR WATER AND WASTEWATER PROJECTS IN OREGON
Construction continued

Program	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
Clean Water State Revolving Fund (CWSRF)	Loans and bond purchase agreements are available for planning, design, and construction projects associated with: publicly owned wastewater treatment and stormwater facilities and systems, non-point source water quality improvement projects and estuary management projects. Interim financing is also available.	Indian tribal governments, cities, counties, sanitary districts, soil and water conservation districts, irrigation districts, various special districts and certain intergovernmental entities.	• Loan: Up to 20 year term, or life of asset • Bond purchase agreement: Up to 30 year term or life of asset • Interest may be discounted depending on funding type and community demographics • Low annual fee (planning loans exempt from this fee) • Possible principle forgiveness	Applications accepted year round with scheduled review and ranking in the first week of February, June and October. Contact the Oregon Department of Environmental Quality (DEQ); call Katie Foreman at (503) 229-5622, email foreman.katie@deq.state.or.us or contact your local project officer. For a list of project officers, go to: http://www.deq.state.or.us/wq/loans/contacts.htm
USDA-Rural Development Water Environmental Programs (WEP) Direct Loan & Grant Program	Pre-construction & construction associated with constructing, repairing, or improving water, sewer, solid waste or storm wastewater disposal facilities.	Public bodies (such as municipality, county, district, or authority); non-profit organizations and Indian tribes serving financially needy communities with service area populations<10,000.	• Primarily loan program • Grants based on need • Interest rates track AA rated 20 yr. muni. bonds and fixed for life of loan • Lower income communities receive an interest rate subsidy • Up to 40-year loan term	Apply year-round based on funding availability. Contact USDA-Rural Development, Oregon State Office at (503) 414-3360 and ask for your regional loan specialist or view program details at: www.rurdev.usda.gov/ORcp.html
LOCAP Full Faith and Credit Obligations **Bridge financing and full project financing**	New capital projects having a useful life greater than 1 year or refunding outstanding bonds and loans. Includes soft costs, such as staff time, design and professional services, directly related to the project.	Cities and counties that are members of the League of Oregon Cities and Association of Oregon Counties and their component units (i.e., service districts and urban renewal agencies)	• Municipal bond market • Interest at market rates • No maximum principal amount	Applications are accepted anytime. Contact the LOCAP coordinator, Katie Schwab, Wedbush Securities, at (503) 471-6798 or email katie.schwab@wedbush.com
LOCAP Utilities Revenue Bonds **Full project financing**	New capital projects for water, sewer, and stormwater systems having a useful life greater than 1 year or refunding outstanding utility revenue bonds. Includes soft costs, such as staff time, design and professional services, directly related to the project.	Cities and counties that are members of the League of Oregon Cities and Association of Oregon Counties and their component units (i.e., service districts and urban renewal agencies)	• Municipal bond market • Interest at market rates • No maximum principal amount • Requires a Debt Service Reserve Fund and satisfactory coverage	Applications are accepted anytime. Contact the LOCAP coordinator, Katie Schwab, Wedbush Securities, at (503) 471-6798 or email katie.schwab@wedbush.com

FUNDING PROGRAMS FOR WATER AND WASTEWATER PROJECTS IN OREGON
Construction continued

Program	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
RCAC Loan Fund **Construction**	Water, wastewater, solid waste and storm facilities that primarily serve low income rural communities. Includes predevelopment costs	Non-profit organizations, public agencies, and tribal governments rural areas with populations of 50,000 or less, or 10,000 if using RD financing as the takeout	• Max $2 million with commitment letter for permanent financing • Security in permanent loan letter of conditions • 1-3 year term • 1% loan fee • Interest rate 5.5%	Applications are accepted anytime. Contact Josh Griff at (720) 951-2163 or email jgriff@rcac.org Applications available on-line at: www.rcac.org
RCAC Loan Fund **Intermediate Term Loans**	Water, wastewater, solid waste and storm facilities that primarily serve low income rural communities. Includes predevelopment costs	Non-profit organizations, public agencies, and tribal governments rural areas with populations of 50,000 or less; or 10,000 if using RD financing as the takeout	• For smaller capital needs projects • Normally not to exceed $100,000 • Up to 20 year term • Interest rate 5.0%	Applications are accepted anytime. Contact Josh Griff at (720) 951-2163 or email jgriff@rcac.org Applications available on-line at: www.rcac.org
US Economic Development Administration **Public Works Grants**	EDA's mission is to help economically distressed communities in ways that help them build long-term economic development capacity. Projects must foster the creation or retention of higher-skilled, higher-wage employment opportunities for local displaced workers and attract private-sector capital investment.	Indian Tribes; state, county, city or other political subdivisions of a state; institutions of higher education; public or private non-profit organizations or associations	• Public Works grant awards are in the range of $500,000 – $2,500,000 with 50% local matching funds required. • Grant funds received from other Federal Agencies may not be used to satisfy local share match.	Visit agency website at www.eda.gov and review latest "Federal Funds Opportunities" (FFO). Submit application through www.grants.gov